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Fiscal Year 2018 Mitigation Action Plan Annual Report for the 2008 Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory(DOE/EIS-0380)

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Title: **Fiscal Year 2018 Mitigation Action Plan Annual Report for the 2008 Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory**

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Contents

Acronyms and Abbreviations

^{60}Co	Cobalt-60
^{137}Cs	Cesium-137
^{192}Ir	Iridium-192
ASER	Annual Site Environmental Report
DARHT	Dual-Axis Radiographic Hydrodynamic Test
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EM-LA	U.S. Department of Energy's Office of Environmental Management, Los Alamos Field Office
EPC	Environmental Protection and Compliance Group
FONSI	Finding of No Significant Impact
FRS	flood retention structure
FY	fiscal year
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
MAP	Mitigation Action Plan
MAPAR	Mitigation Action Plan Annual Report
N3B	Newport News Nuclear BWXT
NEPA	National Environmental Policy Act
NA-LA	U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Field Office
NNSA	U.S. Department of Energy, National Nuclear Security Administration
ROD	Record of Decision
RLUOB	Radiological Laboratory/Utilities/Office Building

SWEIS	Site-Wide Environmental Impact Statement
TA	technical area
WIPP	Waste Isolation Pilot Plant

Executive Summary

In compliance with the U.S. Department of Energy Order 451.1B, *NEPA Compliance Program*, the Department of Energy/National Nuclear Security Administration Los Alamos Field Office compiled the fiscal year 2018 Mitigation Action Plan Annual Report for the 2008 "Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory (DOE/EIS-0380)". In fiscal year 2018, all specified mitigation actions were conducted. These actions and the status of the mitigations are presented in this report.

In addition, the Supplement Analysis to the 2008 Site-Wide Environmental Impact Statement of the Continued Operation of Los Alamos National Laboratory was completed in fiscal year 2018. This document analyzed current operations for the Laboratory as well mitigations identified in the Mitigation Action Plan to date, which remain relevant and appropriate through 2022.

1.0 Introduction

The 2008 Final Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory (SWEIS) identified potential environmental impacts resulting from the implementation of three alternatives (No Action, Reduced Action, and Expanded Operations) and discussed measures that the Department of Energy/National Nuclear Security Administration (DOE/NNSA) considered for the mitigation or reduction of such potential adverse effects (DOE 2008a). The SWEIS Mitigation Action Plan (MAP) management document explains how the mitigation measures and identified commitments in the 2008 SWEIS and subsequent Records of Decision (RODs) are planned and implemented (DOE 2008b, 2008c, 2009a).

NNSA NAP Section 8b10(h) 451.1, *NEPA Compliance Program*, requires the preparation of an annual report that documents actions in accordance with this issued MAP. The Mitigation Action Plan Annual Report (MAPAR) fulfills this requirement, documenting the mitigation actions identified in the 2008 SWEIS MAP and subsequent MAPs. As required by the 2008 SWEIS MAP, a draft MAPAR summarizing the work conducted by LANS and Newport News Nuclear BWXT (N3B) in the previous fiscal year (FY) is submitted for review to the DOE/NNSA Los Alamos Field Office each October . The DOE/NNSA Los Alamos Field Office finalizes and publishes the MAPAR.

The 2008 SWEIS MAP requires tracking of mitigation actions in a log, with quarterly transmission to the DOE/NNSA Los Alamos Field Office NEPA Compliance Officer. The log includes information regarding the scope, schedule, interim milestones, deliverables, and closures of the mitigation actions and any issues identified during that quarter. The annual MAPAR provides a completed tracking log and a summary of the major actions taken during the previous FY (Appendix A).

During the preparation of the MAPAR, the 2008 SWEIS MAP is reviewed to determine whether the mitigation actions remain effective and if any mitigation actions have been completed and need to be formally closed. Revision of the 2008 MAP may be recommended in the MAPAR to address significant changes, new actions, or deficiencies.

As mitigation measures and commitments are completed, recommendations and documentation for mitigation action closure may be provided in the MAPAR. After authorization for closure or direction for further actions are provided, final closure for mitigation measures and commitments are reported in the MAPAR.

This FY 2018 MAPAR is the tenth MAPAR for the 2008 SWEIS and reflects the status of and actions taken for the remaining mitigation action commitments. Although it was identified in the 2008 SWEIS MAP that all associated mitigation actions were

anticipated to be complete by the end of calendar year 2018, many of the remaining actions are anticipated to continue until 2022 as identified in the Supplement Analysis to the 2008 Site-Wide Environmental Impact Statement of the Continued Operation of Los Alamos National Laboratory or until otherwise directed by the DOE/NNSA Los Alamos Field Office (DOE 2018a).

2.0 Background

The 2008 SWEIS was published in May 2008; the first ROD was published in September 2008, and the second ROD was published in June 2009 (DOE 2008a, 2008b, 2009a). In January 2009, the 2008 MAP (DOE 2008c) was finalized and included outstanding 1999 SWEIS (DOE 1999) MAP commitments, continuing mitigations from National Environmental Policy Act (NEPA) decisions made since the 1999 SWEIS, and continuing mitigations made in the September 2008 and June 2009 RODs for the 2008 SWEIS (DOE 2008b, 2009a). After the second 2008 SWEIS ROD was published, the DOE/NNSA Los Alamos Field Office issued a MAP addendum (DOE 2009b). In November 2010, the 2008 SWEIS MAP was revised (DOE 2010a) to incorporate the MAP associated with the "Final Environmental Assessment for the Expansion of the Sanitary Effluent Reclamation Facility and Environmental Restoration of Reach S-2 of Sandia Canyon at Los Alamos National Laboratory, Los Alamos, New Mexico" (DOE 2010b). The 2008 SWEIS MAP was again revised in FYs 2014 and 2016 (DOE 2014, 2016a) to close out completed mitigations and to add new mitigations. The FY 2016 MAP revision incorporated the 2015 "Chromium Plume Control Interim Measure and Plume-Center Characterization, Los Alamos National Laboratory, Los Alamos, New Mexico (DOE/EA-2005) Mitigation Action Plan" (DOE 2015).

With the issuance of the Supplement Analysis to the 2008 Site-Wide Environmental Impact Statement of the Continued Operation of Los Alamos National Laboratory, a review of the 2008 MAP Revision 3 occurred to determine if new mitigation measures are required (DOE 2018a). Based on this review, no new mitigation measures were identified for inclusion into the 2008 SWEIS MAP revision 3.

With the issuance of the Radiological Laboratory/Utilities/Office Building (RLUOB) Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) during FY 2018, a review of the 2008 MAP occurred to determine if new mitigation measures are required (DOE 2018b, DOE 2018c). Based on this review, the RLUOB EA and FONSI did not identify any new mitigation measures required to be identified in the 2008 SWEIS MAP revision 3.

3.0 Mitigation Action Commitments

This section outlines the mitigation actions, as required by the 2008 SWEIS MAP. These actions are based on the mitigation measures and commitments incorporated in the 2008 SWEIS alternatives and other mitigation measures and commitments from other NEPA decisions as identified in the following sections.

3.1 Dual-Axis Radiographic Hydrodynamic Test Facility Mitigation Action Plan

NEPA Driver:

The "Dual-Axis Radiographic Hydrodynamic Test Facility Final Environmental Impact Statement (EIS) Mitigation Action Plan" (DOE 1996) requires a MAPAR to be prepared as part of implementing the DARHT MAP. The DARHT MAPAR provides a status of specific DARHT Facility operations-related mitigation actions that were implemented to fulfill DOE commitments under the DARHT EIS ROD (DOE 1995).

DOE provided stakeholders with the first DARHT MAPAR in June 2004 (DOE 2004a). Appendix B of this MAPAR is the FY 2017 DARHT MAPAR that provides details of the progress on mitigation action commitments. Because sampling results are not available until the second quarter of each year, the DARHT MAPAR is one fiscal year behind the main 2008 SWEIS MAPAR. This DARHT MAPAR reports on the full scope of actions implemented during FY 2017 (October 1, 2016, through September 30, 2017) and represents 19 years of DARHT Facility operations-related mitigation action plans.

Mitigations:

Mitigation 1: Monitor contaminants once per year by sampling soils, plants, mammals, birds, and road kills at the facility and surrounding areas as well as at a control site away from the DARHT Facility.

Mitigation 2: Conduct site monitoring and evaluation consisting of periodic soil, water, and other environmental analyses for solid, hazardous, mixed, and radioactive wastes.

Mitigation 3: Conduct tribal tours of Nake'muu as requested, and conduct annual maintenance visits.

Actions Taken:

In FY 2017, all radionuclides and chemicals in soil, sediment, and vegetation from around the perimeter of the DARHT Facility were either similar to the baseline statistical reference level or below screening levels protective of biota as reported in the

2018 Annual Site Environmental Report (ASER, LANL 2018a). The majority of elements observed in avian eggs were similar to or below the regional statistical reference level.

The following are a summary of specific actions taken during FY 2017.

- Results of soil and sediment samples collected in May 2017 from around the DARHT Facility and in front of the firing site were compiled and reported in the 2017 ASER (LANL 2018a).
- A report was completed in December 2016: "Chemical Concentrations on Passerine Eggs and Nestlings Collected near the Dual-Axis Radiographic Hydrodynamic Test Facility and Technical Areas (TA) 36, 39, and 16 at Los Alamos National Laboratory" LA-UR-17-31033. The data reported is in the 2017 ASER (LANL 2017a).
- Small mammals were trapped and collected from the north side of DARHT and from a regional background location to allow for comparisons. Mice were submitted for chemical analysis.
- No requests for tribal visits were received during FY 2017, though annual maintenance visits were conducted.

Mitigation Status:

Mitigation 1: Annual requirement complete.

Mitigation 2: Annual requirement complete.

Mitigation 3: Annual requirement complete.

Recommendations:

Continue annual sampling at the DARHT Facility (Mitigations 1 and 2).

Continue visits to Nake'muu as requested by the Pueblo de San Ildefonso and annual maintenance visits (Mitigation 3).

3.2 Trails Management Program

NEPA Driver:

In accordance with the 2003 "Environmental Assessment for the Proposed Los Alamos National Laboratory Trails Management Program" (DOE 2003), DOE continues to implement a MAP for this environmental assessment through the Trails Management program to ensure that recreational trails use at LANL continues to respect and protect sensitive natural and cultural resources. The Trails Management Plan was completed in FY 2016 and includes all mitigations associated with the environmental assessment (LANL 2015a).

Mitigations:

Mitigation 1: Implement the Trails Management Plan.

Actions Taken:

- The Trails Management Program continued to address cultural, biological, safety and security issues as required during FY 2018.
- The Trails Working Group met nine times in FY 2018. Highlights from the Trails Working Group Meeting include:
    - Trail users continued to provide status of LANL trails.
    - Trail users informed authorities of potential vandalism at a popular trailhead.
    - One of the meetings was held at San Ildefonso Pueblo.
    - The development and use of the interactive trail map at the LANL external webpage.
- Continued maintenance of trailhead signs/kiosks.
- Trails were maintained by removing downed hazard trees from various trails near the wellness center.
- In a coordinated effort with N3B, affected trails were closed to avoid conflicts with remediation efforts.

Mitigations Status:

Mitigation 1: Annual requirement complete.

Recommendations:

Continue to implement the Trails Management Plan.

3.3 Special Environmental Analysis Mitigation Action Plan

NEPA Driver:

Mitigations were identified in the 2000 "Special Environmental Analysis for the Department of Energy, National Nuclear Security Administration: Actions Taken in Response to the Cerro Grande Fire at Los Alamos National Laboratory" (DOE 2000a). DOE/NNSA issued the Special Environmental Analysis in September 2000 pursuant to the Council on Environmental Quality regulations implementing NEPA under emergency circumstances and regulatory requirements to provide an analysis of the Cerro Grande fire emergency fire suppression, soil erosion, and flood control actions

taken by DOE/NNSA and LANL between May and November 2000. DOE/NNSA also identified mitigations for these actions.

Mitigations:

Mitigation 1: Monitor biota and sediment contamination behind the Los Alamos Canyon weir and the Pajarito Canyon Flood Retention Structure (FRS), and report results in the ASER.

Mitigation 2: Periodically remove sediment from the Los Alamos Canyon weir based on sedimentation rate and contamination accumulation rate.

Actions Taken:

- Data collected in May 2017 from vegetation and small mammal samples from behind the Los Alamos Canyon weir and Pajarito Canyon FRS are reported in the 2018 ASER (LANL 2018a). Vegetation and small mammal samples submitted for radionuclide and inorganic element analyses from both locations had levels that were either not detected, were below regional statistical reference levels, or were below biota dose screening levels (LANL 2018a).
- Understory vegetation and small mammals from the upgradient side of the Los Alamos Canyon weir and from the Pajarito Canyon FRS were collected in May 2018. All samples were submitted for analysis and results will be published in the 2018 ASER.

Mitigation Status:

Mitigation 1: Annual requirement complete.

Mitigation 2: Not necessary in 2018 due to sediment levels.

Recommendations:

Continue annual biota and sediment sampling for comparison purposes and for ascertaining the total inventory and potential sources of radionuclides, metals, and polychlorinated biphenyls that may be added to the Los Alamos Canyon watershed. Continue additional cleanouts from behind these structures as necessary.

3.4 Flood and Sediment Retention Structures

NEPA Driver:

These mitigations are from the "Environmental Assessment for the Proposed Future Disposition of Certain Cerro Grande Fire Flood and Sediment Retention Structures at Los Alamos National Laboratory, Los Alamos, New Mexico" (DOE 2002).

Mitigations:

Mitigation 1: Annually monitor the Pajarito Canyon FRS for structural integrity and safe operations until removed.

Mitigation 2: Remove portions of the FRS in accordance with DOE/EA-1408 (DOE 2002).

Mitigation 3: Recycle demolition spoils from FRS decontamination, decommissioning, and demolition as appropriate.

Mitigation 4: Leave an aboveground portion of the FRS equivalent to the dimensions of a low-head weir to retain potentially contaminated sediments on LANL land.

Mitigation 5: Remove aboveground portions of the steel diversion wall below the FRS.

Mitigation 6: Recontour and reseed disturbed areas to protect surface water quality in Pajarito Canyon after the FRS is removed.

Actions Taken:

- The annual inspection of the Pajarito Canyon FRS was conducted on September 28, 2018 (UI-RPT-003, R8). The inspection report states, "The main structure does not have any obvious, significant structural deterioration and appears to be in good condition considering the construction method used and expected structure longevity. The failures of the north and south fills do not appear to impact retention structure. No corrective actions are recommended at this time."

Mitigation Status:

Mitigation 1: Annual requirement complete.

Mitigations 2–6: On hold, pending removal of the FRS.

Recommendation:

Continue annual inspections of the FRS. The remaining mitigations are on hold until closure of Material Disposal Area G at TA-54, operated by DOE's Office of Environmental Management; the material generated by the FRS removal is a potential cover material for portions of Material Disposal Area G.

3.5 Off-Site Source Recovery Project

NEPA Driver:

This mitigation is derived from the 2008 ROD for the 2008 SWEIS (DOE 2008a, 2008b).

Mitigation:

Mitigation 1: Institute controls on the quantities and methods of storing sealed sources containing cobalt-60 (^{60}Co), iridium-192 (^{192}Ir), or cesium-137 (^{137}Cs) to mitigate the effects of potential accidents.

Actions Taken:

- Not necessary in FY 2018.

Mitigation Status:

Mitigation 1: The LANL Off-Site Source Recovery Project does not currently accept sealed sources containing ^{60}Co, ^{192}Ir, or ^{137}Cs, the sources for which mitigation measures were identified in the 2008 SWEIS MAP (DOE 2008c).

Recommendation:

None at this time.

3.6 Wildland Fire Management Plan

NEPA Driver:

These mitigations are derived from the "Environmental Assessment for the Wildfire Hazard Reduction and Forest Health Improvement Program at Los Alamos National Laboratory" (DOE 2000b), the 2008 SWEIS and 2008 SWEIS MAP (DOE 2008c), DOE's Wildland Fire Management Program (DOE 2004b), and the 2001 Federal Wildland Fire Management Policy and Implementing Actions (DOE Order 450.1A) (DOE 2008d).

Mitigations:

Mitigation 1: Continue to further reduce the consequences of a wildfire by shipping legacy transuranic waste (currently stored in the TA-54 domes) to the Waste Isolation Pilot Plant (WIPP).

Actions Taken:

- The processing of unremediated nitrate salts was completed in March 2018 under DOE EM. All of the processed drums will be staged at TA-54 by N3B for transport to WIPP (DOE 2016b).
- Performed wildfire mitigation measures prior to the start of the 2018 wildfire season. Mitigation measures included repairing and maintaining fire breaks and roads, creating defensible space around occupied structures by vegetation treatments, and performing fuel treatments in designated areas.

Mitigation Status:

Mitigation 1: Fuels treatment of the TA-54 area changed potential fire behavior in and around the area and greatly reduced the wildfire risk to the facility. WIPP is operational and shipments of transuranic waste to WIPP occurred in FY 2018.

Recommendation:

Continue to develop an integrated wildfire hazard reduction and forest health improvement program to ensure the institution incorporates wildfire risk mitigation into its operations and resume the associated supplemental environmental assessment. Continue reducing consequences of a wildfire by making shipments to WIPP, performing mitigation measures to create defensible space, performing fuel treatments, and maintaining fire breaks and roads as required to reduce consequences of wildfire.

3.7 Commitments to Santa Clara Pueblo

NEPA Driver:

The NNSA recognizes that Laboratory operations have affected the people of neighboring communities in Northern New Mexico, including tribal communities. These effects, which vary in nature across communities, include alterations of lifestyles, community, and individual practices. While the analysis conducted by DOE/NNSA found no disproportionately high or adverse impacts to minority or low-income populations, which was based on comments from the Santa Clara Pueblo, the 2008 SWEIS ROD (DOE 2008b) stated,

> "…NNSA will undertake implementation of the decisions announced in this ROD in conjunction with a MAP. The MAP will be updated as the need arises to identify actions that would address specific concerns and issues raised by the Santa Clara Pueblo as well as those of other tribal entities in the area of LANL."

The 2008 SWEIS ROD also stated,

> "…with respect to the concerns raised by the Santa Clara Pueblo, the NNSA will continue its efforts to support the Pueblo and other tribal entities in matters of human health, and will participate in various intergovernmental cooperative efforts to protect indigenous practices and locations of concerns. NNSA will conduct government-to-government consultation with the Pueblo and other tribal entities to incorporate these matters into the MAP."

To this end, the DOE/NNSA Field Office consulted with Santa Clara Pueblo and agreed to provide one-time funding to the Pueblo to develop a mutually acceptable work plan

that addresses specific environmental justice and human health concerns and issues identified by Santa Clara Pueblo during the 2008 SWEIS process. The work plan included specific tasks and timelines and identified the necessary NNSA and Pueblo resources to help ensure implementation of the plan. In consultation with Santa Clara Pueblo, the DOE/NNSA Field Office will update the MAP to incorporate these actions. The commitments to Santa Clara Pueblo are derived from the 2008 SWEIS MAP (DOE 2008c) and the 2008 SWEIS ROD (DOE 2008b).

Mitigation:

Mitigation 1: The NNSA will continue its efforts to support Santa Clara Pueblo and other tribal entities in matters of human health and will participate in various intergovernmental cooperative efforts to protect indigenous practices and locations of concern. The NNSA will conduct government-to-government consultation with the Pueblo and other tribal entities to incorporate these matters into the 2008 SWEIS MAP.

Actions Taken:

The NNSA issued a Notice of Federal Financial Assistance Award to Santa Clara Pueblo during the fourth quarter of FY 2018. The cooperative agreement will allow DOE/NNSA to collaborate with the Pueblo to complete tasks outlined in the "Work Plan for Santa Clara Traditional Human Health Risk Assessment Scenario and Reasonable Maximum Exposure," which was concurred upon by NNSA.

Mitigation Status:

Mitigation 1: Annual requirement complete.

Recommendation:

Implement the "Work Plan for Santa Clara Traditional Human Health Risk Assessment Scenario and Reasonable Maximum Exposure." With the implementation of the work plan, it is recommended that a determination be made if this mitigation action be formally closed following consultation with the Santa Clara Pueblo.

3.8 Chromium Plume Control Interim Measure and Plume-Center Characterization

NEPA Driver:

The mitigations in the 2015 "Chromium Plume Control Interim Measure and Plume-Center Characterization, Los Alamos National Laboratory, Los Alamos, New Mexico (DOE/EA-2005) Mitigation Action Plan" (DOE 2015) were incorporated into the 2008

SWEIS MAP, Revision 3, for reporting and tracking purposes. DOE-EM Los Alamos and N3B are responsible for the implementation of these mitigation measures during all phases of project construction and operations (DOE 2015).

Mitigations:

Mitigation 1: Mitigate potential noise and light impacts to the Mexican spotted owl during construction, drilling, and pumping activities by planning activities outside their breeding season, preferentially selecting equipment with lower noise levels, and using noise barriers where appropriate.

Mitigation 2: Direct all lighting away from the canyon or habitat areas.

Mitigation 3: Paint infrastructure so it blends in with the landscape to minimize potential visual impacts.

Mitigation 4: Comply with the LANL Cultural Resources Management Plan (LANL 2017b).

Mitigation 5: Comply with the Endangered Species Act by adhering to restrictions outlined in the LANL Threatened and Endangered Species Habitat Management Plan (LANL 2017c).

Mitigation 6: Implement required best management practices detailed in the "Floodplain Assessment of the Chromium Plume Control Interim Measure and Plume-Center Characterization in Mortandad Canyon" (LANL 2015b) to minimize short-term negative impacts.

Mitigation 7: Limit well pad footprints to the smallest size necessary in order to minimize land-use impacts.

Mitigation 8: Revegetate with native perennial vegetation to restore the area as infrastructure is downsized or no longer needed.

Mitigation 9: Implement Environmental Protection Agency-regulated National Pollutant Discharge Elimination System General Permit for discharges from construction activities requirements to minimize the discharge of potential pollutants to watercourses.

Mitigation 10: Implement best management practices that will minimize short-term negative impacts associated with the Discharge Permit 1793 (NMED 2015).

Actions Taken:

- Noise and tree-cutting restrictions associated with the Endangered Species Act and the LANL Threatened and Endangered Species Habitat Management Plan were met for FY 2018 by limiting actions taken during bird breeding season and the number of trees removed in near action areas
- Actions taken to comply with the Cultural Resources Management Plan included closing and filling drill pits on several well pads to minimize footprint. The well pad for the new extraction well was minimized to avoid potential impacts to cultural sites. N3B pipeline installation activities utilized existing roadways to limit land-used impacts.
- All required best management practices associated with Discharge Permit 1793 (NMED 2015) were met during FY 2018.
- All National Pollutant Discharge Elimination System General Permit requirements were met for activities associated with new pipeline installation.
- Continued seeding of native vegetation.

Mitigation Status:

Mitigations 1–6, 8-10: Mitigations ongoing.

Mitigation 7: Well pad footprints were constructed/modified to the smallest size necessary to minimized land-use impacts. Mitigation complete.

Recommendation:

Continue implementing all mitigations until the project is complete.

4.0 References

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Appendix A:

2008 Site-Wide Environmental Impact Statement

FY 2018 Mitigation Action Plan Annual Report

Tracking Log

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Green is an annual completed action; yellow is an ongoing action; red is a closed or on-hold mitigation.

Topic	Mitigation Action Commitment	NEPA Driver	Actions Taken	Mitigation Status	Recommendation	Responsible Party
Transition of Previous LANL NEPA Mitigation Commitments into the 2008 SWEIS MAP						
2.1 DARHT MAP	Monitor contaminants by sampling soils, plants, mammals, birds, and road kills at the DARHT Facility and surrounding areas and at a control site away from the Facility.	MAP for DARHT EIS (DOE/EIS 0228; Oct. 1996)	Soil and sediment samples from around the DARHT Facility and in front of the firing site were collected in the third quarter of FY 2018 for chemical analysis.	**Annual requirement complete.**	Continue annual sampling.	LANS Environmental Protection and Compliance (EPC)
	Site monitoring and evaluation will consist of periodic soil, water, and other environmental analyses for solid, hazardous, mixed, and radioactive wastes.		Results of soil, sediment, and vegetation samples collected in May 2017 from around the perimeter and in front of the firing point of the DARHT Facility were reported in the 2018 ASER (LANL 2018a).	**Annual requirement complete.**	Continue annual sampling.	LANS EPC

Topic	Mitigation Action Commitment	NEPA Driver	Actions Taken	Mitigation Status	Recommendation	Responsible Party
	Conduct tribal tours of Nake'muu as requested and conduct annual maintenance visits.		The FY 2017 annual photographic documentation of Nake'muu was conducted on August 29 and 30, 2017	**Annual requirement complete.**	Continue visits to Nake'muu as requested by the Pueblo de San Ildefonso and annual maintenance visits	LANS EPC
2.2 Trails Management Plan	Implement the Trails Management Plan (LANL 2015a).	DOE/EA-1431 (Aug. 2003) and Finding of No Significant Impact (Sept. 2003)	The Trails Working Group met nine times in FY 2018. Trail markers were corrected and repaired on various trails. Trails around the wellness center were maintained by removing downed hazard trees.	**Annual requirement complete.**	Implement Trails Management Plan.	LANS EPC, DOE/NNSA Field Office: NEPA Compliance Officer and Landlord Program Manager

Topic	Mitigation Action Commitment	NEPA Driver	Actions Taken	Mitigation Status	Recommendation	Responsible Party
2.3 Special Environmental Analysis	Monitor biota and sediment contamination behind the Los Alamos Canyon weir and the Pajarito Canyon FRS, and report results in the ASER.	DOE/SEA-03 (Sept. 2000)	Data collected in May 2017 from vegetation and small mammal samples from behind the Los Alamos Canyon weir and Pajarito Canyon FRS are reported in the 2017 ASER (published in Fall 2018). Understory vegetation and small mammals from the upgradient side of the Los Alamos Canyon weir and from the Pajarito Canyon FRS were collected in May 2018. All samples were submitted for analysis and results will be published in the 2018 ASER.	**Annual requirement complete.**	Continue annual sampling and analysis.	N3B and DOE/NNSA
	Periodically remove sediment from the Los Alamos Canyon weir based on sedimentation rate and contamination accumulation rate.		No sediment from the Los Alamos Canyon weir was removed or sampled in FY 2017. A sediment removal plan is tentatively scheduled for FY 2018.	**Annual requirement complete.**	Continue additional clean-outs as necessary.	N3B
2.4 Flood and Sediment Retention Structures	Annually monitor the FRS for structural integrity and safe operations until removed.	DOE/EA-1408 (Aug. 2002)	The annual inspection of the Pajarito Canyon FRS was conducted on September 28, 2018. No corrective actions are recommended at this time.	**Annual requirement complete.**	Continue annual inspections of the FRS.	LANS Utilities and Institutional Facilities Division

Topic	Mitigation Action Commitment	NEPA Driver	Actions Taken	Mitigation Status	Recommendation	Responsible Party
	Remove portions of the FRS in accordance with DOE/EA-1408.		N/A	**Mitigation On Hold** It is anticipated that the material generated by the FRS removal would be used to cover Material Disposal Area G when capped. Thus, activities are on hold until Area G is ready for capping.	On hold, pending removal of the FRS.	DOE EM
	Recycle demolition spoils from FRS decontamination, decommissioning, and demolition as appropriate.		N/A		On hold, pending removal of the FRS.	
	Consider leaving an aboveground portion of the FRS equivalent to the dimensions of a low-head weir to retain potentially contaminated sediments on LANL land.		N/A	**Mitigation On Hold** This mitigation is on hold until the FRS is removed.	On hold pending removal of the FRS.	LANS Associate Directorate for Nuclear and High-Hazard Operations, LANS EPC
	Remove aboveground portions of the steel diversion wall below the FRS.		N/A	**Mitigation On Hold** This mitigation is on hold until the FRS is removed.	On hold pending removal of the FRS.	LANS Associate Directorate for Nuclear and High-Hazard Operations, LANS EPC
2.4 Flood and Sediment Retention Structures (cont.)	Recontour and reseed disturbed areas to protect surface water quality in Pajarito Canyon after the FRS is removed.		N/A	**Mitigation On Hold** This mitigation is on hold until the FRS is removed.	On hold pending removal of the FRS.	

Topic	Mitigation Action Commitment	NEPA Driver	Actions Taken	Mitigation Status	Recommendation	Responsible Party
Project-Specific Mitigation Measures Analyzed in the SWEIS						
2.5 Off-Site Source Recovery Project	Institute adequate controls on quantities and methods of storing sealed sources containing ^{60}Co, ^{192}Ir, or ^{137}Cs to mitigate effects of potential accidents.	2008 ROD for the LANL SWEIS DOE/EIS-0380 (DOE 2008b; Sept. 2008)	N/A	**Mitigation On Hold** LANL currently does not accept sealed sources containing ^{60}Co, ^{192}Ir, or ^{137}Cs.	N/A	LANS Nuclear Engineering and Nonproliferation Division
Institutional Resource Management Responsibilities						
2.6 Wildland Fire Management Plan	Continue to further reduce wildfire risks by shipping legacy transuranic waste, currently stored in the Technical Area 54 domes, to WIPP.	DOE Wildfire Management Policy (Feb. 2004); 2001 Federal Wildland Fire Management Policy and Implementing Actions (Jan. 2001) SWEIS MAPs DOE/EIS-0380 (2008; 2014)	The processing of unremediated nitrate salts was completed in March 2018. All of the processed drums will be staged at Technical Area 54 for transport to WIPP. Performed wildfire mitigation measures prior to the start of the 2018 Wildland Fire season. Mitigation measures include repairing and maintaining fire breaks and roads, creating defensible space around occupied structures, and performing fuel treatment in designated areas.	**LANS, N3B continued to transport transuranic waste to WIPP in FY 2018.**	Implement pollution prevention projects to reduce or eliminate waste streams. Continue shipments to WIPP. Continue performing mitigation measures to create defensible space, perform fuel treatments, and maintain fire breaks and roads as required to reduce consequences of wildfire.	N3B, LANS EPC, DOE EM

Topic	Mitigation Action Commitment	NEPA Driver	Actions Taken	Mitigation Status	Recommendation	Responsible Party
Commitments to Santa Clara Pueblo						
2.7 Consultations with Santa Clara Pueblo	The DOE/NNSA Field Office shall develop a work plan jointly with Santa Clara Pueblo to address environmental justice and human health concerns and issues identified by Santa Clara Pueblo during the SWEIS process. The work plan will include specific tasks and timelines and identify the necessary NNSA and Pueblo resources to help ensure implementation of the plan. In consultation with Santa Clara Pueblo, the DOE/NNSA Field Office will update the MAP to incorporate these actions.	MAP and 2008 ROD DOE/EIS-0380 (Sept. 2008)	The NNSA issued a Notice of Federal Financial Assistance Award to Santa Clara Pueblo during the fourth quarter of FY 2018. The cooperative agreement will allow the DOE/NNSA to collaborate with the Pueblo to complete tasks outline in the "Work Plan for Santa Clara Traditional Human Health Risk Assessment Scenario and Reasonable Maximum Exposure," which was concurred upon by the NNSA.	Annual commitment complete.	Implement the "Work Plan for Santa Clara Traditional Human Health Risk Assessment Scenario and Reasonable Maximum Exposure." Determine whether to close the mitigation or continue the quarterly reporting.	DOE/NNSA and DOE EM-LA in conjunction with Santa Clara Pueblo

Topic	Mitigation Action Commitment	NEPA Driver	Actions Taken	Mitigation Status	Recommendation	Responsible Party
Transition of LANL NEPA Mitigation Commitments since the Issuance of the 2008 SWEIS						
2.8 Chromium Plume Control Interim Measure and Plume-Center Characterization	Mitigate potential noise and light impacts to the Mexican spotted owl during construction, drilling, and pumping activities by planning activities outside their breeding season, preferentially selecting equipment with lower noise levels, and using noise barriers where appropriate. Direct all lighting away from the canyon or habitat areas.	DOE/EA-2005 MAP (DOE 2015)	Noise and tree-cutting restrictions associated with the Endangered Species Act and the LANL Threatened and Endangered Species Habitat Management Plan were met for FY 2018.	**Mitigation ongoing.**	Continue implementing.	N3B, DOE EM
	Paint infrastructure so it blends in with the landscape to minimize potential visual impacts.		No actions taken in FY 2018.	**Not necessary in FY 2017.**	Continue as necessary.	

Topic	Mitigation Action Commitment	NEPA Driver	Actions Taken	Mitigation Status	Recommendation	Responsible Party
2.8 Chromium Plume Control Interim Measure and Plume-Center Characterization (cont.)	Comply with the LANL Cultural Resources Management Plan.	DOE/EA-2005 MAP (DOE 2015)	Actions taken to comply with the Cultural Resources Management Plan included closing and filling drill pits on several well pads to minimize footprint. The well pad for the new extraction well was minimized to avoid potential impacts to cultural sites.	**Mitigation ongoing.**	Continue implementing.	N3B
	Comply with the Endangered Species Act by adhering to restrictions outlined in the LANL Threatened and Endangered Species Habitat Management Plan (LANL 2017c)		Restrictions for the Endangered Species Act and the LANL Threatened and Endangered Species Habitat Management Plan were met for FY 2018.	**Mitigation ongoing.**	Continue implementing.	

Topic	Mitigation Action Commitment	NEPA Driver	Actions Taken	Mitigation Status	Recommendation	Responsible Party
2.8 Chromium Plume Control Interim Measure and Plume-Center Characterization (cont.)	Implement required best management practices detailed in the "Floodplain Assessment of the Chromium Plume Control Interim Measure and Plume-Center Characterization in Mortandad Canyon" (LANL 2015b) to minimize short-term negative impacts.	DOE/EA-2005 MAP (DOE 2015)	Floodplain restrictions were met for FY 2018.	**Mitigation ongoing.**	Continue implementing.	N3B
	Limit well pad footprints to the smallest size necessary to minimize land-use impacts.		No new actions for FY 2018.	**Mitigation ongoing.**	Continue as necessary.	
	Revegetate with native perennial vegetation to restore the area as infrastructure is downsized or no longer needed.		Seeding of native vegetation occurred in the second quarter of 2018.	**Not necessary in FY 2017.**	Continue as necessary.	

Topic	Mitigation Action Commitment	NEPA Driver	Actions Taken	Mitigation Status	Recommendation	Responsible Party
2.8 Chromium Plume Control Interim Measure and Plume-Center Characterization (cont.)	Implement Environmental Protection Agency-regulated National Pollutant Discharge Elimination System General Permit for discharges from construction activities requirements to minimize the discharge of potential pollutants to watercourses.	DOE/EA-2005 MAP (DOE 2015)	All National Pollutant Discharge Elimination System General Permit requirements were met for activities associated with pipeline installation.	**Mitigation ongoing.**	Continue implementing.	N3B
	Require best management practices that will minimize short-term negative impacts associated with the Discharge Permit 1793.		All requirements of Discharge Permit 1793 were met in FY 2018.	**Annual requirement complete.**	Continue implementing.	

*N/A = not applicable.

Appendix B:

Dual-Axis Radiographic Hydrodynamic Test Facility

Mitigation Action Plan Annual Report for FY 2017

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Dual-Axis Radiographic Hydrodynamic Test Facility

Mitigation Action Plan

Annual Report for Fiscal Year 2017

Prepared for:

U.S. Department of Energy Los Alamos Field Office

National Nuclear Security Administration

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Executive Summary

In fiscal year (FY) 2017, all radionuclides and chemicals in soil and sediment collected from around the perimeter of the Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility were either not detected, similar to baseline statistical reference level (mean plus three standard deviations of chemicals in soil or sediment during the DARHT Facility preoperations monitoring phase), or below ecological screening levels that are protective of biota. The majority of elements observed in avian eggs were similar to or below the regional statistical reference level. There were no impacts from DARHT operations on archaeological resources (i.e., Nake'muu Pueblo). The natural environment has a larger impact on the deterioration of the standing wall architecture than operations at DARHT. Although FY 2017 radionuclide and chemical levels were not at concentrations detrimental to human health or to the environment, there were measurable amounts of depleted uranium in all media, and the levels increased over time until 2006. Concentrations of depleted uranium in most media decreased in 2007, which may correspond to the success of employing steel containment vessels. However, because increases of uranium in all media were noted until at least 2006 and uranium may linger in soils for some time, monitoring of these media will continue until the concentrations are similar to baseline statistical reference levels. Overall, foam mitigation has significantly reduced the amount of blast residues released into the environment compared with open-air detonations, and the use of steel containment vessels further reduced those amounts over foam mitigation.

Acronyms

BA	Biological and Floodplain/Wetland Assessment
CFR	Code of Federal Regulations
DARHT	Dual-Axis Radiographic Hydrodynamic Test (facility)
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EPC-CP	Environmental Protection and Compliance - Compliance Programs
EPC-ES	Environmental Protection and Compliance - Environmental Stewardship
FR	Federal Register
FY	fiscal year
LANL	Los Alamos National Laboratory
MAP	Mitigation Action Plan
MAPAR	Mitigation Action Plan Annual Report
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
ROD	Record of Decision
SWEIS	Site-Wide Environmental Impact Statement
SWPPP	Stormwater Pollution Prevention Plan
TA	technical area
TNT	2,4,6-trinitrotoluene
VPB	Vessel Preparation Building
WFO-FOD	Weapons Facilities Operations, Facilities Operations Directorate
WPA	Work Package Agreement

1.0 Introduction

This Mitigation Action Plan Annual Report (MAPAR) was prepared by the U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA) as part of implementing the Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility Mitigation Action Plan (MAP; DOE 1996). This MAPAR provides status on specific DARHT Facility operations-related mitigation actions implemented to fulfill DOE commitments under the DARHT Environmental Impact Statement (EIS) Record of Decision (ROD; DOE 1995) and MAP and the 2008 Site-Wide EIS (SWEIS) MAP (DOE 2008). In January 2009, the SWEIS MAP was finalized; it includes outstanding 1999 SWEIS MAP commitments, all continuing mitigations from National Environmental Policy Act (NEPA) decisions made since the 1999 SWEIS, and those made in the September 2008 and June 2009 SWEIS RODs. Although no new commitments were identified for DARHT, some of the earlier commitments were completed; for example, the need to continue the archeological monitoring of Nake'muu, the only ancestral pueblo at Los Alamos National Laboratory (LANL) retaining its original standing walls.

The DOE/NNSA Los Alamos Field Office (Field Office) is responsible for implementing the DARHT MAP, which is now included in the 2008 SWEIS MAP. In June 2004, DOE provided stakeholders with the first MAPAR, complete with the full scope of commitments and action plans implemented under the DARHT MAP during fiscal year (FY) 2003.

This MAPAR reports on the full scope of actions implemented during FY 2017 (October 1, 2016, through September 30, 2017) and represents the eighteenth year of DARHT Facility operations-related mitigation measures and action plans. All construction-related mitigation measures and action plans were completed in FY 1999 (LANL 1999).

1.1 Background

DOE issued the final EIS on the DARHT Facility (DOE/EIS-0228) at LANL in August 1995 and published the ROD in the Federal Register (60 FR 53588) on October 16, 1995. The DARHT MAP is being implemented consistent with DOE regulations under the National Environmental Policy Act (NEPA) as stated in DOE's Final Rule and Notice for Implementing NEPA (10 Code of Federal Regulations [CFR] 1021, section 331(a), revised July 9, 1996).

The ROD on the DARHT final EIS states that DOE decided to complete and operate the DARHT facility at LANL while implementing a program to conduct most tests inside steel containment vessels with containment to be phased in over 10 years (the Phased

Containment option of the Enhanced Containment alternative[1]). In general, open-air detonations occurred from 2000 to 2002, and detonations within a foam medium occurred from 2003 to 2006. A containment vessel qualification shot was conducted at the technical area (TA)-39 Firing Point 6 in 2006, and shots within steel containment vessels at the DARHT Facility were implemented in May 2007 through 2016.

The ROD further states that DOE will develop and implement several mitigation measures to protect soil, water, and biological and cultural resources potentially affected by the DARHT Facility construction and operation (DOE 1995). In addition, DOE agreed to an ongoing consultation process with affected American Indian tribes to ensure protection of resources of cultural, historic, or religious importance to the tribes. As discussed in Section 5.11, Volume 1, of the DARHT Final EIS, DOE also committed to taking special precautions to protect the Mexican spotted owl (*Strix occidentalis lucida*) by preparing and implementing a LANL-wide Habitat Management Plan (LANL 2017a) for all threatened and endangered species occurring throughout LANL. The DARHT MAP describes those commitments in detail (DOE 1996).

In December 1995, LANL biologists completed a Biological and Floodplain/Wetland Assessment (BA) for the DARHT Facility as required under the Endangered Species Act of 1973 (Keller and Risberg 1995). The BA includes mitigation measures expected to prevent any likely adverse effect to any threatened or endangered species or modification to critical habitat. The mitigation measures identified in the BA were the basis for U.S. Fish and Wildlife Service concurrence with a finding of "may affect, but not likely to adversely affect," and have been used as the basis for establishing mitigation commitments and action plans for potential impacts to threatened or endangered species and critical habitat as identified in the DARHT MAP. These BA mitigation measures, through implementation of the DARHT MAP, have established some of the guidelines under which the DARHT Facility was constructed and will be operated to mitigate the identified potential impacts.

1.2 MAP Function and Organization

The functions of the DARHT MAP are to (1) document potentially adverse environmental impacts of the Phased Containment option delineated in the final DARHT EIS, (2) identify commitments made in the final EIS and ROD to mitigate those potential impacts, and (3) establish action plans to carry out each commitment (DOE 1996).

[1] In addition to containment with vessels, additional mitigation measures for use at the DARHT facility are ongoing. These include aqueous foam for particulate mitigation that is aimed at reducing release of materials from test shots.

The DARHT MAP is divided into eight sections: Sections I through V provide background information regarding the NEPA review of the DARHT Facility project and an introduction to the associated MAP. Section VI references the Mitigation Action Summary Table, which summarizes the potential impacts and mitigation measures; indicates whether the mitigation is design-, construction-, or operations-related; summarizes the organization responsible for the mitigation measure; and summarizes the projected or actual completion date for each mitigation measure. Sections VII and VIII discuss the MAPAR commitment and the potential impacts, commitments, and action plans.

Under Section VIII, potential impacts are categorized into the following five areas of concern:

- general environment, including impacts to air and water;
- soils, especially impacts affecting soil loss and contamination;
- biological resources, especially impacts affecting threatened and endangered species;
- cultural/paleontological resources, especially impacts affecting the archaeological site known as Nake'muu; and
- human health and safety, especially impacts pertaining to noise and radiation.

Each category includes a brief statement of the nature of the impact and its potential cause(s). The commitment made to mitigate the potential impact is identified. The action plan for each commitment is described in detail with a description of actions to be taken, pertinent time frames for the actions, verification of mitigation activities, and identification of agencies/organizations responsible for satisfying the requirements of the commitment.

1.3 MAP Duration and Closeout

The DARHT MAP will be implemented for the operational life (about 30 years) of the DARHT Facility (DOE 1996). Within the DARHT MAP, each DOE commitment and action plan specifies a time frame, verification strategy, and responsible agency/organization. The MAP also includes a summary of mitigation actions that identifies the projected/actual period of mitigation action completion. Each mitigation action time frame correlates with one or more of the following DARHT Facility project stages: design, construction, and operations. This information generally refers to when an individual action will be initiated and completed. All construction-related mitigation measures were completed in FY 1999 (LANL 1999).

1.4 DARHT Facility Schedule and Status

The court-ordered injunction on DARHT Facility construction was lifted on April 16, 1996, and DOE authorized resumption of construction activities on April 26, 1996. The DARHT Facility construction contractor was fully mobilized on August 23, 1996, and full-scale construction was authorized and began on September 30, 1996. In July 1999, with the appropriate DOE authorization, the DARHT Project Office initiated DARHT Facility operations on the DARHT first axis.

During the late summer of 2000, two high-explosive shots using 16 pounds of 2,4,6-trinitrotoluene (TNT) were performed. The purpose of these two experiments was to acquire accelerometer data on the building at the Nake'muu archaeological site. In the late fall of 2000, the first major hydrotest using the DARHT first axis was performed, fragment mitigation measures were in place, and post-shot cleanup was conducted to minimize the release of contaminants to the environment.

In the summer of 2001, one major system checkout experiment and three major hydrotests were performed. Fragment mitigation measures were in place and post-shot cleanup was conducted to minimize the release of contaminants to the environment. Each of the four experiments returned state-of-the-art quantitative radiographic information. The final three hydrotests illuminated the complex hydrodynamics of mockups of stockpiled systems.

In the fall of 2002, hydrotesting continued with two major experiments that again returned state-of-the-art quantitative radiographic information of mockups of stockpiled systems. Fragment mitigation measures were in place and post-shot cleanup operations were conducted. An aqueous foam containment method of particulate containment and blast mitigation was tested at another firing site for implementation at the DARHT Facility. Also during 2002, the DARHT Project continued the major installation of the injector and accelerator components of the second axis. Two major DARHT second-axis commissioning milestones were achieved in 2002. On July 2, 2002, the second-axis injector achieved conceptual design-4a early with e-beam parameters of >250 amps at >2.0 MeV. On December 21, 2002, the full accelerator achieved the technical criteria of conceptual design-4d with e-beam parameters of >1.0 kA at >12.0 MeV for longer than 400 nanoseconds.

In 2003, the construction of the Vessel Preparation Building (VPB) was completed. One hydrotest was fired in the fall of 2003, returning state-of-the-art quantitative radiographic information of a mockup of a stockpile system. This experiment was the initial implementation of aqueous foam mitigation for a hydrotest experiment at the DARHT Facility. The aqueous foam mitigation method achieved at least a 5% reduction in material released to the open air as prescribed for Phase I of the Phased Containment

option. Steel plates and concrete replaced surface gravel at the firing pad to enhance cleanup activities following experiments.

In FY 2004, two major hydrotests were conducted. Aqueous foam particulate mitigation was implemented during these experiments to mitigate blast effects. One of these experiments was the first foam-mitigated experiment to use the new fabric tent configuration for containing the foam.

In FY 2005, hydrotesting continued with three major hydrotest experiments. Fragment mitigation and aqueous foam particulate mitigation using a fabric tent configuration for containing the foam were implemented during these experiments to mitigate blast effects.

In FY 2006, hydrotesting continued with three major hydrotest experiments. Aqueous foam particulate mitigation using a fabric tent configuration for containing the foam was again implemented during these experiments to mitigate blast effects. The VPB underwent a Phase II readiness review in FY 2006 and was approved to begin operations, including the staging, preparation, and decontamination of containment vessels.

In FY 2007 through 2016, single-walled steel containment vessels were used for all hydrotest experiments to mitigate the fragments and particulate emissions associated with the experiments. These steel containment vessels achieved at least a 40% reduction in material released to the open air as prescribed for Phase II of the Phased Containment option. The steel vessels are transported to VPB where they were decontaminated and prepared for the next experiment. A major DARHT second-axis commissioning milestone was achieved in FY 2007. The DARHT Axis II team successfully kicked four pulses through to the target on the scaled accelerator. Each of the four pulses was 35 nanoseconds in duration and uniformly spaced 400 nanoseconds apart. The kicker and downstream transport system performed extremely well. Overall, three hydrodynamic test shots within steel containment vessels at DARHT were conducted in FY 2007, two in FY 2008, none in FY 2009, four in FY 2010, three in FY 2011, six in FY 2012, five in FY 2013, six in FY 2014, five in FY 2015, four in FY 2016, and seven in FY 2017.

2.0 MAP IMPLEMENTATION

The DARHT MAP is implemented on an annual basis in coordination with the federal FY cycle.

The function of the MAPAR is to fulfill DOE's commitment to the stakeholders to report the general status and critical information regarding activities associated with

implementation of the DARHT MAP. The MAPAR reflects new information or changed project and environmental circumstances and changes in mitigation actions or changes to the MAP. In order to ensure the public has full access to this information, the MAPAR is available int eh LANL's public reading rooms.

The organization of the MAPAR is intended to provide the reader with a clear understanding of the scope and status of mitigation actions implemented annually under the DARHT MAP. The MAPAR consists of the following main sections: introduction and background; MAP implementation; MAP scope, schedule, and status including results on potential impacts; and conclusions and recommendations, including future MAP implementation.

3.0 DARHT MAP SCOPE, SCHEDULE, AND STATUS

This MAPAR documents the scope and results of mitigation action tasks implemented throughout FY 2017. Table 3-1 provides a summary of the scope of potential impacts and commitments addressed in this MAPAR.

Table 3-1: Summary of Potential Impacts and Commitments Addressed in this MAPAR

DARHT MAP Potential Impacts/Commitments	DARHT Phase	MAPAR Section
A. General Environment		
1. Contamination of the environment surrounding DARHT Facility with radioactive or hazardous materials: Commitments (b–e)	Operations	3.1
2. Contamination of the environment with various types of wastes as a result of cleaning out the containment vessels	Operations	3.1
3. Contamination of the environment with various types of hazardous materials as a result of spills within the DARHT Facility	Operations	3.1
4. Contamination of the environment with hazardous levels of various substances as a result of discharges of contaminated water from the DARHT Facility	Operations	3.1
B. Soil		
1. Loss of soil and vegetation could occur during construction and operation of the DARHT Facility as a result of severe stormwater runoff: Commitments (a–c).	Operations	3.2
2. Soil erosion and damage to plants caused by additional construction and operations activities, especially off-road and groundbreaking activities: Commitments (a–e)	Operations	3.2
C. Biological Resources		
1. DARHT Facility construction and operations could impact threatened and endangered species as a result of impacts from firings and other operations and activities at the firing sites: Commitments (b–d).	Operations	3.3
2. DARHT Facility construction and operation could impact the Mexican spotted owl as a result of noise from firings and other operations, as well as other activities at the firing sites: Commitments (n–x).	Operations	3.3
3. DARHT Facility construction and operation could impact the American peregrine falcon (*Falco peregrinus anatum*) as a result of noise from firings and other operations, as well as other activities at the firing sites: Commitments (a, b).	Operations	3.3
4. DARHT Facility construction and operation could impact the Northern goshawk (*Accipiter gentilis*) as a result of noise from firings and other operations, as well as other activities at the firing sites: Commitments (a–c).	Operations	3.3
5. DARHT Facility construction and operation could impact the spotted bat (*Euderma maculatum*) as a result of noise from firings and other operations, as well as other activities at the firing sites.	Operations	3.3

DARHT MAP Potential Impacts/Commitments	DARHT Phase	MAPAR Section
6. DARHT Facility construction and operation could impact the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*) as a result of noise from firings and other operations, as well as activities at the firing sites.	Operations	3.3
7. DARHT Facility construction and operation could impact the Jemez Mountains salamander (*Plethodon neomexicanus*) as a result of noise from firings and other operations, as well as other activities at the firing sites: Commitments (a, b).	Operations	3.3
8. DARHT Facility construction and operation could impact the bald eagle (*Haliaeetus leucocephalus*) as a result of noise from firings and other operations, as well as other activities at the firing sites: Commitments (a, b).	Operations	3.3
9. DARHT Facility construction and operation could impact the Townsend's pale big-eared bat (*Corynorhinus townsendii*) as a result of noise from firings and other operations, as well as other activities at the firing sites: Commitments (a, b).	Operations	3.3
10. DARHT Facility construction and operation could impact the wood lily (*Lilium philadelphicum* var. *andinum*) as a result of firings and other operations, as well as other activities at the firing sites: Commitments (a, b).	Operations	3.3
D. Cultural/Paleontological Resources		
1. Blast effects, such as shock waves and flying debris, from shots using high-explosive charges could affect nearby archaeological sites, especially Nake'muu, and the immediately surrounding environment: Commitments (b, e–g).	Operations	3.4
2. Structural or other damage to as-yet-unknown Native American cultural resources within the area of potential effects for the DARHT Facility site. This could occur as a result of DOE's lack of knowledge of these resources in the DARHT Facility area: Commitments (a, b).	Construction/ Operations	3.4
E. Human Health and Safety		
1. Adverse health effects on workers and the general public from high noise levels associated with the DARHT Facility, especially construction and test firings: Commitment (a)	Construction/ Operations	3.5
2. Adverse health effects on workers from radiation from DARHT Facility operations: Commitments (a–c)	Operations	3.5

3.1 Mitigation Actions for the General Environment

Summary of Potential Impacts

MAP Section VIII.A.1(b–e)

The DARHT MAP identifies the potential for hazardous and radioactive materials to be released to the general environment surrounding the DARHT Facility. Hazardous and radioactive materials could be released to the general environment through the following mechanisms: a structural failure of containment vessels or during open-air firing operations; release of various types of waste as a result of cleaning out the containment vessels; release of various hazardous materials as a result of spills within the DARHT Facility; and release of hazardous levels of various substances as a result of discharges of contaminated water from the DARHT Facility.

Mitigation Action Scope

The operational mitigation actions associated with these potential impacts are as follows:

b) EPC-ES will monitor contaminants by sampling soil, plants, mammals, honey birds, and bees at baseline locations and, following the start of operations, within the potential impact area of DARHT, once per year. Note: Starting in FY 2014, soil plus one biota component (on a rotating basis) will be collected per the MAP.

c) Other site monitoring and evaluation will consist of periodic soil, water, and other environmental analyses for solid, hazardous, mixed, and radioactive wastes should spills or other unplanned events occur.

d) Double- and single-walled steel containment vessels will be used appropriately.

e) Vessels will be decontaminated.

Status

MAP Section VIII.A.1(b)

Since 1996, soil, sediment, vegetation, honey bees, and small mammal samples have been collected from around the DARHT facility and analyzed during the construction phase (1996–1999) for baseline conditions. The results of 4 years of analysis of DARHT samples are summarized in a composite report (Nyhan et al. 2001) and were used to calculate baseline statistical reference levels; these are the concentrations of radionuclides and other chemicals (mean plus 3 standard deviations = 99% confidence level) around the DARHT Facility before the start-up of operations, as per the DARHT MAP (DOE 1996). Baselines for potential contaminants, populations, and species diversity in birds were developed at a later date (Fresquez et al. 2007). Bird abundance

and diversity were not negatively impacted at DARHT Facility based on long-term data (Keller et al. 2015). Avian population monitoring was replaced with avian nest box monitoring in 2014.

In FY 2000, operations-phase environmental monitoring was initiated by collecting a suite of samples similar to those collected during the construction phase. Monitoring environmental media in the years to come will continue to assess cumulative impact by documenting accumulations of contaminants in the environmental media.

Monitored constituents in soil and sediment include radionuclides, beryllium (and other metals), and organic chemicals such as high explosives, dioxins, and furans. The plant and animal samples collected at the DARHT Facility have included trees, small mammals, honey bees, and birds. Starting in 2014, soil plus one type of biota were collected per year, with the biota type being rotated each year, however, avian eggs and nestlings are collected when available and could include annual collections. This section of the MAPAR summarizes the results of analyses of soil, sediment and vegetation collected around the perimeter of the DARHT Facility during FY 2017 (Figure 3-1). All of the data can be found in the Annual Site Environmental Report (LANL 2018).

Composite soil samples (five subsamples per location) were collected in May 2017 on the north, east, south, and west sides of the DARHT Facility perimeter along the fence line (Figure 3-1). An additional soil composite sample was collected about 75 feet north of the firing point along the side of the protective berm. Sediment grab samples were collected on the north, east, south, and southwest sides. All soil and sediment samples were analyzed for tritium, plutonium-238, plutonium-239/240, strontium-90, americium-241, cesium-137, uranium-234, uranium-235/236, uranium-238, the inorganic elements listed previously, and high explosives. The sample nearest the firing point was also analyzed for dioxins and furans.

In 2017, nonviable eggs and a nestling that had died from natural causes were collected from nest boxes near the perimeter of DARHT and analyzed for TAL elements; the nestling was also analyzed for uranium isotopes. Results for tritium are reported on a picocuries per milliliter basis, results for the other radionuclides are reported on a picocuries per gram ash weight basis, and results for the inorganic elements are reported on a milligrams per kilogram wet weight basis.

Results of most chemical analyses were compared with the baseline statistical reference levels. The baseline statistical reference levels for the DARHT Facility are the levels below which 99% of samples collected at the facility occurred during 1996 to 1999, before the beginning of firing site operations (Nyhan et al. 2001). In cases where there are no baseline statistical reference levels (mostly inorganic elements like aluminum, calcium, cobalt, iron, magnesium, manganese, potassium, sodium, vanadium, and zinc),

the soil and biota chemical results were compared with regional statistical reference levels.

Soil and Sediment Results at the DARHT Facility

All radionuclides in soil and sediment collected from within and around the perimeter of the DARHT Facility were either not detected (most results), similar to baseline or regional statistical reference levels, or far below the lowest no-effect ecological screening level. No radionuclides are increasing over time in soil or sediment around the DARHT Facility ($p > 0.05$).

The only radionuclides in soil and sediment around the DARHT Facility site that have been consistently measured above the baseline or regional statistical reference levels over the years are the uranium isotopes, primarily uranium-238. Based on the ratio of uranium-234 to uranium-238, most of these samples represent depleted uranium (uranium from testing activities) rather than natural uranium.

Operations at DARHT Facility have changed since 2007 to include the use of closed-containment vessels. Since 2008, uranium-238 activity near the firing point has mostly decreased to the baseline statistical reference level (Figure 3-2), although the trend is not statistically significant ($p > 0.05$). Uranium-238 activity in soil collected from the south side of DARHT Facility has significantly decreased ($p < 0.05$) since 2007.

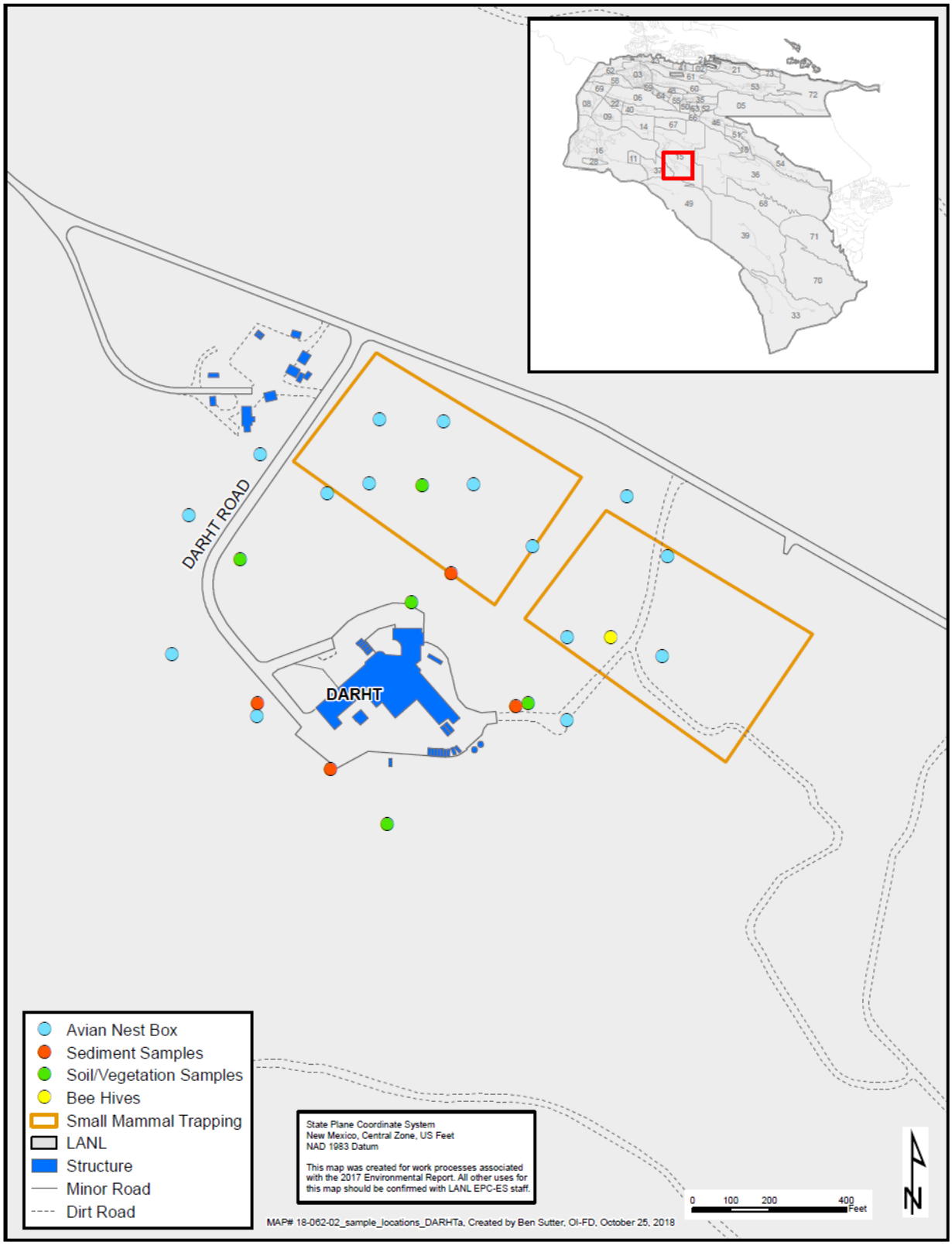

Figure 3-1. Soil, sediment, and biological sample locations at the DARHT Facility.

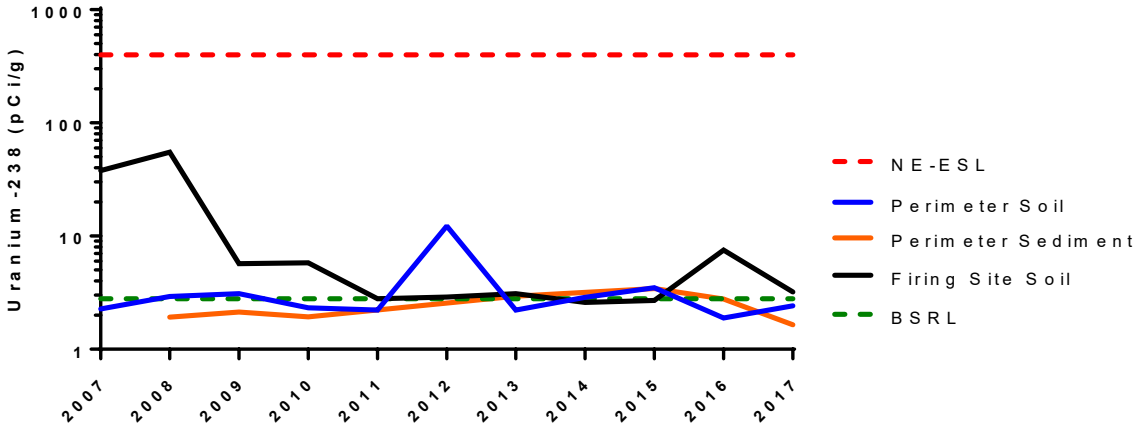

Figure 3-2. Uranium-238 activities in surface soil collected near the firing point and average uranium-238 activities in surface soil and sediment collected around the DARHT Facility perimeter from 2007 to 2017 compared with the baseline statistical reference level (BSRL; mean plus three standard deviations of soil uranium-238 preoperations) and the lowest no-effect ecological screening level (NE-ESL; for lowest no-effect ecological screening level for the plant). Note the logarithmic scale on the vertical axis.

The majority of samples contained selenium concentrations that exceeded the no-effect ecological screening level for the generic plant (0.52 milligrams per kilogram) and the no-effect ecological screening level for the montane shrew (0.70 milligrams per kilogram) but were below the regional statistical reference level, and most values were also below the baseline statistical reference level. The maximum selenium value recorded was 0.75 milligrams per kilogram.

Selenium has significantly increased over time at all soil and sediment sampling locations, including the firing site ($p < 0.05$) since 2007. Arsenic has also increased in soil collected from the south and the east, and antimony has increased in soil from the east of the DARHT Facility. These trends will be monitored closely in future sampling.

The soil sample collected from the firing site in 2017 contained a silver concentration (0.33 milligrams per kilogram) that was higher than the regional statistical reference level (0.26 milligrams per kilogram). However, this concentration was below the baseline statistical reference level (2.1 milligrams per kilogram) as well as below the lowest no effect screening level (2.6 milligrams per kilogram, American robin; (LANL 2017b) protective of biota. All other inorganic elements in the sample collected at the firing site were below the regional statistical reference level, the baseline statistical

reference level, and the lowest no-effect screening level. Barium and selenium concentrations in the soil collected near the firing site have increased over time ($p < 0.05$) since 2007 and will be closely monitored.

Beryllium, listed as a chemical of potential concern before the start-up of operations at the facility (DOE 1995), was not detected above the baseline statistical reference level (1.3 milligrams per kilogram) in any of the soil or sediment samples during 2017. Beryllium concentrations in all soil and sediment samples from 2007 to 2017 have been below the baseline statistical reference level (Figure 3-3). Additionally, beryllium concentrations have significantly decreased in the soil samples collected from the west and south and from the sediment sample collected from the east of the DARHT Facility since 2007 ($p < 0.05$).

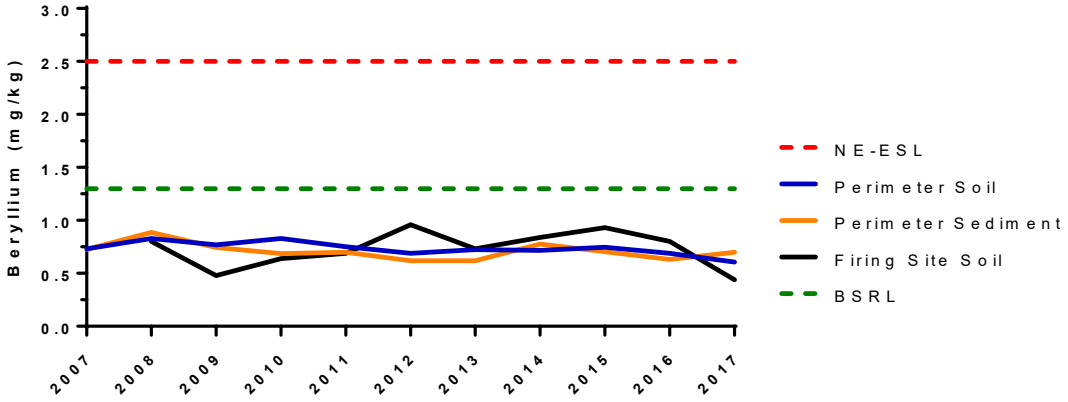

Figure 3-3. Beryllium concentrations in surface soil collected near the firing point and average beryllium concentrations in surface soil and sediment collected around the DARHT Facility perimeter from 2007 to 2017 compared with the baseline statistical reference level (BSRL; mean plus three standard deviations of soil beryllium preoperations) and the lowest no-effect ecological screening level (NE-ESL; for lowest no-effect ecological screening level for the plant). Note the logarithmic scale on the vertical axis. Note mg/kg = milligrams per kilogram.

No high-explosive chemicals were detected in any of the soil or sediment samples collected within or around the perimeter of the DARHT Facility, including the sample closest to the firing point. Most dioxins, including 2,3,7,8-tetrachlorodibenzodioxin (TCDD), and furans were not detected in the sediment sample collected at the firing site. The only dioxins that were detected include 1,2,3,4,6,7,8-heptachlorodibenzodioxin and 1,2,3,4,6,7,8,9-octachlorodibenzodioxin at a concentration of 7.15×10^{-7} and 4.83×10^{-6} milligrams per kilogram, respectively. There are no ecological screening levels for these dioxin congeners, however, toxic equivalent factors for TCDD-like compounds can be used to determine the toxic equivalents of dioxin-like compounds. The toxic

equivalent factor is 0.01 for 1,2,3,4,6,7,8-heptachlorodibenzodioxin and 0.0003 for 1,2,3,4,6,7,8,9-octachlorodibenzodioxin (Van den Berg et al. 2006); multiplying the detectable concentrations of these congeners by their respective toxic equivalents factors yields a value that is orders-of-magnitude less than the no-effect ecological screening level for TCDD.

Avian Egg and Nestling Results at the DARHT Facility

Eggs that did not hatch and nestlings that died of natural causes were collected from nest boxes surrounding the DARHT Facility (Figure 3-1). A total of four egg samples consisting of an individual western bluebird egg (*Sialia mexicana*), an individual mountain bluebird egg (*Sialia currucoides*), an individual ash-throated flycatcher egg (*Myiarchus cinerascens*), and a composite of four western bluebird eggs were collected and submitted for inorganic element analyses. Additionally, one western bluebird composite of three nestlings was collected and analyzed for inorganic elements and uranium isotopes.

Several elements were not detected in bird eggs, including aluminum, antimony, arsenic, beryllium, cadmium, cobalt, lead, nickel, silver, and vanadium. Potassium concentrations in eggs were slightly above (range 2040–2460 milligrams per kilogram) the regional statistical reference level of 1916 milligrams per kilogram. Potassium is an essential macronutrient, so the concentrations observed here are not of concern. All other detectable concentrations of elements were similar or below the regional statistical reference level. Similarly, several elements were not detected in the nestling sample, including uranium-235/236. The nestling sample did contain detectable concentrations of uranium-234 and uranium-238. Uranium isotopes 234, 235/236, and 238 have been detected in soils, sediments, and small mammals collected around the DARHT Facility at levels that have exceeded the regional statistical reference levels in the recent past (Fresquez et al. 2016, Fresquez et al. 2015). These results suggest that uranium is bioavailable and is being incorporated into nestling tissues. Although uranium was detected, it was far below the biota dose screening level, which is 10% of the U.S. Department of Energy limit for radiation doses to biota (DOE 2002). For additional discussion on egg and nestling results from around the DARHT Facility, see Gaukler (2017).

MAP Section VIII.A.1(c)

For routine DARHT Facility operations, the sampling and analysis methodology used in the environmental baseline monitoring conducted under Section VIII.A.1(b) (see above) was designed to include environmental monitoring requirements under this mitigation action. Should the DARHT Facility experience a substantial accidental spill or release of hazardous or radioactive materials, additional environmental monitoring

would be conducted under this mitigation action, as necessary. On January 18, 2005, approximately 385 gallons of mineral oil was released from an aboveground storage tank into the secondary containment system during an oil transfer—this released material did not reach the environment.

MAP Section VIII.A.1(d)

In accordance with the ROD for the DARHT Final EIS, DOE was operating the DARHT Facility while implementing a program to conduct tests inside single-walled steel containment vessels with containment (Note: current DARHT nomenclature is confinement) to be phased in over 10 years (the Phased Containment option of the Enhanced Containment alternative) (DOE 1995). In general, open-air detonations occurred from 2000 to 2006 and detonations within a foam medium occurred from 2002 to 2006. A containment vessel qualification shot was conducted at the TA-39 Firing Point 6 in 2006, and shots within single-walled steel containment vessels at the DARHT Facility were implemented in May of 2007. Three hydrodynamic test shots within single-walled steel containment vessels at the DARHT Facility were conducted in 2007. Two hydrodynamic test shots were conducted within single-walled steel containment vessels at the DARHT Facility in 2008. These steel containment vessels achieved at least a 40% reduction in material released to the open air as prescribed for Phase II of the Phased Containment option.

Measurements using a variety of sampling methodologies (e.g., air particulates, adhesive films, surface swipes, and video analysis) at the firing point and sites downwind (mostly) of the firing point at various distances (50, 135, and 200 meters) during open-air and foam detonations showed that use of foam reduced the size of a plume generated from a hydrodynamic test and the dispersal of contaminants by an average of 80% (Duran 2008); this is far above the 5% reduction prescribed for Phase I of the Phased Containment option.

Similarly, potential contaminant releases during foam mitigation and the use of steel containment vessels were compared using surface swipes, particulate air sampling, and monitoring of detonation gases at the vessel and around the immediate work area. The use of steel containment vessels shows an additional 20% reduction over foam mitigation in potential emissions of uranium and beryllium as a result of a shot. In other words, the use of steel containment vessels reduced the amount of potential contamination by 99.9% and was far above the 40% reduction in material released to the open air as prescribed for Phase II of the Phased Containment option.

MAP Section VIII.A.1(e)

The VPB located at TA-15 near the DARHT Facility underwent a Phase II readiness review in FY 2006 and the facility was approved to begin operations including the staging, preparation, and decontamination of containment vessels. The containment vessel qualification shot conducted in 2006 provided baseline data/characterization of vessel debris resulting from hydrodynamic testing and analysis of the generated gas byproducts to aid in the disposal of future material, to provide data for personnel safety, and to aid in the development of future cleanout procedures for the containment vessels.

Containment vessel decontamination operations began in FY 2007; during FY 2008 containment vessels continued to be decontaminated on the DARHT firing point. Following decontamination, the vessels were transported to the VPB and prepared for the next experiment.

Summary of Potential Impacts

MAP Section VIII.A.2

The DARHT MAP identifies the potential for contamination of the environment with various types of waste as a result of cleaning out the containment vessels.

Mitigation Action Scope

The cleaning operations will recycle materials as much as reasonably possible and use appropriate operations processes to limit discharges of waste to the environment. Waste minimization techniques will be applied to those materials that cannot be recycled and they will be disposed of in permitted disposal facilities.

Status

MAP Section VIII.A.2

LANL completed construction of a permanent VPB to be operated at TA-15 near the DARHT facility. This facility is approved to stage, prepare, and decontaminate, as appropriate, the vessels used in the DARHT hydrodynamic experiments. LANL developed containment vessel cleanout processes in support of the commitment to decontaminate vessels used in experiments.

Process equipment for managing debris from vessel shots was installed in the VPB. Procedures for vessel cleanout, decontamination, and stabilization of debris from vessel shots were prepared to support containment vessel experiments. Waste minimization techniques are applied during the vessel cleanout and decontamination processes.

Typically, nonrecyclable materials are placed into 55-gallon drums, fixed with cement, and disposed of at TA-54, Area G (Zumbro 2010).

Summary of Potential Impacts

MAP Section VIII.A.3

The DARHT MAP identifies the potential for contamination of the environment with various types of hazardous material as a result of spills within the DARHT Facility.

Mitigation Action Scope

Spill containment (physical barriers or sills) within the DARHT Facility will be provided by engineering design to contain all hazardous material spills that could occur. Additionally, a spill prevention control and countermeasures plan will be required before facility operation begins and will be maintained for the life of the facility. Also, a spill response/emergency response team and/or equipment will be available, which can be deployed in the event of an accident.

Status

MAP Section VIII.A.3

Spill containment (physical barriers or sills) within the DARHT Facility is in place and is maintained to contain all hazardous material spills that could occur. A spill prevention control and countermeasures plan was completed and approved before DARHT Facility operations began. This plan will be maintained for the life of the facility consistent with the requirements under the LANL Integrated Safety Management System and Environmental Protection Agency Oil Pollution Prevention Regulation, 40 CFR Part 112. The DARHT Facility has not had a substantial accidental spill of hazardous materials. Should an accidental spill occur in the DARHT Facility, appropriate emergency actions will be taken in accordance with existing operational procedures. These emergency actions would include deployment of the LANL Hazardous Materials Response Team. The Team is on call full-time to respond to all emergency spills within the LANL site and, as needed, the LANL region. The mineral oil release was not considered a spill because it did not reach the environment and did not require Hazardous Materials Response Team deployment.

Summary of Potential Impacts

MAP Section VIII.A.4

The DARHT MAP identifies the potential for contamination of the environment with hazardous levels of various substances as a result of discharges of industrial water from the DARHT Facility cooling tower.

Mitigation Action Scope

Water discharged from the DARHT Facility cooling tower will be monitored to ensure compliance with outfall permits as stated in the National Pollutant Discharge Elimination System (NPDES) permit for the DARHT Facility site. Should discharge levels exceed permit limits, LANL's Environmental Compliance Programs Group (EPC-CP) will act to bring the facility into compliance.

Status

MAP Section VIII.A.4

Water flow from the DARHT facility cooling tower was routinely monitored by EPC-CP to ensure compliance with the NPDES permit. There was an NPDES chlorine exceedance at the DARHT cooling tower (Outfall 03A185) in FY 2006. The compliance sample result of >2.2 mg/L exceeded the daily maximum permit requirement of 500 μg/L (0.5 mg/L). Corrective actions were taken to get the discharge back into compliance. Since 2010, the cooling tower discharges have been tied into the LANL sanitary wastewater treatment plant at TA-46. Consequently, Outfall 03A185 was removed from LANL's NPDES permit on October 10, 2012.

3.2 Mitigation Actions for Soil

Summary of Potential Impacts

MAP Section VIII.B.1(a–c), 2(a–e)

According to the DARHT MAP, loss of soil and vegetation could occur during construction and operation of the DARHT Facility as a result of severe storms and consequent severe stormwater runoff. In addition, off-road and groundbreaking activities caused by additional construction and operational activities may result in further soil erosion and damage to plants.

Mitigation Action Scope

MAP Section VIII.B.1(a–c)

The operational mitigation actions associated with these potential impacts are as follows:

a) Adherence to all soil erosion mitigation measures in accordance with the operational Stormwater Pollution Prevention Plan (SWPPP) to ensure that erosion and sedimentation are minimized and that drainage facilities are in place to control runoff. These measures will include temporary and permanent erosion control, sedimentation control, surface restoration and revegetation, stormwater attenuation in paved and unpaved areas, routine inspection, and best

management practices, which include minimization of fuel and oil spills, good housekeeping practices, and control of stored material and soil stockpiles.

b) Modification of the SWPPP if control measures are ineffective.

c) Establishment and continuance of erosion/sediment control best management practices. The best management practices required by the SWPPP shall be continually monitored and maintained.

Status

MAP Section VIII.B.1(a)

The DARHT Facility operations are conducted in full compliance with an existing SWPPP. The SWPPP has been implemented to ensure that erosion and sedimentation are minimized and measures are in place to control runoff. The plan includes required measures for temporary and permanent erosion control, sedimentation control, surface restoration and revegetation, stormwater attenuation in paved and unpaved areas, routine inspection, and a best management practices plan, which includes minimization of fuel and oil spills, good housekeeping practices, and control of stored material and soil stockpiles. The scope, implementation, and modification of the operational SWPPP are routinely reviewed by Weapons Facilities Operations, Facilities Operations Directorate (WFO-FOD) environmental personnel and EPC-CP.

MAP Section VIII.B.1(b)

If control measures prescribed in the SWPPP are determined to be ineffective, the scope and implementation of the operational SWPPP will be modified, as necessary, by WFO-FOD environmental personnel and EPC-CP.

MAP Section VIII.B.1(c)

Best management practices prescribed in the SWPPP are continually monitored and maintained by DARHT Facility representatives and WFO-FOD environmental personnel. Current control measures have proven appropriate and effective. If control measures are determined to be ineffective, the scope and implementation of the SWPPP are modified, as necessary, by the WFO-FOD environmental personnel and EPC-CP.

Mitigation Action Scope

MAP Section VIII.B.2(a–e)

The operations mitigation actions associated with these potential impacts are as follows:

a) Workers must avoid off-road activities and stay within approved rights-of-way.

b) Any proposed activities requiring the disturbance of mature trees and shrubs must first be approved by EPC-ES to avoid disturbance to threatened and endangered species and other wildlife species.

c) EPC-ES must be notified before any new groundbreaking activities. EPC-ES will review all new sites and evaluate any potential impacts associated with the action. EPC-ES will also provide mitigation to minimize potential impacts, including revegetation as addressed in the SWPPP.

d) The size of a vegetation buffer zone between the facilities and the edge of the mesa tops will be determined by EPC-ES based on topographic aspects and vegetation composition.

e) Native vegetation, for this elevation and forest type, will be planted, as appropriate, for erosion control, landscaping, and additional wildlife habitat.

Status

MAP Section VIII.B.2(a)

DARHT Facility operations are conducted according to procedures that, in part, restrict facility workers to designated areas. Access to undesignated areas of the DARHT Facility site is managed according to procedures that restrict access to authorized personnel on special work assignments such as post-shot material recovery or fire-suppression operations. All other workers avoid off-road activities and stay within approved rights-of-way.

MAP Section VIII.B.2(*b-e*)

In accordance with System Description (SD) 400 *Environmental Management* System, all new and modified planning, construction, and operations activities (excluding office, business, and administrative functions) must be reviewed for requirements and needed controls for the following:

- Air Quality
- Biological Resources
- Cultural Resources
- National Environmental Policy Act
- Pollution Prevention, including resource conservation and sustainable practices
- Potential Release Sites (contaminated sites)
- Waste and Materials Management
- Water Quality

In addition to requiring full compliance with the above, the SD400 requires full and effective implementation of the LANL Habitat Management Plan (LANL 2017). EPC-ES is the Office of Institutional Coordination for the SD400 and is responsible for developing, revising, and maintaining the document, as well as technically assisting in its full and effective implementation

Under the LANL Five-Year Wildland Fire Management Plan (2016-2020) (LANL 2016) and weapons facilities procedure *Vegetation and Fuels Prescription Control Requirements for Sited High Explosives Facilities* (WFO-OP-276), defensible space surrounding the DARHT Facility has been maintained. The DARHT Facility site defensible space activities were reviewed by EPC-ES biologists and EPC-CP stormwater subject matter experts to ensure appropriate protection of Mexican spotted owl and other wildlife habitat in the area (such as vegetation buffer zones and erosion control). All applicable NEPA, biological resources, and cultural resources regulatory requirements, including MAP Section VIII.B.2(b–e), for DARHT Facility operations and other facility management activities around the DARHT Facility site are fully addressed through the ongoing implementation of SD400.

3.3 Mitigation Actions for Biological Resources

Summary of Potential Impacts

MAP Section VIII.C.1(b–d); 2(n–x); 3(a, b); 4(a–c); 5(a); 6(a); 7(a, b); 8(a, b); 9(a, b); and 10(a, b)

According to the DARHT MAP, DARHT Facility construction and operation could impact federally protected threatened and endangered species such as the Mexican spotted owl because of noise from firings and other operations, as well as other activities at the firing site.

Mitigation Action Scope

MAP Section VIII.C.1(b–d); 2(n–x); 3(a, b); 4(a–c); 5(a); 6(a); 7(a, b); 8(a, b); 9(a, b); and 10(a, b)

These sections of the DARHT MAP commit DOE and LANL to implementing mitigation measures selected to protect threatened, endangered, and sensitive species in the DARHT Facility area. These mitigation measures collectively require DARHT Facility representatives to continue to coordinate with EPC-ES on all DARHT Facility site threatened and endangered species issues through the ongoing implementation of the LANL Habitat Management Plan. LANL biologists will conduct the necessary species monitoring and habitat protection measures required for the DARHT Facility site through the Habitat Management Plan (LANL 2017a).

Status

MAP Section VIII.C.1(b–d); 2(n–x); 3(a, b); 4(a–c); 5(a); 6(a); 7(a, b); 8(a, b); 9(a, b); and 10(a, b)

Since January 1999, LANL has fully implemented the Habitat Management Plan. During FY 2000, site-wide implementation of the Habitat Management Plan was included as part of the institutional requirements in SD400. All applicable NEPA, biological resources, and cultural resources regulatory requirements (including MAP Section VIII.C.1 [b–d]; 2 [n–x]; 3 [a, b]; 4 [a–c]; 5 [a]; 6 [a]; and 7 [a, b]) for DARHT Facility operations are addressed through the ongoing implementation of SD400. The Habitat Management Plan was last updated in 2017. No Mexican spotted owls were found around DARHT in FY 2017.

3.4 Mitigation Actions for Cultural Resources

Summary of Potential Impacts

MAP Section VIII.D.1(b, e–g)

The DARHT MAP identifies potential impacts from blast effects, such as shock waves and flying debris, from shots using high-explosive charges. These blast effects could affect nearby archaeological sites, especially Nake'muu, and the immediate surrounding environment.

Mitigation Action Scope

MAP Section VIII.D.1(b, e–g)

The operations mitigation actions associated with these potential impacts are as follows:

b) For large, high-explosive-charge experiments, a temporary expendable fragment mitigation, consisting of glass plates (to dissipate energy), a sand bag revetment, or other shielding material, will be constructed as necessary on a case-by-case basis to mitigate blast effects.

e) A long-term monitoring program will be implemented at Nake'muu using photographs or other means of recording to determine if activities at TA-15 are causing any structural changes to the cultural site over time.

f) DOE will periodically arrange for tribal officials to visit cultural resource sites within TA-15 that are of particular interest to the tribes (at least once a year). DOE is now conducting visits to cultural resource sites in TA-15 as well as Nake'muu when requested by tribal officials.

g) The DARHT Facility operator will periodically pick up metal fragments in the areas where fragments land and will invite local tribes to participate (at least once a year) so that tribal representatives can observe whether there has been damage to any cultural resource sites. DOE will periodically evaluate procedures/measures for mitigation. If damage is discovered, necessary changes will be implemented and reported in the MAPAR. Such changes will be implemented in consultation with the four Accord Pueblos (Cochiti, Jemez, Santa Clara, and San Ildefonso).

Status

MAP Section VIII.D.1(b)

In general, open-air detonations occurred from 2000 to 2006 and detonations within a foam medium and steel containment vessels occurred from 2002 to 2006 and from 2007 to 2008, respectively. None of the large explosive shots in 2002 or 2003 (two shots each year) required fragment mitigation for blast effects, and the employment of foam and steel containment vessels in the latter years significantly reduced the size of a plume and the dispersal of materials (Duran 2008).

Thus, with regard to fragment mitigation measures, all future shots will be evaluated on a case-by-case basis to determine the need for additional fragment protection; however, the current use of steel containment vessels basically eliminates this mitigation concern.

MAP Section VIII.D.1(e)

The results of the 9-year-long annual assessment of physical conditions at Nake'muu (1998–2006) led to the conclusion that the natural environment, in particular the amount of yearly snowfall and elk moving through the site, is responsible for the deterioration of the standing wall architecture, not the operations at the DARHT Facility (Vierra and Schmidt 2006). As a result of this statistically quantitative study, additional annual monitoring at Nake'muu under the DARHT MAP was determined to not be required and was suspended in FY 2007. Note that yearly qualitative assessments of Nake'muu have also been performed as part of the MAP for the Special Environmental Analysis associated with the Cerro Grande fire (DOE 2000a). These field checks, conducted by the LANL Resources Management Team, include brief assessments of the standing walls at Nake'muu along with checks of the associated fire road and firebreak. During the period of FY 2006 to 2009 the Nake'muu field checks were directly tied into the annual visit by the Pueblo de San Ildefonso, which provided Pueblo de San Ildefonso visitors on the DARHT tour with the opportunity to witness and discuss conditions at this ancestral pueblo.

The FY 2017 annual photographic documentation of the site was conducted on August 29 and 30, 2017 by archaeologists on the EPC-ES. One stone from the top of a wall was identified to have fallen since the previous assessment in September 2016. Only one chinking stone was also identified to have fallen from a wall since the previous fiscal year's assessment. Natural erosion continues to be seen throughout the site as well as slight mortar loss. Several wall areas continue to show evidence of undercutting, however no increase in the undercutting in these areas was noted between FY 2016 and FY 2017 assessments (LANL 2017c).

MAP Section VIII.D.1(f)

No requests for visits were received in FY 2017.

MAP Section VIII.D.1(g)

Fragment mitigation measures are implemented for experiments that have the potential to generate fragments. Mitigation measures for material releases to the environment include steel containment vessels, implemented in FY 2007, and aqueous foam, implemented before FY 2007. The post shot operations for the experiments were conducted according to experiment-specific integrated work documents and established procedures.

These procedures were determined appropriate by DOE and are implemented under the LANL Integrated Safety Management System as an integral part of DARHT Facility operations and provide the operational basis and procedures for recovery of metal fragments dispersed during operational shots. In addition to the Integrated Safety Management System requirements, these procedures appropriately address DARHT MAP commitments that are designed to minimize the short- and long-term release of contaminants (radioactive and hazardous materials) to the DARHT Facility site.

Summary of Potential Impacts

MAP Section VIII.D.2(a, b)

The DARHT MAP identifies the potential for structural or other damage to as-yet-unknown Native American cultural resources within the area of potential effects for the DARHT Facility site. Such damage could occur as a result of DOE's lack of knowledge of these resources in the DARHT Facility area.

Mitigation Action Scope

MAP Section VIII.D.2(a, b)

The operational mitigation actions associated with this potential impact are as follows:

a) Consultation with the four Accord Pueblos will continue to identify and protect any such cultural resources throughout the life of activities at the DARHT Facility.

b) Evaluation of cultural resources in the vicinity of TA-15 will also be coordinated with the New Mexico State Historic Preservation Officer, as appropriate, for concurrence of eligibility determinations and potential effects.

Status

MAP Section VIII.D.2(a, b)

No requests for visits were received in FY 2017. 3.5

3.5 Mitigation Actions for Human Health and Safety

Summary of Potential Impacts

MAP Section VIII.E.1(a)

The DARHT MAP identifies potential adverse health effects on workers and the general public from high noise levels associated with the DARHT Facility, especially from construction and test firing.

Mitigation Action Scope

MAP Section VIII.E.1(a)

Under this section of the DARHT MAP there is a commitment to provide noise protection to workers in the form of ear muffs or ear plugs, depending on the expected noise levels, per Occupational Safety and Health Administration Act of 1972 requirements.

Status

MAP Section VIII.E.1(a)

Under the institutional implementation of the Integrated Safety Management System, DARHT Facility operations are managed according to specific procedures that collectively address a wide range of potential impacts to worker safety and health. These procedures fully address potential adverse health effects on workers from high noise levels associated with the DARHT Facility during test firing by requiring the use of appropriate personal protective equipment.

Summary of Potential Impacts

MAP Section VIII.E.2(a–c)

The DARHT MAP identifies the potential for adverse health effects on workers from radiation from DARHT Facility operations.

Mitigation Action Scope

MAP Section VIII.E.2(a–c)

The operations mitigation actions associated with this potential impact are as follows:

a) Radiation shielding will be provided around the accelerators to limit radiation exposure to workers in the facility.

b) DARHT Facility workers will be required to complete DOE-certified core radiological training (minimum Radiation-Worker I level) and be enrolled in the LANL dosimetry program.

c) Engineered controls will be installed as visual indicators to notify workers when the accelerators are operating.

Status

MAP Section VIII.E.2(a–c)

Under the institutional implementation of the Integrated Safety Management System, DARHT Facility operations are managed according to specific procedures that collectively address a wide range of potential impacts to worker safety and health. DARHT Facility accelerator operations are conducted in accordance with the DARHT Operations Standard AP-DARHT-014. This procedure requires appropriate training, radiation dosimetry program participation, and acceleration operations that collectively protect workers from exposure to unacceptable levels of radiation.

4.0 Conclusions

In FY 2017, all radionuclides and chemicals in soil and sediment collected from around the perimeter of the DARHT Facility were either similar to the baseline statistical reference level or below screening levels protective of biota. The majority of elements observed in avian eggs were similar or below the regional statistical reference level.

Although FY 2017 radionuclide and chemical levels were not at concentrations detrimental to human health (DOE 1999a) or to the environment (LANL 2017b, DOE 2002, EPA 2018), there were still measurable amounts of depleted uranium in all media, and the levels were increasing over time to at least FY 2006

The natural environment appears to have a larger effect on the deterioration of the standing wall architecture at Nake'muu than the operations at the DARHT Facility.

4.1 2017 MAP Implementation

In July 1999, all construction-related DARHT MAP mitigation commitments and action plans were completed. The FY 2017 DARHT MAP activities represent the seventeenth year of operation implementation. The DARHT MAP activities implemented during FY 2017 were a continuation of DARHT Facility operations-phase MAP tracking and annual reporting. Should the scope of the DARHT Facility project change during the operations stage, as part of the appropriate NEPA review, the scope of the DARHT MAP could be changed by NNSA as necessary and as directed by the DOE/NNSA Field Office.

4.2 Recommendations

- **Continue monitoring for contaminants that are above baseline statistical reference levels or are on increasing trends.**
- **Continue to issue the DARHT MAPAR annually.** The DARHT MAPAR will continue to be issued annually as part of the SWEIS MAPAR. Detailed analysis of DARHT monitoring data and results will continue to be published in the LANL Annual Site Environmental Report.
- **Continue environmental monitoring activities and tribal visits as requested at Nake'muu.** A formal 9-year annual monitoring project at Nake'muu determined that DARHT operations had no impact on the structure (LANL 2017c). Vegetation removal and site condition monitoring occurs annually and will continue. Tribal visits should continue when requested by the Pueblo (see Section VIII.D.1(f)).
- **Continue to manage DARHT facility operations in accordance with Integrated Safety Management.** Under the institutional implementation of the Integrated Safety Management System, continue to manage DARHT Facility operations according to specific procedures that collectively address a wide range of potential impacts to worker safety and health including, but not limited to, noise and radiation hazards.

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