1-4-2019

Submittal of the Mixed Waste Landfill Five-Year Report, Sandia National Laboratories/New Mexico, EPA ID Number NM5890110518, January 2019

Sandia National Laboratories/NM SNL

Sandia National Laboratories

MIXED WASTE LANDFILL
FIVE-YEAR REPORT

SANDIA NATIONAL LABORATORIES, NEW MEXICO
LONG-TERM STEWARDSHIP

JANUARY 2019

U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

United States Department of Energy
Sandia Field Office

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC., a wholly-owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA-0003525.

MIXED WASTE LANDFILL
FIVE-YEAR REPORT

Facility: Mixed Waste Landfill

Location: Sandia National Laboratories
Albuquerque, New Mexico

EPA ID No.: NM5890110518

Permit Basis: SNL/NM RCRA Facility Operating Permit, Attachment M
New Mexico Environment Department Final Orders:

- *In the Matter of Request for a Class 3 Permit Modification for Corrective Measures for the Mixed Waste Landfill,* No. HWB 04-11(M) (May 2005)

- *In the Matter of Proposed Permit Modification for Sandia National Laboratories EPA ID No. NM5890110518 to Determine Corrective Action Complete with Controls at the Mixed Waste Landfill*, No. HWB 15-18 (P) (February 2016)

Owner: United States Department of Energy
Sandia Field Office
Technical Contact: Mr. David Rast, General Engineer
U.S. Department of Energy, Sandia Field Office
P.O. Box 5400/MS 0184
Albuquerque, NM 87185-5400
(505) 845-5349
David.Rast@nnsa.doe.gov

Operator: National Technology and Engineering Solutions of Sandia, LLC.
Technical Contact: Ms. Christi Leigh, Manager
Environmental Restoration & Stewardship
Sandia National Laboratories
P.O. Box 5800/MS 1103
Albuquerque, NM 87185-5800
(505) 845-0407
cdleigh@sandia.gov

EXECUTIVE SUMMARY

In the May 2005 Final Order, the New Mexico Environment Department (NMED) selected a vegetative soil cover with a biointrusion barrier (i.e., evapotranspirative [ET] cover) as the remedy for solid waste management unit (SWMU) 76, Mixed Waste Landfill (MWL), and established the requirement for a five-year report. This is the first MWL Five-Year Report. The May 2005 Final Order on remedy selection, the February 2016 Final Order on corrective action complete status (NMED May 2005; February 2016), and Section 4.8.2 of the MWL Long-Term Monitoring and Maintenance Plan (LTMMP) (SNL/NM March 2012) establish and delineate the report requirements. As determined by the NMED (Kieling October 2011), the first five-year evaluation period began on January 8, 2014 when NMED approved the LTMMP (Blaine January 2014). In accordance with the LTMMP, this report includes monitoring, inspection, and maintenance results for the first four calendar years under the LTMMP, 2014 through 2017. Subsequent Five-Year Reports will cover a full five-year period.

The MWL is a 2.6-acre SWMU located in the north-central portion of Technical Area-III approximately four miles south of Sandia National Laboratories/New Mexico (SNL/NM) central facilities and five miles southeast of the Albuquerque International Sunport. The MWL was used as a disposal area for low-level radioactive waste, hazardous waste, and mixed waste generated at SNL/NM research facilities and offsite locations from March 1959 to December 1988. The MWL has undergone corrective action and as effective on March 13, 2016, is Corrective Action Complete with Controls (NMED February 2016). All controls required for the MWL are defined in the MWL LTMMP, which is included in Attachment M of the SNL/NM Resource Conservation and Recovery Act (RCRA) Facility Operating Permit (Permit) (NMED January 2015 and Kieling February 2016). Long-term monitoring, maintenance, and reporting are conducted in accordance with the Permit (NMED January 2015, with all approved modifications).

The primary purpose of the Five-Year Report is to evaluate the effectiveness of the selected remedy (i.e., the ET Cover) and the likelihood of contaminants reaching groundwater. The 2014 through 2017 monitoring, inspection, and maintenance results provide the empirical data necessary to establish current site conditions, evaluate the effectiveness of the ET Cover and associated controls, and reevaluate the likelihood of contaminants reaching groundwater. The measure of effectiveness is the protection of human health and the environment.

Based upon four years of monitoring, inspection, and maintenance under the LTMMP, MWL site conditions have improved and continue to be protective of human health and the environment. ET Cover native vegetation has matured and additional best practice measures to reduce erosion and control site drainage have been completed. MWL multi-media monitoring results are consistent with historical data, no trigger levels were exceeded, and there were no indications of new releases or changing conditions that would increase the risk to site workers, the public, or increase the likelihood of contaminants reaching groundwater.

The MWL ET Cover and associated remedy controls are in good condition and performing as designed. The inspection and maintenance results confirm the physical integrity of the ET Cover, site controls, and all monitoring networks. ET Cover maintenance and repairs have decreased over this reporting period as a result of successful revegetation efforts, routine and best practice maintenance, and ET Cover and site improvements (Figure ES-1).

View looking west of the Evapotranspirative Cover

View looking southeast of Monitoring Well MWL-MW8
Western side slope erosion and burrow control improvements
Passive venting BaroBall™ device installed on wellhead

View looking south of western perimeter road
Road ditches and culvert improvements to perimeter drainage

Figure ES-1
Photographs of the Mixed Waste Landfill in Late July 2018

Fate and transport modeling updates were not required based on a comparison of the 2014 through 2017 monitoring results to the previous 2005 modeling. However, the volatile organic compound (VOC) soil-vapor plume model was updated with recent 2014 through 2017 monitoring results to develop a better understanding of plume migration and to reevaluate the likelihood of contaminants reaching groundwater. The updated, simplistic model that conservatively maximizes transport to groundwater predicts VOC soil-vapor concentrations will continue to decrease over time and are unlikely to impact groundwater.

Another Five-Year Report requirement is to reevaluate the feasibility of MWL excavation by updating the *Complete Excavation with Offsite Disposal* remedial alternative originally evaluated in the MWL Corrective Measures Study (CMS) Final Report (SNL/NM May 2003). This requirement was expanded by the February 2016 NMED Final Order to include an evaluation of onsite disposal in a modern landfill that includes a RCRA Subtitle C liner system. This was the only modification to the May 2005 Final Order requirements and is specific to the first Five-Year Report. The evaluation of onsite disposal in a modern landfill was not addressed in the MWL CMS Final Report.

The 2018 excavation feasibility evaluation updates the 2003 evaluation and includes both the offsite and onsite disposal alternatives. Advances in technology since 2003 have not fundamentally changed the excavation and waste management approach. However, radiological decay, use of a more conventional excavation approach, and a streamlined waste management approach represent significant changes. In addition, long-term onsite storage of excavated waste was eliminated for the 2018 evaluation because there are current disposal pathways for all anticipated waste streams.

Complete excavation with offsite and onsite disposal are remedial alternatives that could be implemented, if necessary. There is no short-term risk reduction with excavation remedies as current conditions are protective of human health and the environment. Long-term risk is mitigated by ongoing monitoring and the LTMMP trigger level process. The overall health and safety risk to site workers for the excavation alternatives is high due to the nature of the waste, the complexity and duration of the work, and the risk of physical injury and death associated with remediation construction and transportation hazards. These factors, along with classified waste security requirements and the extensive support facilities required for excavation and waste management, result in substantial technical challenges and a high cost of implementation for both alternatives. MWL excavation and waste management inherently involves significant construction and transportation risk.

MWL site conditions continue to be protective of human health and the environment with multi-media monitoring, inspection, and maintenance/repair safeguards. The monitoring trigger level process provides early warning of changing conditions and requires timely follow-up if a trigger level is exceeded. This process ensures that any future releases or movement of contaminants would be detected and addressed before any detrimental effect on groundwater or increased risk to public health. Best practice measures and follow-up field investigations are being used to improve and better understand site conditions, and plan future actions to protect groundwater, if necessary. This protective approach for the MWL is established in the Permit through the incorporation of the LTMMP in Attachment M. Annual LTMM and Five-Year reporting make all information available to the public. LTMMP monitoring parameters and frequencies have been evaluated as part of this Five-Year reporting effort; no changes are needed for the protection of human health and the environment.

This page intentionally left blank.

TABLE OF CONTENTS

TABLE OF CONTENTS (Concluded)

LIST OF FIGURES

Figure **Page**

LIST OF FIGURES (Continued)

Figure **Page**

LIST OF FIGURES (Concluded)

Figure **Page**

LIST OF TABLES

Table **Page**

LIST OF TABLES (Concluded)

Table **Page**

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

%	percent
ALARA	As Low As Reasonably Achievable
ASTM	ASTM International
CAMU	Corrective Action Management Unit
CFR	Code of Federal Regulations
CWL	Chemical Waste Landfill
BGI Team	Banda Group International and AMEC Foster Wheeler
CMI	Corrective Measures Implementation
CMIP	Corrective Measures Implementation Plan
CMS	Corrective Measures Study
COC	constituent of concern
cy	cubic yards
CY	Calendar Year
D&D	decommissioning and demolition
DOE	U.S. Department of Energy
DOL	U.S. Department of Labor
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
ET	evapotranspirative
ft bgs	feet below ground surface
HazCat	Hazardous Categorization
HEPA	High Efficiency Particulate Air
HWB	Hazardous Waste Bureau
KAFB	Kirtland Air Force Base
LDR	land disposal restriction
LLW	low-level waste
LTMM	Long-Term Monitoring and Maintenance
LTMMP	Long-Term Monitoring and Maintenance Plan
µg/L	micrograms per liter
mrem/yr	millirem per year
MW	mixed waste
MWL	Mixed Waste Landfill
NDA	non-designated area
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Agency
PCE	tetrachloroethene
pCi/L	picocuries per liter
Permit	RCRA Facility Operating Permit for Sandia National Laboratories, EPA ID No. NM5890110518
PPE	personal protective equipment
ppmv	parts per million by volume
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation

ACRONYMS AND ABBREVIATIONS (Concluded)

SAP	Sampling and Analysis Plan
SNL/NM	Sandia National Laboratories, New Mexico
SWMU	Solid Waste Management Unit
TCE	trichloroethene
TSCA	Toxic Substance Control Act
TRU	transuranic
VOC	volatile organic compound
WAC	waste acceptance criteria
WERC	A Consortium for Environmental Education and Technology Development
WIPP	Waste Isolation Pilot Plant

1.0 INTRODUCTION AND BACKGROUND

This is the first Five-Year Report for solid waste management unit (SWMU) 76, Mixed Waste Landfill (MWL), as required by the New Mexico Environment Department (NMED) Final Order (NMED May 2005) that selected the remedy. The MWL is a 2.6-acre SWMU located in the north-central portion of Technical Area-III at Sandia National Laboratories/New Mexico (SNL/NM). This location is approximately four miles south of SNL/NM central facilities and five miles southeast of Albuquerque International Sunport (Figure 1-1). As determined by the NMED (Kieling October 2011), the first five-year evaluation period began on January 8, 2014 when the NMED approved the MWL Long-Term Monitoring and Maintenance Plan (LTMMP) (Blaine January 2014).

The MWL was used as a disposal area for low-level radioactive waste (LLW), hazardous waste, and mixed waste (MW) generated at SNL/NM research facilities and off-site locations from March 1959 to December 1988. The MWL consists of two distinct disposal areas: the Classified Area (occupying 0.6 acres) and the Unclassified Area (occupying 2.0 acres). MWL operational history, including a detailed waste inventory summary by pit and trench, is presented in the following documents.

- *Responses to New Mexico Environment Department Technical Comments on the Report of the Mixed Waste Landfill Phase 2 Resource Conservation and Recovery Act Facility Investigation Dated September 1996* (SNL/NM June 1998)

- *Report of the Mixed Waste Landfill Phase 2 RCRA Facility Investigation* (Peace et al. September 2002, SAND2002-2997)

The MWL is situated between the Manzanita Mountains to the east and the Rio Grande to the west. The ground surface is generally flat with a gentle slope towards the Rio Grande. The regional climate is semi-arid with an average annual rainfall of approximately eight inches per year. Annual net potential evapotranspiration, the amount of water that could evaporate and/or be transpired from the surface and shallow subsurface soils to the atmosphere, is approximately 75 inches per year. In other words, the rate of evaporation and transpiration is approximately nine times greater than the annual precipitation. Groundwater occurs in fine-grained Santa Fe Group alluvial fan sediments approximately 500 feet below the ground surface. Recharge to the regional groundwater aquifer occurs primarily in the Manzanita Mountains approximately five miles east of the MWL.

1.1 Purpose and Scope

The purpose of this report is to analyze the effectiveness of the remedy through a review of monitoring, inspection, and maintenance results collected over the four-year period since NMED approval of the LTMMP (Blaine January 2014). The evaluation period for this report is January 2014 through December 2017. Other report requirements include reevaluation of the feasibility of MWL excavation, updates to the fate and transport model if recent monitoring results differ from the 2005 model, and a reevaluation of the likelihood of contaminants reaching groundwater.

The scope of this report includes addressing all requirements specified in the two Final Orders (NMED May 2005 and February 2016) and the LTMMP, Section 4.8.2 (SNL/NM March 2012). More specific information on the NMED requirements is provided in Section 1.4 of this report.

1.2 Regulatory History

The MWL is a Resource Conservation and Recovery Act (RCRA) SWMU that underwent corrective action in accordance with the following regulatory criteria:

- New Mexico Administrative Code (NMAC), Title 20, Chapter 4, Part 1, Section 600 (20.4.1.600 NMAC) incorporating Title 40 of the Code of Federal Regulations (CFR), Part 264 (40 CFR 264.101)
- SNL/NM RCRA Permit
  - Module IV of RCRA Permit No. NM5890110518 (U.S. Environmental Protection Agency [EPA] August 1993)
  - Facility Operating Permit EPA Identification Number NM5890110518 (NMED January 2015)
- Compliance Order on Consent (NMED April 2004)
- New Mexico Secretary of the Environment's *Final Order In the Matter of Request for a Class 3 Permit Modification for Corrective Measures for the Mixed Waste Landfill Sandia National Laboratories EPA ID No. NM5890110518,* No. HWB 04-11(M) (NMED May 2005)

In October 2014, U.S. Department of Energy/National Nuclear Security Agency (DOE/NNSA) and SNL/NM personnel submitted a request to the NMED for a Class 3 Permit Modification for Corrective Action Complete at the MWL (Beausoleil October 2014). The associated regulatory process included two public comment periods, a public meeting held by DOE/NNSA and SNL/NM personnel in November 2014, and a four-day public hearing held by NMED in July 2015. On February 12, 2016, the NMED issued the *Final Order In the Matter of Proposed Permit Modification for Sandia National Laboratories EPA ID No. NM5890110518 to Determine Corrective Action Complete with Controls at the Mixed Waste Landfill*, No. HWB 15-18 (P) (NMED February 2016). As of March 13, 2016, the February 2016 Final Order became effective, granting the Class 3 Permit Modification to reflect that the MWL is Corrective Action Complete with Controls. All controls required for the MWL are defined in the LTMMP approved by the NMED on January 8, 2014 (Blaine January 2014) and incorporated through reference in Attachment M of the SNL/NM RCRA Facility Operating Permit (Permit) (Kieling February 2016). Long-term monitoring and maintenance is conducted in accordance with the Permit (NMED January 2015, with all approved modifications).

A summary of the MWL operational and regulatory history is provided in Appendix A.

1.3 Remedy and Controls

As part of the RCRA corrective action process for the MWL, the NMED selected a vegetative soil cover with a biointrusion barrier (i.e., evapotranspirative [ET] cover) as the remedy (NMED May 2005). The MWL ET Cover and associated storm water controls limit water infiltration into the disposal areas preventing future migration of contaminants. The ET Cover design was presented in the Corrective Measures Implementation (CMI) Plan (SNL/NM November 2005) along with performance modeling based on site-specific field testing that demonstrated the effectiveness of the design. The ET Cover was constructed in accordance with the CMI Plan design and construction specifications in 2009, as documented in the CMI Report (SNL/NM January 2010, Revision 1) approved by the NMED (Kieling October 2011).

The ET Cover consists of four main layers: Compacted Subgrade, Biointrusion, Compacted Native Soil, and Topsoil. A schematic profile of the cover and its design function is provided in Figure 1-2. Site surface-water controls were incorporated into the design to control surface-water run-on from hydraulically up-gradient areas and runoff from the ET Cover, as shown in Figure 1-3.

The May 2005 Final Order also required the development of a fate and transport model to assess long-term contaminant migration and to provide input for a protective monitoring plan with trigger levels to identify changing conditions that would require further investigation and follow-up actions. The fate and transport model was presented in the CMI Plan along with proposed long-term monitoring and associated trigger levels for identified contaminants of concern in various environmental media. Monitoring and specific trigger levels, maintenance, inspection, and reporting requirements were finalized in the LTMMP (SNL/NM March 2012) that was submitted to the NMED after approval of the CMI Report.

All MWL remedy controls are defined in the LTMMP that was implemented in January 2014. These controls are designed to provide the information needed to determine if the ET Cover is performing as designed, and confirm that site conditions remain protective of human health and the environment. The trigger levels and evaluation process specified in the LTMMP ensure that if conditions change in a manner that could increase the risk to human health and the environment, timely follow-up actions will be taken, including the implementation of an additional or different remedy if necessary. There have been no modifications made to the LTMMP.

1.4 Report Requirements & Organization

Regulatory documents that specify requirements for the Five-Year Report are listed in Table 1-1. Copies of pages from each document are provided in Appendix B, along with a requirements verification matrix (i.e., cross-referenced table) that maps requirements from each document to corresponding chapters and sections of the report. Table 1-2 summarizes the content for each report chapter, providing a cross-walk of the report content to the report requirements. This information clearly establishes the Five-Year Report regulatory requirements and where they are addressed in this report. This first Five-Year Report is due five years after approval of the MWL LTMMP, which is January 8, 2019, and includes monitoring results for the first four years under the LTMMP to allow time to prepare and submit the report. Subsequent Five-Year Reports will cover a full five-year monitoring period.

Table 1-1
Mixed Waste Landfill Five-Year Report Requirements Documents

Document Date	Document Source	Document Name
May 2005	New Mexico Environment Department	*Final Order In the Matter of Request for a Class 3 Permit Modification for Corrective Measures for the Mixed Waste Landfill Sandia National Laboratories EPA ID No. NM5890110518*, No. HWB-SNL-04-11(M) (NMED May 2005)
March 2012	Sandia National Laboratories	*Long-Term Monitoring and Maintenance Plan for The Mixed Waste Landfill* (SNL/NM March 2012)
February 2016	New Mexico Environment Department	*Final Order In the Matter of Proposed Permit Modification for Sandia National Laboratories EPA ID No. NM5890110518 to Determine Corrective Action Complete with Controls at the Mixed Waste Landfill*, HWB-SNL-15-18(P) (NMED February 2016)

Section 4.8.2 of the LTMMP delineates the topics to be addressed in this report. These are summarized below.

- Summary of monitoring and inspections. The ET Cover is evaluated based on the 2014 through 2017 monitoring, inspection, and maintenance results presented in Chapter 2 of this report. This includes details of implemented site improvements.

- Update the fate and transport model. Updates to the fate and transport model originally presented in the CMI Plan (SNL/NM November 2005) are required if monitoring results indicate current conditions are different from the conditions previously modeled. Based on a comparison of the 2014 through 2017 monitoring results to the 2005 modeling, no additional modeling updates are required. However, the volatile organic compound (VOC) soil-vapor plume modeling is updated in this report to include monitoring results available from the soil-vapor monitoring wells installed and approved in 2014 (SNL/NM September 2014 and Kieling September 2014, respectively). These wells provide broader VOC soil-vapor spatial distribution (i.e., depths of 50 to 400 feet below ground surface [ft bgs]) than previously available (i.e., depths of up to 50 ft bgs). Other monitoring results indicate conditions consistent with the original model. The VOC soil-vapor plume update is summarized in Chapter 3 of this report.

- Evaluate effectiveness of the remedy. The measure of effectiveness for the ET Cover is the protection of human health and the environment. The performance of long-term monitoring and maintenance controls and the requirement to present all efforts to ensure any future releases or movement of contaminants are detected and addressed are documented in Chapter 4 of this report.

- Reevaluate the feasibility of excavation. This requirement is defined as an update to the *Complete Excavation with Offsite Disposal* remedial alternative originally evaluated in the MWL Corrective Measures Study (CMS) Final Report, Appendix H (SNL/NM May 2003). This requirement was established in the May 2005 Final Order (NMED May 2005) and expanded by the February 2016 Final Order to include an evaluation of onsite disposal in a modern landfill that includes a RCRA Subtitle C liner system. Evaluation of onsite disposal is specific to this Five-Year Report, and was not previously addressed. The feasibility of excavation and both disposal alternatives are documented in Chapter 5 of this report.

Table 1-2
Mixed Waste Landfill Five-Year Report – Table of Contents Crosswalk to Requirements

Chapter & Main Sections	Content Explanation	Requirements[a]
1.0 Introduction and Background 1.1 Purpose and Scope 1.2 Regulatory History 1.3 Remedy and Controls 1.4 Report Requirements & Organization 1.5 Project Team 1.6 Public Process and Regulatory Review & Approval 1.7 Public Access for Supporting Information	Set Context & Regulatory Process for the Report; define report requirements and how/where requirements are addressed.	1, 5, 6, 7, 15, 16, 17, 18, 19
2.0 Monitoring & Inspections Summary 2.1 Monitoring & Inspection Requirements 2.2 Monitoring Results Summary 2.3 Inspection & Maintenance Summary 2.4 Other Pertinent Data and Information	Address requirement to include a review of monitoring reports and other pertinent data for the purpose of evaluating remedy effectiveness. This information will be used in Chapter 4 to assess remedy effectiveness and detail all efforts to ensure future releases or movement of contaminants are detected and addressed before any effect on groundwater or increased risk to public health.	1, 2, 7, 8, 14, 17
3.0 Fate & Transport Model (F&TM) Review 3.1 Requirement for Update 3.2 Comparison of Monitoring Results to 2005 Modeling Data 3.3 Updated Modeling Approach 3.4 Updated Modeling Results 3.5 Discussion & Conclusions	Address requirement to update the 2005 F&TM with newer monitoring results not covered by previous modeling effort, and reevaluate the likelihood of contaminants reaching groundwater.	1, 3, 7, 10, 11, 12, 13, 14
4.0 Evaluate Effectiveness of the Remedy 4.1 Site Conditions 4.2 Evapotranspirative (ET) Cover System 4.3 ET Cover System Controls 4.4 Future Releases & Contaminant Migration 4.5 Remedy Effectiveness Summary and Conclusions	Address requirement to: 1) analyze the effectiveness of the remedy and 2) detail all efforts to ensure future releases or movement of contaminants are detected and addressed before any effect on groundwater or increased risk to public health. Use monitoring, inspection, and modeling results presented in Chapters 2 and 3.	1, 4, 7, 10, 14
5.0 Reevaluate Feasibility of Excavation 5.1 Background 5.2 Summary of Changes and Updates 5.3 Reevaluation of Excavation – Offsite and Onsite Disposal Alternatives 5.4 Comparison of Offsite and Onsite Disposal Alternatives 5.5 Comparison of 2003 and 2018 Evaluation for Offsite Disposal	Address requirement to reevaluate the feasibility of excavation with offsite and onsite disposal alternatives; requirement for evaluation of onsite disposal in an engineered cell with a Resource Conservation and Recovery Act (RCRA) Subtitle C liner system applies only to this first Five-Year Report. Subsequent reports will only evaluate complete excavation with offsite disposal.	1, 7, 9, 20, 21, 22
6.0 Five-Year Summary & Conclusions	Summarize how requirements have been met and main conclusions.	Not Applicable
7.0 References	Provide references for report.	

Notes: [a]Requirement number from Appendix B, Requirements Verification Matrix.

1.5 Project Team

The project team for the Five-Year Report consists of SNL/NM MWL Project and Long-Term Stewardship program personnel, with additional support provided by SNL/NM subject matter experts in the areas of waste management, RCRA regulations and permitting, radiation protection, and risk assessment. A subcontractor team led by Banda Group International, Inc. (BGI Team) performed the Chapter 5 feasibility evaluation. The BGI Team is comprised of environmental professionals with extensive DOE-Complex experience in excavation and waste management, including major projects at SNL/NM (Chemical Waste Landfill [CWL], Corrective Action Management Unit [CAMU], and MWL) and Los Alamos National Laboratory.

1.6 Public Process and Regulatory Review & Approval

SNL/NM and DOE/NNSA personnel are responsible for submitting this Five-Year Report to the NMED and making the report and supporting information available to the public prior to approval by the NMED. Supporting information is included in the appendices of this report. After the NMED performs a preliminary review and determines it is complete, the report will be available through the federal repository at the University of New Mexico, Main Campus, Albuquerque, Zimmerman Library and the SNL/NM Technical Reports Collection under the “Facilities-Units” page of the digital repository at the following link: *http://digitalrepository.unm.edu/snl_fu/*

Two hardcopies of the Five-Year Report (including appendices) will be placed at the University of New Mexico Main Campus, Albuquerque, Zimmerman Library. The report will be available in the Course Reserves section at this library location.

The NMED is responsible for review and approval of this report, and providing a process whereby members of the public may comment on the report and its conclusions. The NMED is also responsible for responding to public comments submitted during the specified public comment period.

1.7 Public Access for Supporting Information

Much of the information evaluated and summarized in this report is detailed in MWL Annual Long-Term Monitoring and Maintenance (LTMM) Reports. The LTMMP and all Annual LTMM Reports listed below were reviewed and approved by the NMED, and are accessible to the public through the federal repository at the University of New Mexico, Main Campus, Albuquerque, Zimmerman Library (hardcopy) or the “Facilities-Units” page of the digital repository (electronic copy) at the following link: *http://digitalrepository.unm.edu/snl_fu/*

- MWL LTMMP (SNL/NM March 2012)
- MWL Annual LTMM Report, January–March 2014 (SNL/NM June 2014)
- MWL Annual LTMM Report, April 2014–March 2015 (SNL/NM June 2015)
- MWL Annual LTMM Report, April 2015–March 2016 (SNL/NM June 2016)
- MWL Annual LTMM Report, April 2016–March 2017 (SNL/NM June 2017)
- MWL Annual LTMM Report, April 2017–March 2018 (SNL/NM June 2018)

CHAPTER 1 FIGURES

This page intentionally left blank.

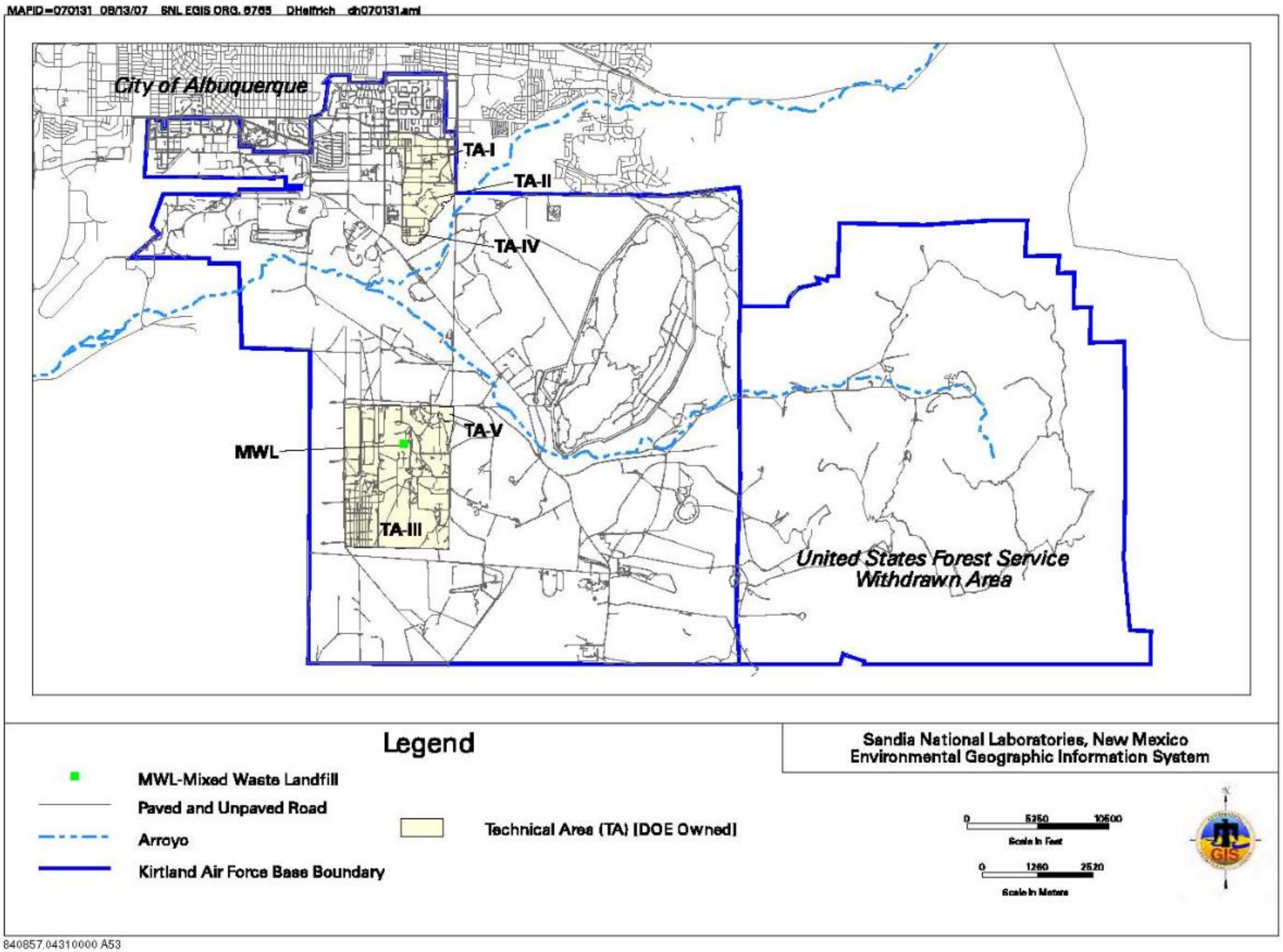


Figure 1-1
Location of the Mixed Waste Landfill with Respect to Kirtland Air Force Base and the City of Albuquerque

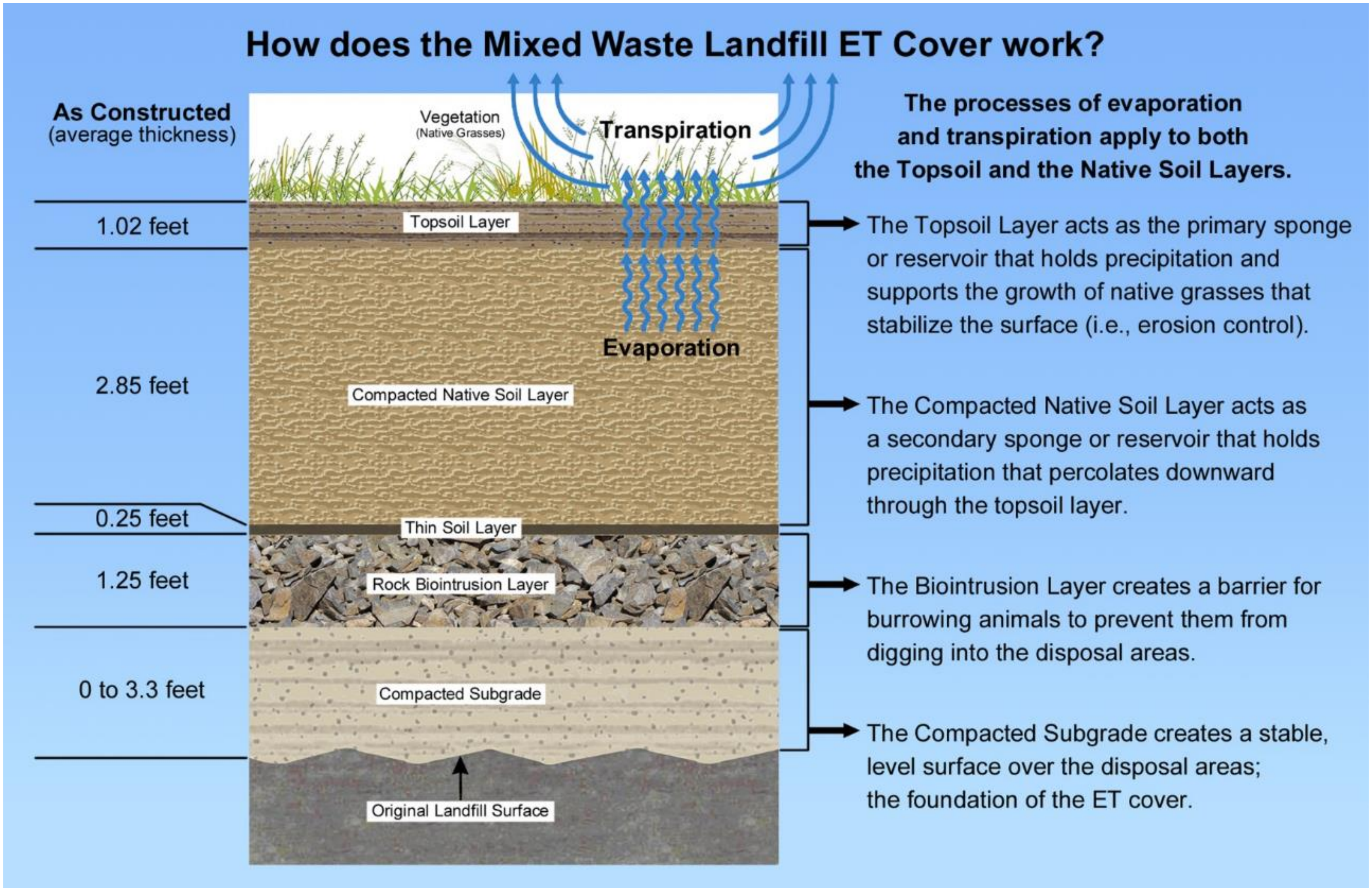


Figure 1-2
Schematic Profile of the Mixed Waste Landfill Evapotranspirative (ET) Cover and How it Works

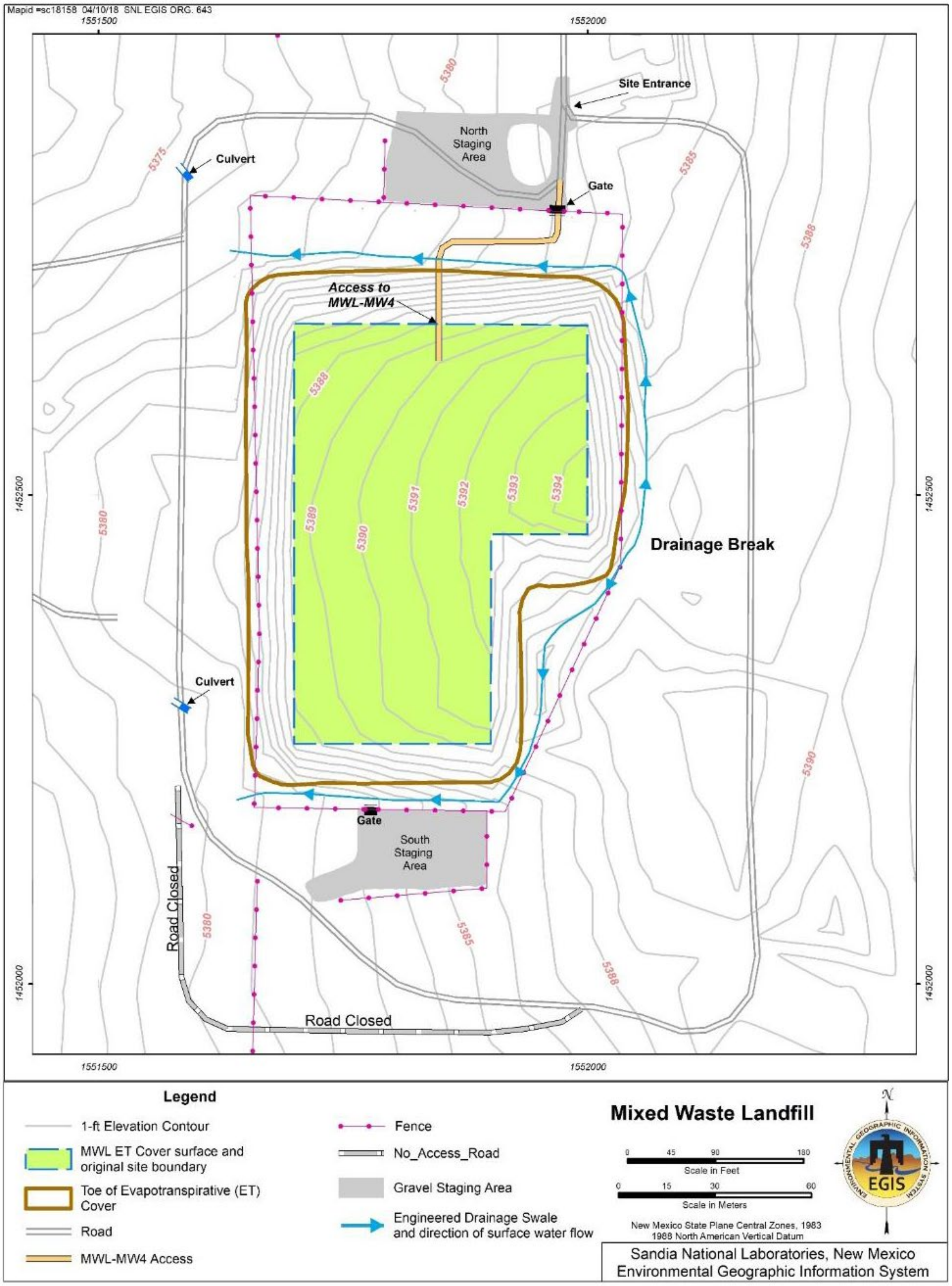


Figure 1-3
Mixed Waste Landfill Engineered Storm-Water Drainage Swale

This page intentionally left blank.

2.0 MONITORING & INSPECTIONS SUMMARY

The primary objective of monitoring, inspection, maintenance, and repair activities at the MWL is to ensure site conditions are protective of human health and the environment and that the ET Cover, site controls, and monitoring networks perform as designed. The monitoring networks provide the information needed to assess site conditions and ET Cover performance. The inspection, maintenance, and repair process provides the information needed to verify the ET Cover, site controls, and monitoring networks are in good physical condition and are operating as designed.

The MWL monitoring program detailed in the LTMMP, Chapter 3 (SNL/NM March 2012) and summarized in Section 2.1.1 of this report is based upon process knowledge and the results of extensive site characterization and monitoring conducted from 1989 through 2008. Constituents of concern (COCs) and media-specific trigger levels were developed through evaluation of the Phase 1 and Phase 2 RCRA Facility Investigation (RFI) results (SNL/NM September 1990 and September 1996; Peace et. al. September 2002), fate and transport modeling presented in the MWL CMI Plan (SNL/NM November 2005; Ho et al. November 2005 and January 2007), a confirmatory field investigation performed during the CMI Plan review and approval period (SNL/NM August 2008),18 years of groundwater monitoring documented in Annual Groundwater Monitoring Reports, and input from NMED and the public.

The MWL inspection program detailed in the LTMMP, Chapter 4 and summarized in Section 2.1.2 of this report is conducted on a regularly scheduled basis to ensure the integrity and performance of the ET Cover, storm-water diversion swale, perimeter security fence and signage, survey monuments, and all monitoring networks and sampling equipment. The program includes routine maintenance and repair activities. Repair work is initiated based on inspection requirements that include specifications for inspected items. Repairs are performed when inspected items exceed or do not meet requirements and as best practices to improve performance and/or minimize maintenance. Best practice measures are actions and/or improvements not explicitly required by the LTMMP or Permit conditions.

For the January 2014 through December 2017 reporting period, monitoring and inspection results are summarized in Sections 2.2 and 2.3, respectively. Section 2.4 presents other pertinent information focusing on best practice actions completed during the reporting period to improve site conditions and ET Cover performance. The information evaluated and summarized in Chapter 2 of this report is detailed in MWL LTMM Annual Reports reviewed and approved by the NMED, and available to the public (Section 1.7).

2.1 Monitoring and Inspection Requirements

This section summarizes background information and requirements for the MWL monitoring and inspection programs that are detailed in the LTMMP, Chapters 3 and 4, respectively.

2.1.1 Monitoring Program Requirements

The routine monitoring of air, surface soil, vadose zone (soil moisture and soil vapor), groundwater, and biota (soil and plants) provides an early warning detection system for changing conditions and empirical data to evaluate site conditions and ET Cover performance. Monitoring is performed following the procedures and requirements stipulated in the LTMMP, Chapter 3 and sampling and analysis plans (SAPs) provided in Appendices C through G. Sampling media, monitoring parameters or COCs, frequencies, locations and number of samples, and monitoring methods are summarized in Table 2-1. Monitoring trigger levels and the trigger level process, if there is an exceedance, are detailed in the LTMMP, Chapter 5. All monitoring results are reported along with supporting information (e.g., field forms, data validation reports, subject matter expert evaluation reports) in Annual LTMM Reports.

The multi-media monitoring program established in the LTMMP includes parameter-specific trigger levels and ensures long-term protection through:

- multi-media monitoring focused on the most mobile contaminants and most likely exposure pathways, and

- a trigger level process that requires timely follow-up if changing conditions are indicated by exceedance of a monitoring trigger level, including additional investigation and implementation of an additional or different remedy, if necessary, as determined by NMED.

2.1.2 Inspection Program Requirements

Inspections of the ET Cover, storm-water diversion swale, perimeter security fence and signage, survey monuments, and all monitoring networks and sampling equipment are performed by field personnel following the processes and requirements specified in the LTMMP, Chapter 4.

Information detailing the MWL systems and networks that are inspected, the frequency of inspections, inspection parameters and specifications, and maintenance/repair requirements are provided in Table 2-2. Identified maintenance and repairs for inspection parameters and specifications must be completed within 60 days of identification, with the exception of reseeding on the ET Cover. Reseeding repairs may be delayed to the growing season to facilitate results. All inspection-maintenance-repair activities are documented on checklists/forms provided in the LTMMP, Appendix I; completed forms are included in MWL Annual LTMM Reports.

2.2 Monitoring Results Summary

A summary of monitoring results collected over the January 2014 through December 2017 reporting period is provided in the sections that follow. Detailed information for each annual reporting period can be found in the corresponding MWL Annual LTMM Reports. A more detailed presentation of monitoring results for each of the annual reporting periods can be found in the MWL Annual LTMM Reports, Chapters 3 through 8. Refer to Section 1.7 for a list of the Annual LTMM Reports and information on how to access them.

Table 2-1
Mixed Waste Landfill Monitoring Parameters, Frequencies, and Methods

Sampling Media	Monitoring Parameters[a]/ Constituents of Concern	Monitoring Frequency[a]	Number of Samples Per Event	Monitoring Locations	Monitoring Method[b]	Comments
Air	Radon	Year 1 – Quarterly Year 2 – Quarterly Year 3 – Semiannual Year 4 – Semiannual Year 5 and subsequent years – Annual[c]	17	10 detectors placed at corners and midpoints of perimeter fence 5 detectors placed on completed cover 2 detectors at background locations	Track-etch detectors (at breathing zone height); sampling and analysis per LTMMP Appendix C	Samples provide time-weighted average results for the specified monitoring duration (e.g., for first two years results are for 3-month period). Radon monitoring reported on a calendar year basis.
Surface Soil	Tritium	Annual	4	One sample collected from each corner of the MWL ET Cover	Grab samples of soil collected; moisture extracted and analyzed for tritium using liquid scintillation per LTMMP Appendix G	Samples collected from the MWL ground surface at the four corners of the ET Cover.
Vadose Zone	VOCs in soil vapor	Year 1 – Semiannual Year 2 – Semiannual Year 3 – Semiannual Year 4 and subsequent years – Annual* *Monitoring frequency being maintained at semiannual frequency to facilitate keeping sampling ports open through more frequent purging	17	Samples collected from 2 single-port soil-vapor monitoring points installed through the ET Cover (MWL-SV01 and MWL-SV02) and 3 perimeter multi-port FLUTe™ wells (MWL-SV03, MWL-SV04, and MWL-SV05)	Sampling and analysis of soil vapor per LTMMP Appendix D	MWL-SV01 and MWL-SV02 have a sampling port approximately 35 ft below the original ground surface. MWL-SV03, MWL-SV04, and MWL-SV05 have sampling ports at depths of approximately 50, 100, 200, 300, and 400 ft bgs.
Vadose Zone	Moisture content beneath the ET Cover	Year 1 – Semiannual Year 2 – Semiannual Year 3 and subsequent years – Annual	171	3 soil-moisture monitoring access tubes Measurements obtained at 1-ft increments from 4 to 25 ft bgs, then 5-ft increments to total depth of the access tube (200 linear ft)	Soil-moisture monitoring per LTMMP Appendix E	Moisture content in vadose zone beneath the cover is measured using a neutron probe to evaluate moisture infiltration through the ET Cover.

Refer to footnotes at end of table.

Table 2-1 (Concluded)
Mixed Waste Landfill Monitoring Parameters, Frequencies, and Methods

Sampling Media	Monitoring Parameters[a]/ Constituents of Concern	Monitoring Frequency[a]	Number of Samples Per Event	Monitoring Locations	Monitoring Method[b]	Comments
Groundwater	VOCs, metals[d], tritium, radon, gamma-emitting radionuclides[e], and gross alpha/beta activity	Semiannual	4	MWL compliance groundwater monitoring well network: MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9	Sampling and analysis of groundwater samples per LTMMP Appendix F	Monitoring wells MWL-MW4, MWL-MW5, and MWL-MW6 retained for monitoring groundwater elevation only.
Biota – Surface Soil	Metals[f] and gamma-emitting radionuclides[g]	Annual	Up to 4 (2 each, if present)	Variable - ant hills and animal burrows on the MWL ET Cover located during ET Cover inspections, if present	Grab sampling and analysis of surface soil at animal burrow and/or ant hill features per LTMMP Appendix G	If no features are identified, no samples will be collected.
Biota – Cover Vegetation	Gamma-emitting radionuclides (short list) in vegetation	Annual	Up to 2, if present	Variable - potentially deep-rooted vegetation overlying former disposal areas located during ET Cover inspections, if present	Grab sampling and analysis of vegetation, including the plant and root system per LTMMP Appendix G	If no potentially deep-rooted plants are present, no samples will be collected.

Notes:
[a]Monitoring parameters and frequency will be reevaluated every five years in the Five-Year Report.
[b]Sampling and Analysis Plans and sampling requirements included in appendices of the LTMMP (SNL/NM March 2012).
[c]Currently available detectors can only be deployed for 6 months; therefore, semiannual monitoring will continue instead of transitioning to annual.
[d]Required metals analyses reported for groundwater include cadmium, chromium, nickel, and uranium (SNL/NM March 2012).
[e]Radionuclide results reported for groundwater include americium-241, cesium-137, and cobalt-60.
[f]Required metals analyses reported for biota include RCRA metals plus copper, nickel, vanadium, zinc, cobalt, and beryllium (SNL/NM March 2012).
[g]Radionuclide results reported for biota include cesium-137, cobalt-60, radium-226, thorium-232, uranium-235, and uranium-238.

bgs	= Below ground surface.
ET	= Evapotranspirative.
FLUTe™	= Flexible Liner Underground Technologies, Ltd.™
ft	= Foot (feet).
LTMMP	= Long-Term Monitoring and Maintenance Plan.
MWL	= Mixed Waste Landfill.
RCRA	= Resource Conservation and Recovery Act.
VOC	= Volatile organic compound.

Table 2-2
Mixed Waste Landfill Inspection, Maintenance, and Repair Requirements

MWL System to be Inspected	Inspection Frequency/ Performed by	Inspection Parameters	Maintenance Implementation	Maintenance/Repair Frequency[a]
ET Cover Surface Biology Inspection (Cover vegetation and signs of animal activity)	Quarterly until vegetation is established, annually thereafter by a staff biologist[b]	Vegetation Inventory	Soil augmentations and/or reseeding	Within 60 days of discovery of needed repairs. Reseeding repairs may be delayed to await the appropriate growing season.
		Contiguous areas of no vegetation >200 ft^2	Revegetate barren areas that exceed prescribed limits	
		Animal intrusion burrows in excess of 4 inches in diameter	Repair cover system damage that exceeds prescribed limits	
ET Cover System (Surface)	Quarterly by a field technician	Settlement of cover surface in excess of 6 inches	Repair cover system damage that exceeds prescribed limits	Within 60 days of discovery of needed repairs. Reseeding repairs may be delayed to await the appropriate growing season.
		Erosion of cover soil in excess of 6 inches deep		
		Ponding of water on the ET Cover surface in excess of 100 ft^2		
		Animal intrusion burrows in excess of 4 inches in diameter		
		Contiguous areas of no vegetation >200 ft^2 [c]	Revegetate barren areas that exceed prescribed limits[c]	Within 60 days of discovery of needed repairs.
ET Cover Surface-Water (Storm Water) Drainage Features *applies to the engineered storm-water diversion swale, see Figure 1-3	Quarterly by a field technician	Channel or sidewall erosion in excess of 6 inches deep	Repair erosion that exceeds prescribed limits	Within 60 days of discovery of needed repairs.
		Accumulations of sediment in excess of 6 inches deep or debris that blocks more than 1/3 of the channel width	Remove sediment and debris accumulations that exceed prescribed limits	
Soil-Vapor Monitoring Wells, Soil Moisture Monitoring Access Tubes, and Groundwater Monitoring Wells	Groundwater and Vadose Zone Network Components: Field technician to inspect at same frequency/time that monitoring occurs	Concrete pads, stanchions, and protective casings	Maintain, clean, repair, replace, and re-label, as appropriate	Within 60 days of discovery of needed repairs.
		Well cover caps and Swagelok® (or equivalent) dust caps		
		Monitoring wells and soil-vapor sampling port labels		
		Locks		
		Sampling pumps and tubing		
		Neutron probe and cable system		

Refer to footnotes at end of table.

Table 2-2 (Concluded)
Mixed Waste Landfill Inspection, Maintenance, and Repair Requirements

MWL System to be Inspected	Inspection Frequency/ Performed by	Inspection Parameters	Maintenance Implementation	Maintenance/Repair Frequency[a]
ET Cover Physical Controls	Quarterly by a field technician	Presence of wind-blown plants and debris	Remove wind-blown plants and debris	Within 60 days of discovery of needed repairs.
		Condition of fence wires, posts, gates, gate locks, warning signs, and survey monuments in the local area	Repair broken wire sections and posts, repair/oil gates, clean/replace locks, repair/replace warning signs, and clear dirt/debris from monuments	

Notes:
[a]Maintenance/repairs will be performed as necessary, based upon the results of inspections.
[b]The transition from quarterly to annual inspections by a staff biologist is based upon meeting successful revegetation criteria as determined by the staff biologist (SNL/NM March 2012).
[c]Barren areas exceeding >200 ft^2 will not require corrective action after ET Cover vegetation is determined to have met successful revegetation criteria if they are the result of relatively short-term climate stresses (e.g., severe short-term drought), and the staff biologist determines they will naturally fill in over time. However, these areas will be noted and tracked during inspections and reviewed annually by the staff biologist to determine whether action is required based upon comparison to surrounding vegetation.
\> = Greater than.
ET = Evapotranspirative.
ft^2 = Square feet.
MWL = Mixed Waste Landfill.

2.2.1 Air Monitoring for Radon

The objective of air monitoring for radon is to collect data to evaluate radon gas flux (i.e., movement) to the atmosphere from the MWL. Based on fate and transport modeling (Ho et al. November 2005 and January 2007), radon gas (radon-222) could exceed the conservatively-applied indoor regulatory standard of 4 picocuries per liter (pCi/L) if sealed radium-226 sources disposed in the MWL degrade or breach.

Air monitoring activities and data evaluation are performed in accordance with the LTMMP, Section 3.2.1 and Appendix C *Air SAP* (SNL/NM March 2012). Monitoring results are compared to the 4 pCi/L trigger level defined in the LTMMP, Section 5.2.1. The minimum monitoring duration requirement was quarterly for Calendar Year (CY) 2014 and CY 2015, and semiannually in CY 2016 and CY 2017 (Table 2-1). For CY 2017, the radon monitoring was switched back to a quarterly duration to allow for more data to be collected to evaluate different detectors (SNL/NM June 2018). For CY 2018 and beyond, the monitoring duration will be semiannual.

Radon detectors are deployed at sampling locations shown in Figure 2-1. Detectors are deployed at the start of the monitoring period and are collected/exchanged for new detectors at the end of the monitoring period. Locations RN1 through RN10 are on the perimeter fence. The trigger level of 4 pCi/L (time-weighted average) is conservatively based on the EPA-recommended action level for radon in households and only applies to these perimeter fence locations. Locations RN11 through RN15 are located on the ET Cover surface directly above the pits and trenches with known sealed radium-226 sources. RN16 and RN17 are background sample locations, located away from the MWL but in the general vicinity.

Table 2-3 presents a summary of the range of radon monitoring results for the January 2014 through December 2017 reporting period. All validated results from all locations are below the 4 pCi/L trigger level and show radon activities that are equivalent to background activities. The maximum radon activity was 1.4 pCi/L from the CY 2014 data set. All radon monitoring results for the reporting period are consistent with historical MWL results and indicate radon flux at the MWL, as measured in pCi/L, is not significantly different than local background values.

2.2.2 Tritium in Surface Soil

The objective of monitoring tritium in surface soil is to determine and evaluate tritium flux to the atmosphere from moisture in surface soil at the MWL. This monitoring provides an early warning for new releases of tritium or changing conditions that would warrant additional investigation.

The monitoring of tritium in surface soil is performed in accordance with the LTMMP, Section 3.3 and Appendix G *Tritium and Biota SAP* (SNL/NM March 2012). Samples are collected annually from four ET Cover corner monitoring locations shown in Figure 2-2 (Table 2-1). Monitoring results are compared to the trigger level of 20,000 pCi/L defined in the LTMMP, Section 5.2.2.1.

Table 2-3
Summary of Mixed Waste Landfill Radon Air Monitoring Results

Monitoring Location[a]	Trigger Level (pCi/L)	Radon Air Activity Range (pCi/L) CY 2014 Range	CY 2015 Range	CY 2016 Range	CY 2017 Range[b]
RN1	4	0.6–0.8	0.4–0.9	0.2–0.8	0.14–0.5
RN2	4	0.6–1.4	0.4–1.1	0.2–0.7	0.11–0.6
RN3	4	0.3–0.9	0.4–0.9	0.2–0.8	0.14–0.9
RN4	4	0.3–1.1	0.4–1.2	0.2–0.6	<0.08–<0.8
RN5	4	0.3–0.7	0.4–1.1	0.2–0.5	0.16–0.9
RN6	4	0.3–0.8	0.4–0.8	0.2–0.6	0.11–<0.8
RN7	4	0.3–0.9	0.5–0.9	0.2–0.7	0.14–1.3
RN8	4	0.3–0.9	0.3–0.9	0.3–0.7	0.08–0.9
RN9	4	0.3–1.1	0.5–1.1	0.2–0.8	0.14–<0.8
RN10	4	0.3–0.4	0.5–0.6	<0.2–0.7	<0.08–0.8
RN11	NA	0.3–0.9	0.4–1.0	0.2–0.6	<0.08–0.6
RN12	NA	0.3–0.8	0.4–0.8	0.2–0.6	0.11–<0.8
RN13	NA	0.3–0.5	0.4–1.0	0.2–0.7	0.11–0.7
RN14	NA	0.3–0.7	0.4–0.9	0.2–0.4	0.11–0.6
RN15	NA	0.3–0.7	0.4–0.8	0.2–0.7	0.14–<0.8
RN16	NA	0.3–0.7	0.5–0.7	0.2–0.8	0.11–<0.8
RN17	NA	0.3–0.9	0.6–0.8	0.3–0.8	0.11–1.0

Notes:
[a]Bolded locations are the monitoring locations where the trigger level applies.
[b]For CY 2017 monitoring, up to three different detectors that had different detection limits were used at each location. For the lowest value in the range, the lowest detected value was used if it was lower than the lowest detection limit for non-detect results. For the highest value in the range, the highest detection limit was used if it was higher than the highest detected value.
CY = Calendar year.
NA = Trigger level not applicable to locations RN11 through RN17.
pCi/L = Picocuries per liter.

Table 2-4 summarizes tritium results for the January 2014 through December 2017 reporting period, and Figure 2-2 shows the sampling locations. All tritium results are below the trigger level, with the highest results associated with the CY 2014 samples. Tritium activities have decreased slightly during this reporting period, with no results over the minimum detectable activity in CY 2016 and CY 2017. This is expected because of the relatively short half-life of tritium (12.30 years) and the low activity of tritium in the near-surface soils. However, other factors also impact the analytical results (e.g., amount of soil moisture, barometric pressure), which are subject to variation. The results are consistent with historical results and indicate no new releases from the disposal area.

Table 2-4
Summary of Tritium Results
Mixed Waste Landfill Surface Soil Monitoring

Sample Location	Trigger Level (pCi/L)	Tritium in Soil Results (pCi/L)			
		CY 2014[a]	CY 2015	CY 2016[b]	CY 2017[b]
MWL TS-2NW	20,000	1,210 ± 216	719 ± 171	<MDA (183)	<MDA (183)
MWL TS-2SW	20,000	1,660 ± 271	527 ± 152J	<MDA (179)	<MDA (228)
MWL TS-2NE	20,000	1,370 ± 235	550 ± 153J	<MDA (182)	<MDA (228)
MWL TS-2SE	20,000	1,830 ± 294	369 ± 136J	<MDA (182)	<MDA (227)

Notes:
[a]CY 2014 results from re-samples collected in January 2015.
[b]Analyzed for but not detected above the MDA, shown in parentheses.
CY = Calendar year.
J = Validation qualifier; value is an estimated quantity greater than the MDA, but less than 3 times the MDA.
MDA = Minimum detectable activity.
pCi/L = Picocuries per liter.

2.2.3 Soil Vapor

VOCs are the most mobile of the hazardous constituents detected in the vadose zone alluvial sediments beneath the MWL. The objective of soil-vapor monitoring is to provide spatial and temporal concentration data for VOCs at various depths throughout the approximately 500-foot-thick vadose zone beneath the MWL. The vadose zone is comprised of relatively dry (i.e., moisture content generally less than 5 percent [%]) subsurface sediments located between the site surface and the regional groundwater table. In other words, subsurface sediments with pore space that is not filled by, or saturated with water. Concentration trends in shallow sampling ports (41.5 to 100 ft bgs) provide an early warning for any new releases of VOCs from the disposal areas. Concentrations from deeper sampling ports provide early warning for potential impact to groundwater. Vadose zone VOC monitoring and trigger levels are designed to provide early detection of changing conditions throughout the vadose zone for the long-term protection of groundwater.

Soil-vapor monitoring activities, analytical results, and data evaluation are performed in accordance with the LTMMP, Section 3.4.1 and Appendix D *Soil-Vapor SAP* (SNL/NM March 2012). Samples are collected on a semiannual basis from the two single-sampling port monitoring wells (MWL-SV01 and MWL-SV02, sampling ports at 42.5 and 41.5 ft bgs, respectively) and the three multi-sampling port monitoring wells (MWL-SV03 through MWL-SV05, sampling ports at 50, 100, 200, 300, and 400 ft bgs) (Table 2-1). Well locations are shown in Figure 2-3 and a detailed description of the soil-vapor monitoring well network can be found in the LTMMP, Section 3.4.1.

Results from the deepest sampling ports of the multi-sampling port soil-vapor wells, located at 400 ft bgs, are compared to trigger levels defined in LTMMP Section 5.2.3.1.

- 20 parts per million by volume (ppmv) for Tetrachloroethene (PCE)
- 20 ppmv for Trichloroethene (TCE)
- 25 ppmv for Total VOCs (i.e., the sum of detected, validated VOC concentrations)

Tables 2-5, 2-6, and 2-7 provide results for PCE, TCE, and Total VOCs, respectively, for all sampling ports. Each table presents results for the eight monitoring events conducted since implementation of the LTMMP in 2014; key points are summarized below.

- Results for individual VOCs from all monitoring well sampling ports are low concentrations (i.e., less than 0.600 ppmv) and are well below the trigger levels.
- Concentrations throughout the 500-foot thick vadose zone are relatively consistent and indicate stable conditions (i.e., results for each sampling port show only minor variability).
- The soil-vapor monitoring results indicate an old source (i.e., disposal period of 1958 through 1988) that has slowly dissipated by the process of diffusion throughout the vadose zone.
- The distribution of VOC concentrations in the vadose zone indicates the VOC soil-vapor plume is stable with no new releases from the disposal area.
- 2014 through 2017 results reflect lower concentrations than were measured during the Phase 2 RFI in 1994 (Peace et al. September 2002) and 2008 VOC Soil-Vapor Investigation (SNL/NM August 2008).

PCE, TCE, and Total VOCs concentrations over time for all soil-vapor monitoring wells and sampling ports are presented in Figures 2-4 through 2-15. The variation in PCE and TCE concentrations over the eight sampling events conducted from 2014 to 2017 is less than 0.100 ppmv for all sampling ports except MWL-SV01-42.5 (the maximum PCE variation was 0.260 ppmv between the September 2014 and May 2017 results). The PCE concentrations at the MWL-SV03 400 ft bgs sampling port showed slight increases from September 2014 through October 2016. However, the 2017 results are the lowest concentrations measured over the four-year monitoring period, indicating stable conditions with small fluctuations over the four-year period. The MWL-SV01 (42.5 ft bgs sampling port) and the MWL-SV03 (400 ft bgs sampling port) locations have consistently shown the highest VOC concentrations (PCE ranging from 0.300 to 0.560 ppmv) and Total VOCs concentrations (ranging from 0.62930 to 1.14010 ppmv). The 2014 through 2017 data sets are very similar indicating stable VOC concentrations throughout the 500-foot thick vadose zone. The variability shown in the data is expected given the vadose zone geology, which is laterally and vertically discontinuous, and comprised of interfingering, unconsolidated, alluvial-fan deposits ranging in grain size from clay to poorly sorted coarse gravels.

2.2.4 Soil Moisture

Soil-moisture monitoring is conducted to establish soil-moisture trends in the vadose zone beneath the MWL to evaluate ET Cover performance. The soil-moisture monitoring network functions as a detection system for water percolation and infiltration through the ET Cover.

Table 2-5
Summary of PCE Concentrations
Mixed Waste Landfill Soil-Vapor Monitoring
Calendar Years 2014 through 2017

Tetrachloroethene (PCE) Trigger Level is 20 parts per million volume basis (ppmv)

Well ID & Sample Port Depth[a]	September 2014[b] (ppmv)	October 2014[b] (ppmv)	April 2015[b] (ppmv)	October 2015[b] (ppmv)	April 2016[b] (ppmv)	October 2016[b] (ppmv)	May 2017[b] (ppmv)	October 2017[b] (ppmv)
MWL-SV01-42.5	0.560	0.400	0.460	0.470	0.410	0.450	0.300	0.420
MWL-SV02-41.5	0.086	0.067	0.075	0.068	0.068	0.070	0.071	0.072
MWL-SV03-50	0.140	0.120	0.150	0.110	0.170	0.140	0.100	0.140
MWL-SV03-100	0.210	0.230	0.240	0.220	0.240	0.240	0.160	0.220
MWL-SV03-200	0.300	0.320	0.310	0.290	0.270	0.270	0.210	0.260
MWL-SV03-300	0.290	0.320	0.290	0.370	0.310	0.300	0.220	0.280
MWL-SV03-400	0.390	0.400	0.420	0.450	0.430	0.440	0.390	0.310
MWL-SV04-50	0.072	0.076	0.076	0.074	0.078	0.077	0.052	0.063
MWL-SV04-100	0.130	0.120	0.120	0.120	0.130	0.130	0.089	0.110
MWL-SV04-200	0.180	0.180	0.170	0.150	0.180	0.150	0.110	0.130
MWL-SV04-300	0.110	0.130	0.110	0.120	0.130	0.130	0.095	0.120
MWL-SV04-400	0.110	0.140	0.120	0.140	0.150	0.130	0.100	0.110
MWL-SV05-50	0.052	0.048	0.055	0.040	0.060	0.045	0.044	0.021
MWL-SV05-100	0.092	0.096	0.100	0.077	0.099	0.095	0.089	0.070
MWL-SV05-200	0.140	0.170	0.150	0.120	0.170	0.140	0.140	0.100
MWL-SV05-300	0.090	0.120	0.097	0.110	0.100	0.110	0.110	0.091
MWL-SV05-400	0.100	0.110	0.080	0.120	0.110	0.110	0.100	0.092

Notes:
[a]Port depth is the last number in the Well ID, and is in feet below ground surface.
[b]If a duplicate sample was collected, then maximum concentration of the environmental-duplicate sample pair is shown.
ID = Identification.
PCE = Tetrachloroethene.
ppmv = Parts per million by volume.

Table 2-6
Summary of TCE Concentrations
Mixed Waste Landfill Soil-Vapor Monitoring
Calendar Years 2014 through 2017

Trichloroethene (TCE) Trigger Level is 20 parts per million volume basis (ppmv)

Well ID & Sample Port Depth[a]	September 2014[b] (ppmv)	October 2014[b] (ppmv)	April 2015[b] (ppmv)	October 2015[b] (ppmv)	April 2016[b] (ppmv)	October 2016[b] (ppmv)	May 2017[b] (ppmv)	October 2017[b] (ppmv)
MWL-SV01-42.5	0.110	0.090	0.099	0.110	0.091	0.100	0.071	0.086
MWL-SV02-41.5	0.075	0.058	0.067	0.065	0.063	0.065	0.070	0.067
MWL-SV03-50	0.100	0.082	0.097	0.080	0.140	0.110	0.098	0.120
MWL-SV03-100	0.190	0.190	0.200	0.200	0.210	0.210	0.130	0.180
MWL-SV03-200	0.300	0.300	0.290	0.310	0.250	0.270	0.250	0.230
MWL-SV03-300	0.190	0.210	0.170	0.260	0.200	0.220	0.200	0.210
MWL-SV03-400	0.290	0.280	0.260	0.350	0.300	0.320	0.250	0.230
MWL-SV04-50	0.061	0.059	0.060	0.066	0.070	0.067	0.054	0.058
MWL-SV04-100	0.130	0.120	0.120	0.130	0.140	0.150	0.120	0.120
MWL-SV04-200	0.210	0.210	0.190	0.200	0.220	0.200	0.180	0.170
MWL-SV04-300	0.076	0.091	0.064	0.093	0.081	0.097	0.087	0.094
MWL-SV04-400	0.075	0.096	0.060	0.097	0.070	0.091	0.085	0.081
MWL-SV05-50	0.067	0.061	0.064	0.052	0.074	0.058	0.049	0.042
MWL-SV05-100	0.140	0.130	0.130	0.120	0.130	0.130	0.110	0.100
MWL-SV05-200	0.200	0.240	0.210	0.200	0.210	0.200	0.190	0.150
MWL-SV05-300	0.100	0.130	0.082	0.120	0.096	0.120	0.120	0.120
MWL-SV05-400	0.094	0.100	0.066	0.120	0.089	0.100	0.087	0.097

Notes:
[a]Port depth is the last number in the Well ID, and is in feet below ground surface.
[b]If a duplicate sample was collected, then maximum concentration of the environmental-duplicate sample pair is shown.
ID = Identification.
ppmv = Parts per million by volume.
TCE = Trichloroethene.

Table 2-7
Summary of Total VOCs Concentrations
Mixed Waste Landfill Soil-Vapor Monitoring
Calendar Years 2014 through 2017

Total VOCs Trigger Level is 25 parts per million volume basis (ppmv)

Well ID & Sample Port Depth[a]	September 2014[b] (ppmv)	October 2014[b] (ppmv)	April 2015[b] (ppmv)	October 2015[b] (ppmv)	April 2016[b] (ppmv)	October 2016[b] (ppmv)	May 2017[b] (ppmv)	October 2017[b] (ppmv)
MWL-SV01-42.5	1.14010	1.00870	1.11670	1.03620	0.93510	0.97570	0.740723	0.89810
MWL-SV02-41.5	0.71822	0.67880	0.76470	0.69150	0.71030	0.70780	0.62944	0.67594
MWL-SV03-50	0.36957	0.31750	0.37076	0.30743	0.48016	0.42248	0.34860	0.42918
MWL-SV03-100	0.61151	0.63820	0.69490	0.74420	0.73270	0.73682	0.53366	0.62881
MWL-SV03-200	0.91906	0.94754	0.99016	0.93230	0.84151	0.87920	0.78555	0.78590
MWL-SV03-300	0.64917	0.67835	0.59506	0.83120	0.68678	0.74430	0.61278	0.71640
MWL-SV03-400	0.87270	0.81410	0.85950	0.95920	0.87980	0.89730	0.69654	0.62930
MWL-SV04-50	0.25949	0.26359	0.28424	0.28232	0.30064	0.29728	0.232861	0.25573
MWL-SV04-100	0.45631	0.42879	0.44346	0.46616	0.50930	0.53785	0.40932	0.43340
MWL-SV04-200	0.68361	0.66935	0.64340	0.63160	0.72689	0.66068	0.56579	0.56287
MWL-SV04-300	0.26624	0.32355	0.27345	0.34519	0.32831	0.37126	0.32319	0.35562
MWL-SV04-400	0.25031	0.3246	0.26702	0.35374	0.35148	0.38251	0.31282	0.32932
MWL-SV05-50	0.36547	0.31833	0.33990	0.30406	0.37770	0.35609	0.29951	0.26189
MWL-SV05-100	0.56578	0.54556	0.57169	0.53248	0.59430	0.61891	0.54760	0.51172
MWL-SV05-200	0.70237	0.82115	0.73680	0.65830	0.80567	0.73190	0.69410	0.57349
MWL-SV05-300	0.35628	0.42371	0.33576	0.44336	0.36421	0.46092	0.47695	0.44050
MWL-SV05-400	0.54096	0.39521	0.25075	0.45245	0.30765	0.40839	0.29962	0.29543

Notes:
[a]Port depth is the last number in the Well ID, and is in feet below ground surface.
[b]If a duplicate sample was collected, then maximum concentration of the environmental-duplicate sample pair is shown.
ID = Identification.
ppmv = Parts per million by volume.
VOCs = Volatile organic compounds.

Soil-moisture monitoring activities are conducted in accordance with the LTMMP, Section 3.4.2 and Appendix E *Soil-Moisture Monitoring Plan* (SNL/NM March 2012). In accordance with the LTMMP, two semiannual monitoring events were conducted in CYs 2014 and 2015, and one annual monitoring event was conducted in CYs 2016 and 2017 (Table 2-1). Monitoring results are compared to the baseline soil-moisture profile established for each soil-moisture monitoring access tube prior to construction of the ET Cover subgrade in late 2006, and to the trigger level of 23% moisture by volume defined in the LTMMP, Section 5.2.3.2.

The trigger level applies to the results for the vertical depth range of 8.7 to 86.6 ft bgs for each soil-moisture access tube. Table 2-8 summarizes the January 2014 through December 2017 reporting period soil-moisture monitoring results for this depth interval directly beneath the ET Cover and disposal area. The location of the three soil-moisture monitoring access tubes, which are angled boreholes oriented 60 degrees from the horizontal ground surface that extend below the MWL, are shown in Figure 2-16.

Table 2-8
Summary of Mixed Waste Landfill Soil-Moisture Monitoring Results

Sample Location	Trigger Level (% moisture by volume)	Background Range (% moisture by volume)	CY 2014 Range	CY 2015 Range	CY 2016 Range	CY 2017 Range
			Soil Moisture Results (% moisture by volume)			
MWL-VZ-1	23	1.7–5.6	1.8–4.9	1.4–5.2	1.8–5.1	1.8–5.2
MWL-VZ-2	23	2.1–5.5	2.1–4.8	2.0–4.8	2.2–4.7	2.0–4.6
MWL-VZ-3	23	1.8–4.5	1.3–4.6	1.4–5.1	1.4–4.5	1.3–4.1

Notes:
Results summarized are for the vertical depth range of 8.7 to 86.6 ft bgs for each soil-moisture access tube.
% = Percent.
CY = Calendar year.
MWL = Mixed Waste Landfill.

Soil-moisture measurements have remained consistent for the three monitoring locations over the past four years, are well below the trigger level of 23%, and track very closely with the baseline soil-moisture content. The results indicate the ET Cover is performing as designed, and confirm a dry vadose zone (i.e., soil-moisture content generally less than 5% by volume) beneath the ET Cover. A more detailed presentation of soil-moisture monitoring for each annual reporting period can be found in the MWL Annual LTMM Reports, Chapter 4, including graphs showing measured soil-moisture content versus baseline soil moisture content.

2.2.5 Groundwater

Since 1990, MWL groundwater has been characterized and monitored for major ion chemistry, VOCs, semivolatile organic compounds, nitrate, metals, radionuclides, and perchlorate. Based on this historical data set and site characterization, groundwater monitoring COCs have been narrowed as defined in Table 2-1. The objective of groundwater monitoring under the LTMMP is to obtain analytical results representative of groundwater in the uppermost part of the Regional Aquifer beneath the MWL. This, combined with soil-vapor monitoring, functions as an early warning detection system for the protection of groundwater.

Groundwater monitoring activities, sample analyses, and data evaluation are performed in accordance with the LTMMP, Section 3.5.1 and Appendix F *Groundwater SAP* (SNL/NM March 2012). Samples are collected on a semiannual basis from four monitoring locations shown in Figure 2-17 (Table 2-1). A detailed description of the groundwater monitoring well network can be found in the LTMMP, Section 3.5.1, and the MWL LTMM Annual Reports, Section 7.1. Results are compared to trigger levels defined in LTMMP, Section 5.2.4.

Table 2-9 summarizes groundwater monitoring results and associated trigger levels for the eight semiannual monitoring events conducted during the January 2014 through December 2017 reporting period. Results include VOCs; the metals cadmium, chromium, nickel, and uranium; the gamma emitting radionuclides americium-241, cesium-137, and cobalt-60; gross alpha and gross beta activity; tritium; and radon-222. Reported laboratory results qualified during data validation as not-detected due to laboratory contamination and/or quality control sample results (i.e., laboratory or field blank sample detections) are not included in the Table 2-9 summary.

PCE and TCE were the only VOCs detected in groundwater samples during the reporting period. TCE was detected once in the April 2014 sample from monitoring well MWL-MW8 at an estimated concentration of 0.380 micrograms per liter (µg/L). When this well was resampled in June 2014 to confirm this detection, TCE was not detected above the method detection limit of 0.300 µg/L. PCE was detected two times during the eight sampling events; in the April 2014 and April 2016 samples from monitoring well MWL-MW8, at very low estimated concentrations of 0.450 and 0.310 µg/L, respectively. VOCs were not detected above respective trigger levels, and VOCs were not detected in samples from the October 2014, April and October 2015, October 2016, and May and October 2017 monitoring events. Methylene chloride and acetone, which are common laboratory contaminants, were reported by the laboratory in samples from October 2015 and 2017, respectively, but were qualified during data validation as non-detects due to laboratory and field blank contamination.

All metal results for the January 2014 through December 2017 reporting period were consistent with historical results and below established trigger levels. All gamma-emitting radionuclides and tritium results were below the minimum detectable activity (i.e., non-detections). Gross beta activities were within the established background range and consistent with historical results. Gross alpha and radon-222 results were consistent with historical results and below established trigger levels.

Nickel and Uranium Concentration and Gross Alpha Activity Plots

Concentrations and activities over time for nickel, uranium, and gross alpha are presented in Figures 2-18 through 2-20 for the reporting period. Trigger levels are not shown on these plots, as the respective trigger levels are higher than the maximum concentration or activity depicted on the vertical axis of these figures. For non-detect results, the method detection limit or minimum detectable activity was used. For environmental-duplicate sample pairs, the highest result was used. Variation shown in these plots reflects natural background variation in the concentration of these constituents within the Regional Aquifer.

Table 2-9
Summary of Mixed Waste Landfill Groundwater Monitoring
April 2014–October 2017

Analyte	Trigger Level	Results Range CY 2014–CY 2017	Units
VOCs			
Tetrachloroethene	2.50	ND (0.300)–0.450J	µg/L
Trichloroethene	2.50	ND (0.300)–0.380J	µg/L
Metals			
Cadmium	0.0025	ND (0.00011)–ND (0.0003)	mg/L
Chromium	0.043	ND (0.002)–0.00208	mg/L
Nickel	0.050	ND (0.0005)–0.00173	mg/L
Uranium	0.015	0.00652–0.00978	mg/L
Radiological Constituents			
Americium-241	NE	ND	pCi/L
Cesium-137	NE	ND	pCi/L
Cobalt-60	NE	ND	pCi/L
Gross Alpha[a]	15	ND (-0.10)–12.06	pCi/L
Gross Beta	4 millirem per year[b]	4.13–12.2	pCi/L
Tritium	4 millirem per year[c]	ND	pCi/L
Radon-222	1,000	80.2–509	pCi/L

Notes:
[a]Gross alpha activity measurements were corrected by subtracting the total uranium activity from the total gross alpha result (40 Code of Federal Regulations 141). Negative numbers indicate the sample count or result was less than the instrument background; result is below the minimum detectable activity.
[b]Trigger level is a dose rate that only applies if a gross beta result exceeds established background range. No results exceeded the established background range for gross beta activity. See Annual LTMM Reports, Section 7.2.1 for a more detailed explanation.
[c]The equivalent activity for 4 millirem per year for tritium is 20,000 pCi/L assuming an onsite receptor. See Annual LTMM Reports, Section 7.2.1 for a more detailed explanation.
CY = Calendar year.
J = Laboratory qualifier; estimated value greater than the method detection limit, but less than the practical quantitation limit.
LTMM = Long-Term Monitoring and Maintenance.
µg/L = Micrograms per liter.
mg/L = Milligrams per liter.
ND = Analyte was not detected above the MDL shown in parenthesis (for VOCs and metals).
NE = Not established.
pCi/L = Picocuries per liter.
VOCs = Volatile organic compounds.

Hydrogeologic Assessment

A detailed conceptual site model is provided in the *MWL Phase 2 RCRA Facility Investigation Report* (Peace et al. September 2002) and the *Mixed Waste Landfill Groundwater Report, 1990 through 2001* (Goering et al. December 2002). An update to the conceptual site model integrating the findings from the current groundwater monitoring well network installed in 2008 is presented in the *Mixed Waste Landfill Annual Groundwater Monitoring Report, Calendar Year 2009* (SNL/NM June 2010).

The upper surface of the Regional Aquifer at the MWL is contained within the interfingering, unconsolidated, fine-grained alluvial-fan deposits of the Santa Fe Group. The more transmissive, coarser-grained Ancestral Rio Grande sediments underlie the fine-grained alluvial deposits beneath the MWL. The depth to water is approximately 500 ft bgs and groundwater flows generally westward, away from the Manzanita Mountains and towards the Rio Grande. Several water-supply wells operated by Kirtland Air Force Base (KAFB) and the Albuquerque Bernalillo County Water Utility Authority have profoundly modified the natural groundwater flow regime near the MWL by creating a trough in the water table in the western and northern portions of KAFB. As a result, water levels at the MWL have historically declined since monitoring began in 1990.

Figure 2-21 shows the rate of groundwater elevation decline at MWL groundwater monitoring wells for the time period 2000 through 2017. Since 2010, the rate of groundwater elevation decline in all wells has been relatively slow and constant, and less than 2 feet overall. The rate of groundwater elevation decline in the upper screen interval of MWL-MW4 (north central part of the MWL) has stabilized since April 2010. The overall decline in MWL-BW2 (east of the MWL) since 2009 has been approximately 3 feet, reflecting a slightly higher rate of decline than observed in the other wells.

Over the past two years the rate of decline has significantly slowed, and between 2015 and 2017 all wells located west of the MWL (i.e., all wells except MWL-BW2 and MWL-MW4) showed an increase ranging from 0.11 to 0.53 feet. From October 2015 to October 2017, the groundwater elevation decline in well MWL-MW4 was 1.60 feet and the groundwater elevation decline in well MWL-BW2 was 0.52 feet.

The recent subtle water table rebound measured in the monitoring wells on the west side of the MWL has been observed in wells located farther north on KAFB and is most likely related to a relaxation in groundwater removal from the Regional Aquifer by the Albuquerque Bernalillo County Water Utility Authority. Recharge from infiltration of precipitation at the MWL is negligible due to high evapotranspiration, low precipitation, the thick sequence of unsaturated Santa Fe Group deposits above the water table, and the presence of the ET Cover. Groundwater recharge of the Regional Aquifer occurs by the infiltration of precipitation in the Manzanita Mountains located approximately 5 miles to the east.

Figure 2-22 shows the October 2017 potentiometric surface of the Regional Aquifer beneath the MWL, which has remained very consistent over the January 2014 through December 2017 reporting period. Groundwater flows towards the west and northwest. Measured orthogonally from the potentiometric surface contours, the horizontal gradient for October 2017 ranges from approximately 0.03 to 0.08 feet per foot. Groundwater velocities in the alluvial-fan sediments were calculated using the current potentiometric surface gradient, the average hydraulic

conductivity obtained from slug testing of the four compliance monitoring wells, and an effective porosity of 25%. The calculated 2017 groundwater velocity ranges from 0.02 to 0.06 feet per day; the average is 0.04 feet per day. These very low values and the general position of the groundwater elevation contours have not changed over the past four years, and are consistent with previous estimates for horizontal groundwater flow at the water table in the MWL vicinity.

2.2.6 Biota

The objective for biota monitoring is to provide data to evaluate mobilization of contaminants (e.g., metals and radionuclides) from the subsurface to surface by animals and plants. Biota monitoring functions as a detection system to determine if this type of contaminant mobilization is occurring, and if so, timely action can be taken to address this contaminant transport process.

Biota monitoring activities are performed in accordance with the LTMMP, Section 3.6 and Appendix G *Tritium and Biota SAP* (SNL/NM March 2012). In accordance with the LTMMP, biota samples are collected on an annual basis. During the annual ET Cover Biology Inspection performed in August or early September (i.e., peak of the New Mexico growing season) animal burrows, ant hills, and potentially deep-rooted plants are identified, if present, and flagged for sampling. Up to two animal burrows and/or ant hills (maximum of four total samples) and up to two potentially deep-rooted plants are then sampled and analyzed for metals and gamma-emitting radionuclides (plants only analyzed for gamma-emitting radionuclides).

In accordance with LTMMP Section 5.2.2, monitoring results are compared to the trigger levels for metals and NMED-approved background activities for radionuclides (Dinwiddie September 1997). There are no trigger levels established for radionuclides, and no background levels established for radionuclides in vegetation. Background activities for radionuclides are not considered trigger levels; they are used for comparison and evaluation.

Tables 2-10 and 2-11 summarize the biota monitoring metals and gamma-emitting radionuclide results, respectively, and provide details on the number of samples collected for each sample type for each year. NMED-approved background levels for metals and radionuclides, and trigger levels for metals are also included for comparison. No surface soil metal results from ant hills and animal burrows exceeded the trigger levels, and no surface soil radionuclide results exceeded NMED-approved background activities. All metal results were also below or very close to NMED-approved background levels. Only selenium and vanadium results slightly exceeded background levels but were several orders of magnitude below the established trigger levels. Based on historical sampling results, these slight exceedances of background levels represent natural variation in surface soil.

2.3 Inspection & Maintenance Summary

A summary of inspection and maintenance results for the January 2014 through December 2017 reporting period is provided in the sections that follow. Inspection, maintenance, and repair activities are conducted in accordance with requirements in the LTMMP, Section 4.0 and *MWL Long-Term Monitoring Inspection Checklists/Forms,* Appendix I (SNL/NM March 2012). Inspection requirements are summarized in Table 2-2. Table 2-12 provides a listing of the

Table 2-10
Summary of Metals Results
Mixed Waste Landfill Biota Monitoring
Calendar Years 2014–2017

Sample Type	Parameter	Trigger Level (mg/kg)	NMED Background[a] (mg/kg)	Results Range (mg/kg)
Ant Hill Soil Samples 2014 – 2 samples 2015 – 2 samples + duplicate 2016 – 2 samples + duplicate 2017 – 2 samples	Arsenic	17.7	5.6	2.18–4.94
	Barium	100,000	130	66.1J–101J
	Beryllium	2,260	0.65	0.328J–0.509
	Cadmium	897	<1	0.0903J–0.125J
	Chromium	63.1	17.3	4.90–9.71
	Cobalt	20,500	5.2	2.14–3.41
	Copper	45,400	15.4	4.96–7.63
	Lead	800	21.4	3.32–7.92
	Mercury	73.6	<0.25	0.00383J–0.016
	Nickel	22,500	11.5	4.55–7.12
	Selenium	5,680	<1	0.399J–1.43J
	Silver	5,680	<1	ND(0.0988)–0.136J
	Vanadium	5,680	20.4	13.7–20.9J
	Zinc	100,000	62	15.9–30.8
Animal Burrow Soil Samples 2014 – 2 samples 2015 – 0 samples 2016 – 0 samples 2017 – 2 samples + duplicate	Arsenic	17.7	5.6	2.57–4.57
	Barium	100,000	130	75.9J–116J
	Beryllium	2,260	0.65	0.390J–0.502
	Cadmium	897	<1	ND(0.0893)–0.0948J
	Chromium	63.1	17.3	6.37–10.1J
	Cobalt	20,500	5.2	2.89–3.63
	Copper	45,400	15.4	5.83–6.87
	Lead	800	21.4	6.61J–9.63
	Mercury	73.6	<0.25	0.0141J–0.041
	Nickel	22,500	11.5	5.72–7.87
	Selenium	5,680	<1	ND(0.446)–0.950J
	Silver	5,680	<1	ND(0.0893)–ND(0.099)[b]
	Vanadium	5,680	20.4	15.1J–20.4
	Zinc	100,000	62	18.4–24.9J

Notes:
[a]Dinwiddie September 1997, Letter from R.S. Dinwiddie (NMED) to M.J. Zamorski (DOE), "Request for Supplemental Information: Background Concentrations Report, SNL/KAFB," dated September 24, 1997.
[b]All animal burrow results for silver were ND. The 0.099 value shown was the highest ND value reported by the laboratory.

< = Less than.
DOE = United States Department of Energy.
J = Laboratory and/or validation qualifier; the result is an estimated value.
KAFB = Kirtland Air Force Base.
mg/kg = Milligram(s) per kilogram.
ND = Analyte was not detected above the Reporting Limit, shown in parentheses.
NMED = New Mexico Environment Department.
SNL = Sandia National Laboratories.

Table 2-11
Summary of Gamma Spectroscopy Results
Mixed Waste Landfill Biota Monitoring
Calendar Years 2014–2017

Sample Type	Parameter	Results Range		NMED Background[a] (pCi/g)
		Low Value (pCi/g)	High Value (pCi/g)	
Ant Hill Soil Samples 2014 – 2 samples 2015 – 2 samples + duplicate 2016 – 2 samples + duplicate 2017 – 2 samples	Cesium-137	0.0465 ± 0.0334J	0.108 ± 0.0175	1.5
	Cobalt-60	ND(-0.0000702)	ND(0.0086)	NA
	Radium-226	0.604 ± 0.0705	0.734 ± 0.0551	2.7
	Thorium-232[b]	0.841 ± 0.0874	0.979 ± 0.101	1.5
	Uranium-235	ND(-0.0322)	ND(0.117)	0.18
	Uranium-238	ND(0.259)	1.20 ± 0.603J	2.3
Animal Burrow Soil Samples 2014 – 2 samples 2015 – 0 samples 2016 – 0 samples 2017 – 2 samples + duplicate	Cesium-137	0.0662 ± 0.0241	0.173 ± 0.0392	1.5
	Cobalt-60	ND(0.000638)	ND(0.00526)	NA
	Radium-226	0.594 ± 0.0913	0.772 ± 0.100	2.7
	Thorium-232[b]	0.858 ± 0.0924	1.02 ± 0.0999	1.5
	Uranium-235	ND(-0.00092)	ND(0.0467)	0.18
	Uranium-238	ND(0.069)	ND(0.440)	2.3
Potentially Deep-Rooted Vegetation Samples[c] 2014 – 1 sample 2015 – 0 samples 2016 – 0 samples 2017 – 0 samples	Cesium-137	ND(-0.00542)	ND(-0.00542)	1.5
	Cobalt-60	ND(0.0188)	ND(0.0188)	NA
	Radium-226	ND(0.0112)	ND(0.0112)	NA
	Thorium-232[b]	ND(-0.00803)	ND(-0.00803)	NA
	Uranium-235	ND(0.00297)	ND(0.00297)	NA
	Uranium-238	ND(0.452)	ND(0.452)	NA

Notes:
Negative numbers indicate the result is less than the instrument background; result is below the MDA.
[a]Dinwiddie September 1997, Letter from R.S. Dinwiddie (NMED) to M.J. Zamorski (DOE), "Request for Supplemental Information: Background Concentrations Report, SNL/KAFB," dated September 24, 1997. Cobalt-60 is not naturally occurring; therefore, it does not have a listed background activity. There are no established background activities for vegetation.
[b]Thorium-232 activity is quantified using the daughter isotope Lead-212 results.
[c]Only one potentially deep-rooted plant sample collected for 2014 through 2017 reporting period.
DOE = United States Department of Energy.
EPA = United States Environmental Protection Agency.
J = Validation qualifier; the result is an estimated value.
KAFB = Kirtland Air Force Base.
MDA = Minimum detectable activity.
NA = Not applicable.
ND = Analyte was not detected.
NMED = New Mexico Environment Department.
pCi/g = Picocuries per gram.
SNL = Sandia National Laboratories.

Table 2-12
Mixed Waste Landfill Inspection Types, Frequency, and Months Performed
January 2014–December 2017 Reporting Period

Inspection Type	Frequency	Form/Checklist[a]	Month Performed
ET Cover Biology Inspection	Annual[b]	Biology Inspection Checklist/Form	August or September
ET Cover Surface Inspection	Quarterly	Cover Inspection Checklist/Form	May or June
			August or September
			November or December
			February or March
Storm-Water Diversion Structure Inspection[c]	Quarterly	Cover Inspection Checklist/Form	May or June
			August or September
			November or December
			February or March
Soil-Vapor Monitoring Network Inspection	Semiannually[d]	Soil-Vapor Monitoring Network Checklist/Form	April or May
			September and October
Soil Moisture Monitoring Network Inspection	Annually[d]	Soil-Moisture Monitoring Network Checklist/Form	April and October
Groundwater Monitoring Network Inspection	Semiannually[d]	Groundwater Monitoring Network Checklist/Form	April or May and October
Security Fence Inspection[c]	Quarterly	Cover Inspection Checklist/Form	May or June
			August or September
			November or December
			February or March

Notes:
[a]All reporting period inspection forms are provided in Annex F of respective Annual LTMM Reports.
[b]Transition from quarterly to annual inspection frequency based upon meeting successful revegetation criteria as determined by the staff biologist during the August 14, 2014 growing season Biology Inspection.
[c]These inspections are conducted at the same time as the ET Cover Surface Inspection and documented on the same inspection form. As of June 2016, these quarterly inspections are performed on a June, September, December, and March schedule.
[d]Monitoring network inspections are performed at the same frequency and at the same time as the associated monitoring. Soil moisture monitoring transitioned to annual frequency in 2016 and is typically performed in April.
ET = Evapotranspirative.
LTMM = Long-Term Monitoring and Maintenance.

inspections performed, the inspection frequency, and the month when inspections are typically performed. Detailed information for each annual reporting period can be found in MWL Annual LTMM Reports, Chapter 9 (see Section 1.7).

2.3.1 Cover System

The cover system includes the ET Cover vegetation and ET Cover surface (note the term ET Cover includes the top surface and side slopes). ET Cover vegetation is inspected annually by an SNL/NM staff biologist and documented on the *Biology Inspection Form/Checklist*; Section 2.3.1.1 provides a summary of these inspection results. The ET Cover surface is inspected quarterly by a field technician and documented on the *Cover Inspection Checklist/Form*; Section 2.3.1.2 provides a summary of these inspection results. During the quarterly inspections, the field technician also inspects the storm-water diversion swale, security fence and signage, and survey monuments, which are summarized in Sections 2.3.1.3 and 2.3.1.4.

2.3.1.1 Biology

ET Cover *Biology Inspections* were initiated in May 2013, prior to LTMMP approval on January 8, 2014. The ET Cover has met the LTMMP criteria for successful revegetation as documented in all *Biology Inspections*. In accordance with the LTMMP, the frequency of *Biology Inspections* transitioned to an annual frequency after the August 2014 growing season inspection, which provided confirmation that all successful revegetation criteria had been met (SNL/NM June 2015). Although only the annual *Biology Inspection* is required, the staff biologist also performs verification inspections as a best practice to support the quarterly ET Cover surface inspections, which are performed by a field technician.

Throughout the 2014 through 2017 reporting period, the ET Cover vegetation met or exceeded all LTMMP criteria for successful revegetation. Based on the most recent *Biology Inspection* conducted on August 21, 2017, the approximate foliar coverage on the ET Cover was 51%, with 99% of this coverage composed of native vegetation. The foliar coverage is dominated by native grasses, with Galleta grass (native clump grass species) comprising approximately 40% of the total foliar coverage. There were no contiguous areas of 200 or more square feet without vegetation and no plants capable of developing deep root systems were identified. During all annual *Biology Inspections* ant hills were observed distributed evenly across the cover surface and side slopes. Small animal burrow and diggings have been rare on the ET Cover surface and side slopes, but occasionally very small diggings have been observed and documented. Overall, the ET Cover vegetation and surface is in good condition.

No action or repairs were required during the reporting period based on the *Biology Inspections.* Periodic live and dead/windblown weed removal, and herbicide application to the 3-foot area outside the perimeter fence and graveled staging areas, were performed as a best practice to support the long-term health of the native grasses. From March 2014 through March 2015, five weed removal events were performed to remove live and dead weeds from the ET Cover and site perimeter. These weed control activities help the desired native grasses by reducing the availability of weed seeds and competition from the future growth of invasive plants.

Supplemental watering was performed during May, June, and October 2014 to help establish the native grasses (SNL/NM June 2015). Since that time additional supplemental watering has not been needed, and the temporary above-ground watering system was decommissioned in July and August 2015.

Additional detailed information is provided in Annual LTMM Reports, which include the *Biology Inspection Form/Checklist* (Annex F) and the *Annual Biology Report* (Annex G). The Biology Report summarizes ET Cover background information, local climate trends, best practice maintenance performed to support the vegetation, and recommendations for the ET Cover based on inspections performed during the reporting period.

2.3.1.2 ET Cover System/Surface

ET Cover surface inspections were performed on a quarterly frequency by a field technician during the 2014 through 2017 reporting period, fulfilling the LTMMP inspection requirement (Table 2-12). There were no signs of subsidence, ponding water on the cover surface, or

erosion. During the May 2015 inspection, Russian thistle weeds were observed growing on and around the ET Cover; they were removed in July 2015 within 60 days of the inspection.

Animal burrows in the perimeter area surrounding the ET Cover have been periodically observed. The burrows that occurred under monitoring well pads (see Section 2.3.2 below) were repaired by backfilling after inspection by the staff biologist. No repairs were required for the ET Cover during the reporting period.

2.3.1.3 Storm-Water Diversion Structure

Storm-water diversion structure inspections were combined with the quarterly ET Cover System/Surface Inspections during the reporting period, fulfilling the LTMMP inspection requirement (Table 2-12). These inspections addressed the storm-water diversion swale on the north, east, and south sides of the ET Cover just beyond the toe of the cover side slopes (Figure 1-3), and were documented on the same *Cover Inspection Checklist/Form*. No inspection items required follow-up actions, although windblown weeds were periodically removed from the swale as a best practice. There were no observations of ponded water in the swale after storm events; the swale is operating as designed.

2.3.1.4 Security Fence

Perimeter security fence inspections were combined with the quarterly ET Cover System/Surface Inspections during the reporting period, fulfilling the LTMMP inspection requirement (Table 2-12). The inspections addressed the security fence, access controls (gates, locks, signs), and survey monuments, and were documented on the same *Cover Inspection Checklist/Form*. Clearing the perimeter fence of dead, windblown Russian thistle weeds was the most common required maintenance for the reporting period. Depending upon the magnitude of weed buildup on the fence, this work was either performed by the field technician at the time of the inspection or within 60 days of the inspection by the ET Cover maintenance contractor. Because of these periodic buildups along the fence, the perimeter fence line is more prone to weed growth. Timely application of preventive herbicides to this area have helped minimize weed growth. Periodic maintenance of the gate locks, and replacement of faded/damaged signs was also performed during the inspections.

2.3.2 Monitoring Networks & Equipment

Inspections of the soil-vapor, soil moisture, and groundwater monitoring networks and sampling equipment were performed concurrently with the monitoring events during the reporting period, fulfilling the LTMMP inspection requirement (Table 2-12). Routine maintenance was performed as needed, including repainting the bollards and replacing the locks on the three soil-moisture monitoring wells in April and October 2014. No other inspection parameters required repairs for the three monitoring networks.

As mentioned previously, small animal burrows were observed in the ET Cover perimeter area, including under the concrete well pads of soil moisture monitoring wells MWL-VZ-1 and MWL-VZ-3. These burrows under the MWL-VZ-1 and MWL-VZ-3 well pads were inspected and

backfilled as a best practice in November 2015 and again in February 2016 after inspections by the staff biologist and determinations that the burrows were inactive. These observations and repair actions resulted in a more comprehensive, long-term solution implemented as a best practice, as discussed in the next section.

2.4 Other Pertinent Data and Information

As part of the LTMM effort at the MWL, process and site improvements were made during the 2014 through 2017 reporting period. These improvements, or best practices, are not explicitly required by LTMMP or Permit conditions; they are summarized in the following sections. Process improvements are designed to facilitate monitoring network performance and data quality. The site improvements are designed to enhance ET Cover long-term effectiveness and minimize required maintenance.

2.4.1 Process Improvements

After review of the September 2014 soil-vapor monitoring results that showed low detections (i.e., less than 1.0 ppmv) of VOC soil-vapor concentrations at 400 ft bgs, passive soil-vapor venting devices (i.e., BaroBalls™) were installed on groundwater monitoring wells MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9 as a best practice on February 2, 2015. These devices allow soil-vapor that diffuses into monitoring wells to move toward the surface during periods of low atmospheric pressure, and prevent the downward movement of soil vapor in the well during periods of high barometric pressure. This is a concern at groundwater monitoring well MWL-MW8, which has shown very low concentrations (i.e., sub-part per billion) of PCE in two of eight groundwater samples collected during the reporting period, as discussed in Section 2.2.5. The most likely explanation for these detections based on site conditions and extensive investigation at the nearby CWL is that PCE soil-vapor is diffusing into the MWL-MW8 well, being pushed downward toward the groundwater surface by changes in barometric pressure in the atmosphere, and impacting groundwater inside the well screen. The BaroBall™ devices are a passive control measure installed on the groundwater monitoring wellheads that should help prevent this barometric pumping effect in the groundwater wells.

During the 2014 through 2017 reporting period an improved method for the collection of environmental duplicate soil-vapor samples was developed, tested, and implemented. The new method involves simultaneously collecting the environmental and environmental duplicate sample pair from a sampling port, using a split stream sampling manifold system (i.e., collect the duplicate sample at the same time as the associated environmental sample). Based on field and laboratory results, this approach helps reduce variability caused by the more conventional method that involved collection of the duplicate sample after collection of the environmental sample (i.e., collection of the two samples in series).

2.4.2 Site Improvements

During CYs 2016 and 2017, two site improvement projects were completed at the MWL that are detailed in the June 2017 Annual LTMM Report (SNL/NM June 2017). These projects included a significant upgrade to the access and perimeter road designed to improve site drainage, and

erosion and small animal burrow controls designed to protect perimeter monitoring wells from small burrowing mammals and protect the ET Cover western side slope from erosion during large storm events.

Access and Perimeter Road Improvements

From November 2016 to February 2017, improvements were made to the MWL site access and perimeter road to provide outer perimeter surface-water protection for the ET Cover. The entire road surface was built up approximately six inches and side drainages (i.e., road ditches) were established. Culverts were installed in two areas along the access road (north of the MWL) and at two locations along the perimeter road (near northwest and southwest corners) to allow storm water to drain off the road and away from the MWL. The two culverts on the perimeter road have eliminated areas that temporarily held water after large precipitation events prior to the improvements. Figures 1-3 and 2-23 show the road and drainage improvements, which provide outer perimeter surface-water drainage protection for the ET Cover by intercepting upgradient surface-water and diverting it away from and downgradient of the site via road ditches and culverts.

Perimeter Monitoring Well Erosion and Burrow Control Measures

During CY 2016, erosion and burrow control alternatives were evaluated for five locations where the ET Cover western side slope used to steepen near the cover toe, adjacent to perimeter monitoring wells (SNL/NM June 2017). During construction of the ET Cover in 2009, small mounds were created in these locations to divert surface water flowing off the ET Cover surface around the monitoring wells. These localized diversions were required because the ET Cover western side slope toe extended to and impinged upon the monitoring wells (SNL/NM January 2010, Revision 1). These locations were more prone to surface erosion during larger storm events due to the steeper slope in the immediate vicinity of the monitoring wells. Small mammal burrows under some of these perimeter monitoring well concrete pads, specifically MWL-VZ-1 (west side) and MWL-VZ-3 (east side), had also been observed and repaired during previous inspections.

A detailed engineering design for the erosion and burrow control measures at all 10 perimeter monitoring well locations was developed in early 2016, incorporating rock-filled Gabion baskets and Reno mattresses. The control measures were installed at the MWL from September through November 2016 (see the June 2017 MWL LTMM Annual Report for construction specification and process details).

The completed Gabion basket and Reno mattress installations at the 10 perimeter monitoring wells are shown in Figure 2-24. The Gabion baskets were installed at the upslope end of the five western side slope locations to anchor the horizontal Reno mattresses and provide additional erosion control at these sloped locations. Each of the five wells located farther from the ET Cover toe only required a horizontal Reno mattress. These robust controls reestablished the smooth western side slope design of the ET Cover (i.e., eliminated the small steeply-sloped mounds installed next to the five monitoring wells immediately adjacent to the western side slope toe), provide long-term protection of all perimeter monitoring wells from both erosion and small animal burrows, and minimize long-term maintenance.

On July 26, 2018 between 9 and 10:00 p.m. 1.4 inches of rain fell in the MWL area, representing a 50-year storm event. Of this total, 0.98 inches fell in a 15-minute period. The site was inspected the next morning to check for any ponded water on or around the ET Cover, erosion on the side slopes, and the condition of the perimeter road, ditches, and culverts. The photograph in the lower right-hand corner of Figure 2-24 and in Figure 2-25 were taken during this inspection. The site was in good condition with no ponded water on or around the immediate ET Cover perimeter, and only minor evidence of erosion. The most prominent erosion was observed along the two-track drive path on the northern side slope of the ET Cover that provides access to groundwater well MWL-MW4 (Figure 1-3). This relatively minor erosion (i.e., small rills) was less than 3-inches deep and was caused by the surface-water channeling effect of the drive path. While they do not exceed the erosion specification in Table 2-2, they will be repaired as a best practice in 2018 to minimize future erosion in this area. The western side slope and perimeter erosion control features were in good condition, in part due to native grass growth that has reestablished in the area since construction of the features (Figure 2-24). The perimeter drainage swale and perimeter road ditches performed as designed, intercepting surface water and channeling it around the perimeter of the site and to the west. There was no ponded water in the road ditches and culvert areas. This storm event provided an opportunity to evaluate the MWL surface water controls, which performed as designed. A photograph of the ET Cover taken the morning of July 27, 2018 after this major precipitation event is shown in Figure 2-25.

CHAPTER 2 FIGURES

This page intentionally left blank.

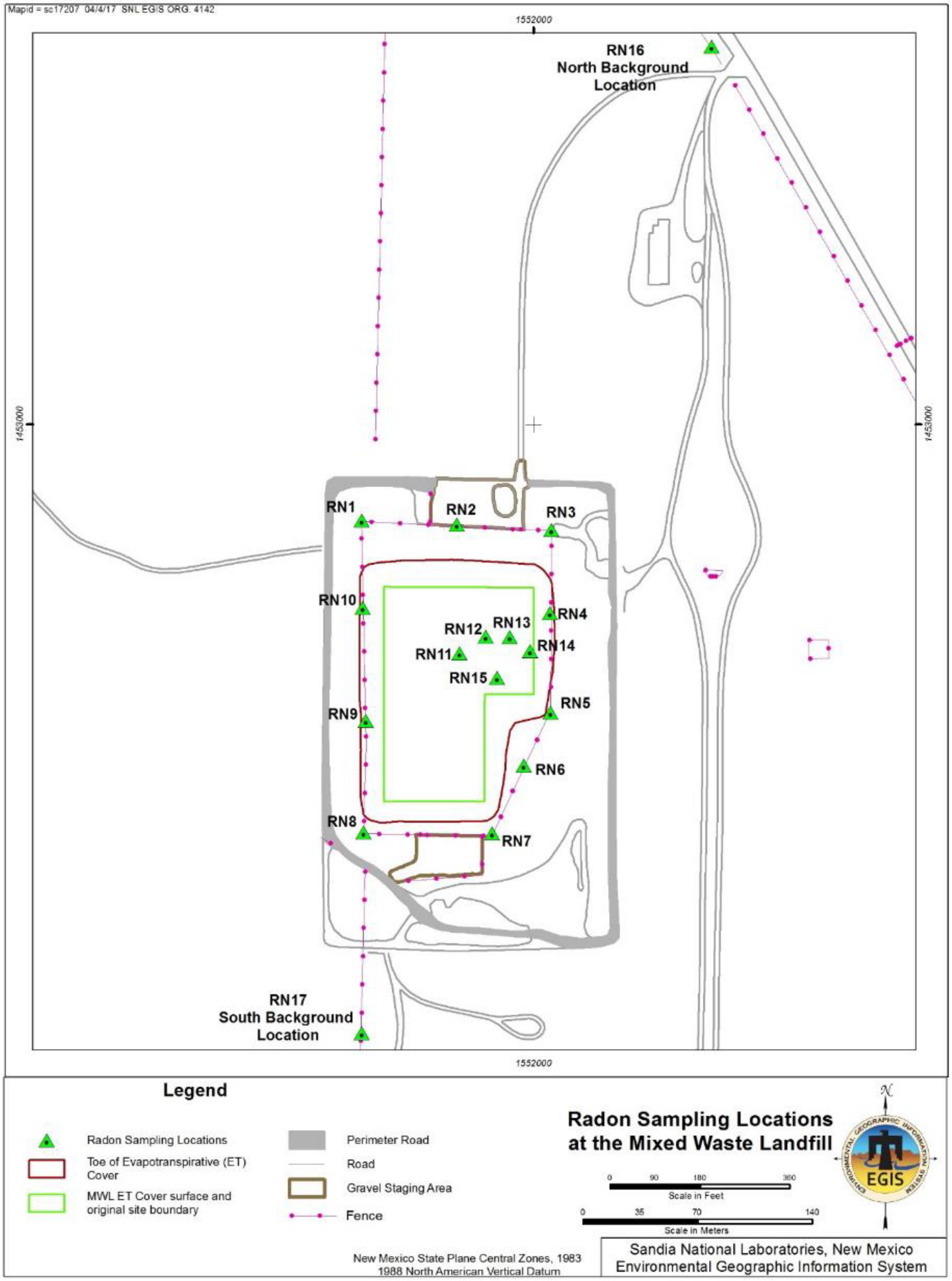


Figure 2-1
Mixed Waste Landfill Radon Detector Locations

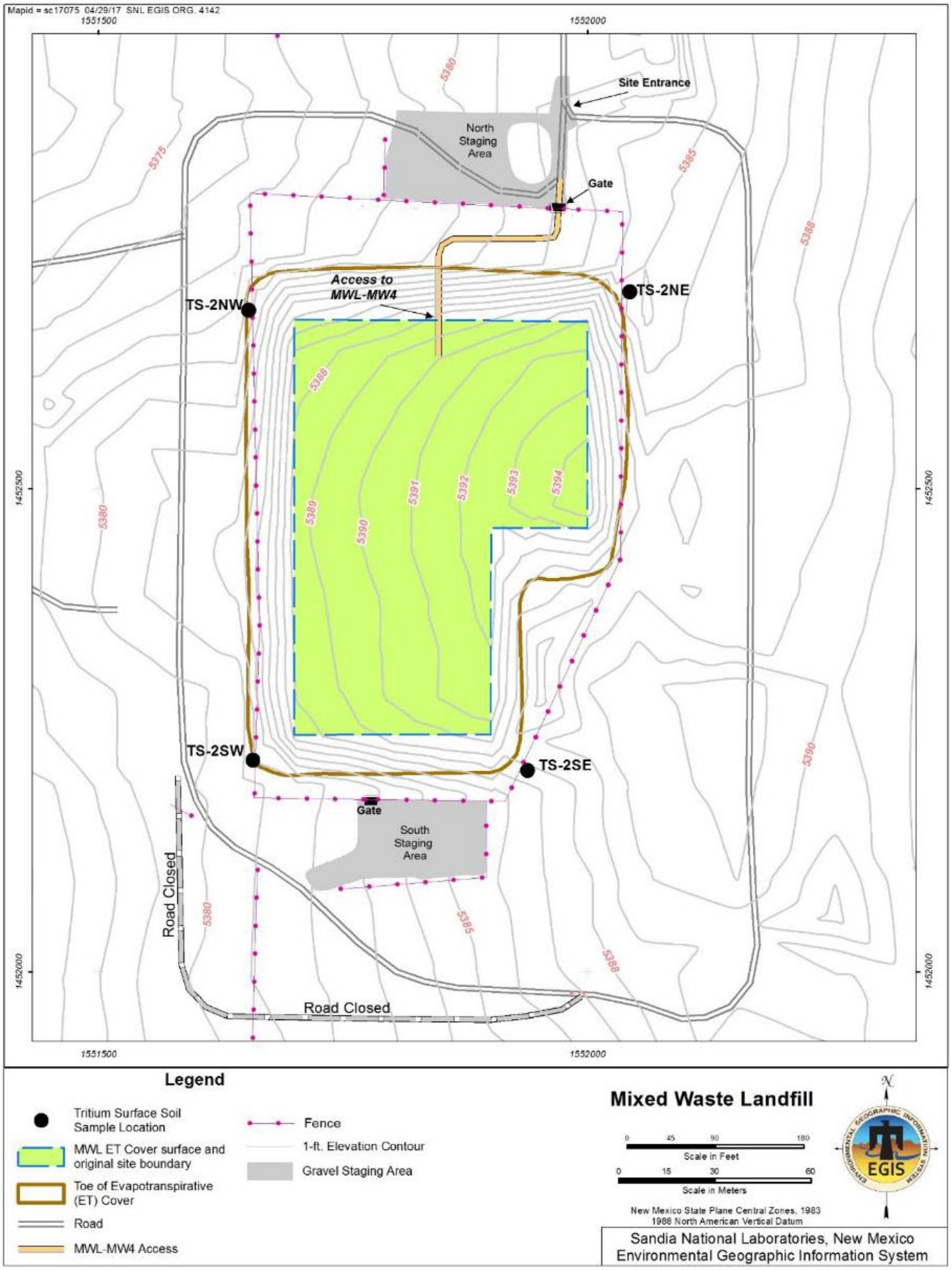


Figure 2-2
Mixed Waste Landfill Tritium Surface Soil Sampling Locations

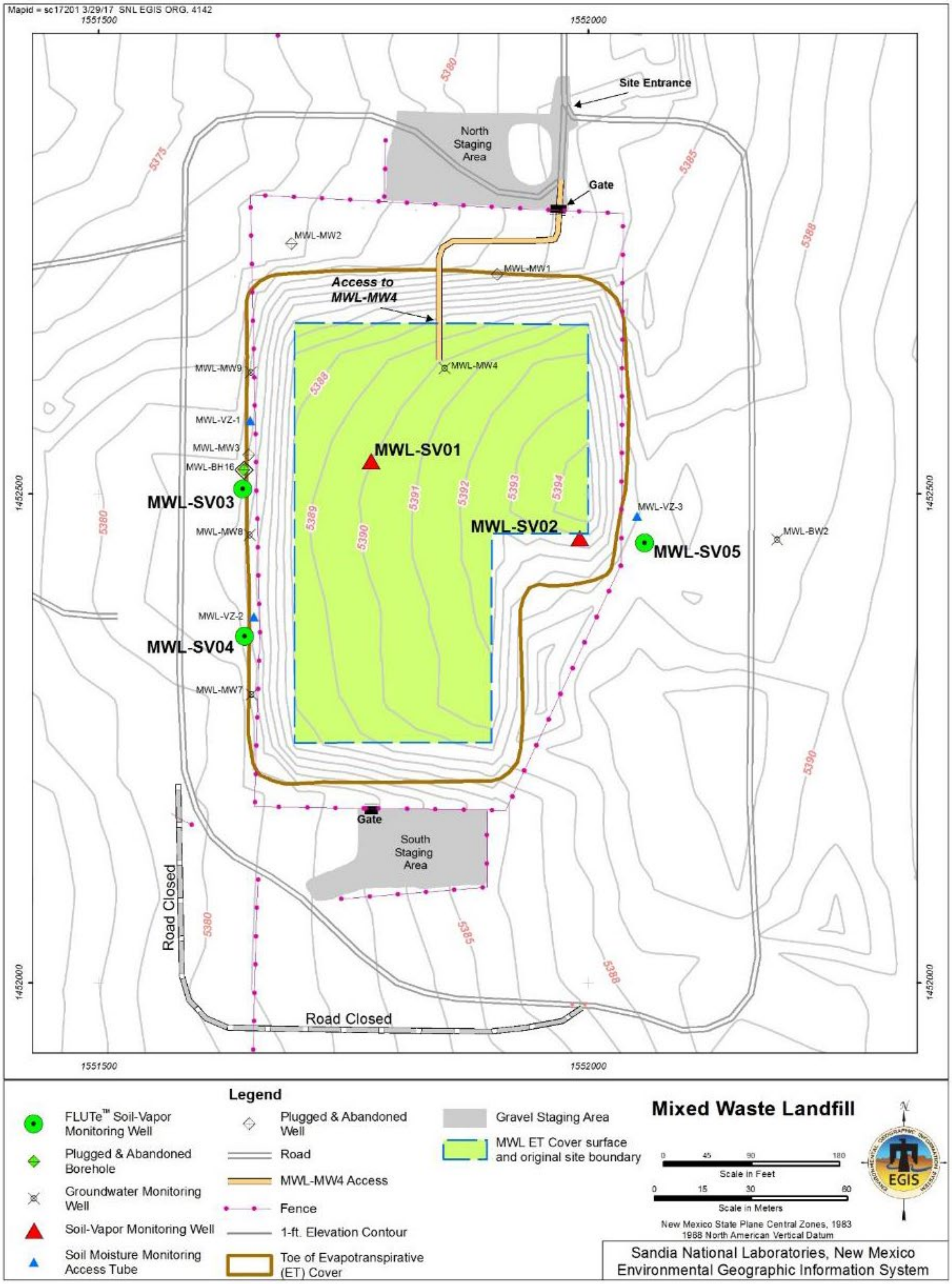


Figure 2-3
Mixed Waste Landfill Soil-Vapor Monitoring Well Locations

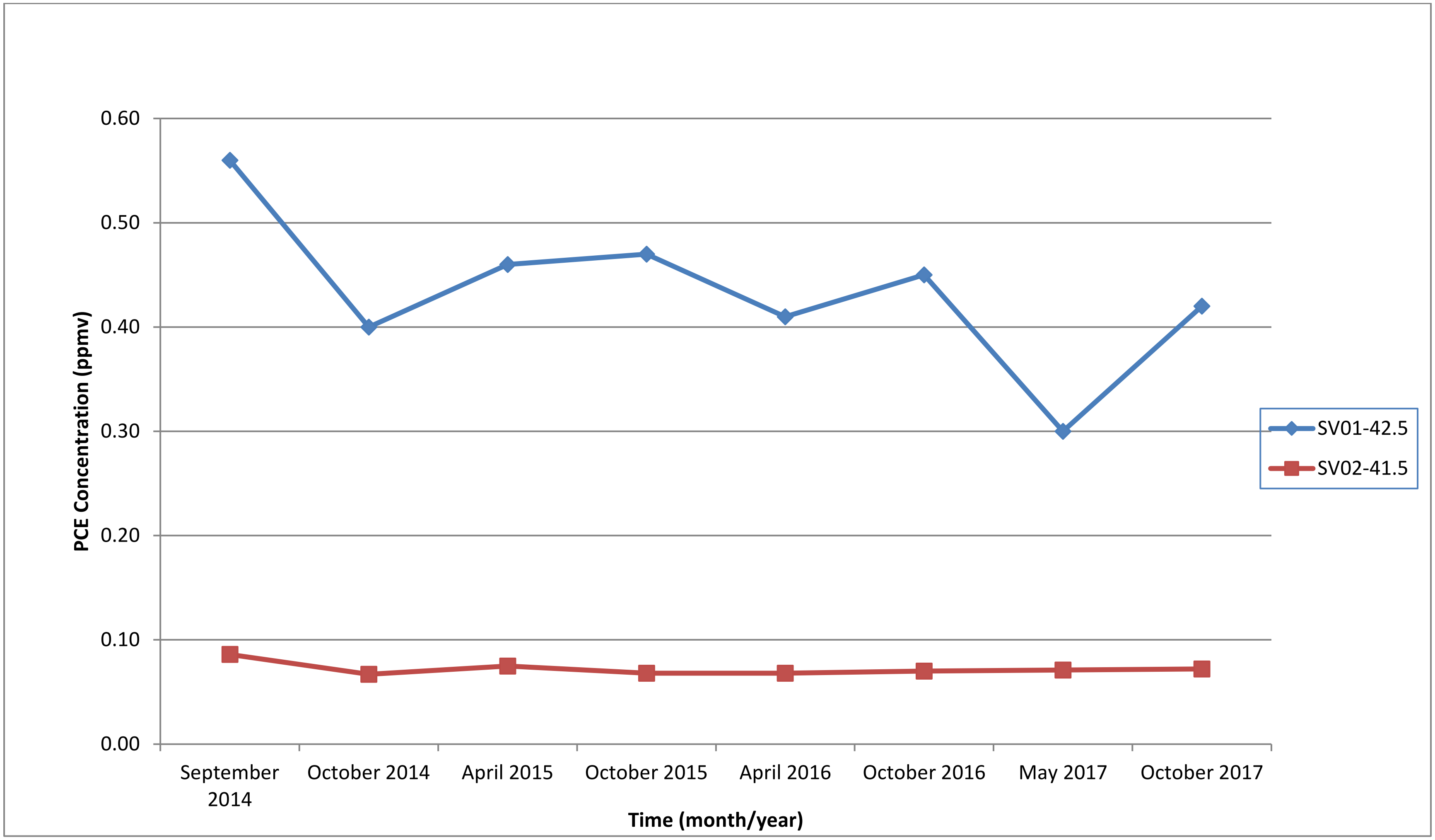


Figure 2-4
PCE Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Wells SV01 and SV02 Ports

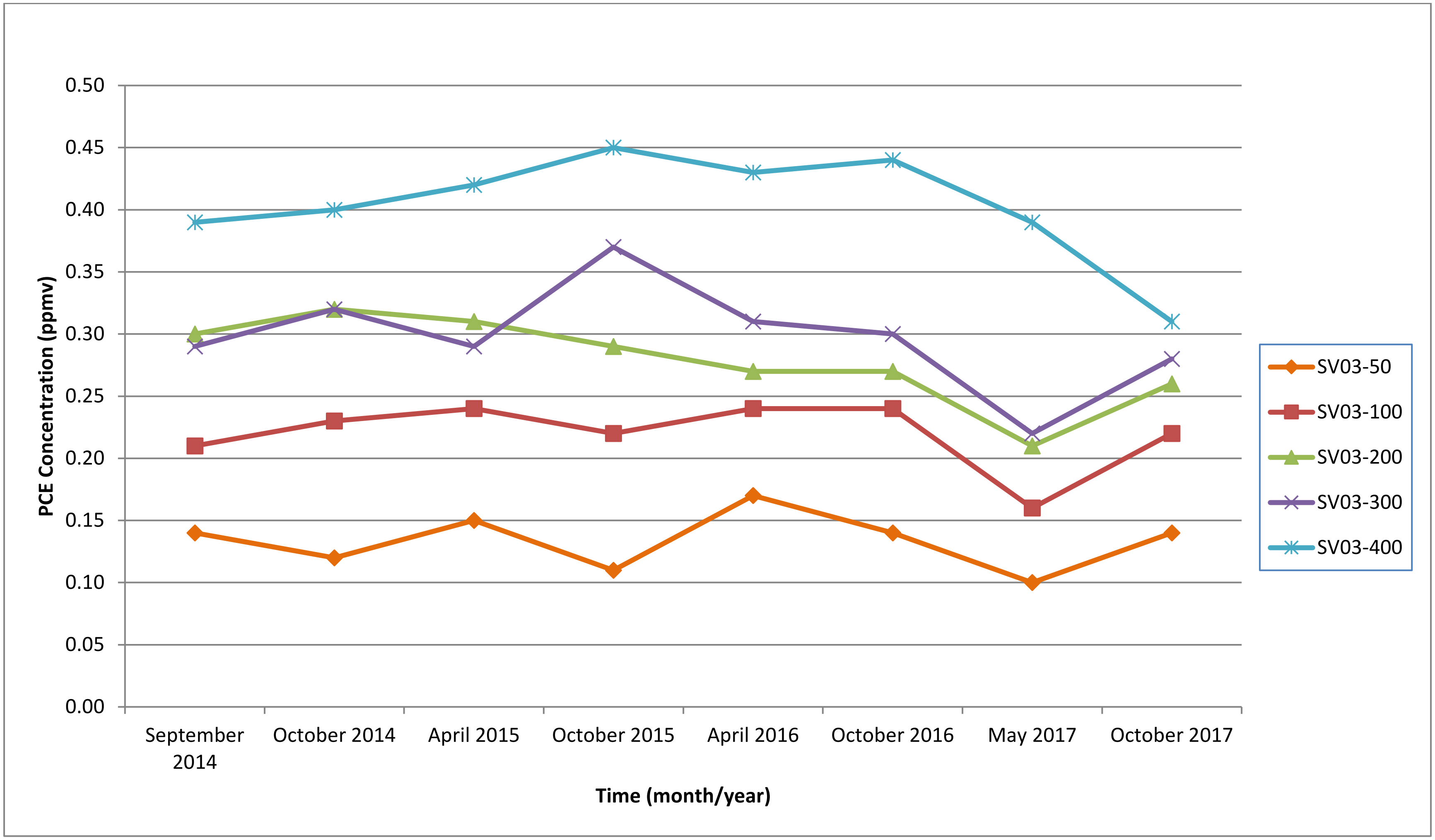


Figure 2-5
PCE Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Well SV03 Ports

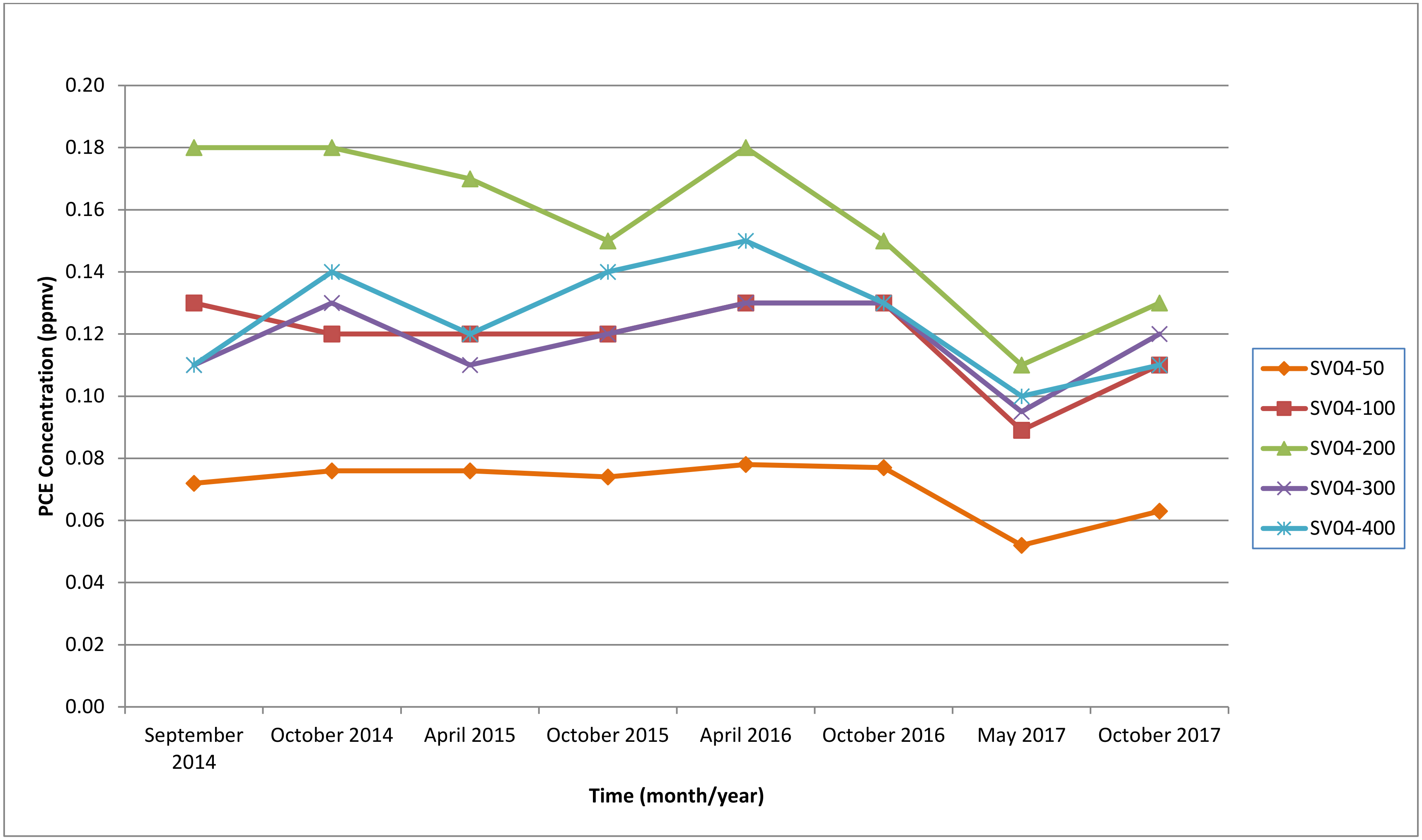


Figure 2-6
PCE Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Well SV04 Ports

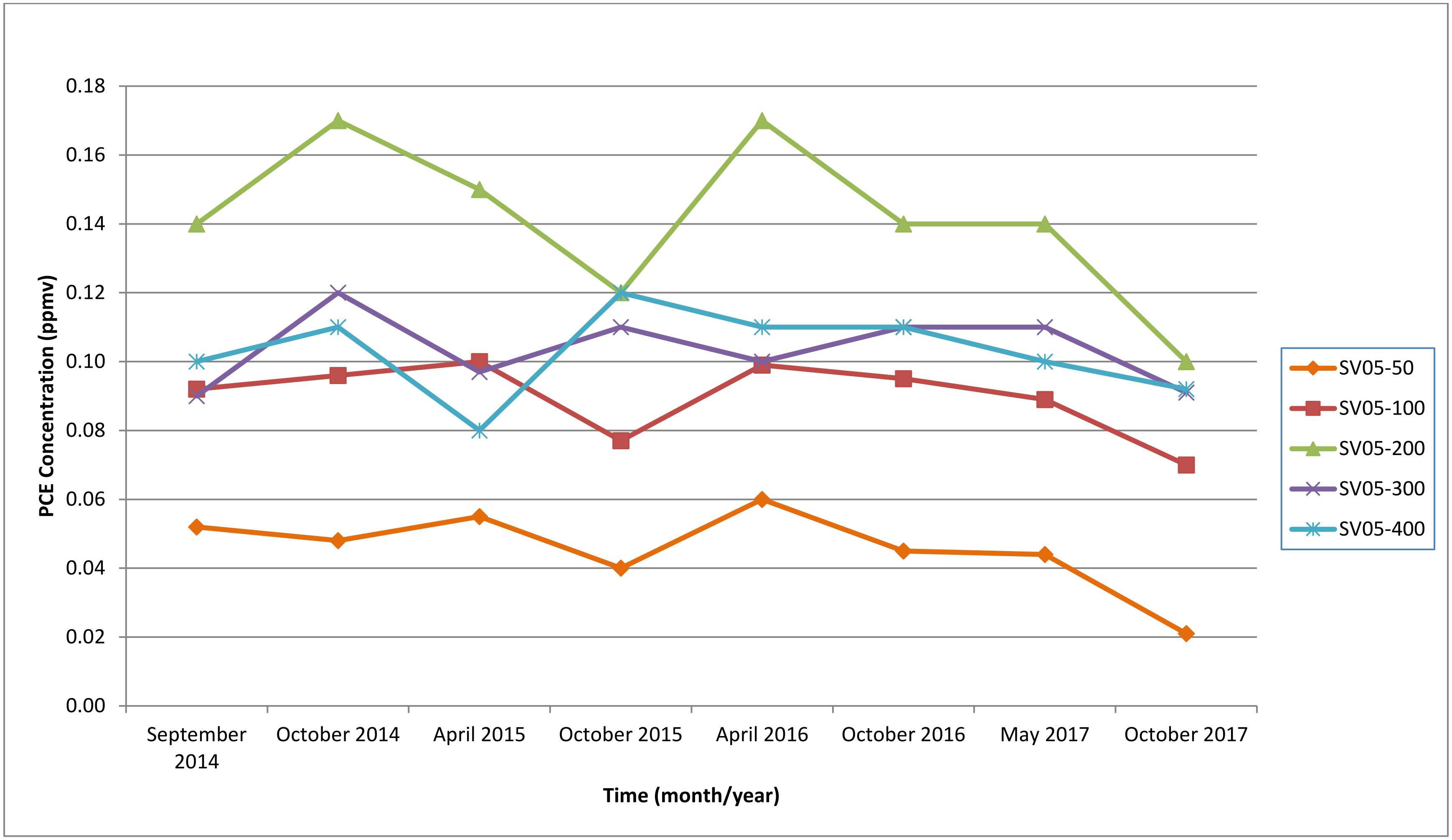


Figure 2-7
PCE Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Well SV05 Ports

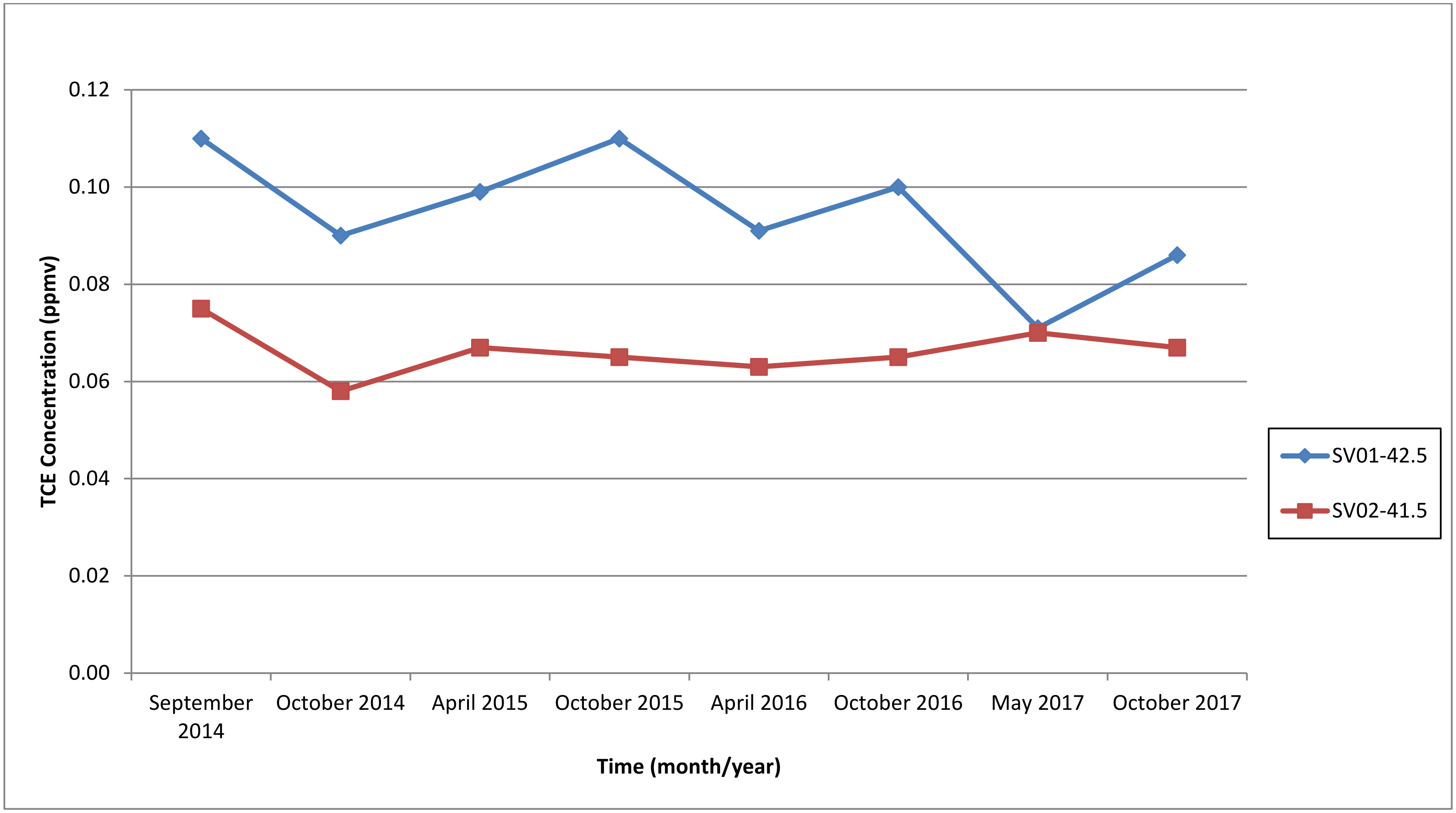


Figure 2-8
TCE Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Wells SV01 and SV02 Ports

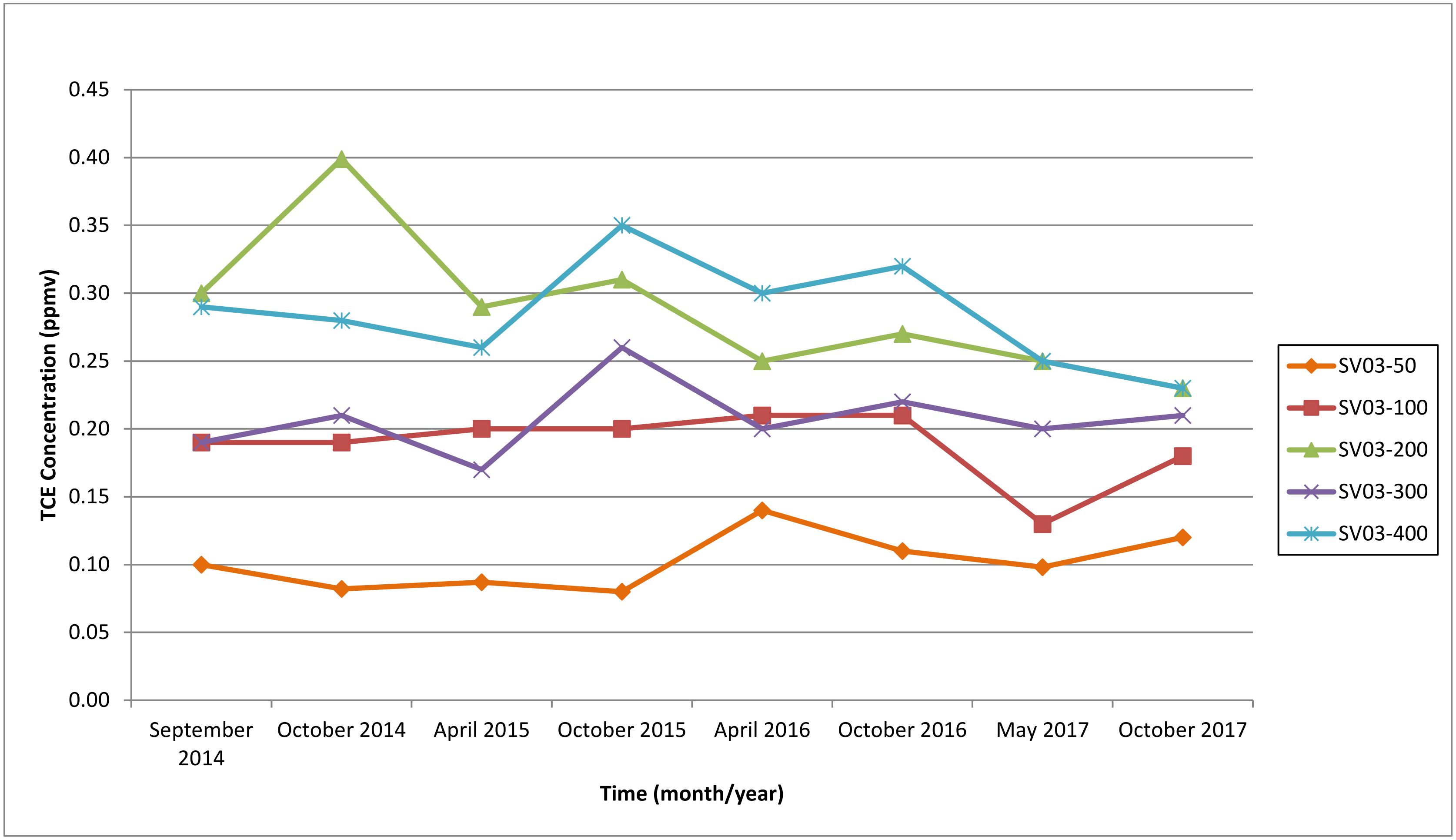


Figure 2-9
TCE Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Well SV03 Ports

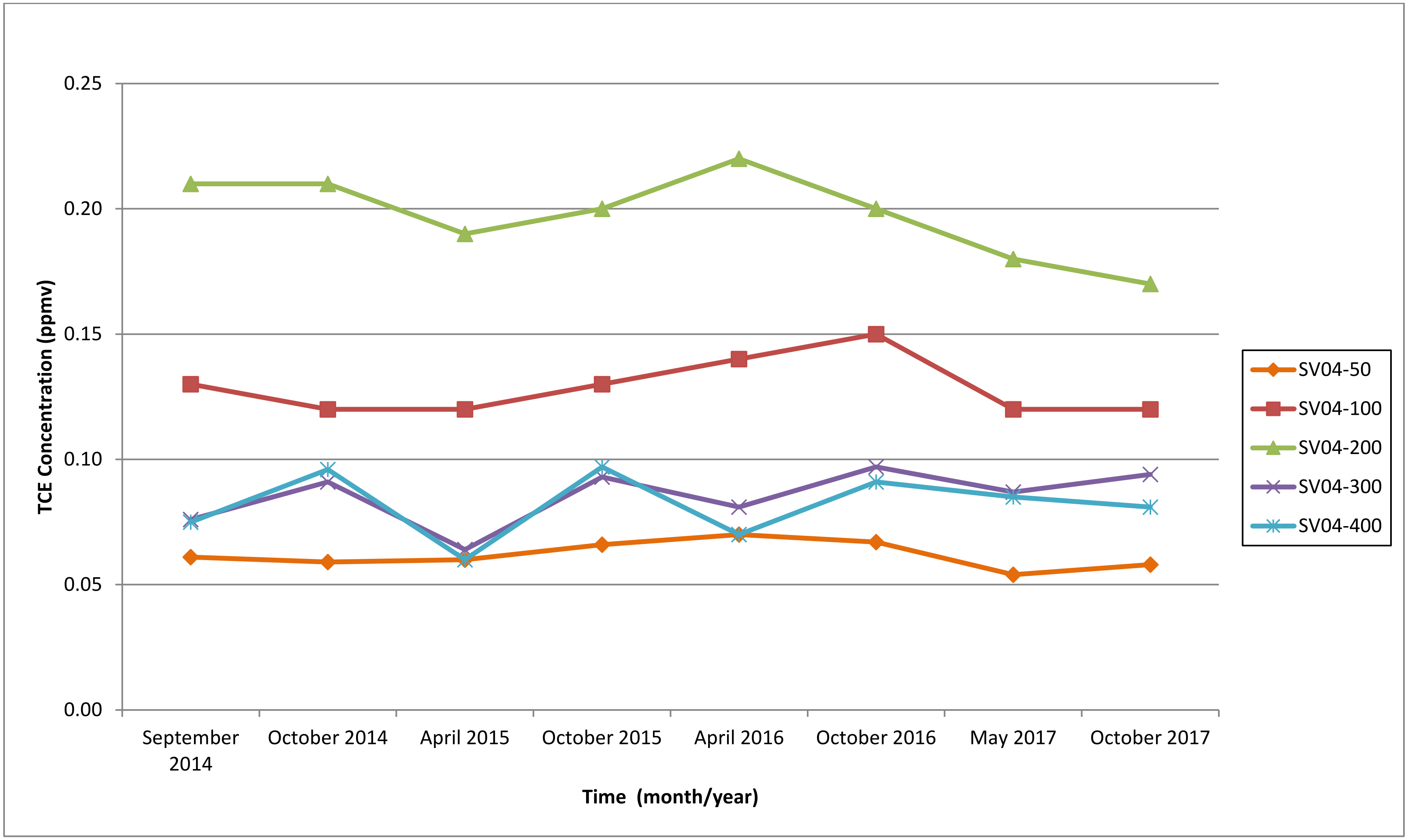


Figure 2-10
TCE Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Well SV04 Ports

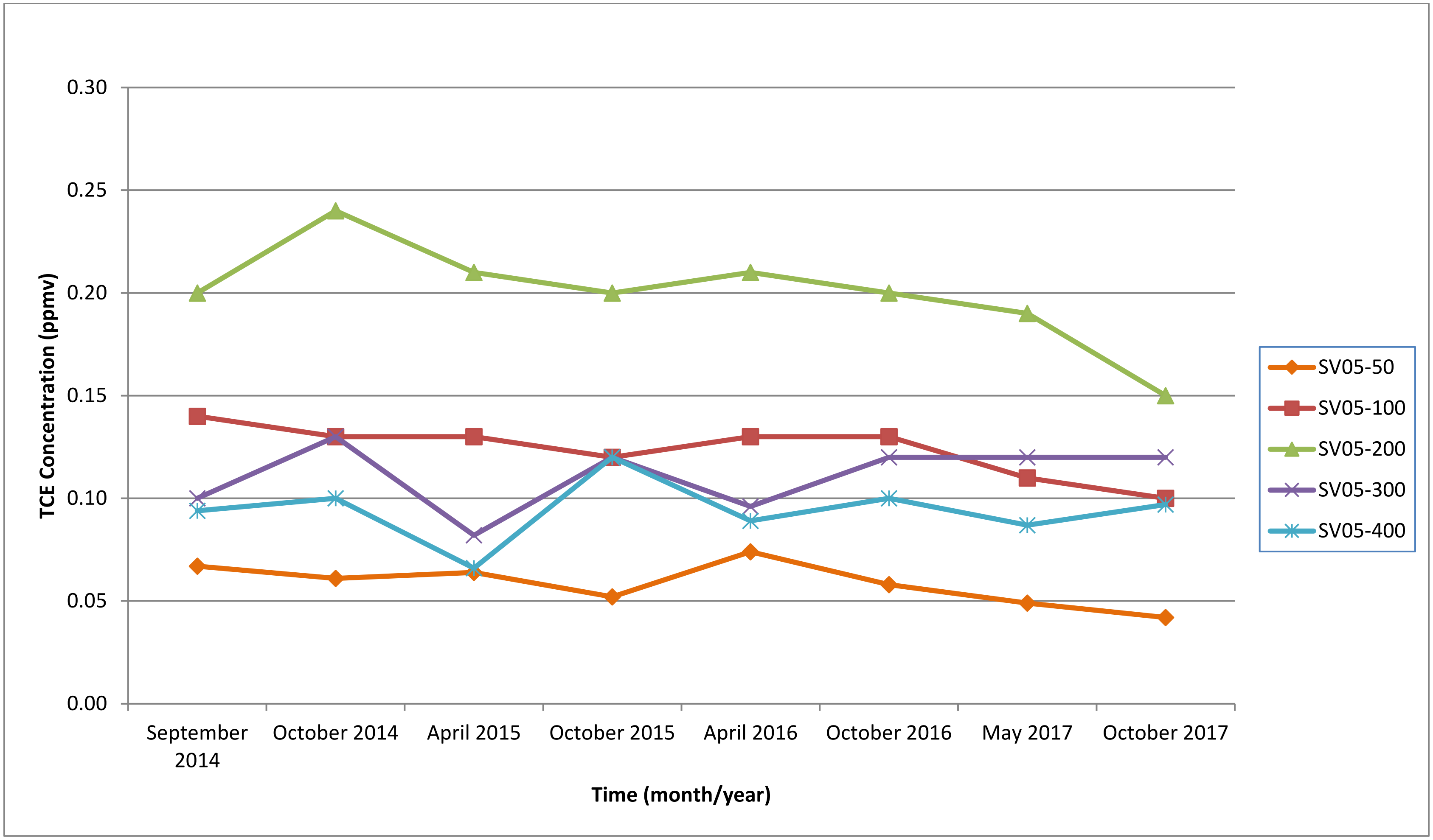


Figure 2-11
TCE Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Well SV05 Ports

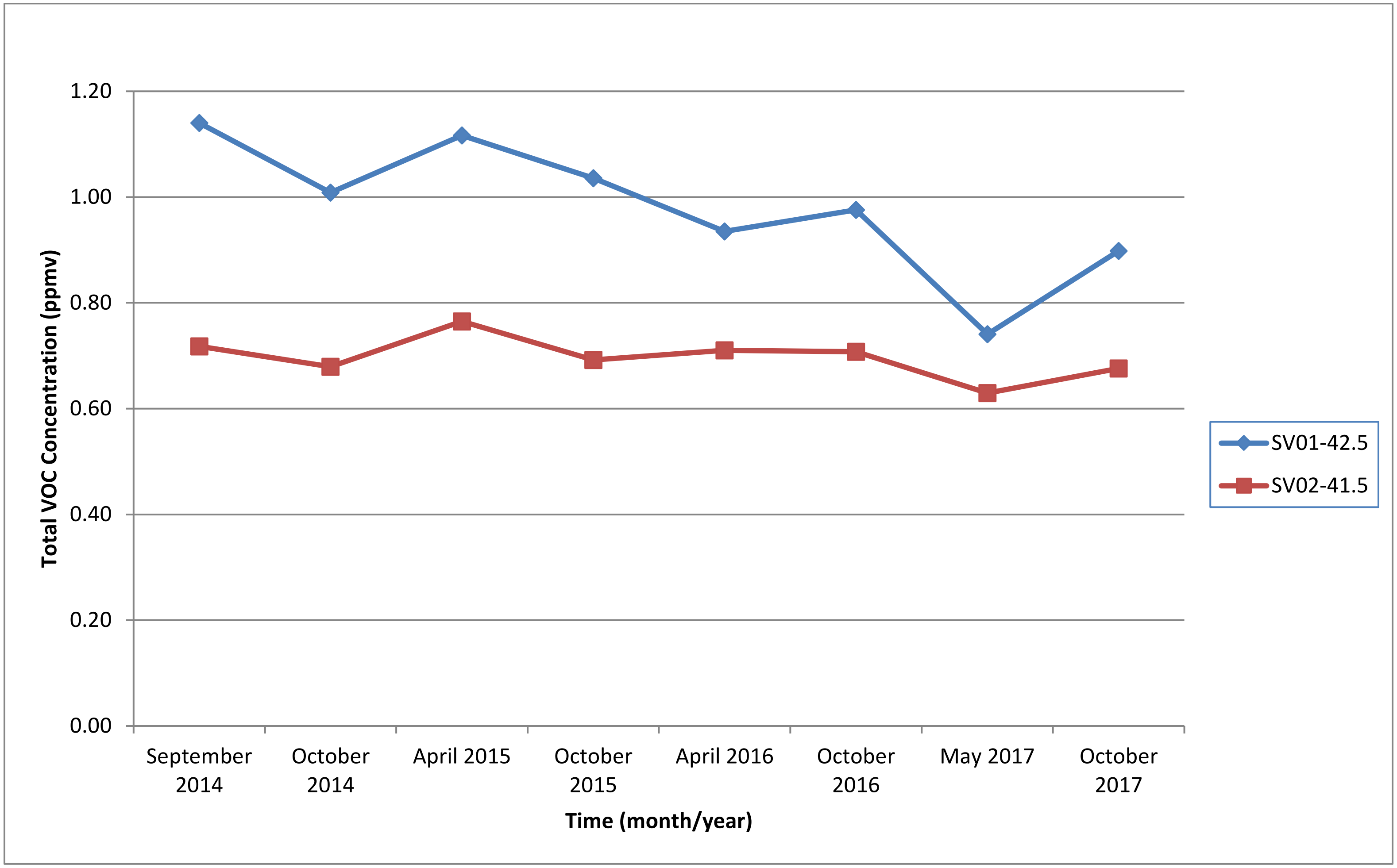


Figure 2-12
Total VOCs Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Wells SV01 and SV02 Ports

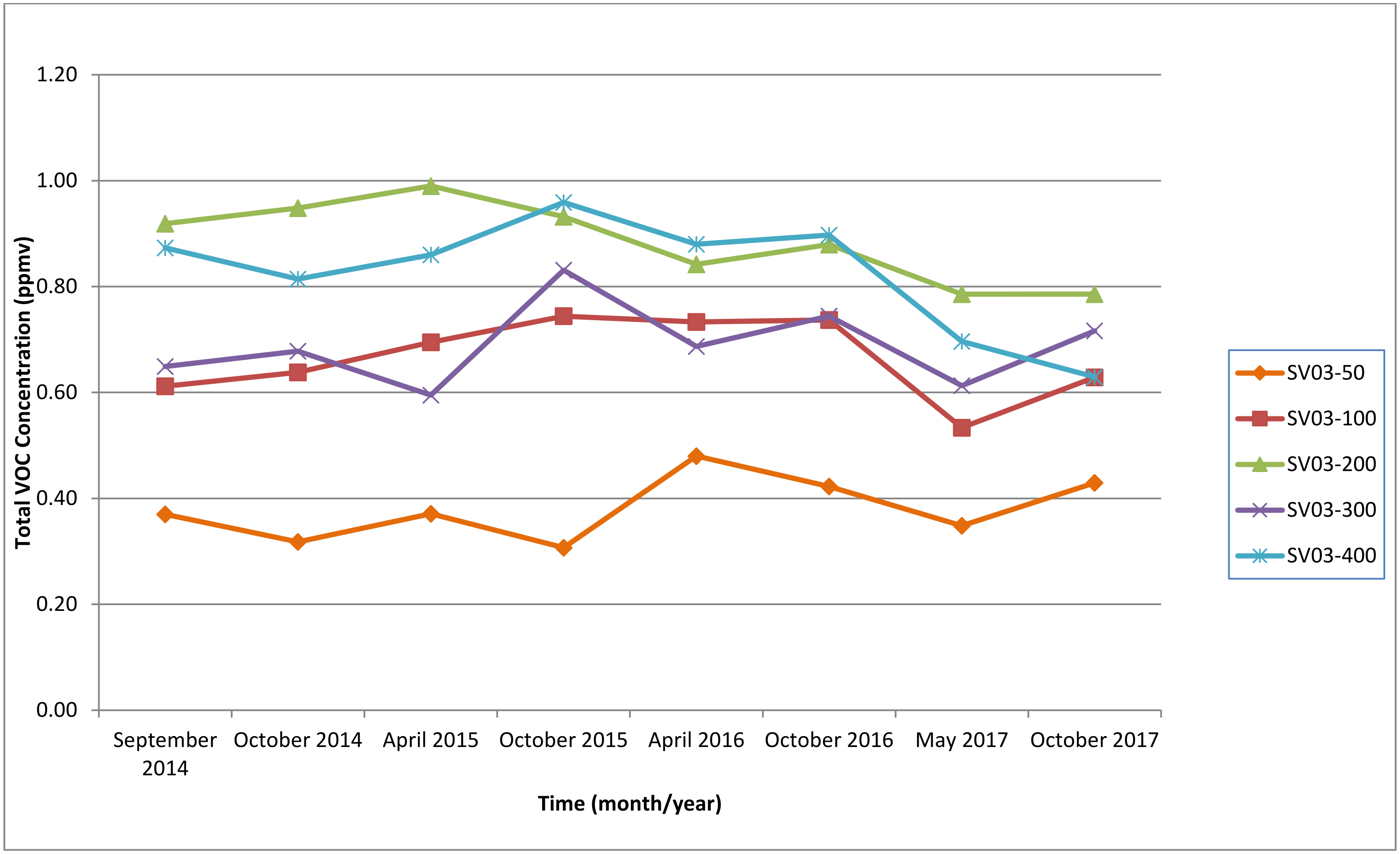


Figure 2-13
Total VOCs Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Well SV03 Ports

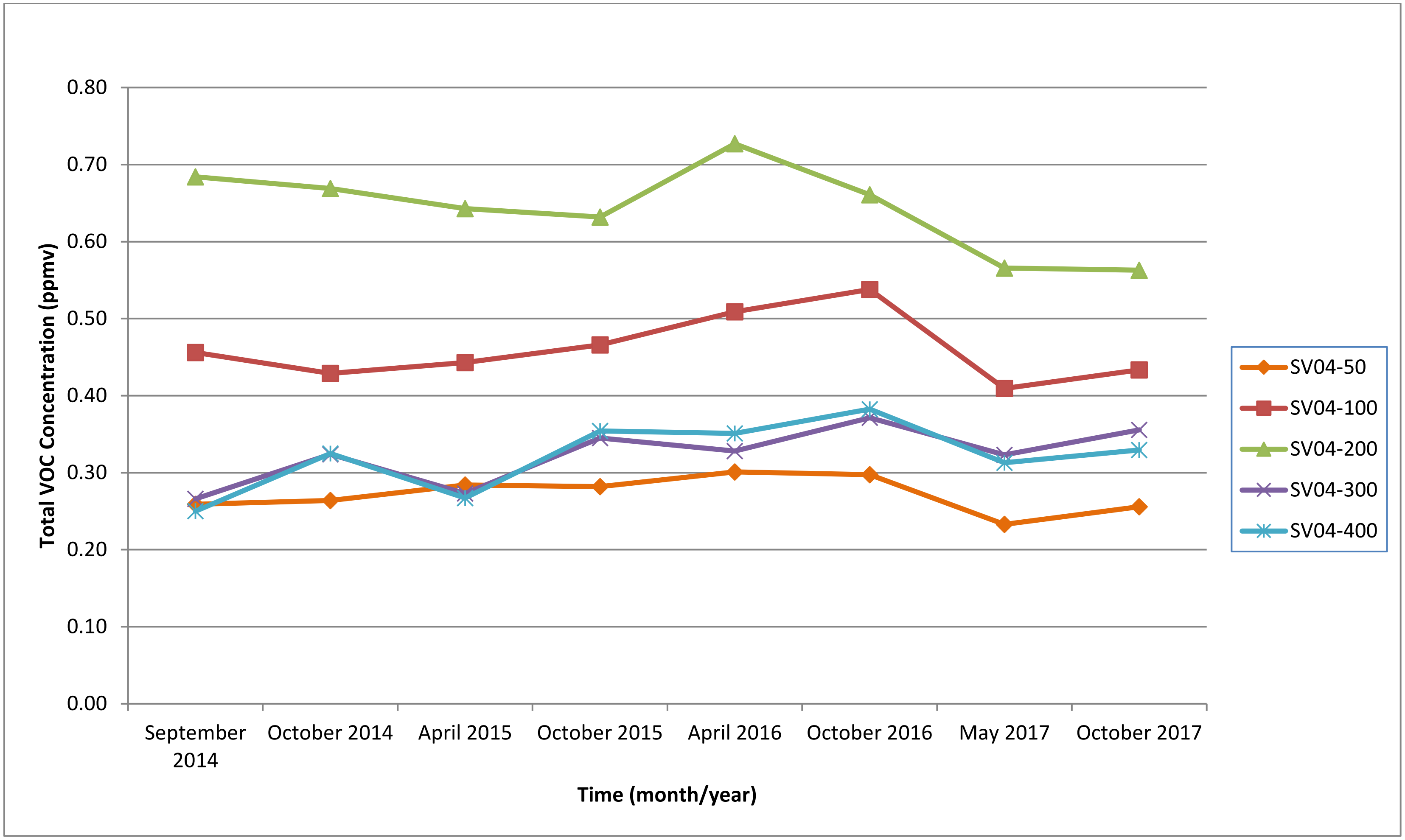


Figure 2-14
Total VOCs Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Well SV04 Ports

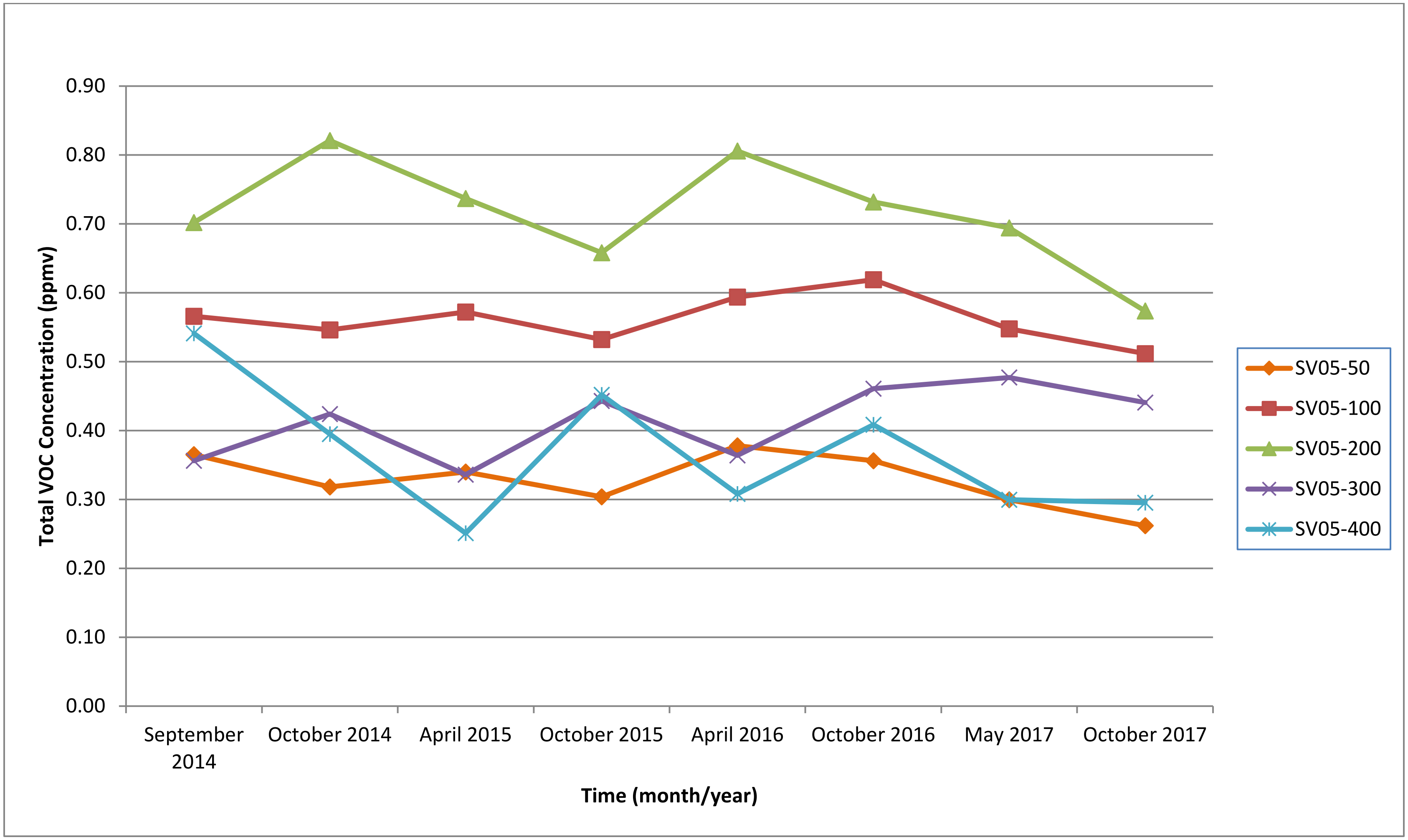


Figure 2-15
Total VOCs Concentrations vs. Time
Mixed Waste Landfill Soil-Vapor Monitoring Well SV05 Ports

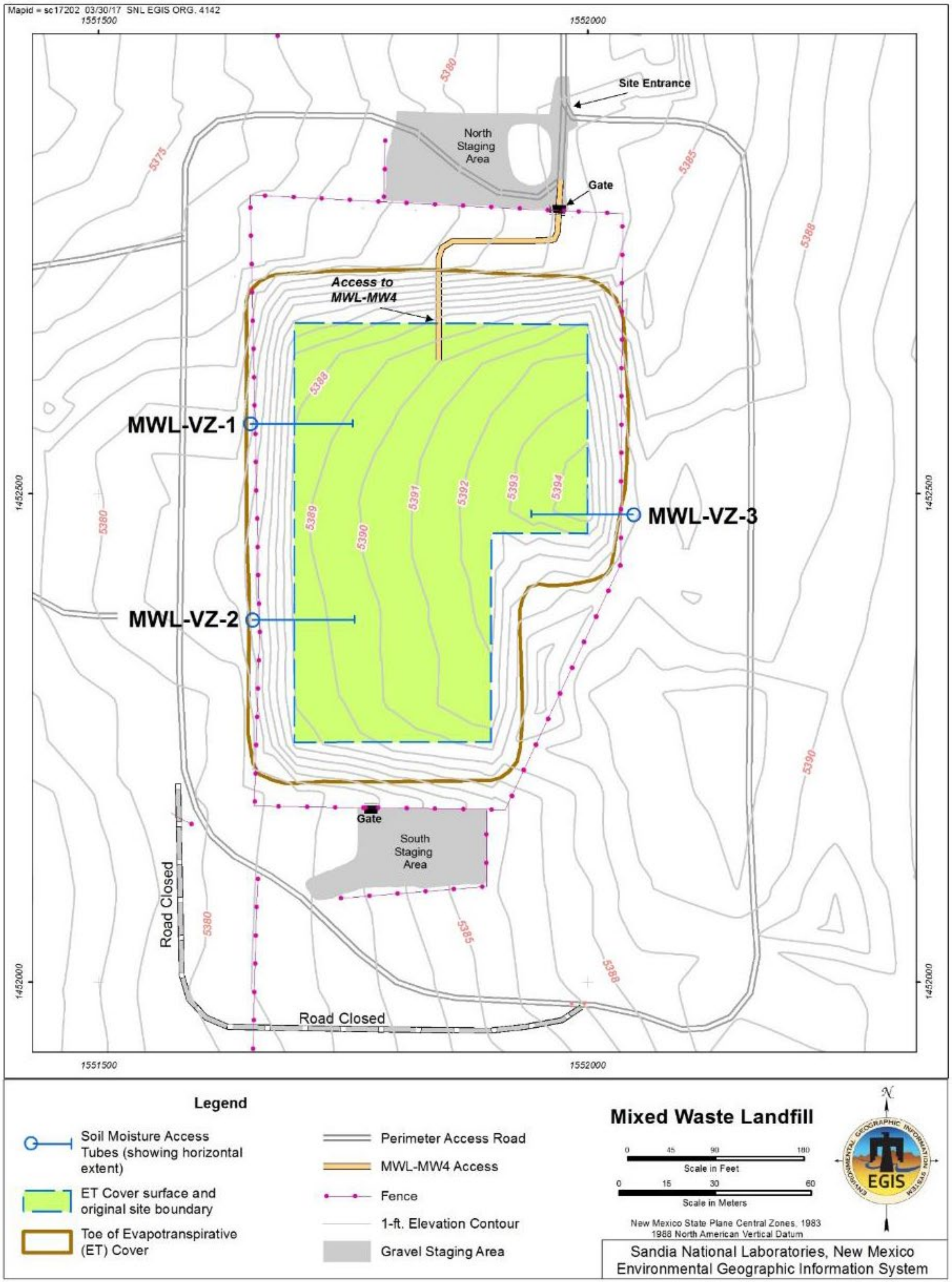


Figure 2-16
Mixed Waste Landfill Soil-Moisture Monitoring Locations

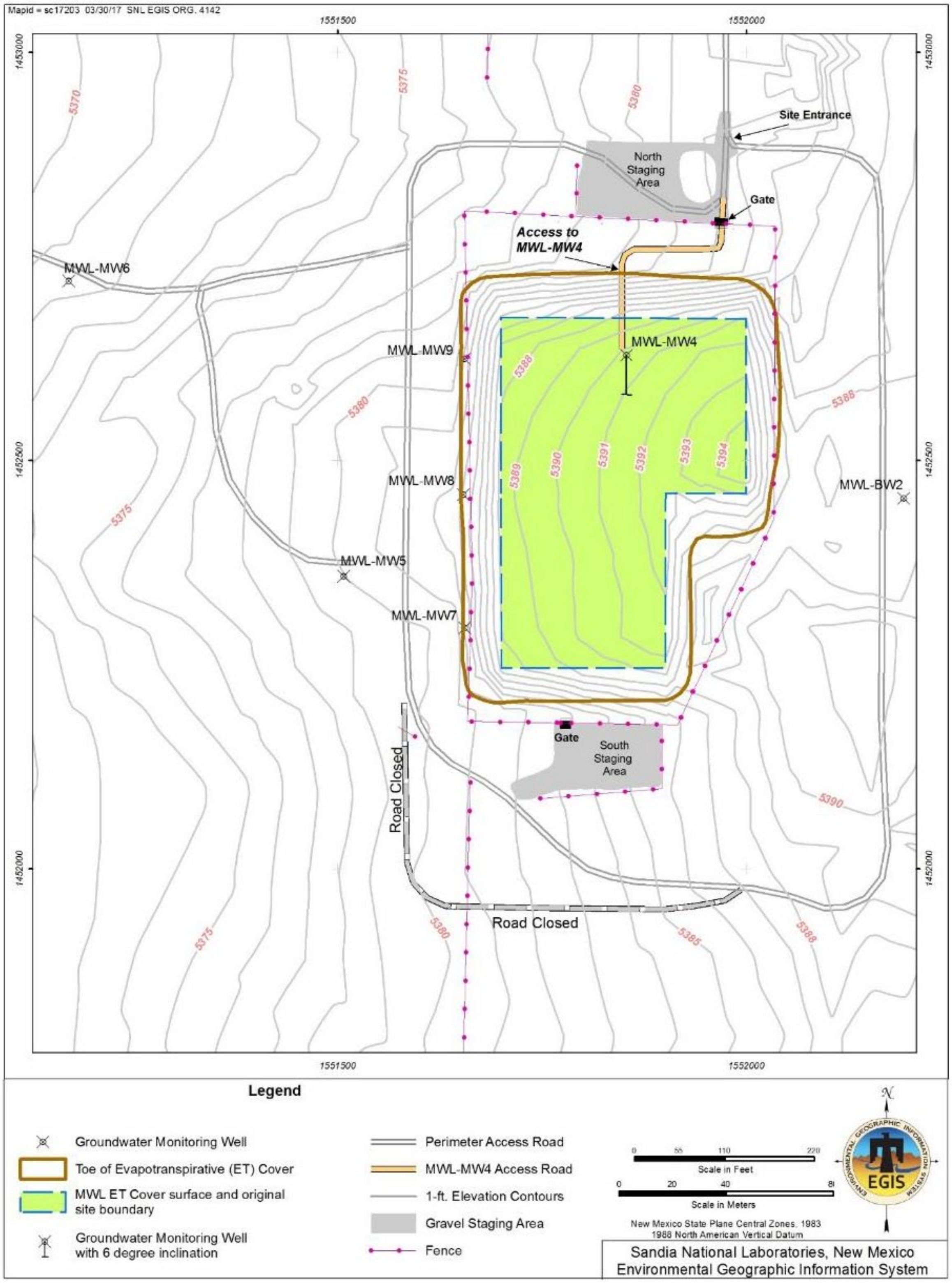


Figure 2-17
Mixed Waste Landfill Groundwater Monitoring Well Locations

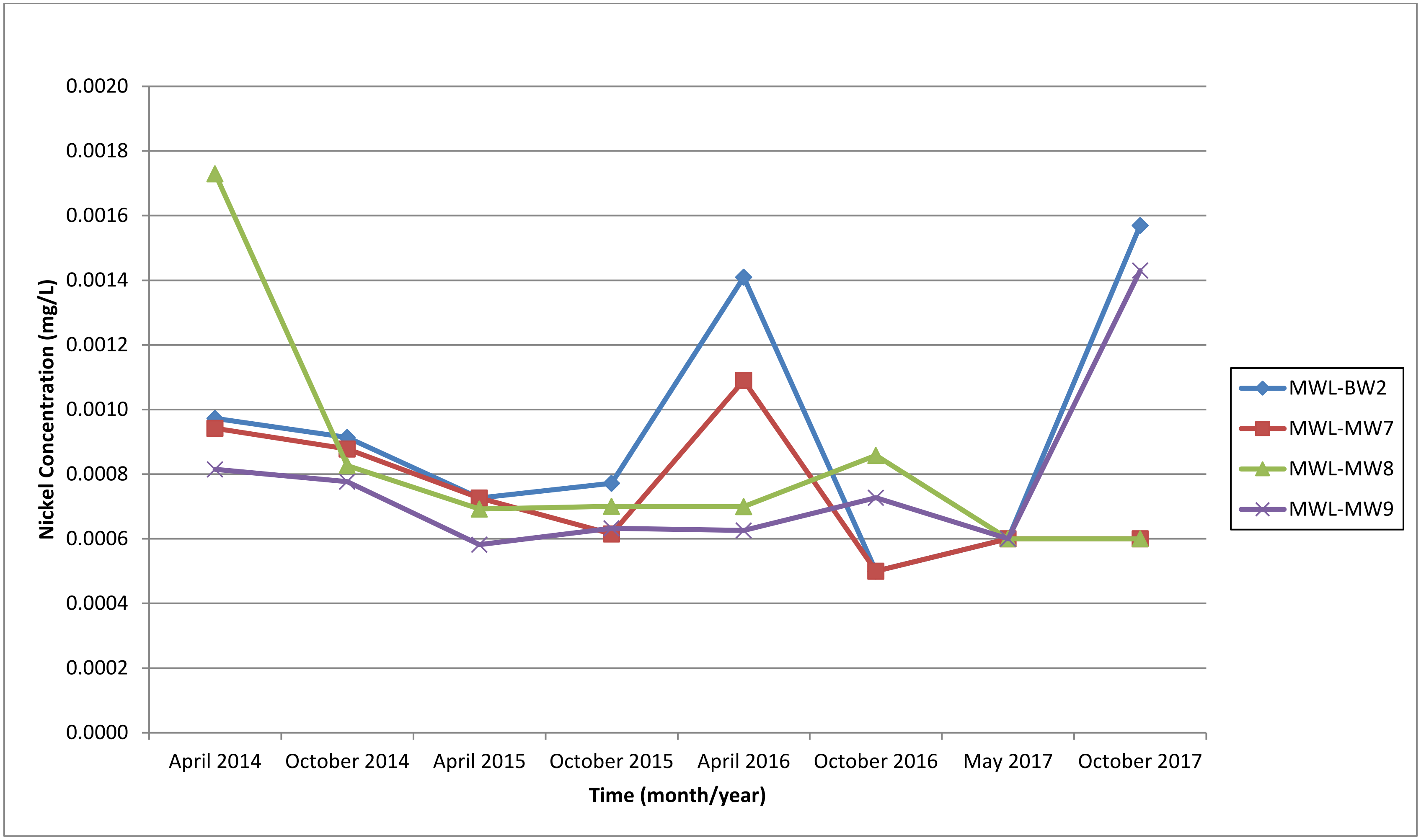


Figure 2-18
Nickel Concentrations vs. Time
Mixed Waste Landfill Groundwater Monitoring Wells

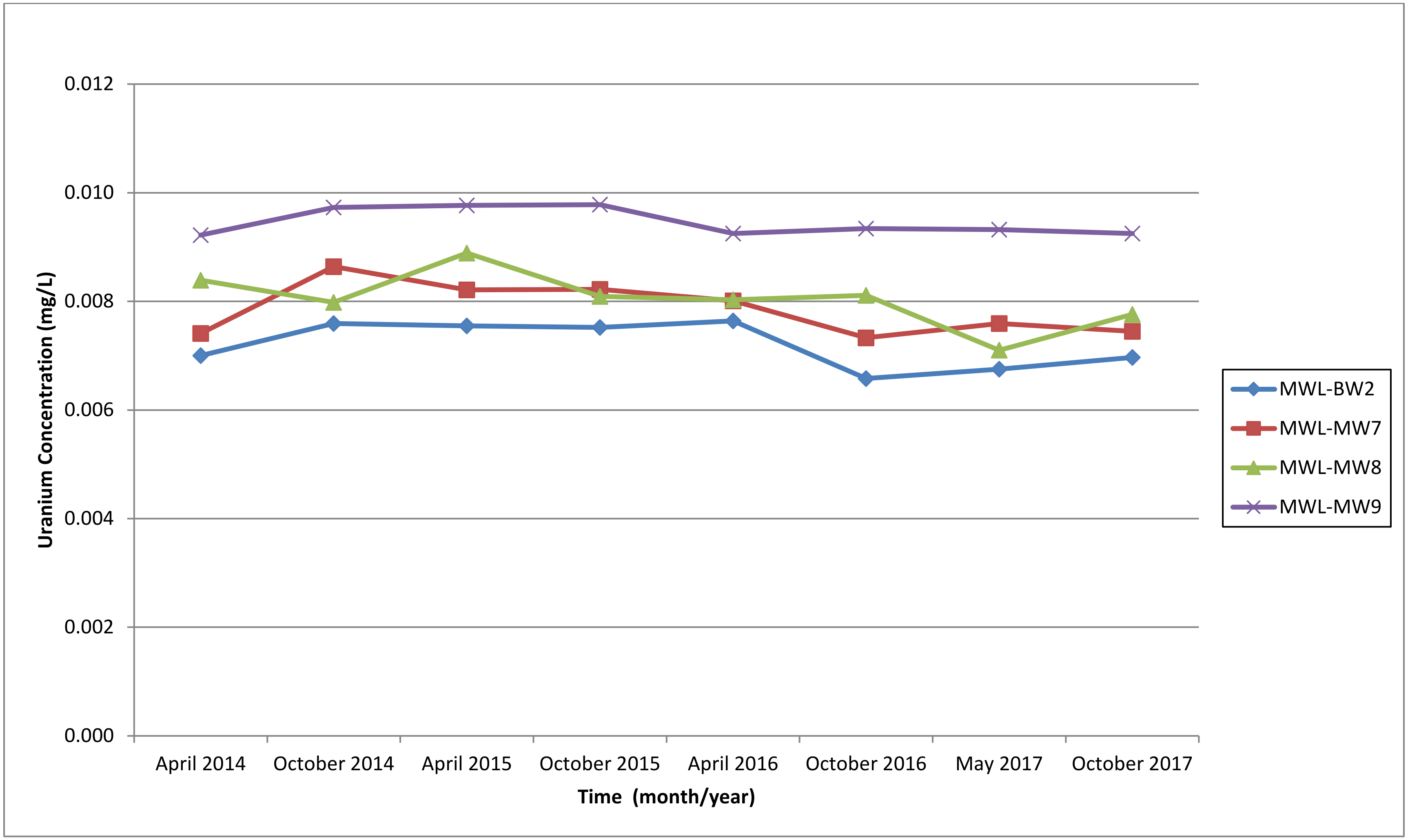


Figure 2-19
Uranium Concentrations vs. Time
Mixed Waste Landfill Groundwater Monitoring Wells

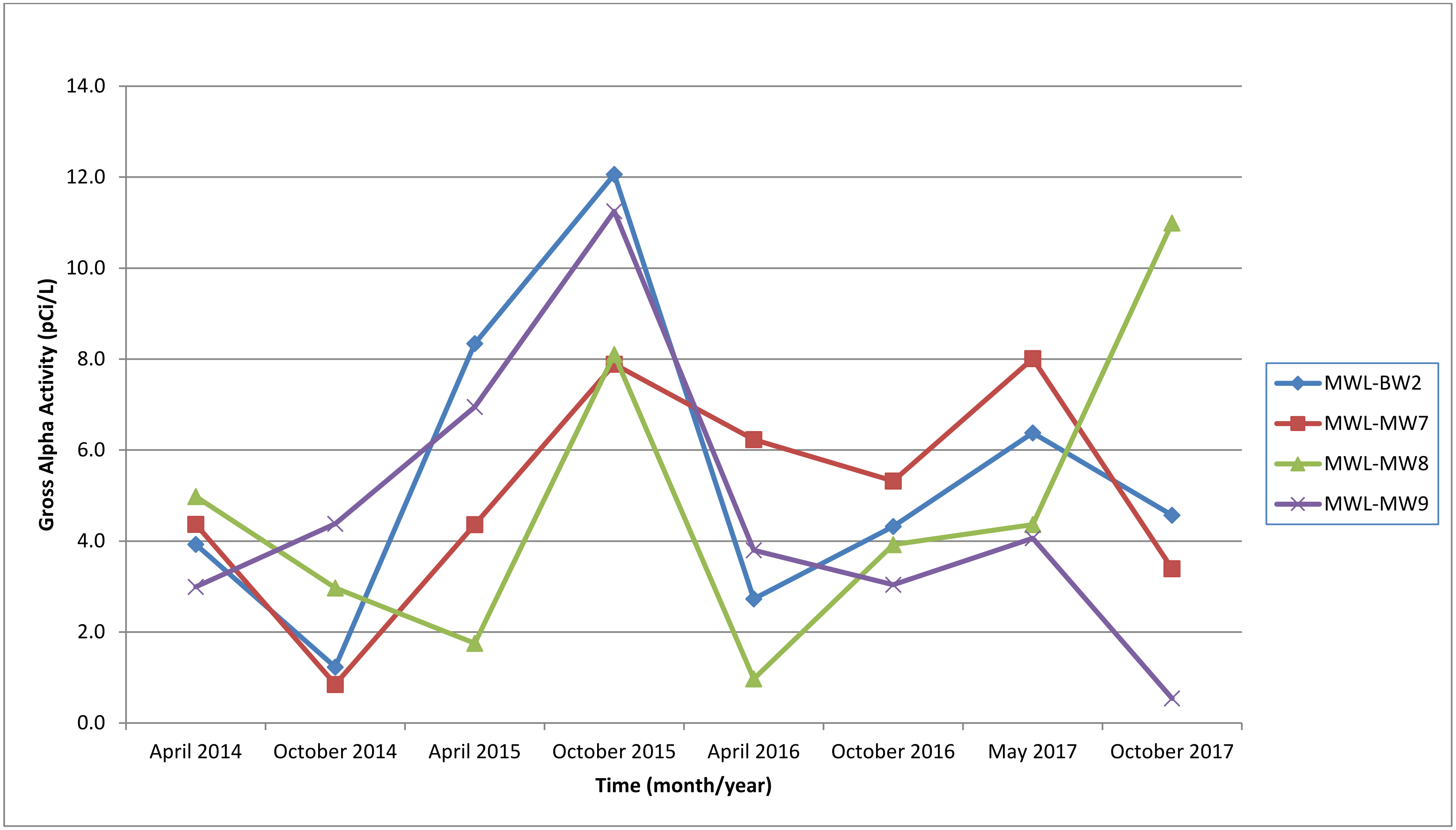


Figure 2-20
Gross Alpha Activity vs. Time
Mixed Waste Landfill Groundwater Monitoring Wells

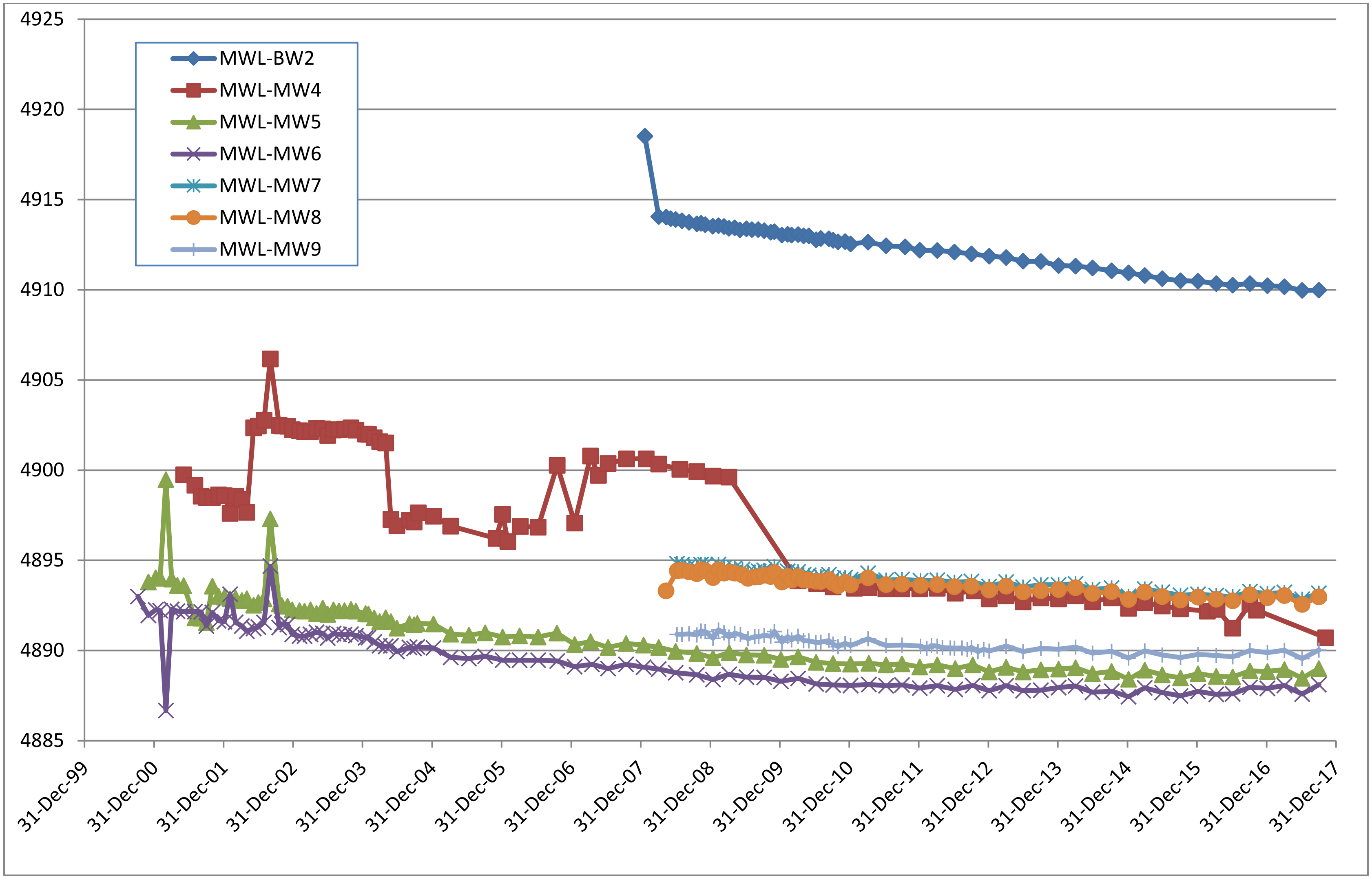


Figure 2-21
Groundwater Level Elevations at Mixed Waste Landfill Groundwater Monitoring Wells

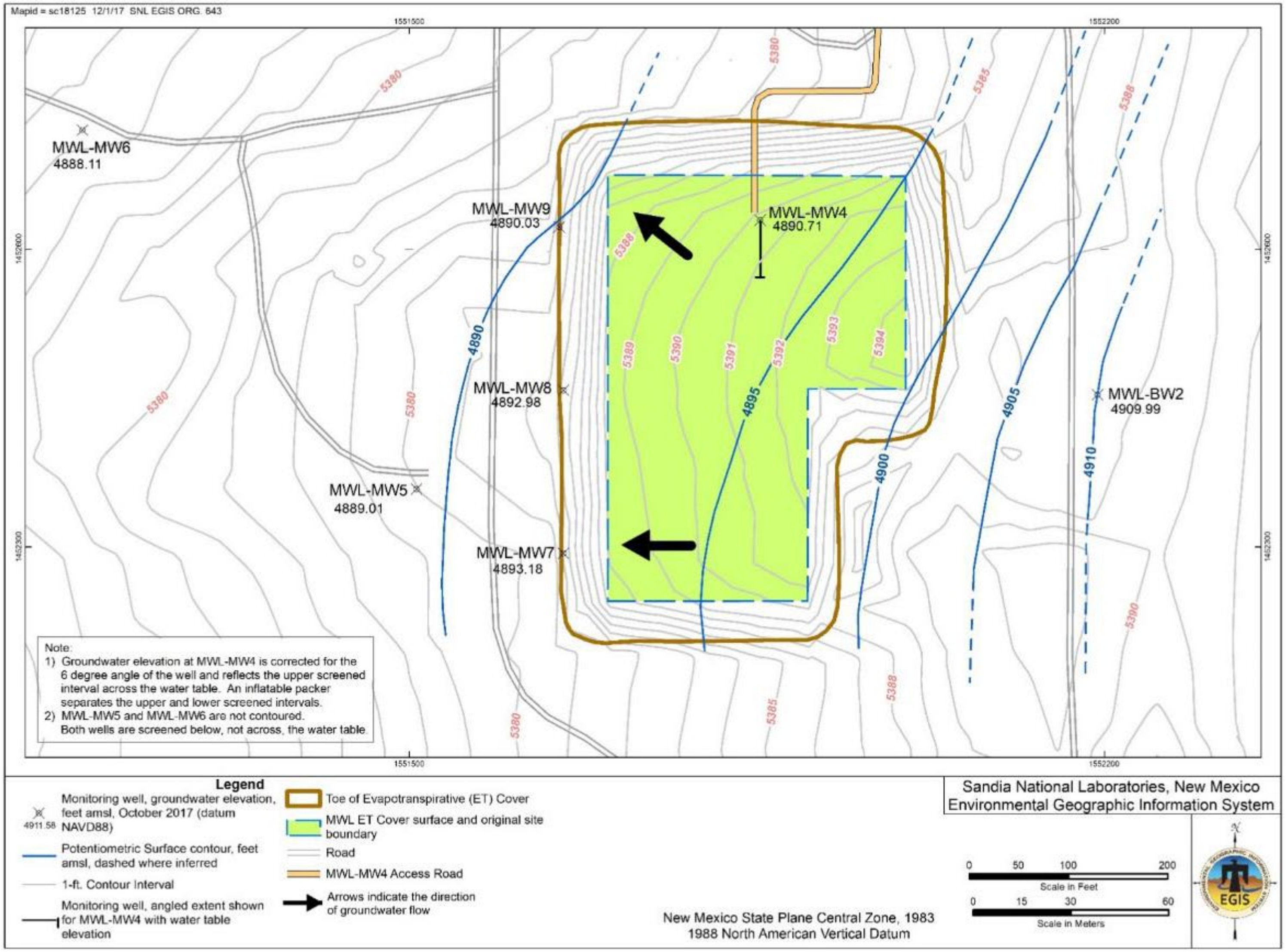


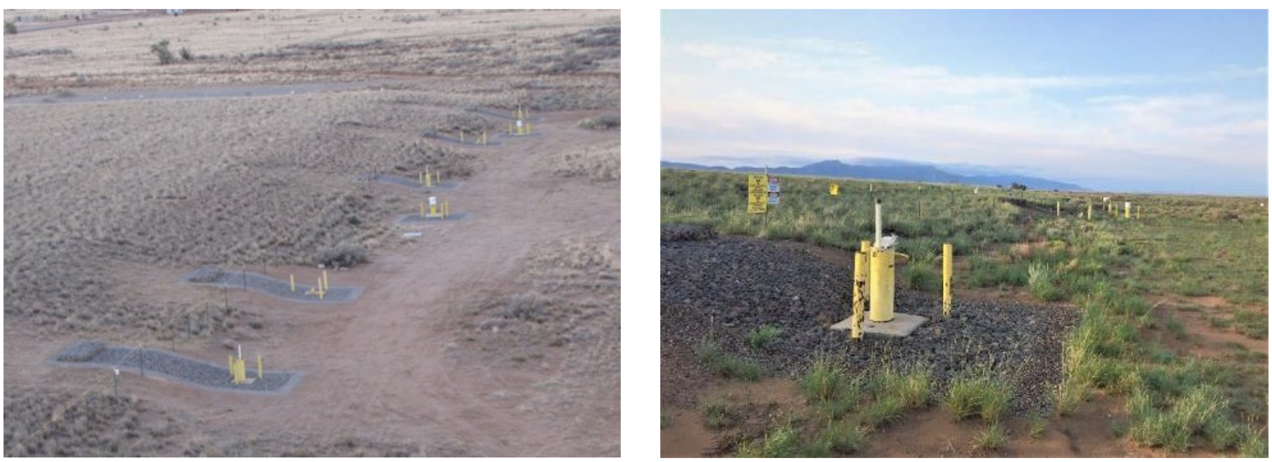
Figure 2-22
Localized Potentiometric Surface of the Regional Aquifer at the Mixed Waste Landfill, October 2017

View to the north of the site access road and new drainage culverts located north of the MWL. The culverts allow surface water to move to the west (to the left).

View to the south of the perimeter road and new drainage culverts at the northwest corner of the perimeter road. The culverts allow surface water to move to the west (to the right), away from the road and MWL.

Figure 2-23
Photographs of the Mixed Waste Landfill Site Access Road and Drainage Improvements

View of groundwater monitoring well MWL-MW7 on the western side slope prior to (left) and after (right) installation of erosion and burrow control. Gabion basket anchor required for this location immediately adjacent to the ET Cover toe.



View looking south of western side slope in November 2017 immediately after installation of erosion and burrow controls (left). View to the south of western side slope and perimeter on July 27, 2018 with native grasses reestablished around the erosion and burrow controls (right).

Figure 2-24
Photographs of the Mixed Waste Landfill
Erosion and Burrow Control Measures Before and After Installation

Figure 2-25
Mixed Waste Landfill Evapotranspirative (ET) Cover in Late July 2018
View Looking West

This page intentionally left blank.

3.0 FATE AND TRANSPORT MODEL REVIEW

This Chapter summarizes updates to the fate and transport model originally presented in the CMI Plan (SNL/NM November 2005, Ho et al. November 2005 and January 2007).

3.1 Requirement for Update

The May 2005 Final Order states "In each 5-year report, Sandia shall update the fate and transport model for the site with current data, and re-evaluate any likelihood of contaminants reaching groundwater." In accordance with clarifying guidance in the LTMMP, Section 4.8.2, if the monitoring results reflect conditions that are consistent with the previous modeling inputs and results, the fate and transport model does not need to be updated. Current monitoring results presented in Chapter 2 of this report were compared to the modeling performed in 2005 and 2007. All monitoring results reflect conditions that are generally consistent with those previously modeled; therefore, updates to the fate and transport model are not required.

However, an update to the fate and transport model of the MWL VOC soil-vapor plume is included in this Five-Year Report to provide a more comprehensive understanding of plume migration and to evaluate potential impacts to groundwater using recent results from the LTMMP soil-vapor monitoring well network (Section 2.2.3 and Figure 2-3). The two single-sampling-port soil-vapor monitoring wells installed during ET Cover construction in 2009 provide monitoring results from directly beneath the disposal area at depths of 42.5 and 41.5 ft bgs, respectively. The three multi-sampling port Flexible Liner Underground Technology, Ltd.™ soil-vapor monitoring wells installed and approved in 2014 (SNL/NM September 2014 and Kieling September 2014, respectively) provide monitoring results from 50, 100, 200, 300, and 400 ft bgs. This modeling update integrates VOC soil-vapor monitoring data from these five monitoring wells for CYs 2014 through 2017, which provide a broader spatial distribution of VOC concentrations throughout the 500-foot thick vadose zone beneath the MWL than previously available. Phase 2 RFI VOC soil-vapor results from 1994 were limited to depths of up to 30 ft bgs (Peace et al. September 2002) and results from the VOC soil-vapor investigation performed in 2008 provided results to depths of 50 ft bgs (SNL/NM August 2008).

3.2 Comparison of Monitoring Results to 2005 Modeling Data

Section 2.2.3 presents a detailed summary of the 2014 through 2017 VOC soil-vapor data collected and evaluated under the LTMMP. The VOC soil-vapor concentrations were measured at depths ranging from 41.5 to 400 ft bgs in five monitoring wells. The measured values were generally stable at each depth over this time period, with average PCE soil-vapor concentrations ranging from approximately 0.050 to 0.560 ppmv depending on well location and sampling port depth. In 1994 as part of the Phase 2 RFI, PCE soil-vapor concentrations were measured at depths of 10 and 30 ft bgs and ranged from approximately 0.02 to 5.00 ppmv. The range of the current measurements are toward the low end of the PCE soil-vapor concentrations measured in 1994, which is expected after 25 years and is consistent with previous modeling results.

Figure 3-1 shows a plot of the measured average PCE soil-vapor concentration data from 2014 to 2017, where the vertical axis is depth and the horizontal axis is soil-vapor concentration. Colored symbols denote average concentrations, and error bars denote plus/minus two standard deviations about the mean PCE soil-vapor concentrations. These soil-vapor monitoring results are compared with updated model simulations.

3.3 Updated Modeling Approach

Previous MWL VOC soil-vapor plume simulations (Ho et al. November 2005 and January 2007) focused on PCE groundwater concentrations as a function of time to compare against the regulatory standard (i.e., EPA maximum contaminant level of 5 µg/L). In this update, additional attention is given to the simulated PCE soil-vapor concentrations as a function of depth and time in the vadose zone to compare against recent data collected from the monitoring network, which includes sampling ports located at depths ranging from 41.5 to 400 ft bgs (Figure 3-1 and Section 2.2.3). The goal of this update is to calibrate the 2005 model with new data from 41.5 to 400 ft bgs and develop a more comprehensive understanding of plume migration and current conditions. The same modeling approach and assumptions were used for this update as summarized below.

A one-dimensional model of PCE transport in the vadose zone was used and assumes that a contaminated zone initially exists with a defined thickness and concentration. The assumption of one-dimensional transport maximizes transport toward the groundwater, providing a simplistic, conservative approach to evaluate VOC soil-vapor migration using PCE as the proxy for the VOC soil-vapor plume. PCE is used because it is the VOC with the highest measured concentrations, has a greater Henry's constant, and hence a greater gas-phase transport rate than TCE, and is the only VOC of concern at the MWL that has the potential to impact groundwater based on previous studies (Klavetter August 1995).

PCE can exist in three phases: an adsorbed phase on solids, a dissolved phase in water, and a vapor phase. PCE can be transported in the dissolved phase by liquid diffusion and advection, and in the vapor phase by gas diffusion. Over time, PCE migrates and degrades (through biological/chemical degradation according to an effective half-life) assuming a flux boundary condition at the surface, defined by an atmospheric boundary layer thickness (Jury et al. 1983), and a zero concentration boundary infinitely far below the waste zone (i.e., disposal area). Superposition is used to account for clean overburden (i.e., ET Cover and 3-foot clean soil layer) above the waste zone (Jury et al. 1990). The analytical solution to this model was implemented in Mathcad® and a Monte Carlo analysis was implemented with selected stochastic input variables using 100 realizations to yield a distribution of probabilistic results.

Tables 3-1 and 3-2 present the input parameters and distributions that were used in the model. Appendix C includes the Mathcad® model that implements the analytical solution for PCE transport through the vadose zone (Jury et al. 1983 and 1990).

Table 3-1
Summary of Input Parameters and Distributions for PCE Used in the Model[a]

Constituent and Molecular Weight	Inventory[b]	Half-Life	Adsorption Coefficient, K_d (mL/g)	Liquid-Phase Diffusion Coefficient (m^2/s)	Gas-Phase Diffusion Coefficient (m^2/s)	Henry's Constant (C_g/C_l)
PCE 165.83	Uniform: 9 - 145 kilograms	Log-Uniform: 9 months – 10^{10} years	Log-Uniform: 0.038 - 2	9.2×10^{-10}	9.5×10^{-6}	0.42

Notes:
[a]Input parameters from Ho et al. November 2005 and January 2007, Table 2, except for inventory range.
[b]The inventory range of PCE was increased from estimates made in 2005 (from 5 to 70 kilograms to 9 to 145 kilograms) to better fit the 2014 through 2017 data. The same inventory inputs were used for maximum areal extent and thickness.
C_g/C_l = Dimensionless, gas concentration divided by liquid concentration.
m^2/s = Square meters per second.
mL/g = Milliliter per gram.
MWL = Mixed Waste Landfill.
PCE = Tetrachloroethene.

Table 3-2
Summary of Input Parameters and Distributions for the Vadose Zone

Input Parameter	Value or Distribution	Basis and Comments[a]
Atmospheric Boundary Layer Thickness [m]	Uniform 0.001 – 1	Minimum is based on values reported by Jury et al. [3]. Maximum is a conservative upper value.
Thickness of Cover and Clean Overburden [m]	Uniform 1.83 – 4.88	Nominal thickness of cover ranges from 6 – 16 feet
Thickness of Vadose Zone [m]	Uniform 141 - 151	Thickness of the vadose zone is based on measured depths to the water table. The range of vadose-zone thicknesses accounts for the waste-zone thickness.
Infiltration Rate [m/s]	Uniform 1.18×10^{-11} – 6.12×10^{-11}	Minimum value based on infiltration through 2 feet of engineered cover under current climate; maximum value based on two times the current maximum precipitation in a natural analog vegetative cover to account for future climates.
Porosity [-]	Uniform 0.302 – 0.445	Table 4, [1, 2]
Volumetric Moisture Content [-]	Uniform 0.053 – 0.225	Table 4, [1, 2]
Liquid-Phase Tortuosity Factor [-]	Uniform 0.001 – 1	Lower bound based on formulation of Millington (1959); upper bound is physical limit.
Gas-Phase Tortuosity Factor [-]	Uniform 0.1 – 1	Lower bound based on formulation of Millington (1959); upper bound is physical limit.

Notes:
[a]Cited references can be found in Ho et al. November 2005 and January 2007, Tables 4 and 5.
m = Meters.
m/s = Meters per second.

3.4 Updated Modeling Results

Figure 3-2 shows the simulated average PCE soil-vapor concentrations for depths of 0 to 400 ft bgs at different times since emplacement (i.e., disposal). Initially the PCE soil-vapor concentration is highest near the surface where the waste was initially emplaced, and the vapor concentration quickly decreases with depth. As time progresses from 0.1 to 100 years, the peak soil-vapor concentration decreases and sinks downward as it diffuses through the subsurface.

Figure 3-3 shows a plot of the measured (colored symbols) and modeled (light grey horizontal lines) average PCE soil-vapor concentrations as a function of depth. The modeled times of 26 years and 58 years were chosen to represent the possible range of times since PCE emplacement based on the operational period of the MWL (1959 – 1988) and the dates of the recent soil-vapor concentration measurements (2014 – 2017). The results show that with a PCE inventory of 9 to 145 kilograms, the modeled results encompass the measured concentrations with 95% confidence (plus/minus two standard deviations). At 58 years (i.e., beginning of MWL operational period, 1959 through 2017), the simulation fits well with all actual measured PCE vapor concentrations as a function of depth in wells MWL-SV02, MWL-SV04, and MWL-SV05. Both the measured and simulated values for MWL-SV04 and MWL-SV05 show a peak PCE concentration at a depth of approximately 200 feet, with the concentration decreasing both up and down, toward the surface and groundwater.

The measured soil-vapor concentrations in MWL-SV03 at depths less than approximately 300 feet show slightly higher soil-vapor concentrations that are matched well by the simulation at 26 years. The peak measured soil-vapor concentration at 400 ft bgs in MWL-SV03 is not matched as well by the model, and could be related to subsurface geologic features that allowed PCE concentrations to migrate to greater depths from nearby areas with higher initial PCE concentrations. The higher concentration at MWL-SV01 relative to the model results could be due to variations in disposal amount and location. This monitoring well was installed where historical PCE soil-vapor concentrations were the highest, and it is approximately 130 feet east of MWL-SV03.

Overall, the updated model captures and matches the new data set. All measured concentrations from the 2014 through 2017 monitoring data set are within the simulation error bars that span a 95% confidence interval about the mean simulated PCE soil-vapor concentrations (i.e., horizontal light grey lines in Figure 3-3). This simulation incorporates the uncertainty distributions of the input parameters. In other words, the updated model results capture and simulate the 2014 through 2017 measured results for all MWL soil-vapor monitoring wells and sampling ports at a high confidence interval.

3.5 Discussion & Conclusions

The modeling results provide validation of the one-dimensional analytical model of PCE transport through the vadose zone originally presented in the CMI Plan (SNL/NM November 2005; Ho et al. November 2005 and January 2007). The spatial-temporal trends in the recently measured data are captured by the model with 95% confidence, accounting for uncertainty in the model inputs. To obtain a better simulated match with the 2014 through 2017 soil-vapor data that include PCE concentrations to depths of up to 400 ft bgs, the only modeling change required was to increase the estimated PCE inventory range input. The PCE inventory range

used for the original modeling effort and based on the more limited Phase 2 RFI VOC soil-vapor results, was estimated at 5 to 70 kilograms (Ho et al. November 2005 and January 2007); this estimate was increased to 9 to 145 kilograms to produce the best match with recent monitoring results at depths of 400 ft bgs. Simulations with the original inventory range of 5 to 70 kilograms and larger inventory estimates (i.e., greater than 9 to 145 kilograms) did not yield better results. Adjustments to the estimated PCE inventory range are reasonable given the Phase 2 RFI soil-vapor results available for the 2005 modeling effort, which included data to a depth of 30 ft bgs versus 400 ft bgs.

As predicted by the model, PCE soil-vapor concentrations are decreasing when compared to measurements made in 1993, and the concentrations are diffusing throughout the vadose zone. As shown in Figure 3-2, the model predicts that the PCE soil-vapor concentrations will continue to decrease, but are expected to remain stable for the foreseeable future.

Additional processes not considered in the model could potentially impact diffusion of soil vapor through the vadose zone and the ability of the VOC plume to impact groundwater. Barometric pumping may help explain the higher PCE soil-vapor concentrations at 400 ft bgs in MWL-SV03 relative to modeling results. The capillary fringe is a region of static water held under tension (i.e., by capillary forces) that occurs above the water table. The capillary fringe acts to retard downward movement of VOCs by forcing a transition from relatively rapid transport through the soil-vapor medium to relatively slow transport through essentially immobile soil moisture. The thickness of this layer varies with sediment grain size, and is expected to be quite thick beneath the MWL (i.e., many feet) due to the fine-grained nature of the water table sediments and the slowly declining groundwater level over time. To continue to move downward and impact regional groundwater, all soil-vapor VOC molecules must eventually dissolve into and diffuse through the pore water of the capillary fringe according to gas-liquid equilibrium partitioning theory, as expressed by Henry’s Law. The capillary fringe acts as a protective barrier between the water table and the vadose zone and is not addressed in the simplistic one-dimensional model. A more detailed explanation of the capillary fringe and how it impacts the downward migration of VOC soil vapor is presented in the CWL CMS Report (Annex E, SNL/NM December 2004).

Figure 3-4 shows the simulated PCE groundwater concentrations as a function of time for 100 realizations using the updated model. Results are similar to the original simulations from 2005 (Ho et al. November 2005 and January 2007), and show that peak groundwater concentrations are expected within the first hundred years following disposal. Figure 3-5 shows the cumulative probability distribution of the simulated peak PCE groundwater concentrations for the 100 realizations. Consistent with the earlier modeling results, the probability of exceeding the EPA maximum contaminant level of 5 µg/L remains very low even with the assumption of one-dimensional transport, which maximizes VOC transport to groundwater.

Conclusions

The MWL fate and transport model of PCE soil-vapor transport in the vadose zone was updated because new monitoring results from the LTMMP soil-vapor monitoring network provided an opportunity to test and validate earlier VOC soil-vapor plume modeling and to reevaluate the likelihood of contaminants reaching groundwater. The recent 2014 through 2017 monitoring results were used to provide a broader spatial distribution (i.e., depths of 50 to 400 ft bgs) than

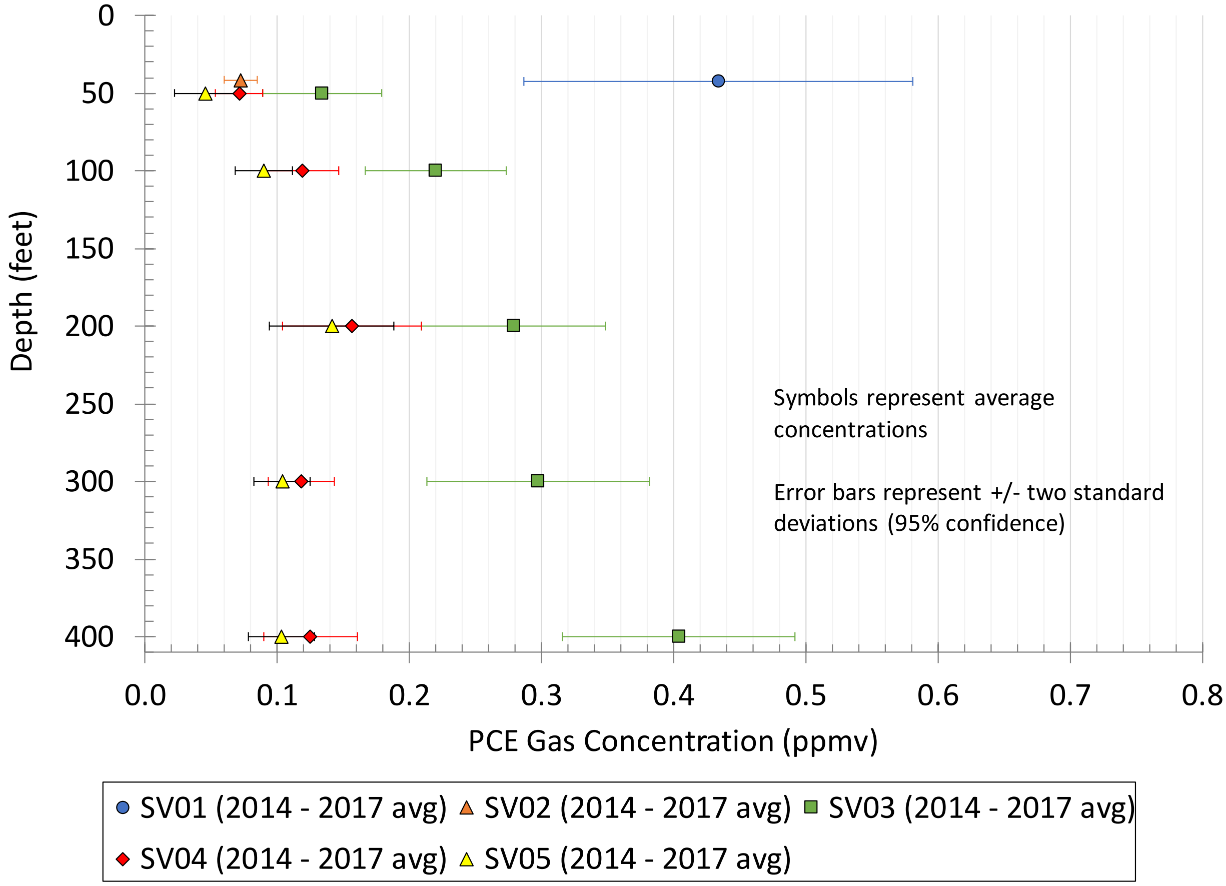
previously available. The spatial-temporal trends in the recent monitoring results are incorporated and captured with high confidence in the updated model, which honors the uncertainty distributions of the input parameters.

To better fit the 2014 through 2017 soil-vapor data, the modeled PCE inventory range was changed from 5 to 70 kilograms (2005 assumption based on Phase 2 RFI VOC soil-vapor monitoring results) to 9 to 145 kilograms (inventory range based on 2014 – 2017 results, which produced best match with this broader data set). All measured PCE soil-vapor concentrations are low and within the model error bars that span a 95% confidence interval, indicating good model agreement with field measurements. The updated model predicts that the PCE soil-vapor concentrations will continue to decrease over time, and are unlikely to impact groundwater.

The simplistic one-dimensional model conservatively maximizes transport toward the groundwater and does not account for the natural protective capillary fringe barrier above the regional water table. Given this modeling conservatism, the updated model predictions of low probability for future groundwater impact, and the monitoring results from 2014 through 2017, the VOC soil-vapor plume does not pose a significant threat to groundwater. Current controls, including ongoing semiannual VOC soil-vapor and groundwater monitoring together with the LTMMP trigger level process, address uncertainty and ensure that if conditions change, timely action would be taken.

CHAPTER 3 FIGURES

This page intentionally left blank.



Note: Modeled PCE inventory range is ~9 to 145 kilograms

Figure 3-1
Summary of Measured PCE Soil-Vapor Concentrations from 2014 to 2017

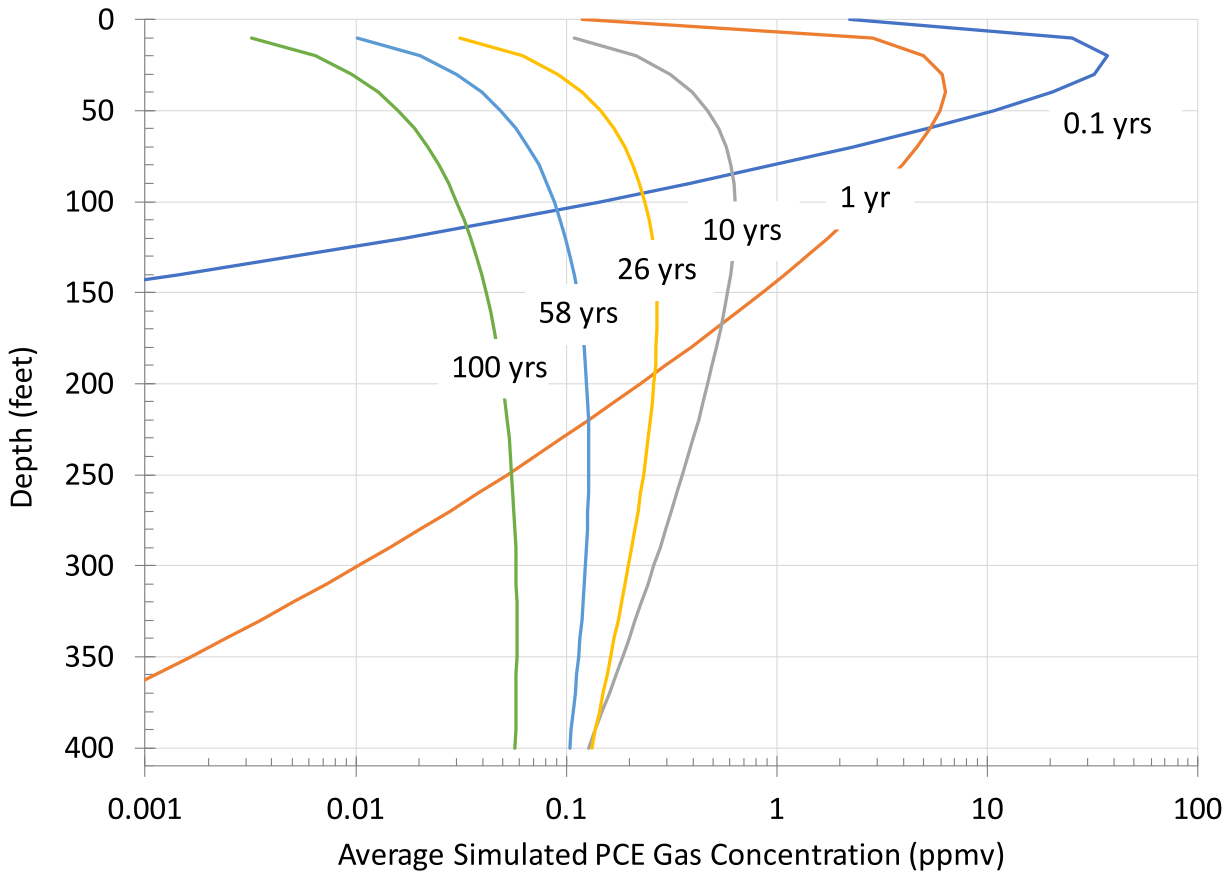
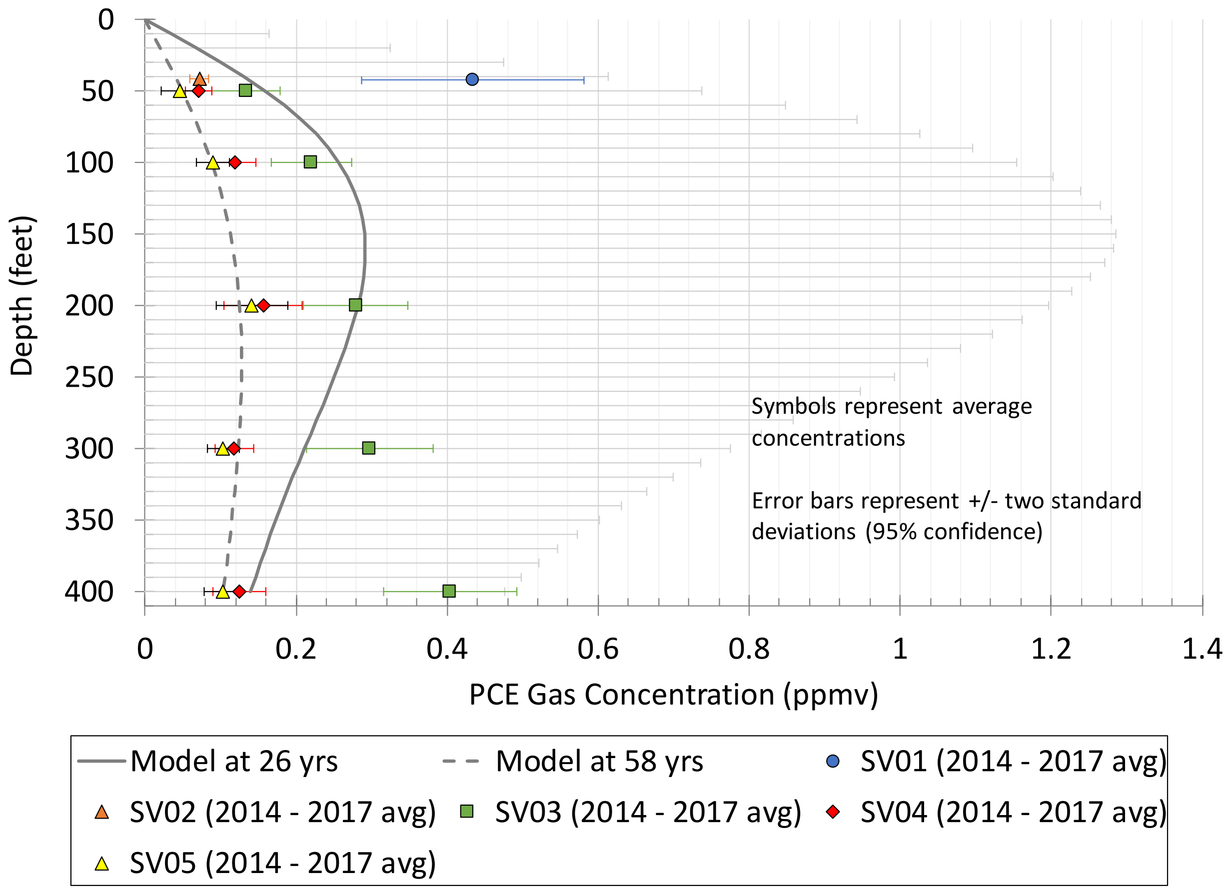
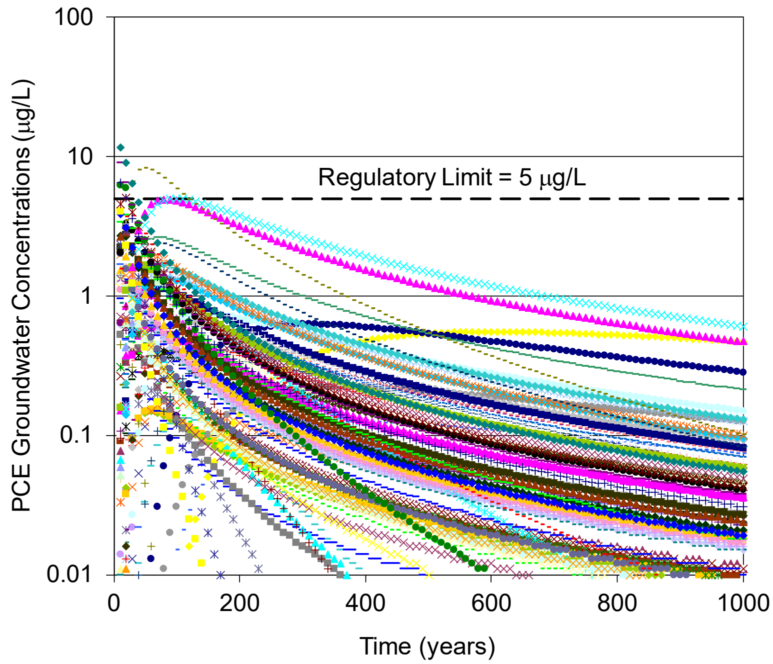


Figure 3-2
Model Predictions of Average PCE Soil-Vapor Concentration as a
Function of Depth and Time Since Disposal



Notes:
1) The solid and dashed lines represent the model results of average PCE soil-vapor concentrations at 26 years and 58 years since disposal, respectively. The range of disposal times is due to the uncertainty of contaminant disposal and the range of monitoring well measurement dates (i.e., 2014 to 2017).
2) Modeled PCE inventory range is ~9 to 145 kilograms

Figure 3-3
Plot of Measured and Modeled PCE Soil-Vapor Concentration as a Function of Depth



Note: microgram per liter = µg/L

Figure 3-4
Simulated PCE Groundwater Concentrations as a Function of Time Since Disposal in the Mixed Waste Landfill for 100 Realizations

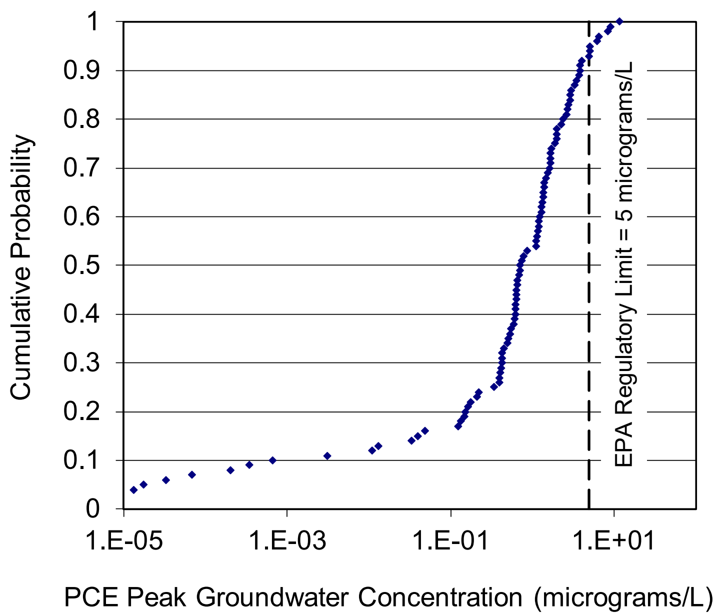


Figure 3-5
Cumulative Probability of Simulated Peak PCE Groundwater Concentrations

4.0 EVALUATE EFFECTIVENESS OF THE REMEDY

The primary purpose of the Five-Year Report is to evaluate the effectiveness of the ET Cover and the likelihood of contaminants reaching groundwater. In accordance with the LTMMP, Section 4.8.2, the effectiveness of the ET Cover is based upon the 2014 through 2017 monitoring, inspection, and maintenance results, which are presented in Chapter 2 of this report. Multi-media monitoring, inspection, and maintenance results establish site conditions and provide the empirical data to determine if the ET Cover, monitoring networks, and site controls are performing as designed.

LTMMP multi-media monitoring and the associated trigger level process is an early warning detection system for changing conditions that ensures any future releases or movement of contaminants are detected and addressed in a timely manner. The multi-media monitoring program is summarized in Table 2-1 and results for the reporting period are presented in Section 2.2.

The inspection and maintenance process provides information on the physical condition of the ET Cover and site controls, including the surface-water diversion swale, perimeter security fence and signage, monitoring networks, and associated sampling equipment. This information is used to evaluate the physical condition and performance of the ET Cover and site controls in accordance with design. The inspection and maintenance program is summarized in Table 2-2 and results for the reporting period are presented in Section 2.3.

An assessment of current site conditions, ET Cover System performance, and ET Cover System controls is presented in Sections 4.1, 4.2, and 4.3, respectively. Future releases and contaminant migration are addressed in Section 4.4 and an overall remedy assessment summary is presented in Section 4.5.

4.1 Site Conditions

Current site conditions are established based upon the monitoring, inspection, and maintenance results for the 2014 through 2017 reporting period. The monitoring results are compared with historical investigation, characterization, and monitoring results to determine if conditions are changing in a way that could represent increased risk to human health and the environment.

MWL multi-media monitoring results for this reporting period are consistent with historical results and indicate site conditions continue to be protective of human health and the environment. No trigger levels were exceeded, and there were no indications of changing conditions that would increase the risk to site workers or the public.

Inspection and maintenance results confirm the good physical condition of the site. The ET Cover, surface-water diversion swale, perimeter security fence and signage, and all monitoring networks and sampling equipment were inspected at regular intervals and determined to be in good condition. Routine maintenance and repairs were performed and documented. In addition to routine maintenance and repairs, best practice ET Cover vegetation maintenance and erosion and drainage controls were implemented to improve site conditions. These best

practice measures are intended to minimize long-term maintenance and improve long-term ET Cover performance (Section 2.4.2).

Based upon the four years of monitoring, inspection, and maintenance under the LTMMP, MWL site conditions have improved and remain protective of human health and the environment.

4.2 ET Cover System

The primary design function of the ET Cover is to limit the movement of soil moisture from the surface down into and through the disposal area, thereby limiting the potential for contaminant migration out of the disposal area (Figure 1-2).

Monitoring, inspection, and maintenance results indicate the ET Cover conforms with design requirements, is in good condition, and is performing as designed. Soil moisture monitoring results are consistent with the pre-ET Cover construction baseline data and are well below the soil moisture trigger level. There are no indications of increasing soil moisture beneath the ET Cover and disposal area.

The inspection and maintenance results confirm the physical integrity of the ET Cover and the good condition of the cover vegetation. No evidence of surface subsidence, ponding water, significant erosion, or any type of cracks or fissures in the ET Cover surface were observed during the reporting period. Best practice maintenance was performed to ensure the establishment and long-term health of the ET Cover native grass vegetation, which is in good condition and exceeds LTMMP successful revegetation criteria. In other words, the foliar coverage of perennial native grasses on the ET Cover is greater than the minimum LTMMP requirement for successful revegetation. Perimeter road and monitoring well erosion/burrow control improvements completed during the reporting period will enhance the long-term performance of the ET Cover, protect the monitoring well networks, and minimize future maintenance (Section 2.4.2).

Based upon four years of monitoring, inspection, and maintenance under the LTMMP, the ET Cover is in good condition and performing as designed. Overall maintenance and repairs have decreased over this time period as a result of successful revegetation efforts, best practice maintenance, and best practice ET Cover/site improvements.

4.3 ET Cover System Controls

ET Cover system controls defined in the LTMMP include the perimeter surface-water diversion swale, perimeter security fence and signage, and all monitoring networks and sampling equipment. The perimeter road provides additional surface-water drainage control for the site and ET Cover with the established road ditches.

Inspection and maintenance results confirm the good physical condition of the ET Cover system controls. The surface-water diversion swale, perimeter security fence and signage, and all monitoring networks and sampling equipment were inspected at regular intervals and determined to be in good condition. Routine maintenance and repairs were performed and documented.

Perimeter road improvements provide additional protection for the ET Cover and surface-water diversion swale by intercepting upgradient surface-water flow and diverting it around and away from the site in the road ditches and through culverts, as well as catching surface water flowing to the west off the ET Cover and western side slope. Perimeter monitoring well erosion and burrow control measures provide extra protection from erosion and small animal burrows, especially on the western side slope, which is important as this area receives surface water that flows off the gently-sloping ET Cover surface during stronger precipitation events (Figure 1-3). These best practice improvements will minimize long-term maintenance of the ET Cover and perimeter monitoring wells.

4.4 Future Releases & Contaminant Migration

The MWL multi-media monitoring program detailed in Chapter 3 of the LTMMP (SNL/NM March 2012) and summarized in Section 2.1.1 of this report is designed based upon MWL process knowledge and the results of extensive site characterization and monitoring conducted from 1989 through 2008 (see Section 2.0). The LTMMP monitoring program is focused on the most mobile COCs and ensures that any future releases or movement of contaminants are detected and addressed before any detrimental effect on groundwater or increased risk to public health.

Based on historical investigation and monitoring data, monitoring results from the 2014 through 2017 reporting period, and fate and transport modeling, PCE is the primary MWL COC that could impact groundwater. Updated fate and transport modeling for the VOC soil-vapor plume presented in Chapter 3 incorporates the monitoring results performed under the LTMMP that provide VOC soil-vapor concentration data for depths of 41.5 to 400 ft bgs. The updated one-dimensional modeling results for PCE soil vapor indicate that impact to groundwater is unlikely. Conservative, protective trigger levels for PCE, TCE, and Total VOCs (i.e., total of all validated VOC results for an individual sample) were established in the LTMMP and apply to the 400 ft bgs sampling ports of MWL-SV03, MWL-SV04, and MWL-SV05. All monitoring results for these sampling ports for the reporting period are well below the respective trigger levels.

PCE is a primary COC and has been detected twice during the eight semiannual monitoring events conducted during the reporting period at very low, estimated (i.e., J-qualified) concentrations. The two detections were below one part per billion and an order of magnitude below the trigger level in groundwater samples from monitoring well MWL-MW8 (Section 2.2.5). Although not required based on the frequency of detections and the concentrations detected, additional actions and an investigation have been initiated. As presented in Section 2.4.1, passive venting soil-vapor devices (i.e., BaroBalls™) were installed on groundwater monitoring wells in February 2015. These devices are designed to prevent downward movement of soil vapor that enters monitoring wells during periods of high atmospheric barometric pressure. Since the installation of the Baroballs™, there has been only one detection of PCE (April 2016) in an MWL-MW8 groundwater sample for the six groundwater monitoring sampling events conducted.

Based on extensive soil-vapor characterization and remediation experience at the nearby CWL, the most likely explanation for these infrequent, low-concentration detections is PCE soil-vapor migration into the casing and/or screen interval of monitoring well MWL-MW8. The screen interval of MWL-MW8 includes approximately 24 feet of screen above the water table surface. Once PCE soil vapor enters the well, it can be barometrically pumped downward in the well

casing (i.e., pushed downward in the well during periods of high atmospheric pressure), allowing direct interface with, and diffusion into, groundwater within the monitoring well.

To better understand the possible cause of PCE detections and test this hypothesis, passive soil-vapor samplers were deployed at various depths above the groundwater level (i.e., water table) in monitoring well MWL-MW8 in April 2018. Preliminary results show detectable concentrations of PCE and TCE soil vapor in the well at intervals corresponding to 1, 8, 15, 22, 41, 91, and 241 feet above the water table in the well. PCE concentrations were very low, all less than 0.030 ppmv. TCE concentrations were slightly lower. These results are generally consistent with VOC soil-vapor monitoring results at nearby soil-vapor monitoring well MWL-SV03, located approximately 65 feet to the south of MWL-MW8.

The passive soil-vapor results collected within well MWL-MW8 confirm that PCE and TCE soil vapor has diffused into the well above the water table, and support the hypothesis that the two estimated, very low-concentration PCE detections in April 2014 and April 2016 groundwater samples are most likely due to PCE soil-vapor migration into the well. These investigation results will be presented and evaluated more thoroughly in the MWL LTMM Annual Report submitted to the NMED in June 2019. No additional actions are required based on the infrequent detections and very low, estimated concentrations that are below the trigger level of 2.5 µg/L. Additionally, the passive venting BaroBalls™ that were installed on all groundwater monitoring wells in February 2015 are performing effectively based on semiannual inspections of the wells and passive venting devices, groundwater monitoring results, and the preliminary investigation results.

4.5 Remedy Effectiveness Summary and Conclusions

Based upon four years of monitoring, inspection, and maintenance under the LTMMP, MWL site conditions have improved and continue to be protective of human health and the environment. MWL multi-media monitoring results are consistent with historical results, no trigger levels were exceeded, and there are no indications of changing conditions that would increase risk to site workers or the public. In addition to multi-media monitoring results, fate and transport modeling was used to reevaluate the likelihood of contaminants reaching groundwater.

The MWL ET Cover is in good condition and performing as designed. ET Cover maintenance and repairs have decreased over this 2014 through 2017 reporting period as a result of successful revegetation efforts, best practice maintenance, and best practice ET Cover and site improvements. The inspection and maintenance results confirm the good physical condition of the ET Cover and associated ET Cover system controls.

The LTMMP multi-media monitoring program is focused on the most mobile COCs and includes a trigger level process that ensures any future releases or movement of contaminants are detected and addressed in a timely manner, consistent with the LTMMP and the May 2005 Final Order requirements. Best practice actions and follow-up field investigations are being used to augment LTMMP requirements, better understand site conditions, and plan future actions as necessary.

Monitoring parameters and frequencies have been evaluated as part of this Five-Year reporting effort; no changes are needed for the protection of human health and the environment.

5.0 REEVALUATE FEASIBILITY OF EXCAVATION

This chapter addresses the May 2005 Final Order (NMED May 2005) requirement to reevaluate the feasibility of MWL excavation with offsite disposal. In accordance with the MWL LTMMP, Section 4.8.2, reevaluation of excavation feasibility is modeled after and updates the evaluation of the *Complete Excavation with Offsite Disposal* alternative presented in Appendix H of the May 2003 MWL CMS Final Report (SNL/NM May 2003).

The February 2016 Final Order (NMED February 2016) requirement to evaluate onsite disposal in an engineered cell that includes a RCRA Subtitle C liner system (i.e., a modern landfill) is the only modification to Five-Year Report requirements originally established in the NMED May 2005 Final Order, and is specific to this first Five-Year Report. The evaluation of onsite disposal was not addressed in the May 2003 MWL CMS Final Report.

This chapter includes an evaluation of two disposal alternatives: offsite disposal at one or more offsite facilities, and onsite disposal in an engineered cell similar to the SNL/NM CAMU. The fundamental planning, excavation, waste management, closure, and long-term monitoring and maintenance approach is similar for both disposal alternatives. Therefore, Chapter 5 will present a reevaluation of complete excavation with two disposal alternatives following the NMED-approved CMS Appendix H format. Where there are differences related to the disposal alternatives, they are addressed in the following sections.

5.1 Background

In January 2001, the U.S. Congress requested that WERC (a Consortium for Environmental Education and Technology Development) perform an independent peer review of the performance of the MWL. This review focused on historical operational information and the Phase 1 and 2 RFIs. WERC held MWL public meetings in March and May of 2001. After responding to public comments, they completed their Final Report on August 31, 2001 (WERC August 2001).

In the fall of 2002, DOE requested WERC perform a second independent technical peer review. This review addressed the Draft MWL CMS Report completed in November 2002 and included additional public meetings in December 2002 and January 2003. WERC issued their Final Report on January 31, 2003 (WERC January 2003). DOE and SNL/NM personnel submitted the MWL CMS Final Report to the NMED in May 2003 after reviewing and addressing the WERC Report. NMED completed their review and public process and issued general and specific comments in November 2003. DOE and SNL/NM personnel submitted responses to the NMED technical comments in December 2003, which were accepted without further comments by the NMED. As documented in the administrative record, the MWL investigation data and CMS Final Report went through an extensive public, independent peer, technical, and regulatory review process (including a four-day public hearing) prior to the NMED remedy selection of an ET cover with biointrusion layer in the May 2005 Final Order.

Complete excavation of the MWL with offsite disposal was one of several corrective measures alternatives evaluated in the May 2003 CMS Final Report. This alternative was considered

acceptable as a viable approach in the initial screening evaluation of potential corrective measures, but was eliminated from further consideration due to other alternatives providing the same protection with substantially less risk to site workers and overall cost. The *Future Excavation* alternative was carried through the full evaluation process. Due to community interest, a detailed evaluation of this alternative was requested by the NMED and was included as Appendix H. The May 2003 evaluation and associated cost estimate followed the criteria established in the CMS Final Report, Chapter 4. The Hazardous and Solid Waste Amendments and EPA guidance were considered and integrated in the 2003 CMS Final Report evaluation approach, along with the Corrective Measures Evaluation approach outlined in the SNL/NM Compliance Order on Consent (NMED April 2004).

As presented in the CMS Final Report, Chapter 4, EPA and NMED consider five main criteria for evaluating corrective measures alternatives that address technical measures and management controls for environmental issues at the site. The criteria, listed below, form the structure of Section 5.3 of this report.

1. Long-term reliability and effectiveness
2. Reduction of toxicity, mobility, or volume of wastes
3. Short-term effectiveness
4. Implementability
5. Cost

Worker safety and the safety of surrounding facilities and the public are major considerations in this reevaluation, consistent with the 2003 evaluation.

Section 5.2 of this chapter presents a summary of changes and updates since the May 2003 evaluation. The updated evaluation of the complete excavation with offsite and onsite disposal alternatives is summarized in Section 5.3. The remainder of Section 5.3 provides the comprehensive, updated evaluation in the same format as the 2003 evaluation. Sections 5.4 and 5.5 provide a comparison of the two disposal alternatives and a comparison of the 2003 and 2018 evaluations, respectively.

5.2 Summary of Changes and Updates

Changes and updates to the *Complete Excavation with Offsite Disposal* alternative evaluation presented in the May 2003 CMS Report Final Report, Appendix H, are summarized below and detailed in the discussion of excavation and waste management activities in Section 5.3.

Excavation and Waste Management Approach

- Removal, staging, and reinstallation of the 2009 ET Cover over the excavated and backfilled MWL disposal area is new scope for this evaluation

- Evaluation of onsite disposal in an engineered cell constructed with a RCRA Subtitle C liner system is new scope included for this January 2019 Five-Year Report

- Advances in technology since 2003 have not fundamentally changed the excavation and waste management approach, but should facilitate procurement and customization of conventional and specialized equipment needed for excavation and the two disposal alternatives

- Classified Area excavation strategy would be shifted to a more conventional, manually-operated equipment approach due to radiological decay of waste material; more limited, remotely-operated and specialized equipment capabilities would be implemented for specific pits as needed

- Classified Area excavation approach revised to include removal of soil surrounding the pits and soil separating Trench D from the western portion of the Classified Area, resulting in approximately 20,000 cubic yards (cy) of additional soil that would be excavated for the following reasons:

  - minimize the hazards created by working adjacent to open pits
  - allow options for lateral or vertical access to pit contents
  - facilitate a more feasible, comprehensive, post-excavation verification

- Faster excavation and waste management production rates were assumed based on using a conventional approach whenever possible, having remote-operations and specialized equipment capabilities in place when needed, and one streamlined waste management approach for all excavated waste

  - 2003 evaluation assumed approximately 6 years for excavation

  - 2018 evaluation assumes approximately 5.3 years with a larger excavation volume

- Radiological decay since the 2003 evaluation has reduced the radiation exposure risk associated with some MWL waste, in particular cobalt-60 and tritium waste

- Waste management approach would be streamlined and debris waste streams simplified to align with current permitted disposal facility waste acceptance criteria (WAC)

- Debris segregation and characterization would occur in two support facilities and in the excavation; a separate, self-contained characterization system would not be needed for the Classified Area waste items

- Shredding of small debris and combining with soil for disposal has been eliminated for the following reasons:

  - not necessary to meet disposal facility WAC
  - minimize creation of airborne contaminants resulting from shredding
  - reduce waste management steps
  - reduce site worker exposure

- Borrow soil for excavation backfilling and onsite engineered cell ET cover construction would be imported from a nearby offsite source; no borrow sites would be established on DOE property to eliminate long-term storm-water management and closure requirements

Support Facility Layout

- Facilities would be sited more to the west due to consideration of a nearby test facility
- Larger operational area footprint (both disposal alternatives) would be needed to accommodate a staging area for the 2009 ET Cover materials
- Shipping Center/Staging Center warehouse would be added to streamline offsite and onsite disposal logistics
- Long-term storage warehouse for waste with no disposal pathway would be eliminated because all anticipated waste has a disposal pathway
- Larger operational area footprint would be needed for the onsite disposal alternative to accommodate the onsite engineered cell with RCRA Subtitle C liner system and an additional staging area for the excavated soil produced to create the engineered cell

Risk (Radiological, Construction, and Transportation)

- Overall, site worker radiation exposure risk would be less, due mostly to decay of cobalt-60 and tritium
- Construction and transportation risk would be greater for the offsite disposal alternative due to all waste having an offsite disposal pathway
- Construction risk would be greater for the onsite disposal alternative due to construction-waste placement-ET cover installation for the onsite engineered cell

5.3 Reevaluation of Excavation – Offsite and Onsite Disposal Alternatives

In accordance with the May 2005 and February 2016 Final Orders, the feasibility evaluation of MWL excavation presented in the May 2003 CMS Final Report has been reevaluated and updated to include offsite and onsite disposal alternatives.

The fundamental technical approach and requirements for both disposal alternatives have similarities. For example, excavation and most of the waste management processes are the same for both alternatives. Therefore, the following feasibility evaluation is presented focusing on the reevaluation of complete excavation. Any differences related to the two disposal alternatives are addressed in the following sections.

Excavation and waste management would incorporate a conventional approach whenever possible for operational efficiency, but would include limited remote-operations capabilities for the Classified Area and the use of specialized equipment for both areas, as needed, to safely excavate and move specific inventory items. Mitigation of risk to surrounding facilities, the public, and environment would be accomplished by performing excavation and waste management activities in temporary tent structures with ventilation systems, hereinafter referred to as Sprungs™. A dedicated debris management warehouse with appropriate security controls and ventilation system would be used to process, manage, and store classified debris through ultimate disposition.

For the 2003 evaluation and this 2018 reevaluation, the overall approach to MWL excavation would be based on regulatory requirements and risk. Clean closure may be possible if levels of hazardous constituents remaining in unexcavated soil do not exceed NMED-approved clean closure levels for the site. Consistent with the 2003 evaluation, this updated 2018 evaluation assumes a risk-based approach designed to meet industrial land-use levels at completion (i.e., a permitted, risk-based approach designed to meet industrial land-use requirements). This approach minimizes the volume of waste generated and ensures any remaining residual hazardous constituents are below concentrations that may pose a risk to human health and the environment under industrial land use. While this may meet the definition of clean closure, as NMED has not finalized clean closure levels for the site, this report assumes that the excavated site may still require a cover with monitoring requirements remaining similar to current practices.

MW and LLW debris would be separated from soil, treated and packaged, as appropriate, and either shipped to a permitted offsite facility for disposal (offsite disposal alternative) or disposed onsite in an engineered cell constructed with a RCRA Subtitle C liner system and ET cover (i.e., CAMU-equivalent cell) (onsite disposal alternative). Soil would be separated into replaceable[1], MW, and LLW streams based on process knowledge and characterization data that meets disposal facility acceptance criteria. Based on current disposal facility WAC, all waste could be disposed either offsite or onsite; no long-term storage of waste would be required. All excavated waste would be packaged and disposed within approximately one year of excavation completion.

Replaceable soil and a considerable volume of offsite borrow soil would be used to backfill the excavation to grade after verification of debris removal and meeting industrial risk-based levels for remaining soil. Backfill material would undergo sampling and analysis to confirm it meets risk-based levels prior to use.

The Sprung™ over the excavation would be decommissioned after backfilling. Based on NMED direction, construction of an ET cover with biointrusion layer would commence over the excavation (i.e., reinstall the 2009 ET Cover removed prior to excavation). Groundwater and soil-vapor monitoring networks, decommissioned prior to excavation, would be installed after completion of the Excavation ET Cover (the cover over the backfilled MWL). Long-term monitoring, inspection, and maintenance of the site would begin at this point and would be performed in parallel with site closure activities.

[1] Replaceable soil is defined as excavated soil that meets industrial land-use risk-based levels for use as backfill material based on analytical characterization data (i.e., excavated soil that is safe to use as backfill material for industrial land-use).

For the onsite cell disposal alternative, construction of the Onsite Cell ET Cover would begin immediately after placement of all excavated waste. This would run in parallel with construction of the Excavation ET Cover.

Risk to site workers would be a primary concern for the multi-year duration of excavation and waste management activities. In addition to performing activities in ventilated Sprungs™, worker risk mitigations would include detailed planning, use of Level B personal protective equipment (PPE) with supplied-air full-face respirators, real time monitoring with alarms and action levels, use of distance and shielding, and limiting time of exposure to radiation. A conceptual layout of site facilities is illustrated for both disposal alternatives in Figures 5-1 (offsite disposal alternative) and 5-2 (onsite disposal alternative). Overview project schedules showing the six main work phases (bolded, left justified titles) and associated tasks (indented) are provided for both disposal alternatives in Figures 5-3 (offsite disposal alternative) and 5-4 (onsite disposal alternative).

Risk associated with the transfer of waste to the surface through excavation, and to other facilities through disposal, are concerns with complete excavation. Consistent with the 2003 evaluation, transportation and remediation (i.e., construction) risks far exceed the risks of chemical or radiological exposure associated with excavation and waste management.

5.3.1 Long-Term Reliability and Effectiveness

The complete excavation alternative ranks high for long-term reliability and effectiveness. The long-term reliability and effectiveness for the excavated area are the same for both disposal alternatives, although additional long-term controls would be required for the onsite engineered cell, including monitoring, inspections, maintenance/repairs, and leachate management. At the excavation site, constituent concentrations or activities would be reduced to acceptable industrial risk-based and/or background levels through excavation and confirmatory sampling. Therefore, the long-term risk associated with excavation would be below NMED guidelines for industrial land use. However, waste and its associated risk would be transferred to another facility, either a permitted offsite facility or the permitted onsite engineered cell.

For the excavation site under the assumed approach, VOC soil-vapor and groundwater monitoring would be required for the long-term monitoring and maintenance period. Potential biological intrusion and associated contaminant redistribution would be minimized under the risk-based approach with residual contamination meeting industrial land-use requirements in the subsurface soil. Institutional controls similar to those currently required by the Permit that incorporates the MWL LTMMP would remain.

5.3.2 Reduction of Toxicity, Mobility, or Volume of Wastes

Excavation of the MWL would reduce the toxicity and mobility of waste. The volume may also be reduced. Waste items would be segregated into waste streams in accordance with disposal facility WAC. The inventory and estimated soil volumes have been distributed into several waste streams and packaging types. Treatment and packaging would be used as appropriate to ensure safe disposal meeting land disposal restrictions (LDRs) for both disposal alternatives. Appendix D-1 includes the guidelines and assumptions for waste management, the detailed

waste inventory and distribution table, and waste stream volume estimates for all excavated debris and soil. Toxicity would be transferred from the MWL to other sites, including offsite disposal facilities (for offsite disposal alternative) and the onsite engineered cell (for onsite disposal alternative). Disposal pathways are not limited by WAC; all waste streams currently have a defined disposal option.

The waste volume would be minimized, to the extent possible, through a risk-based approach to excavation (i.e., all waste and only contaminated soil that exceeds risk-based levels would be removed). Over-excavation would be performed to achieve industrial risk-based levels of COCs. Geophysical surveys would be used to verify removal of all debris and soil verification sampling and analysis would be performed to confirm industrial risk-based levels are achieved.

Potential mobility of contaminants from the disposal areas to the groundwater would be reduced by removal of all waste and contaminated soils exceeding industrial risk-based levels. Some mobile contaminants have already migrated outside the area that would be excavated (e.g., VOC soil vapor and tritium), so long-term monitoring and institutional controls would still be required. However, previous characterization studies and ongoing long-term monitoring results indicate that contamination remaining outside the excavation would not pose a threat to human health and the environment, including the regional groundwater aquifer. A post-excavation risk assessment would be performed to confirm this conclusion and provide the technical basis for closure and transition to long-term monitoring and maintenance.

5.3.3 Short-Term Effectiveness

Worker risk associated with complete excavation of the MWL and management of the excavated wastes and soil was assessed in the context of worker health and safety. Since the 2003 evaluation, 15 years of decay has reduced site worker exposure risk relative to radiological waste with shorter half-lives, most notably cobalt-60 and tritium. Health and safety concerns related to internal exposure to airborne radioactive particulates (i.e., inhalation and ingestion pathways) and the potential for physical injury and/or death due to remediation construction and transportation activities remain as primary health and safety concerns no matter when this remediation alternative would be implemented.

The MWL inventory would be used to develop trench/pit-specific plans and waste profiles to minimize waste handling and processing steps, simplify the waste management process, and reduce site worker risk. Most work duties would be performed in Level B PPE with supplied-air full-face respirators or in supplied-air, sealed equipment cabs. Excavation and waste management activities would be performed in ventilated Sprungs™ and include dust control measures. All vented air from the Sprung™ structures would be filtered through high efficiency particulate air (HEPA) filters. This approach would help mitigate the hazards from airborne particulates, but would not be effective for removal of VOCs and tritium vapor. Based upon the 2003 evaluation, these inhalation hazards were not a major health and safety concern, as VOCs occur at very low concentrations and the inhalation hazard for tritium was not a significant risk concern. Direct-reading instrumentation and the principles of distance and shielding would be used to comply with DOE and SNL/NM As Low As Reasonably Achievable (ALARA) requirements. The long duration of work performed in Level B PPE and the risk of physical injuries and fatalities related to remediation construction activities and transportation of waste and fill material remain as serious health and safety concerns.

Updates to site worker risk are summarized in the following sections using the same format as the 2003 evaluation of *Complete Excavation with Offsite Disposal* (MWL CMS Final Report, Appendix H). Supporting information for this evaluation is provided in Appendix D-2.

5.3.3.1 Radiological Excavation Risk

As part of the 2003 assessment of radiological excavation risk for the complete excavation alternative, the exposure risk from excavation and handling of the highest activity cobalt-60 source buried in Classified Area Pit SP-5 was evaluated (10,000 curies in 1960 when manufactured). Since this evaluation, approximately 15 years have passed, or almost three cobalt-60 half-lives. Assuming a start date of 2030 for excavation of the Classified Area, the radioactivity of the cobalt-60 sources in Pit SP-5 would be on the order of 0.1 curies each after approximately 70 years of decay (i.e., 1960 to 2030). That would result in unmitigated exposure rates of approximately 1.4 rem per hour at a distance of 1 foot for each source, or 9 rem per hour at 1 foot for all the source pellets. These estimations do not account for the two-layer shielding provided by the 6.7-cubic foot lead inner cask and the 24-cy concrete outer burial cask, but do provide a worst-case potential exposure for this source package if all shielding/containerization were removed.

Based on the assumption that the source shielding would still be intact, these sources would not present an exposure hazard to site workers unless the shielding was removed. Removal of shielding could be required for safer movement and transport, and/or for waste characterization. Regardless, radiological controls and specialized equipment (e.g., large crane) would be required to excavate and process the Pit SP-5 source package for disposal.

The cobalt-60 source package in Pit SP-5 provides an important example of how radiological decay would reduce the site worker exposure risk for specific waste items. Table 5-1 summarizes half-life and radioactivity information for various radionuclides listed in the MWL inventory. The number of half-lives elapsed and the percentage of parent material remaining was calculated for 1973 (mid-point of disposal period, 1959-1988) to 2027 and 2030, which correspond, respectively, to the estimated start of excavation in the Unclassified Area and Classified Area for the offsite disposal alternative. This table shows that for radionuclides with relatively short half-lives, such as cobalt-60 and tritium, the radioactivity of buried sources or contaminated items would have decreased, and the percentage of remaining parent material in 2030 would be only 0.06% and 4.10%, respectively. For radionuclides with longer half-lives, such as uranium-238, thorium-232, and radium-226, the impact of decay on exposure risk is negligible. While the overall radiation exposure risk is reduced by natural decay, the inventory still contains sources, waste items, and contaminated materials that pose a risk to site workers. Internal exposure through inhalation of radioactive particulates remains a site worker health and safety concern regardless of time and decay.

In the 2003 CMS Final Report (SNL/NM May 2003), a risk screening assessment was performed using the RESRAD code to evaluate the *Future Excavation* alternative (complete excavation in 2039). RESRAD is a widely-accepted computer code used to calculate site worker radiation dose. This screening assessment was presented in the 2003 CMS Final Report, Section 4.3.4.3 and Appendix I (SNL/NM May 2003) and is summarized below.

Table 5-1
Radiological Decay Summary – 1973 to 2027[a]

Radionuclide	Half-Life (years)	Number of Half Lives Elapsed 2027[a]	Percentage of Parent Material Remaining 2027[a]	Number of Half Lives Elapsed 2030[a]	Percentage of Parent Material Remaining 2030[a]
Cobalt-60	5.27	10.18	0.09%	10.756	0.06%
Tritium	12.30	4.36	4.87%	4.61	4.10%
Strontium-90	28.80	1.86	27.51%	1.97	25.56%
Cesium-137	30.17	1.78	28.91%	1.88	27.34%
Barium-133	10.51	5.10	2.91%	5.39	2.38%
Krypton-85	10.76	4.99	3.16%	5.27	2.59%
Sodium-22	2.60	20.62	0.00%	21.80	0.00%
Promethium-147	2.60	20.62	0.00%	21.80	0.00%
Polonium-210	0.38	141.48	0.00%	149.55	0.00%
Selenium-75	0.33	162.98	0.00%	172.28	0.00%
Tantalum-182	0.31	170.77	0.00%	180.51	0.00%
Uranium-235	7.04E8	7.62E-8	99.98%	8.05E-8	99.98%
Uranium-238	4.47E9	1.19E-8	100.00%	1.26E-8	100.00%
Thorium-232	1.40E10	3.83E-9	100.00%	4.05E-9	100.00%
Plutonium-239	2.41E4	2.20E-3	99.85%	2.35E-3	99.84%
Radium-226	1.60E3	3.35E-2	97.71%	3.54E-2	97.58%
Americium-241	4.32E2	1.24E-1	91.76%	1.31E-1	91.31%
Samarium-151	8.88E1	5.96E-1	66.17%	6.30E-1	64.63%
Plutonium-238	8.77E1	6.11E-1	65.46%	6.46E-1	63.89%
Iridium-192	7.38E1	7.26E1	60.45%	7.68E-1	58.74%

Notes:
[a]Assume decay begins mid-way through disposal period in 1973. Offsite disposal alternative excavation would begin in the Unclassified Area in 2027, and in the Classified Area in 2030.
% = Percent.

For the *Future Excavation* screening assessment, the maximum activities for 10 radionuclides detected in Phase 2 RFI soil samples (americium-241, cobalt-60, cesium-137, plutonium-238, plutonium-239, radium-226, strontium-90, thorium-232, tritium, and uranium-238) were assumed to be uniformly distributed in the total excavated waste volume and no credit was applied for health and safety controls (e.g., PPE, engineering controls).

For these radionuclides under the *Future Excavation* alternative, the incremental total effective dose equivalent is 3,230 millirem per year (mrem/yr), which is greater than the EPA numerical guideline of 15 mrem/yr for industrial land use (OSWER Directive No. 9200.4-18, EPA 1997), but below the applicable guideline for an SNL/NM remediation site worker of 5,000 mrem/yr, found in 10 CFR 835 “Occupational Radiation Protection.” The estimated excess cancer risk is 3.7E-2.

The *Future Excavation* screening assessment summarized above provides a conservative assessment of potential site worker exposure risk during excavation and waste management

operations. The use of maximum soil activities overestimates the risk associated with much of the excavated soil and some debris with no or very low radionuclide activity, but underestimates the short-term exposure risk for high-activity waste items. In general, these results represent a worst-case scenario and highlight the need for careful planning and implementation of health and safety controls for the complete excavation alternative with offsite or onsite disposal.
Any site worker radiological risk assessment is limited by fundamental assumptions and generalizations required to model the complex processes and potential exposure pathways involved in excavation and waste management operations conducted on this scale. Based on MWL inventory information, all radioactive sources were disposed with significant shielding and in appropriate containers that provided protection for the site workers disposing the waste. However, to characterize these sources to meet disposal facility WAC, intrusive characterization and removal of shielding may be required. Internal exposure to airborne radioactive particulates via the inhalation and/or ingestion pathway is a significant concern given the volume of radioactive debris and the unavoidable generation of airborne dust during remediation activities.

The *Future Excavation* radiological risk screening results provide a conservative estimate of potential site worker risk for the purpose of this evaluation and demonstrate that exceedance of the applicable regulatory limit in 10 CFR 835 “Occupational Radiation Protection” of 5,000 mrem/year per worker is unlikely. Adherence to DOE and SNL/NM dose guidelines is achievable following ALARA principles using sound health physics-based approaches (i.e., hazard mitigation planning and controls) as previously described in Section 5.3.3.

5.3.3.2 Construction Risk

Construction risk was evaluated for remediation activities conducted onsite, including excavation, waste management, backfilling, ET Cover(s) construction, and closure decommissioning and demolition (D&D). Long-term monitoring and maintenance activities are not included as they do not involve the same level of complexity, worker crew size, or heavy equipment. Three components (i.e., scenarios, probability, and consequence) must be defined with respect to the activities performed, and the risk is a product of probability and consequence. Site worker risk (i.e., physical injury and death) is determined from 2016 accident statistics (most recent available) related to specific industries from the U.S. Department of Labor (DOL) and other sources. The DOL industrial labor classification of construction was used to estimate the injury and fatality rates per workhour. For this evaluation, only equipment-related consequences are quantified; it is assumed that exposure to chemicals and radionuclides would be mitigated through health and safety controls.

Project schedules were used to determine field technician, equipment operator, and survey crew workhours (Figures 5-3 for offsite disposal alternative; Figure 5-4 for onsite disposal alternative) and the Remedial Action Cost Engineering and Requirements (RACER™) cost estimation reports. Workhour totals cover construction and remediation activities for Support Facility Construction (Phase 2) through Closure (Phase 4). Labor hours for turn-key contractor professional staff (e.g., Project Manager, Staff Engineers) were not included. The DOL construction industry statistics based on total effort in workhours were used to estimate injuries and fatalities for complete excavation and both disposal alternatives. The expected construction injuries and fatalities are summarized below and are similar for both disposal alternatives.

Disposal Alternative	Total Field Technician Hours	Field Technician FTEs	Construction Injuries	Construction Fatalities
Offsite	562,472	281	9.0	0.03
Onsite	713,570	357	11.4	0.04

FTEs = Full-time Equivalents, with one FTE = 2,000 workhours

- Risk of occupational injury per FTE (construction labor classification) is 3.2 x 10–2 (DOL 2018)
- Risk of occupational fatality per FTE (construction labor classification) is 1.01 x 10–4 (DOL 2018)

5.3.3.3 Transportation Risk

Evaluation of risk associated with transportation is very similar in concept to the determination of risk for remediation activities. Transportation risk for this evaluation only considers vehicle transportation mileage on public roads to and from the MWL; transportation onsite (e.g., excavation to Soil Staging Areas) is not included. Only vehicle-related consequences that include traffic injuries and fatalities are quantified; exposure to chemicals and radionuclides associated with accidents is not included in this evaluation. National average rates for all vehicles from the U.S. Department of Transportation (DOT) National Highway Traffic Safety Administration (DOT 2018) were used to evaluate injury and fatality rates. The input parameters used to determine transportation risk for each disposal alternative are summarized below.

Offsite Disposal Alternative

- Roundtrip mileage for transport of all waste (i.e., excavated soil and debris, PPE, HEPA filters, and facility D&D materials, scraped soil, equipment) to offsite disposal facilities; assume roundtrip mileage specific to the disposal facility

- Roundtrip mileage for transport of soil fill material from an offsite borrow source for backfilling the excavation; assume roundtrip mileage of 30 miles

Onsite Disposal Alternative

- Roundtrip mileage for transport of all project generated and closure waste (PPE, HEPA filters, facility D&D materials, scraped soil, and equipment) to offsite disposal facilities; assume roundtrip mileage specific to the disposal facility

- Roundtrip mileage for transport of soil fill material from offsite borrow source for backfilling the excavation and for construction of the Onsite Cell ET Cover; assume roundtrip mileage of 30 miles

The expected transportation injuries and fatalities are summarized below for both disposal alternatives.

Disposal Alternative	Total Waste Shipment Mileage	Total Borrow Soil Fill Mileage	Grand Total Mileage	Transportation Injuries	Transportation Fatalities
Offsite	13,432,550	125,910	13,558,460	13.4	0.16
Onsite	7,062,000	247,320	7,309,320	7.2	0.09

- Risk of accident injury per 100 million vehicle miles traveled is 99 (DOT 2018)
- Risk of accident fatality per 100 million vehicle miles traveled is 1.18 (DOT 2018)

5.3.3.4 Risk Summary

The overall health and safety risk of complete excavation with offsite or onsite disposal is ranked high due to the nature of the waste, complexity and duration of the work, and the fact that site workers would be performing the work in Level B PPE. Consistent with the 2003 evaluation, physical risks associated with transportation and remediation construction far exceed the chemical or radionuclide exposure risk associated with excavation and waste management activities. The substantial decay of some radionuclides, in particular cobalt-60 and tritium, has decreased the overall site worker radiological exposure risk. However, detailed planning and the implementation of significant health and safety controls would still be required, and site worker internal exposure to radioactive particulates for the long duration of excavation and waste management activities remains a concern.

5.3.4 Implementability

The following section presents the general implementation approach for MWL excavation for the two disposal alternatives summarized in Section 5.3. Implementation consists of six major work phases that form the basis for the project schedules provided in Figures 5-3 (offsite disposal alternative) and 5-4 (onsite disposal alternative). The overall approach for both alternatives is very similar. Differences between the two disposal alternatives are described in the following sections.

5.3.4.1 Planning and Support Facility Construction

Extensive planning would be necessary to successfully and safely excavate the MWL and disposition all waste under both disposal alternatives. The Planning & Permitting phase would begin with an SNL/NM procurement process for a turn-key design-build contract to allow for the most time-efficient project execution. In accordance with the regulatory process applicable to the MWL, the implementation of excavation would require the development of a CMI Plan which requires NMED approval (for the purpose of this Chapter, the CMI Plan is hereafter referred to as a CMIP). The CMIP would include a comprehensive set of documents addressing all excavation, health and safety, waste management, engineering design, closure, and post-closure/long-term monitoring and maintenance activities and requirements. These documents would include, at a minimum, a site-specific excavation plan, health and safety/radiation protection plan, waste management plan, SAP, site security plan, quality assurance plan, closure plan, and LTMMP. Engineering design included in the CMIP would address excavation, all support facilities and site layout, security measures and controls, waste management operations, excavation backfilling, and the Excavation ET Cover for both disposal alternatives; and for the onsite disposal alternative, the onsite engineered cell with RCRA Subtitle C liner system and Onsite Cell ET Cover.

The CMIP would also provide the technical basis and information needed for all necessary permitting processes required by the NMED, EPA, and local authorities. Two major permitting actions would establish the risk-based approach designed to meet industrial land-use requirements under RCRA and the Toxic Substances Control Act (TSCA). Although polychlorinated biphenyls and asbestos are not directly listed in the MWL inventory, there are items listed (e.g., fluorescent ballasts and building materials) that would likely contain TSCA-

regulated constituents. Therefore, TSCA permitting would be applicable and submitted in parallel with the RCRA permitting effort for efficiency. The regulatory authority for modification of the RCRA Permit would be the NMED, and the EPA would be the regulatory authority for the project-specific TSCA Permit Application.

Preparation of permitting documentation would begin approximately one year after the start of CMIP development to allow for completion of initial planning and engineering design needed for the permitting process. The CMIP and respective permitting documents would be submitted in parallel for regulatory review and approval in approximately 2.5 years, including a 6-month SNL/NM procurement effort. Regulatory review and final approval of the CMIP and permitting documentation would take an additional 2.5 years for the offsite disposal alternative and 3.5 years for the onsite disposal alternative, which would include the required public notice process and time to resolve technical comments provided by the regulators. The additional year for the onsite disposal alternative would be needed for a public hearing, which is anticipated for the associated Class 3 RCRA Permit modification request. These timeframes for development and regulatory approval of the CMIP and permitting documents (5 years for offsite disposal alternative, 6 years for onsite disposal alternative) represent best-case scenarios, and assume available resources and regulatory acceptance of a risk-based remediation approach (Figure D3-1, Appendix D-3).

The Support Facility Construction phase would begin immediately upon regulatory approval of the CMIP and all related permitting actions, and would be completed in approximately 2.7 years in accordance with CMIP designs. This represents a major construction project that includes an initial 6-month procurement effort by the selected turn-key contractor, followed by site grading and drainage earthwork, utility installation, construction of large temporary tent structures and two metal warehouses, removal and staging of the MWL ET Cover materials, mobilization of administrative and onsite laboratory facilities (i.e., mobile trailers), functional testing of all facilities and equipment, completion of all site worker training, and readiness review.

Figures 5-1 and 5-2 illustrate a conceptual layout of support facilities needed to safely excavate the MWL and manage waste materials for the offsite and onsite disposal alternatives, respectively. To minimize impact to the adjacent Short Sled Track Test Site, all support facilities are located west of the MWL eastern boundary. To mitigate worker, public, and environmental risk, the excavation and waste management operations would be conducted in large, temporary Sprungs™. Construction of these six Sprungs™ would include installation of ventilation systems with HEPA filtration. To meet DOE and SNL/NM security requirements, a metal warehouse building with a concrete floor equipped with access restrictions would be used for processing and storing classified debris. One additional metal warehouse constructed to serve as a waste shipping facility/onsite engineered cell staging center would be used to stage, certify, track, and load waste packages prior to disposal. A covered container storage area (metal roof, no walls) would provide extra storage space for both empty and full waste containers immediately south of the Shipping Center. Administrative (office space and shower facilities for site workers) and onsite laboratory facilities would be housed in mobile trailers staged on leveled gravel pads. Open-air soil and material staging areas would be included for the current ET Cover materials that would be removed prior to excavation, for replaceable soils, and for clean soils excavated during construction of the onsite engineered cell for the onsite disposal alternative. All support facilities would be connected by gravel roadways and enclosed by an eight-foot high perimeter fence that would include a security access gate.

The support facilities and site layout for both disposal alternatives is the same, with the following exceptions. The overall footprint for the onsite disposal alternative is larger to accommodate the onsite engineered cell and the staging area for the excavated soil (96 versus 72 acres). This larger footprint results in a greater length of perimeter fencing and gravel roadways. An additional administrative trailer would be included at the northwest corner of the onsite cell to support disposal operations and long-term monitoring and maintenance. The Shipping Center for the offsite disposal alternative would be used as the Disposal Cell Staging Center for the onsite disposal alternative.

Although the Soil Storage Sprungs™ are labeled according to the two excavation areas, they would be used as needed to store soil waste from either area as the excavation progresses. The goal of support facility sizing and layout is to allow for the maximum achievable excavation rate by providing sufficient space for waste staging and processing. The various areas are not large enough to manage all excavated waste at one time; rather they are balanced to accommodate an excavation rate that would at times exceed the waste processing rate. Waste management would begin in parallel with excavation, but due to the time required for the processing of some waste and to accumulate enough waste to begin offsite shipments or placement in the onsite engineered cell, waste management would extend beyond the excavation period for both disposal alternatives by approximately one year. Administrative and engineering controls, including all monitoring equipment and alarms, security, construction equipment, temporary facilities, and waste management equipment, would be inspected and functionally tested and verified prior to starting excavation. Required worker training would be completed and verified prior to excavation start, and refreshed as necessary throughout the project duration. Task hazard analyses for all activities and emergency procedures would be reviewed with all site workers. Trial excavation and waste handling processes would be conducted to verify proper, intended equipment and labor function. These processes would be continually tested, evaluated, and improved during the Excavation & Waste Management phase. Readiness review sessions would be conducted with surrounding facilities and would include SNL/NM and DOE management and safety personnel, Quality Assurance/Quality Control personnel, and regulatory personnel as necessary.

The Planning & Permitting and Support Facility Construction phases of this project represent a major effort lasting approximately 7.7 years for the offsite disposal alternative (5 years for CMIP and Permitting, 2.7 years for support facility construction), and approximately 8.7 years for the onsite disposal alternative (6 years for CMIP and Permitting, 2.7 years for support facility construction). Summary-level project schedules that show all six work phases and associated tasks are provided in Figures 5-3 (offsite disposal alternative) and 5-4 (onsite disposal alternative). Additional technical and costing assumptions for planning, permitting, and support facility construction are included in Appendix D-3).

5.3.4.2 Excavation of Unclassified Area

Excavation of the Unclassified and Classified Areas of the MWL would involve removal of soil and debris from trenches, pits, and surrounding areas, but would also include activities to manage debris and soils immediately following removal. This section and the section that follows provide an overview of the excavation approach for the two areas and initial waste management activities conducted within the MWL Excavation Sprung™. Definitions for much of

the terminology used here and a comprehensive description of the complete waste management process are provided in Section 5.3.4.4, *Waste Management*.

The excavation approach would be the same for both disposal alternatives and would begin in Trenches A through G, within the MWL Excavation Sprung™. Based on historical disposal information, Trenches A, B, C, D, and G would be excavated with 1:1 sloping on three sides and 3:1 sloping on the north ends for equipment access. Trenches E and F are rectangular with vertical sidewalls on all four sides. Due to proximity, the Trench A excavation would overlap and include Trench B. Similarly, the eastern side sloping of Trench D would overlap with the western boundary of the Classified Area. Two non-designated areas (NDAs) would be excavated in the Unclassified Area to confirm geophysical data and the extent of disposal. The Excavation Site Plan and detailed cross sections of Trenches A through G are included in Appendix D-1, *Inventory Waste Distribution, Soil Volumes, and Excavation Site Plan,* as Figures D1-1 through D1-8.

A detailed approach for each trench would be developed during the Planning & Permitting phase (Section 5.3.4.1) that incorporates all available information, including descriptions of inventory items, possible hazards, and estimated radiological activity at the time of excavation for specific sources and/or waste material. Action levels and hold points would be established to streamline activities and protect site workers through timely implementation of hazard controls. Controls for site worker safety would include real-time radiation monitoring with action levels and hold points, and visual screening by an experienced, trained excavator-operator.

A conventional approach using standard, manually-operated construction equipment would be used to excavate the majority of the Unclassified Area trenches, screen and segregate materials, and safely move soil and debris within the MWL Excavation Sprung™ and to other support facilities. Conventional equipment would include a tracked excavator equipped with radiation sensors and various attachments (e.g., standard and clamshell buckets, grappler, attachment), a mobile vibrating mechanical screen (mechanical screen), front-end loaders, all-terrain forklifts, and other similar equipment. Excavation of each trench would begin with removal of the three-foot-thick soil cover overlying each trench. This soil would be processed through the mechanical screen set up to separate items greater than two inches in diameter (i.e., rocks and any debris, if present) from the soil. The mechanical screen would be located adjacent to the excavation area and moved within the MWL Excavation Sprung™ as needed for operational efficiency. Once screened, the cover soil would be transported to the Replaceable Soils Staging Area for confirmation sampling and analysis and future use. The same process would be followed for excavation of soil from the NDAs.

The excavation of each trench would begin in the northwest corner, span the width of the trench, and proceed south. As the excavator operator removes the contents of the trench, an initial visual inspection would be performed to look for items easily identifiable as suspected classified or prohibited based upon disposal facility WAC. Sensors installed on the excavator would be used to identify and segregate items with high radiological activity from the excavated waste. Items too large to fit on the mechanical screen would be set aside in a designated area for additional evaluation and processing.

Excavated soil and non-discrete debris would then be placed on the mechanical screen to separate debris and rocks from soil. A large metal container (e.g., roll-off or similar) would be placed to collect debris as it comes off the mechanical screen. Soil would pass directly through

and accumulate under the screen. Visual inspection for discrete items and items that may require treatment and/or special handling would be performed by waste management technicians during this mechanical screening step. If identified at the time of excavation or mechanical screening, items requiring special management would be segregated from the main debris waste stream and transferred to the Debris Segregation & Management Sprung™ or Classified Debris Management Warehouse for further evaluation, treatment if needed, and processing. Large, heavy items (i.e., oversize items) and/or items with radiation hazards could be managed in the MWL Excavation Sprung™. Measures required for safe and secure management of these items would be addressed on a case-by-case basis.

Screened soil would be periodically removed from below the mechanical screen using a front-end loader, field scanned to measure radioactivity, and placed in dump trucks for transport to the Unclassified Area Soil Storage Sprungs™. Sampling of the screened soil would be performed either during the loading process or after transport, and results would be used to confirm the soil waste type prior to packaging and disposition. Containers of debris collected off the mechanical screen would be transported using a forklift or front-end loader equipped with forks to the Debris Segregation & Management Sprung™. Excavation and initial segregation activities performed in the MWL Excavation Sprung™ are shown on the left-hand side of Figure 5-5.

Specialized equipment, including a manually-operated rough terrain 100-ton crane, would be available to move items that require special handling due to size, unique shape, weight, high radiation hazard, or other unique hazards. This crane provides the protection of distance from the object. For example, the Hallum cask contaminated with multiple fission products listed in the Trench F inventory is 19 feet long and weighs approximately 80,000 pounds. This oversize item would be extracted and moved with shielding intact using the 100-ton crane to allow for further evaluation in the excavation. There are four other large, heavy shipping casks listed in Trench F. Any material or item determined to represent a hazard to site workers exceeding implemented controls would remain in the excavation while the necessary safety and operational controls were established. Onsite laboratory capabilities (discussed in Section 5.3.4.4) and real-time monitoring would also be used to characterize and evaluate hazards during excavation.

Table 5-2 summarizes the waste stream and replaceable soil volumes as estimated from the MWL inventory and Excavation Site Plan (Appendix D-1). During this reevaluation, debris waste streams were simplified to align with current permitted disposal facility WAC. Smaller routine debris, referred to as non-discrete debris (e.g., miscellaneous paper, glass, wood, metal, wire, etc.), would be categorized and managed as MW. Only larger, easily distinguishable items, referred to as discrete items (e.g., items such as 35-gallon drums or larger), that can be reasonably segregated and characterized with a high level of certainty would be managed as LLW or transuranic (TRU) waste. Based on the inventory and waste management approach, the probability of generating waste that meets the “concentration of specific alpha-emitting isotopes per mass” requirement for TRU waste (i.e., 100 nanocuries per gram) is very low. Additional supporting information regarding the proposed waste management process and terminology is presented in Section 5.3.4.4 and Appendix D-1.

The configuration of the excavation footprint for Trenches A, B, D, and E would vary from the dimensions shown in the corresponding Appendix D-1 figures (Figures D1-2, D1-3, D1-5, and D1-6, respectively). Due to the location of these trenches, some side slopes would overlap,

Table 5-2
Estimated Unclassified Area Excavation Soil and Debris Volumes

Type of Waste	Volume (cy)
Soil[a]	
LLW	30,646
Replaceable[b]	14,129
Debris	
LLW	1,369
MW	10,173
TRU Waste	0
TOTAL	56,317

Notes:
[a]All soil volumes include an expansion factor of 1.3.
[b]Replaceable soil is not waste, but is included as part of the total excavation volume.
cy = Cubic yard(s).
LLW = Low-level waste.
MW = Mixed waste.
TRU = Transuranic.

altering the excavated dimensions. These factors were incorporated into the volume calculations. The figure for each trench includes dimensions and assumptions used to calculate the estimated soil and debris volumes.

Excavation rates were determined for the Unclassified Area trenches based on process knowledge (i.e., inventory and disposal information), estimated waste management production rates, and excavation experience at other SNL/NM and Los Alamos National Laboratory disposal sites. The excavation rate for the soil and debris from the core, sides, and ends of the Unclassified Area trenches is estimated to be approximately 300 cy per week. The excavation rate for the replaceable and LLW soil from the trench covers, sides, and ends is estimated to be approximately 400 cy per week. Using these rates, excavation and initial screening of 42,188 cy of debris and soil waste and 14,129 cy of replaceable soil would take approximately 2.9 years to complete. Based on the waste management production rate, the majority of Unclassified Area waste management activities would be completed during the Unclassified Area excavation phase. Additional technical and costing assumptions for the excavation and waste management approach are provided in Appendix D-3.

5.3.4.3 Excavation of Classified Area

Excavation activities in the Classified Area would begin after completion of the Unclassified Area excavation. During this reevaluation it was determined that the entire Classified Area would need to be excavated, including the areas between pits, as shown in Appendix D-1, Figures D1-1 and D1-9. This approach includes excavating a larger volume of soil than the approach proposed in 2003, but is necessary to minimize the hazards created by working adjacent to open pits; allow lateral and vertical access to pit contents; and facilitate more feasible, comprehensive, post-excavation verification (sampling and geophysical surveys). Under this approach the entire Classified Area would be excavated with 1:1 sloping on all sides. One NDA would be excavated in the northwest part of the Classified Area to confirm geophysical data and the extent of disposal (Appendix D-1, Figure D1-1). Soil excavated from the NDA would also be initially categorized as replaceable.

A detailed approach for the Classified Area and each of the 41 pits containing waste would be developed during the Planning & Permitting phase (Section 5.3.4.1) with the same considerations used for the Unclassified Area. The approach for each individual pit would be based upon the inventory for the pit to be excavated and the adjacent pits. Excavation of the Classified Area represents the greatest operational challenge due to the number and close proximity of the pits, and the generally higher hazards associated with their contents. As discussed in Section 5.3.3.1, significant decay of cobalt-60 sources and tritium sources/contamination has occurred since the time of the 2003 evaluation, reducing the associated site worker exposure risk. Despite the decay of these radioisotopes, the remaining radiological hazards and compliance with DOE and SNL/NM ALARA principles would require two excavation approaches as described below.

Where possible for operational efficiency, the conventional approach would be used for lower-hazard areas, including the soils separating the Classified Area from the Trench D excavation, the 1:1 side slopes, the Classified Area NDA, and the areas between individual pits. A remote operations approach would be implemented to excavate and remove the contents of specific pits, as necessary, based on planning and actual field conditions. The remote operations approach would include computer-controlled equipment, remotely operated from a truck-mounted operator control console (i.e., mobile control vehicle) enclosed with shielding and positive-pressure, breathing air. Appropriate air locks would be included to maintain a safe working environment for the operators. The mobile control vehicle would be positioned inside the MWL Excavation Sprung™ at a safe distance but within direct line of sight of the excavation. Remotely-operated equipment would include a conventional tracked excavator equipped with radiation sensors and multiple attachments (for excavation of soil and debris and movement of larger debris items) and a front-end loader (for moving segregated soil and debris). The mechanical vibrating screen would be set up with a remote on/off control. Specialized equipment would include a manually-operated rough terrain 100-ton crane for lifting and moving large, heavy items intact.

Excavation would begin in the northwest corner of the Classified Area, bordering the Unclassified Area, to remove the replaceable soils on the east side of Trench D to gain access to the west side of the Classified Area. To access the debris in the pits, the manually-operated excavator would remove the three-foot soil cover and three-foot concrete cover from the first pit. All excavated soils would be run through the visual and mechanical screening process and managed as described in Section 5.3.4.2. Concrete would be segregated and sized in the excavation for ultimate disposition. After removal of cover materials, the pit would be surveyed for radiation levels and evaluated. A change in approach to remote operations would be based on radiation survey results and the previously established plan for the pit. During excavation of pit contents, radiation levels would be continuously monitored. Debris and soil from the pit would be removed manually or remotely, as appropriate, and segregated using the mechanical screening process described in Section 5.3.4.2 and shown in Figure 5-5. Larger, heavier items would be removed and segregated by the excavator with a grappler attachment or with the 100-ton crane. An example of a discrete item requiring special handling is the cobalt-60 source package in Pit SP-5, which is estimated to weigh 102,000 pounds with lead and concrete shielding in place. As described in Section 5.3.3.1, the cobalt-60 sources could be removed from the pit, evaluated, and managed safely in the MWL Excavation Sprung™ with the shielding in place.

Initial segregation and management of excavated debris and soil would be performed following the process described in Section 5.3.4.2 and shown in Figure 5-5, including the early segregation of special items. After being field scanned to measure radioactivity, accumulated screened soil would be loaded into dump trucks and moved to the Classified Area Soil Storage Sprungs™. Debris collected after mechanical screening would be surveyed for radiation levels and transported to the Debris Segregation & Management Sprung™ or the Classified Debris Management Warehouse for further segregation and characterization. Classified items would be managed as described in Section 5.3.4.2. Oversize items would be evaluated in the excavation. If required for ultimate disposition, removal of shielding layers, size reduction, and/or additional processing would likely be performed in the MWL Excavation Sprung™. Characterization, and treatment and packaging, if required, could occur in the MWL Excavation Sprung™, Debris Segregation & Management Sprung™, or the Classified Debris Management Warehouse.

After the contents from a pit are extracted and processed, the surrounding soils would be removed using the conventional operations approach. In general, once higher-hazard items have been removed from the immediate excavation area, the conventional approach would be used to excavate and move soil and non-discrete debris to the appropriate support facility. The remote operations approach would only be used when needed to protect site workers. To maximize operation efficiency, excavation planning would consider the progression of excavation given the proximity and known contents of the pits.

The Classified Area approach integrates the use of remote operations and specialized equipment to mitigate site worker risk. Whenever possible, intact shielding would be left surrounding radiation sources and higher-activity items. Special shielding, standard waste containers, and remote-handling equipment would be used to safely manage and process smaller items with radiation or other hazards.

Table 5-3 summarizes the waste stream and replaceable soil volumes as estimated from the MWL inventory and Excavation Site Plan (Appendix D-1). Cross-sections of the Classified Area excavation are included in Appendix D-1, Figure D1-9, which include dimensions and assumptions used to calculate the estimated soil and debris volumes. The approximate 20,000-cy increase in the total volume of excavated soil as compared to the estimate presented in the 2003 evaluation would be necessary for reasons described earlier in this section. As discussed in Section 5.3.4.2, the debris waste streams were simplified to align with WAC requirements for current permitted disposal facilities. One larger item was identified in Pit SP-2 that could potentially meet TRU waste criteria. If confirmed as TRU waste, this item would be characterized, packaged, and stored prior to transport to the Waste Isolation Pilot Plant (WIPP) for ultimate disposal. Additional supporting information regarding the proposed waste management process is presented in Section 5.3.4.4 and Appendix D-1.

Excavation rates were determined for the Classified Area based upon the same factors cited in Section 5.3.4.2 and the periodic use of the remote operations approach. A production rate of 150 cy per week is estimated for the contents of the Classified Area pits. The estimated production rate for the replaceable soil between Trench D and the Classified Area (4,049 cy) and the Classified Area NDA (152 cy) is 500 cy per week. The estimated production rate for the MW soil surrounding the pits, and the LLW soil and MW concrete covering the pits is 300 cy per week. Using these rates, excavation and initial screening of 33,361 cy of debris and soil waste and 4,201 cy of replaceable soil would take approximately 2.4 years to complete. Waste

Table 5-3
Estimated Classified Area Excavation Soil and Debris Volumes

Type of Waste	Volume (cy)
Soil[a]	
LLW	11,848
MW	18,905
Concrete	395
Replaceable[b]	4,201
Debris	
LLW	209
MW	1,997
TRU	7
TOTAL	37,562

Notes:
[a]All soil volumes include an expansion factor of 1.3.
[b]Replaceable soil is not waste, but is included as part of the total excavation volume.
cy = Cubic yard(s).
LLW = Low-level waste.
MW = Mixed waste.
TRU = Transuranic.

management activities would progress concurrently with excavation and continue for an additional year to complete all processing and ultimate disposal of the excavated waste.

Excavation rates were balanced with estimated waste management production rates to ensure all excavated waste would be disposed in a timely manner without overwhelming onsite storage capacity. Additional technical and costing assumptions for the Classified Area excavation and waste management approach are detailed in Appendix D-3.

Excavation Verification

Verification of removal of all debris and contaminated soil exceeding industrial risk-based levels would be performed immediately after completion of Unclassified Area and Classified Area excavation, respectively. Geophysical surveys would be performed to confirm removal of all buried debris. Verification soil samples would be collected from the floor and sidewalls to confirm remaining soils meet industrial risk-based levels in accordance with Permit requirements. These samples would be collected using a 25-foot grid and analyzed at an offsite laboratory for all defined COCs to determine post-excavation concentrations and activities. The results would be compared to industrial risk-based levels and provided to the NMED (RCRA) and EPA (TSCA) in a letter report for approval. Upon NMED and EPA approval, backfilling of the excavation would begin as described in Section 5.3.4.5. The excavation approach presented in Sections 5.3.4.2 and 5.3.4.3 includes over excavation of all trench and pit floors and sidewalls. Additional excavation based on verification geophysical surveys and confirmation soil sample results is not anticipated.

5.3.4.4 Waste Management

Waste management encompasses all activities necessary to prepare wastes for ultimate disposition in a permitted offsite or onsite facility. As explained later in this section, the waste characterization process would begin prior to excavation during the Permitting & Planning phase. Available information for each trench and pit would be evaluated to determine waste profiles and streamline the waste characterization process. This approach would be designed to minimize, to the extent possible, site worker risk throughout the waste management process while meeting acceptance criteria for disposal.

Waste management activities performed during the excavation process within the MWL Excavation Sprung™ are described in Sections 5.3.4.2. and 5.3.4.3 and include initial visual screening, mechanical screening, and waste segregation. As excavation proceeds, sampling/analysis, consolidation, characterization, treatment, and packaging activities would be conducted to support ultimate disposition. Waste management activities would occur primarily in the MWL Excavation and Debris Segregation & Management Sprungs™. Support facilities for both the offsite and onsite disposal alternatives are displayed in Figures 5-1 and 5-2, respectively. The excavation and waste management process steps and the movement of excavated materials to the various support facilities through ultimate disposition are illustrated in Figure 5-5.

If identified at any point in the process, discrete and special items would be segregated from the non-discrete debris waste stream and transferred to designated shielded areas and/or containers within the Debris Segregation & Management Sprung™ or the excavation. Items identified as classified or suspected classified would be segregated and transferred to the Classified Debris Management Warehouse for further evaluation, processing, and storage. To minimize logistics and site worker risk, oversize items could remain in the excavation area for additional evaluation and safe processing (lower portion of Figure 5-5).

Based upon the waste inventory presented in Appendix D, Table D1-1 and the resulting soil and debris waste streams, a flow diagram was developed to provide a conceptual representation of the waste management process. Figure 5-6 shows this process and the associated decision points. Together, Figures 5-5 and 5-6 illustrate the waste management process for all excavated debris and soil. The waste management approach was developed to meet the following objectives.

- Protection of site workers and the environment
- Maximize efficiency by streamlining and standardizing the process, where possible
- Compliance with all applicable requirements and disposal facility WAC

Due to the nature of disposal practices during the MWL operational period, most smaller waste items would be inseparable from adjacent debris during excavation. For waste management purposes, large (i.e., equal to or greater than a 32-gallon drum) or more distinguishable items based upon size, shape, weight, or radiation levels are referred to as discrete items. Smaller routine debris (e.g., glass, wood, metal, plastics, and wire) is referred to as non-discrete. Discrete items include larger items, such as 55-gallon drums, large shipping casks, glove boxes, or other equipment, and radiological sources with lead and concrete shielding. Smaller items with distinguishing characteristics, such as various weapons components, are also considered discrete. Special handling and/or treatment may be required for some discrete items that require

disassembly and/or resizing, need to be deenergized (e.g., gas cylinders and thermal batteries), have higher radiation levels, or would be prohibited by disposal facility WAC. Any classified items must also be segregated and managed separately in the Classified Debris Management Warehouse. As mentioned in Section 5.2, all anticipated waste has a disposal path under both disposal alternatives. Additional information about how the inventory items were categorized as discrete and non-discrete, as well as a breakout of all inventory items by trench (Unclassified Area) and pit (Classified Area) is presented in Appendix D-1.

Current costs are similar for disposal of treated MW and LLW, with the main difference coming from packaging requirements. Categorizing all non-discrete debris as MW streamlines the waste handling and characterization process, thereby reducing the potential for site worker exposure to radiological hazards. Furthermore, it is very difficult to characterize non-discrete debris with a high level of certainty to rule out the presence of RCRA hazardous constituents as required to meet disposal facility WAC. Consistent with current SNL/NM waste management practices, only discrete items, confirmed to meet LLW requirements with a high level of certainty, would be managed as LLW.

Although the probability is low for identifying debris that meets the requirements for categorization as TRU waste, provisions have been made for segregating, characterizing, and properly managing items in this waste category (Figure 5-6). Under current waste facility WAC, classified items can be disposed as LLW or treated MW without declassification, but they must be segregated and properly labeled. Packaging requirements and disposal costs are the same for non-classified and classified debris waste; however, transportation costs are slightly higher. Classified TRU waste does not have a current disposal pathway, so if a classified discrete item is determined to be TRU waste, declassification of that item would be necessary prior to packaging and disposal.

Excavated soil, once separated from debris, can be accurately characterized as LLW or MW through standard radiological and chemical analysis of representative samples. Soil waste would be managed protectively in Soil Storage Sprungs™ for ultimate disposition as LLW or MW. Soil excavated from areas other than the interior of trenches or pits that meets risk-based criteria would be categorized as replaceable soil and stockpiled separately from LLW or MW soil for use to backfill the excavation. Additional information regarding waste categories and packaging types can be found in Appendix D-1.

Waste management activities are essentially the same for both disposal alternatives as the onsite engineered cell is assumed to have similar WAC as the permitted offsite facilities that can currently accept MWL waste. The main difference between the two alternatives would occur in the packaging of waste, as transport over public roads is not required for the onsite disposal alternative. Based upon experience and estimated excavation versus waste processing rates, waste management activities would extend beyond the excavation period by approximately one year. The following paragraphs describe the waste management process for both offsite and onsite disposal alternatives. Figure 5-5 provides a visual depiction of the process from excavation through packaging and ultimate disposition.

Screening/Segregation. Excavated materials would go through three distinct steps to ensure the waste management objectives listed earlier in this section are successfully met. The first two steps, performed at the time of excavation in the MWL Excavation Sprung™, are described in Sections 5.3.4.2 and 5.3.4.3. Debris transported from the MWL Excavation Sprung™ to the

Debris Segregation & Management Sprung™ would be mechanically placed onto a conveyor system and spread evenly for the third and last inspection and segregation step (central portion of Figure 5-5). Trained waste management technicians would visually inspect debris and remove any remaining prohibited, potentially classified, and discrete items that may require special handling or additional evaluation. The conveyor system in the Debris Segregation & Management Sprung™ would be equipped with radiation sensors, an overhead crane, and robotic manipulators to allow for remote segregation of higher hazard items. These items would be placed within designated shielded areas and/or containers in the Debris Segregation & Management Sprung™ or Classified Debris Management Warehouse for safe processing. The remaining non-discrete debris would be removed from the conveyor and placed into a container for consolidation. These items would be mechanically compressed prior to packaging as described in the section below.

Based on initial planning assumptions, screened soils would be transported to the appropriate Unclassified Area or Classified Area Soil Storage Sprungs™ or the Replaceable Soil Staging Area. All screened soils would be placed in 100-cy piles that would be individually characterized for both hazardous and radioactive constituents using sampling and analysis performed at the Onsite Laboratory. Based upon analytical results, individual soil piles would be segregated and staged as replaceable, LLW, or MW. Replaceable soils would be confirmed through sampling and analysis, and managed to minimize contact with soil and debris excavated from the trenches and pits. Any soil piles re-categorized based on analytical results would be moved to the appropriate Soil Storage Area. For example, a MW soil pile that is determined to be LLW soil based on analytical results would be moved to the Unclassified Area Soil Storage Sprung™ and then packaged for disposal as LLW soil. The management process for soil is portrayed in the upper part of Figure 5-5, but does not show the confirmation/re-categorization process discussed above.

Sampling/Analysis. Sampling and analysis of excavated soil and debris is part of the overall waste characterization process. Most analyses would be performed at the Onsite Laboratory, which would be equipped to perform radioactive assay, chemical analyses, and hazardous categorization (HazCat) testing. The Onsite Laboratory would conduct all analyses used to categorize and segregate soils as replaceable, LLW, or MW, and characterize excavated debris, to the extent possible, per disposal facility WAC requirements. An offsite laboratory would be under contract to provide analyses to confirm Onsite Laboratory results and provide analytical support for characterization to meet disposal facility WAC, if required.

Waste Segregation/Consolidation. The majority of the debris volume in the MWL inventory is non-discrete, including materials such as paper, plastic, PPE and decontamination materials, rubber, glass, wire, wood, and various metal. Using both experience and available technology, the process to segregate and consolidate this material for packaging and disposal as MW is designed to minimize handling and site worker exposure while meeting disposal facility WAC. The requirement to segregate prohibited and classified items from the debris waste stream drives the need for visual inspection and categorization of all debris by trained waste management technicians under the supervision of SNL/NM Derivative Classifiers.

Non-discrete debris items remaining after the inspection/segregation process performed in the Debris Segregation & Management Sprung™ would be removed from the conveyor and placed into a container for consolidation. These items would be compressed in a machine that compacts the debris to form a rectangular bale, which would then be packaged for disposal.

The compaction and consolidation process would facilitate meeting container void space requirements for offsite or onsite disposal, result in more efficient packaging than standard packaging methods, and support meeting waste management objectives listed earlier in this section.

Based upon previous excavations conducted at SNL/NM, it is expected that a significant volume of rocks and soil would be present on the conveyor belt after the removal of debris items. Accordingly, the remaining rocks and soils would be collected in a container at the end of the conveyor and segregated by additional mechanical screening, sampling, and analysis. Soil would be transported to the appropriate Soil Storage Sprung™ as either LLW or MW soil based on the area it came from, and then sampled to confirm the classification prior to packaging. Rocks would be transported to the Replaceable Soils Staging Area, characterized if necessary, and stored for future use as a marker layer on the bottom of the excavation as part of backfilling operations.

Most discrete debris items would be segregated early in the process in the MWL Excavation Sprung™. Some routine discrete debris would be consolidated following the same process as non-discrete debris, but unique discrete items requiring treatment and/or special handling (i.e., special or oversize items, Figure 5-5) would likely not be processed in the same manner or location. Due to considerations such as size, weight, radiation levels, or other factors, these items may be managed within designated areas of the MWL Excavation Sprung™ or within shielded areas and/or containers within the Debris Segregation & Management Sprung™ or Classified Debris Management Warehouse. For example, the Hallum cask discussed in Section 5.3.4.2 and the cobalt-60 source discussed in Section 5.3.4.3 represent oversize items that would require special handling due to their weight. Including the weight of the vehicle transporting these objects, both items exceed the standard federal DOT maximum weight limits and would require oversize/overweight vehicles and associated DOT load permits to transport the intact items to a disposal facility. An alternative approach would be to perform onsite size/weight reduction, such as removing the concrete outer layer surrounding the cobalt-60 burial cask, to prepare them for offsite disposal.

To reduce the weight of shielded oversize items, the layers of shielding would be evaluated for removal based upon actual conditions. This would be accomplished using an approach designed to minimize the potential for direct worker exposure and creating airborne contamination, while removing sufficient shielding material to allow for transportation (for offsite disposal alternative). If required, based on characterization, the remaining cask would be treated by encapsulation prior to ultimate offsite or onsite disposal. Any shielding removed from these items would be segregated and disposed as LLW or MW based upon characterization. Removal of shielding layers and/or resizing would not be required for onsite disposal if the item could be safely moved and placed in the onsite engineered cell.

Treatment. Macroencapsulation would be the primary treatment method used to meet disposal facility requirements for MW debris. Consolidated debris (i.e., rectangular bales) would be placed into macroencapsulation containers that meet LDR requirements and eliminate the need for additional treatment. These containers are lined boxes, drums, or other packaging that are either bolted or welded shut, and comply with specifications for encapsulation. Other treatment methods potentially needed to meet offsite and onsite facility WAC would be permitted during the Planning & Permitting phase and include the following.

- Stabilization – MW soils with RCRA metals above LDRs
- Deenergize – reactive waste, e.g., explosives, thermal batteries, and cylinders
- Solidification – any free liquids encountered, not anticipated
- Size reduction – large, heavy discrete items, for packaging purposes and to meet DOT weight limits

The consolidation process for debris would be included in the permitting effort if considered by the NMED to be RCRA waste treatment. It is expected that any needed treatment, including macroencapsulation, would be performed in the Debris Segregation & Management Sprung™ (unclassified debris) or the Classified Debris Management Warehouse (classified debris). Stabilization of MW soil would be performed at an offsite facility for the offsite disposal alternative, and in one of the Soil Storage Sprungs™ for the onsite disposal alternative. Classified items would not be treated or processed solely to declassify, since there is a disposal pathway for classified debris. The only exception would be for a classified item determined to be TRU waste; if this occurred, the necessary steps to declassify the item would be performed prior to packaging.

Characterization. Characterization is waste-type specific and includes all activities needed to show full compliance with offsite or onsite disposal facility WAC. Waste profiles based on the inventory information would be developed during the Planning & Permitting phase to streamline and simplify, to the extent possible, the characterization process for the soil and debris LLW, MW, and TRU waste streams. The methods and procedures used to characterize the waste would ensure that physical, chemical, and radiological characteristics are recorded and tracked during all stages of the waste management process. Visual inspections conducted by trained personnel would be used to remove prohibited items, segregate classified material, and identify waste items that require special handling. Sampling and analysis would supplement inventory process knowledge for determining the presence and concentration/activities of regulated hazardous and radiological constituents.

The waste characterization process would begin prior to excavation during the Planning & Permitting phase. Disposal records and inventory information for each trench and pit would be reviewed to determine the expected physical, chemical, and radiological nature of the waste. Research would be conducted on discrete items to determine the best approach for handling, characterization, and packaging. During excavation, the waste would be evaluated by visual observation and field instrumentation to supplement planning information and determine deviations from process knowledge. The information collected early in the excavation and waste management process would be used to support, confirm, and revise the waste profiles. Whenever possible, non-intrusive investigative approaches, such as radiography (i.e., use of a mobile X-ray unit to examine inaccessible interior areas), would be used to meet acceptance criteria and verify waste information. As necessary, various sampling and analyses approaches would be used to meet WAC requirements.

As depicted in Figure 5-5, soil samples would be collected following segregation and transport to Soil Storage Sprungs™ or the Replaceable Soil Staging Area. Consolidated debris would be sampled following consolidation. Discrete items that are not consolidated would be sampled prior to containerization. The development of detailed waste profiles during the Planning & Permitting phase, early characterization efforts, and the use of macroencapsulation would help minimize the need for sampling and characterization of debris managed as MW. Classified waste would be profiled and segregated into separate waste streams and characterized

following the same process. When required, sampling could include onsite and offsite analyses; use of a mobile radiography unit to examine drums and other discrete debris items; cutting, drilling into, or otherwise opening intact containers to access internal areas; or other investigative techniques. All of this information would be documented and tracked to support the waste management process for both onsite and offsite disposal alternatives. If an offsite disposal facility requires additional samples for WAC compliance, arrangements would be made to supply them.

If necessary, based on characterization completed onsite for all potential TRU waste items, MWL project personnel would work closely with SNL/NM Radioactive and Mixed Waste Management Unit personnel to complete waste characterization in accordance with the WIPP Waste Analysis Plan and WAC. If generated, TRU waste would be stored in the Classified Debris Management Warehouse. Based upon estimated finish dates for excavation, it is anticipated that any TRU waste generated could be shipped to WIPP in a timely manner (i.e., prior to completion of Closure activities).

Packaging/Offsite Disposal. Following the completion of the characterization process, all waste generated would be packaged to meet applicable DOE directives and 10 CFR regulations, as well as EPA regulations in 40 CFR, and DOT regulations in 49 CFR (i.e., vehicle placarding, weight restrictions, and other requirements for transporting waste on public roads). Disposal packages are required to be capable of withstanding the stresses associated with loading, handling, stacking, and shipping. The waste would be placed inside the appropriate packages to minimize void space. If excessive voids exist due to the configuration of the debris, the resulting void space would be filled with approved materials, including soft debris such as project-generated or excavated PPE.

Tables 5-2 and 5-3 include the volumes of waste that would be generated by excavation of the MWL. These quantities, not including replaceable soil volumes, would be packaged for offsite disposal. All MW debris would be macroencapsulated in macroboxes. These boxes are lined to meet LDRs for MW. LLW debris would be packaged in intermodal containers, 7-4-4 boxes, or 55-gallon drums as appropriate to meet WAC requirements for the selected disposal facility. Any TRU waste generated would be packaged in standard waste boxes for shipment to WIPP. MW soils would be packed in lined intermodals and transported to an offsite disposal facility; stabilization to meet LDRs and disposal would occur at the facility. LLW soil would be packaged in intermodals. Oversize items would be secured on a semi-tractor trailer in a customized, lined disposal bag that meets LDRs (if MW) or transported without packaging (LLW). Project-generated waste, including PPE and HEPA filters, would be packaged in intermodals. All Closure phase waste for both disposal alternatives, including PPE, Sprung™ fabric, D&D facility materials, and operational area scraped soils/gravel, would be packaged in intermodals and disposed offsite. Equipment requiring disposal, such as the conveyor and compactor, would be secured and transported on a semi-tractor trailer.

Sealed waste containers would be stored in the Shipping Center or the covered Container Storage Area where they would be protected from the elements to maintain package integrity while awaiting transportation. Waste certification and required shipping paperwork would be maintained at the Shipping Center. Tamper-indicating devices, clips, or banding would be used to provide confirmation that the package had not been opened.

Packaging/Onsite Disposal. The packaging process for onsite disposal would be identical to the process described above with two exceptions: 1) 49 CFR requirements would be removed, and 2) treatment of MW soil would be added. For the onsite disposal alternative, MW soils would be stabilized onsite in one of the Soil Storage Sprungs™, tested to confirm stabilization meets LDRs, and then transported and placed in the onsite engineered cell. Encapsulation of oversize items, if characterized as MW, would be accomplished using customized, lined disposal bags that meet LDRs. Additional technical and costing assumptions for the excavation and waste management approach are included in Appendix D-3.

5.3.4.5 Backfilling and ET Covers

The backfilling task would begin after completion of Unclassified and Classified Area excavation verification described in Section 5.3.4.3. Based on the total excavation volume (93,879 cy) and the estimated replaceable soil volume (18,330 cy), approximately 75,549 cy of additional clean backfill soil would be required. This clean soil fill material would be obtained and transported to the site from a borrow source within 20 miles of SNL/NM. Replaceable soil would be transported to the excavation from the Replaceable Soils Staging Area. All soil used for backfilling would be placed in compacted lifts to fill the excavation.

Borrow soil characteristics would meet geotechnical engineering requirements to support replacement of the ET Cover over the excavation. The soil would be sampled and analyzed for RCRA constituents at the Onsite Laboratory to confirm the soil is free of contamination. In addition, replaceable and borrow soils would be free of gravel and cobbles greater than 2 inches median diameter and characterized by standard, ASTM International (ASTM) geotechnical laboratory testing procedures, including:

- Gradation (ASTM C117 and C136)
- Classification and Atterberg Limits (ASTM D2487 and D4318)
- Standard Proctor (ASTM D698)

Based on backfilling experience at SNL/NM, it is estimated that replaceable soil would be transported to the excavation at a rate of 900 cy per day, and offsite borrow soil would be imported at a rate of approximately 540 cy per day. Soil would be blended with water to achieve optimum moisture content, placed in the excavation in one-foot lifts, and compacted to greater than or equal to 95% of the Standard Proctor value and within ±2% of the optimum gravimetric moisture for source material. Geotechnical field technicians would test soil density and moisture content of each lift using nuclear density gauges during compaction operations at regular intervals to confirm compaction specifications are met.

After backfilling to grade is completed, the Excavation ET Cover with biointrusion layer and surrounding surface-water diversion features would be reinstalled using the same construction approach as used in 2009. Because the footprint of the ET Cover with side slopes would extend beyond the MWL Excavation Sprung™, the Sprung™ would be removed and decommissioned prior to construction of the ET Cover. After seeding of the ET Cover topsoil layer, a supplemental watering system would be installed on the ET Cover to facilitate re-establishment of the native grasses needed to stabilize the surface, transpire moisture from the ET Cover to the atmosphere, and minimize long-term maintenance.

For the onsite disposal alternative, an additional ET cover system with a biointrusion layer would be installed over the onsite engineered cell. Construction of the Onsite Cell ET Cover would begin as soon as all excavated waste is placed, and would be performed in parallel with the Excavation ET Cover to keep the overall project schedule minimized. The Onsite Cell ET Cover would be constructed following the same process as the Excavation ET Cover; both covers would meet the performance standards listed below.

- Minimize downward water migration
- Perform with minimum maintenance
- Provide for surface-water drainage such that erosion is minimized
- Accommodate subsidence to maintain cover integrity through a “soft” cover design

Construction of the Excavation ET Cover would follow prior protocol provided in the MWL Corrective Measures Implementation Report (SNL/NM January 2010, Revision 1). The detailed conceptual design of the onsite engineered cell, including the Onsite Cell ET Cover, is presented in Appendix D-3, Figure D3-2. Additional technical and costing assumptions for excavation backfilling and construction of the ET Covers are included in Appendix D-3 for both disposal alternatives.

5.3.4.6 Closure

For both the onsite and offsite disposal alternatives, closure would begin following the completion of Excavation ET Cover construction and all generated Closure phase waste would be disposed offsite. The structures within the boundary of the support facility perimeter fence shown in Figures 5-1 and 5-2 would be decommissioned as part of site closure. D&D activities would be sequenced to allow for efficient utilization of administrative and laboratory facilities throughout the Closure phase. In general, the D&D sequence would begin with the removal of structures and abandonment of unneeded utilities. Removal of the five remaining Sprung™ structures, two metal warehouses, and Container Storage Area would be performed in parallel. This D&D waste would be disposed offsite as LLW. The metal framework of the Sprungs™ would be characterized by wipe samples analyzed at the Onsite Laboratory and recycled. The Sprung™ fabric would be cut into operationally efficient sections and packaged for offsite disposal as LLW.

After D&D of the site support structures, the operational area where contaminated soil and debris were managed would be scraped to remove the gravel and soil. The soil would be characterized with in-situ samples collected on a 50-foot grid and analyzed at the Onsite Laboratory prior to scraping to determine whether the scraped soil would meet offsite disposal WAC. Once sample results are obtained, scraping to a depth of two inches would begin and scraped soils and gravel would be stockpiled in operationally efficient volumes, loaded into containers, and shipped offsite for disposal as LLW. Verification sampling of scraped areas would be conducted using the same 50-foot grid to confirm site closure requirements are met; all verification samples would be analyzed at the Offsite Laboratory. The area underlying the Administrative Facilities, Laboratory Facilities, Shipping Center, and Covered Storage Area would be considered clean areas. After D&D/removal of these facilities these areas would be graded for drainage only.

After completion of operational area verification and closure waste management activities, the Laboratory Facilities would be decontaminated and demobilized by the vendor or reapplied through SNL/NM Reapplication. Throughout the project and concluding in the Closure phase, heavy equipment would be decontaminated and released from the site. Specific pieces of equipment, such as the waste compactor and conveyor, would be disposed offsite as LLW. Upon completion of Closure phase activities, the entire operational area footprint would be graded for storm-water control and re-seeded as necessary.

The data needed to support Closure Reporting phase requirements would be collected and prepared as it becomes available. The scope of closure reporting includes providing all data and results documenting the excavation and waste management processes (e.g., excavation verification analytical results), as well as information documenting closure D&D activities. As shown in the project schedules (Figures 5-3 and 5-4) and explained in Section 5.3.4.8, the closure reporting effort would start during the excavation phase after completion of Classified Area excavation verification, and conclude after completion of the Closure phase. The early start for this reporting phase would facilitate the documentation of excavation and waste management activities/results as they are completed, and ensure submittal for regulatory review and approval as soon as possible upon completion of closure activities.

The closure reporting effort would include two reports, one submitted to the NMED (RCRA requirements) and one submitted to the EPA (TSCA requirements). The contents of these reports would be similar and would document all excavation, waste management, and site closure activities and results. The closure reports would also include development of an LTMMP approved by NMED and a summary of LTMM activities completed to that point. Project closure would be achieved upon regulatory approval of both closure reports, and the site would transition to LTMM. Additional technical and costing assumptions for the Closure and Closure Reporting phases are included in Appendix D-3.

5.3.4.7 Long-Term Monitoring and Maintenance

For both the onsite and offsite alternatives, LTMM activities would begin after completion of Excavation ET Cover construction and continue for at least 30 years. This phase of the project would begin with installation/replacement of the groundwater and soil-vapor monitoring networks decommissioned prior to the start of excavation. The configuration, location, and requirements for these monitoring networks would be similar to the existing MWL networks and the monitoring well installation plan would be included in the CMIP. Monitoring, inspection, maintenance, and reporting requirements would be documented and approved in an LTMMP included in the TSCA and RCRA closure reports.

The groundwater monitoring network would consist of four monitoring wells screened across the top of the Regional Aquifer water table, including one hydraulically upgradient background well and three downgradient wells. The VOC soil-vapor monitoring network would consist of three perimeter multi-sampling port wells with five sampling ports per well. Sampling ports would be spaced to cover depths of approximately 50 to 400 ft bgs.

Based on the assumption of this report and 30 years of experience with NMED authority on RCRA corrective action at SNL/NM, semiannual groundwater and annual VOC soil-vapor monitoring would be required for the excavation. In addition, quarterly ET Cover and site feature

(e.g., surface-water controls, security fencing, and signage) inspections and annual ET Cover vegetation inspections would also be required. Maintenance and repair requirements would apply and ensure that the ET Cover and all monitoring networks and associated sampling equipment perform as designed. All LTMM activities and results would be documented in annual LTMM reports submitted to the NMED for review and approval. The duration for LTMM activities is anticipated to be 30 years but could be extended or shortened at the discretion of the NMED.

For the onsite disposal alternative, additional monitoring and inspections would be required for the onsite engineered cell, including two soil moisture monitoring networks: 1) horizontal access tubes under the cell monitored using a neutron soil moisture probe, and 2) a perimeter vertical borehole time domain reflectometry network. The monitoring networks for the onsite engineered cell are detailed in the engineered cell design drawings, Figure D3-2 in Appendix D-3. These systems would be used to measure soil moisture as an indicator of cell performance. VOC soil-vapor monitoring would not be required for the onsite engineered cell based on the very low VOC concentrations in MWL soil. Quarterly ET Cover and site feature inspections, and annual ET Cover vegetation inspections would also be required for the Onsite Cell ET Cover, as well as leachate pumping-removal-disposal from the leachate collection system.

Based on meeting industrial risk-based cleanup levels for the excavation, meeting LDRs for all waste placed in the onsite engineered cell, and experience with performance monitoring at the at the SNL/NM CWL and CAMU, the defined LTMM activities for both disposal alternatives would be adequate to meet NMED regulatory requirements.

5.3.4.8 Schedule

Summary level project schedules for both alternatives are provided in Figures 5-3 and 5-4. These schedules show the six project work phases and associated main tasks. Wherever possible for both disposal alternatives, activities would be performed in parallel to minimize the overall schedule duration. The CMIP and all related permitting documents would be approved by the NMED and EPA prior to starting the Support Facility Construction phase.

The Planning & Permitting and Support Facility Construction phases include significant procurement tasks necessary to obtain the considerable resources needed for project execution. The aggressive schedule for these procurement tasks assumes adequate funding and resources would be available. The Excavation & Waste Management phase would not begin until all support facilities are constructed and function tested, necessary equipment is on site and cleared for use by SNL/NM Safety Engineering personnel, and site workers have received required training and satisfied security requirements. For both disposal alternatives, the duration of Unclassified Area and Classified Area excavation is approximately 2.9 years and 2.4 years, respectively.

Table 5-4 presents the six work phases with estimated durations in work days and CYs for the offsite disposal alternative. Where there is overlap between work phases, this is noted and the sequential duration is also provided. Project duration from Planning & Permitting through completion of Closure Reporting is 17.9 years.

Table 5-5 presents the six work phases and estimated durations in work days and CYs for the onsite disposal alternative. Project duration from Planning & Permitting through completion of

Table 5-4
Estimated Durations Based on Activity – Offsite Disposal Alternative[a]

Activity	Estimated Duration (work days)	Estimated Duration (calendar years)	Sequential Duration (calendar years)
Planning & Permitting	1,309	5	5
Support Facility Construction	694	2.7	2.7
Excavation & Waste Management	1,768	6.8	6.8
Closure	482	1.8	1.8
Closure Reporting – TSCA & RCRA	1,203[b]	4.6[b]	1.6
Long-Term Monitoring & Maintenance	7,827[b]	30[b]	26.6
		Total Duration	**44.5**

Notes:
[a]Activities and durations taken from the Offsite Disposal Alternative Schedule in Figure 5-3.
[b]Duration from schedule and includes overlap with previous phase(s).
RCRA = Resource Conservation and Recovery Act.
TSCA = Toxic Substances Control Act.

Table 5-5
Estimated Durations Based on Activity – Onsite Disposal Alternative[a]

Activity	Estimated Duration (work days)	Estimated Duration (calendar years)	Sequential Duration (calendar years)
Planning & Permitting	1,570	6	6
Support Facility Construction	706	2.7	2.7
Excavation & Waste Management	1,879	7.2	7.2
Closure	482	1.8[b]	1.3
Closure Reporting – TSCA & RCRA	1,203	4.6[b]	1.6
Long-Term Monitoring & Maintenance	7,827	30[b]	26.5
		Total Duration	**45.4**

Notes:
[a]Activities and durations from the Onsite Disposal Alternative Schedule in Figure 5-4.
[b]Duration from schedule and includes overlap with the previous phase(s).
RCRA = Resource Conservation and Recovery Act.
TSCA = Toxic Substances Control Act.

Closure Reporting is 18.9 years, which reflects the additional year needed for completion of a more complex public process, including an anticipated public hearing. For the onsite disposal alternative, the Closure phase would begin after completion of the Excavation ET Cover and in parallel with construction of the Onsite Cell ET Cover.

5.3.5 Cost

Rough order of magnitude cost was estimated using RACER®, Version 11.4 software. Project costs for both alternatives are based on the summary level project schedules shown in Figures 5-3 and 5-4 and the technical approach described in Section 5.3.4. Direct costs for the six work phases for the offsite disposal alternative are summarized in Table 5-6, and for the onsite disposal alternative in Table 5-7. These costs are considered Net Present Value and reflect “current dollars”; they do not include out-year escalation. Costs for Phases 1 through 5

Table 5-6
Estimated Costs for Excavation – Offsite Disposal Alternative

Project Phase	Cost[a]
Planning & Permitting	$ 8,946,486
Support Facility Construction	$ 57,375,540
Excavation & Waste Management	$ 192,720,257
Closure	$ 27,334,356
Closure Reporting – TSCA & RCRA	$ 2,156,097
Long-Term Monitoring & Maintenance	$ 6,251,000
Indirect/Markup	$ 232,663,073
Net Present Value Cost	$ 527,446,809

Notes:
[a]Costs taken directly from RACER® reports. Net Present Value Cost is affected by rounding within RACER®.
RACER® = Remedial Action Cost Engineering and Requirements.
RCRA = Resource Conservation and Recovery Act.
TSCA = Toxic Substances Control Act.

Table 5-7
Estimated Costs for Excavation – Onsite Disposal Alternative

Project Phase	Cost[a]
Planning & Permitting	$ 10,307,485
Support Facility Construction	$ 61,058,728
Excavation & Waste Management	$ 123,256,215
Closure	$ 27,334,356
Closure Reporting – TSCA & RCRA	$ 2,379,843
Long-Term Monitoring & Maintenance	$ 7,967,000
Indirect/Markup	$ 235,668,402
Net Present Value Cost	$ 467,972,030

Notes:
[a]Costs taken directly from RACER® reports. Net Present Value Cost is affected by rounding within RACER®.
RACER® = Remedial Action Cost Engineering and Requirements.
RCRA = Resource Conservation and Recovery Act.
TSCA = Toxic Substances Control Act.

include labor for the turn-key contractor performing the work and SNL/NM oversight and support labor. Costs for Phase 6, LTMM, include only SNL/NM labor, equipment, materials, and services and are based on current SNL/NM Long-Term Stewardship program costs. RACER® software cost summary reports for both alternatives are included in Appendix D-4.

Offsite disposal alternative total costs are higher primarily due to the cost for offsite treatment (i.e., stabilization) and disposal of the 18,905 cy of MW soil from the Classified Area, as well as transportation costs for all waste. The MW soil treatment and disposal cost does not include a volume discount, which would be negotiated as part of the Planning & Permitting phase and would likely reduce this overall cost substantially. Additional supporting information for the costing of both alternatives is included in Appendix D-3.

5.3.6 Summary

A reevaluation of the complete excavation alternative with offsite disposal was conducted in accordance with the NMED Final Orders (NMED May 2005 and February 2016) and MWL LTMMP (SNL/NM March 2012) requirements. The 2018 evaluation presents updates to the 2003 evaluation, including excavation and waste management technologies and approaches, waste disposal pathways, site worker risk, and cost. In addition, the 2018 evaluation includes the onsite disposal alternative in an engineered cell with a RCRA Subtitle C liner system and an ET cover. The evaluation followed the same approach as presented in the 2003 MWL CMS Final Report (SNL/NM May 2003) and is based on the following criteria.

- Long-term reliability and effectiveness
- Reduction of toxicity, mobility, or volume of wastes
- Short-term effectiveness
- Implementability
- Cost

Table 5-8 summarizes the results of this evaluation. Complete excavation with offsite and onsite disposal alternatives are both remedial alternatives that could be implemented if necessary for the protection of human health and the environment. The overall health and safety risk to site workers is high due to the nature of the waste, the complexity and duration of the work, and the risk of physical injury and death associated with remediation and transportation hazards.

Technical implementation challenges are considerable given the nature of Unclassified and Classified Area waste, security requirements and protocols associated with classified waste, and the size and scope of support facilities required. These factors result in a high cost of implementation for both alternatives.

5.4 Comparison of Offsite and Onsite Disposal Alternatives

For this Five-Year Report, complete excavation with disposal in an onsite engineered cell with a RCRA Subtitle C liner was evaluated along with offsite disposal. The fundamental technical approach and requirements for both disposal alternatives are very similar. Onsite disposal is a viable alternative, with the primary benefit of reduction in transportation risk. However, with this alternative comes the long-term costs and liability of maintaining a permitted disposal facility. Given the current availability of offsite disposal options, this would be the preferred disposal alternative. As the evaluation of onsite disposal was specific to this first Five-Year Report, subsequent Five-Year Reports will not evaluate onsite disposal.

5.5 Comparison of 2003 and 2018 Evaluations for Offsite Disposal

The 2018 reevaluation of the feasibility of MWL excavation is presented in this chapter and updates the *Complete Excavation with Offsite Disposal* alternative presented in the 2003 MWL CMS Final Report (SNL/NM May 2003). Consistent with the 2003 evaluation, this updated 2018 evaluation assumes a risk-based approach designed to meet industrial land-use levels at completion. However, as NMED has not defined clean closure levels for the MWL, this report does not assume clean closure.

Table 5-8
Summary Evaluation MWL Excavation Alternative

Evaluation Criteria	Summary
Long-term Reliability and Effectiveness	
Magnitude of remaining risk(s) after implementation of the alternative.	Non-rad: Hazard Index = 0.07; Excess cancer risk = 3E-6; Risk below NMED guidelines Rad: TEDE = 0.3 mrem/yr; Excess cancer risk = 2E-6; Risk below EPA guidelines Ecorisk insignificant Industrial land-use risk-based levels would be achieved
Extent of long-term monitoring	Groundwater & Soil-Vapor monitoring would continue for at least 30 years
Uncertainties associated with leaving waste in place	Very Low, ongoing LTMM ensures detection of changing conditions and appropriate follow-up actions if needed
Potential for failure of alternative	Very Low
Reduction in Toxicity, Mobility, and Volume of Wastes	
Reduction in Toxicity	Reduction in on-site toxicity; toxicity transferred to off-site facility or onsite engineered cell
Reduction in Mobility	Reduced by removal of waste from disposal cells; transferred to offsite facility or onsite engineered cell
Reduction in Volume	Reduction in onsite volume for offsite disposal alternative Transfer of volume to disposal cell for onsite disposal alternative
Short-term Effectiveness	
Short-term reduction in existing risk(s)	No short-term reduction; risk currently below NMED guidelines Ecorisk unchanged
Short-term risk(s) posed to site workers, the community, and the environment during implementation of the alternative	Rad excavation risk: Conservative site worker TEDE of 3.23 E+3 mrem/yr; Excess cancer risk: 3.7 E-02 Transportation: Offsite - injuries: 13.4 & fatalities: 0.16 Onsite - injuries: 7.2 & fatalities: 0.09 Construction: Offsite - injuries: 9.0 & fatalities: 0.03 Onsite - injuries: 11.4 & fatalities: 0.04
Implementability	
Availability of materials, equipment, and contractors	Specialty Turn-Key Contractor
Technical and administrative difficulties	Significant; excavation and waste management activities present significant challenges
Permits and approvals	Surface Disturbance; Storm-Water; Radiological; Air Quality; Resource Conservation Recovery and Act (RCRA); Toxic Substances Control Act; and Department of Transportation Onsite disposal cell would require Class 3 SNL/NM RCRA Facility Operating Permit Modification
Cost - Total Direct & Indirect	
Offsite Disposal Alternative	$ 527,446,809
Onsite Disposal Alternative	$ 467,972,030

Notes:
EPA = United States Environmental Protection Agency.
LTMM = Long Term Monitoring and Maintenance.
mrem/yr = Millirem per year.
MWL = Mixed Waste Landfill.
NMED = New Mexico Environment Department.
SNL/NM = Sandia National Laboratories, New Mexico.
TEDE = Total Effective Dose Equivalent.

Section 5.2 provides a detailed summary of changes and updates. As summarized in Section 5.2, advances in technology since 2003 have not fundamentally changed the 2018 excavation and waste management approach. However, radiological decay, use of a more conventional excavation approach for the Classified Area, and one streamlined waste management approach for all excavated waste represent the most significant changes. The fact that there are now disposal pathways for all anticipated waste is the biggest change that has impacted the 2018 evaluation. This allowed the elimination of onsite long-term storage of excavated waste streams with no disposal pathway that was included in the 2003 evaluation.

The 2018 evaluation assumed a more streamlined waste management process based on meeting offsite disposal facility WAC. This approach was designed to minimize handling and processing steps for the protection of site workers, and was facilitated, in part, by radionuclide decay that has occurred over the 15 years since the 2003 evaluation. Decay also allowed the excavation approach for the Classified Area to be shifted more towards a conventional, manually-operated equipment approach. The streamlined waste management process and more conventional excavation approach resulted in faster estimated excavation and waste management production rates in the 2018 evaluation.

The Classified Area approach also includes additional soil excavation between and around the pits, which is more realistic given the close proximity of the pits and the hazards associated with working in this area with multiple sloped excavations. The additional excavated soil volume resulting from the revised approach does increase the overall waste management scope, but does not adversely impact the overall excavation schedule, which is shorter in this 2018 evaluation (approximately 5.3 years versus 6 years).

Radionuclide decay also reduced the estimated site worker radiological exposure risk in the 2018 evaluation. However, consistent with the 2003 evaluation, the greatest risk to site workers is related to construction activities and transportation accidents. While injury and fatality rates have changed over time, these major risk components inherent with complete excavation and waste disposal have not changed, and will not change for the foreseeable future. MWL excavation and waste management will always involve significant risk to site workers related to construction and transportation.

With these changes, the associated estimated overall rough order of magnitude Net Present Value cost has decreased compared to the 2003 evaluation. This is due in part to the cost model for SNL/NM operations, which resulted in lower estimated SNL/NM Oversight labor costs. However, the most significant cost impacts resulted from all waste now having a disposal pathway, and the shift to a more conventional excavation and waste management approach. These changes allowed a more streamlined excavation and waste management approach, with less reliance on customized and specialized equipment, which resulted in a shorter excavation and waste management duration.

This page intentionally left blank.

CHAPTER 5 FIGURES

This page intentionally left blank.

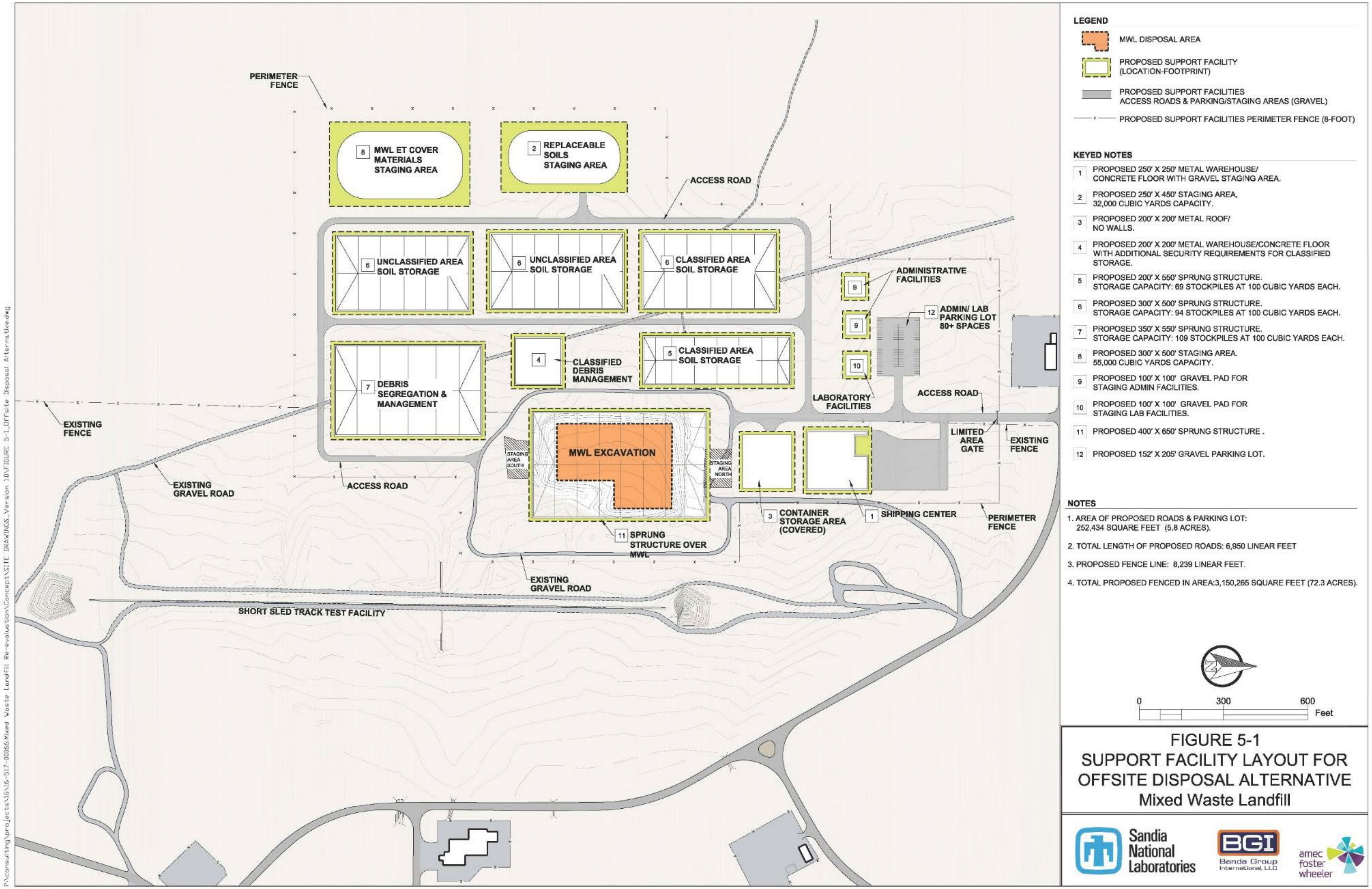


FIGURE 5-1
SUPPORT FACILITY LAYOUT FOR OFFSITE DISPOSAL ALTERNATIVE
Mixed Waste Landfill

This page intentionally left blank.

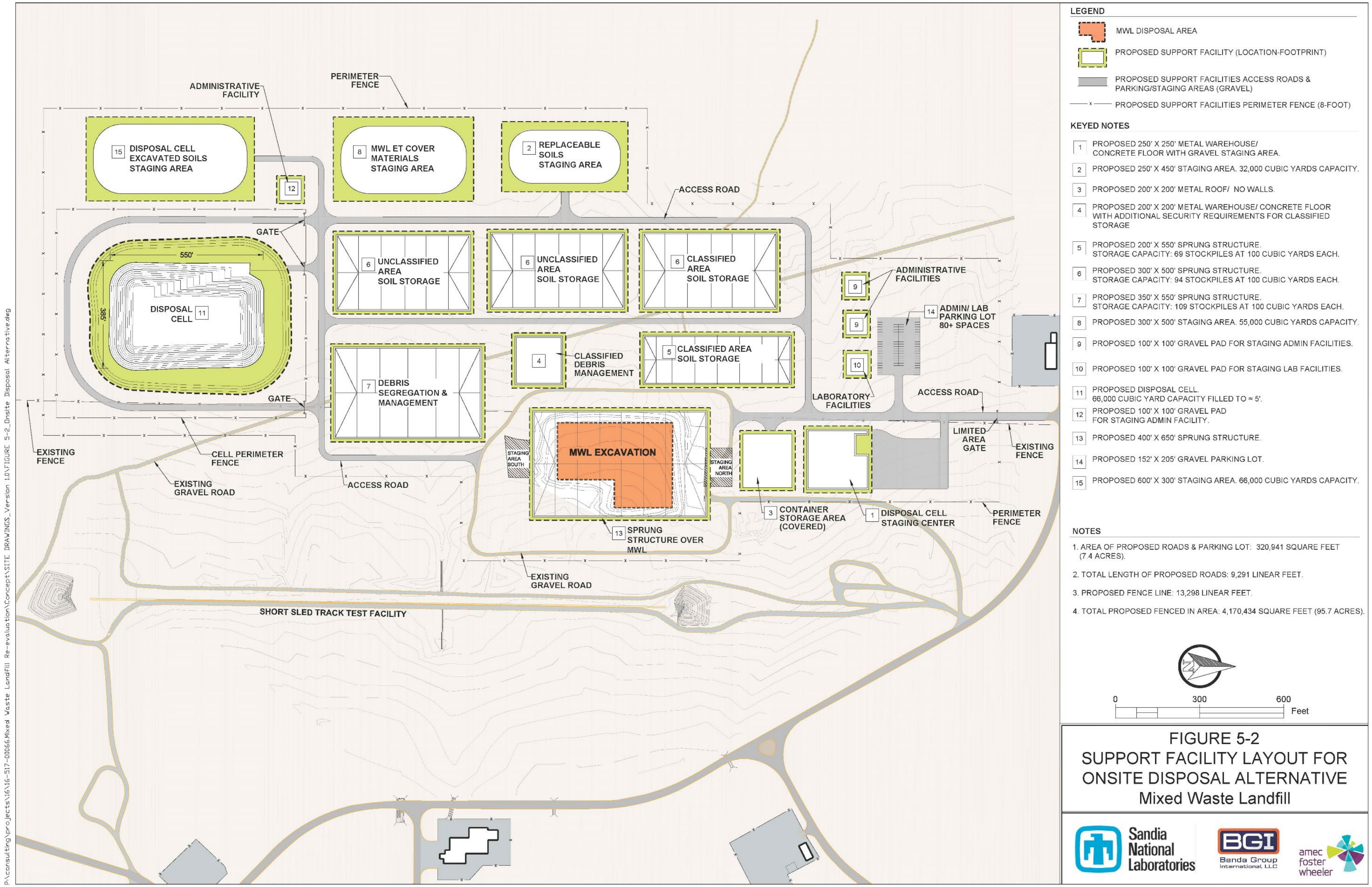


FIGURE 5-2
SUPPORT FACILITY LAYOUT FOR ONSITE DISPOSAL ALTERNATIVE
Mixed Waste Landfill

This page intentionally left blank.

Offsite Disposal Alternative

ID	Task Name	Duration	Start	Finish
1	**2018 Offsite Disposal Alternative**	11598 days	Wed 1/1/20	Fri 6/13/64
2	**Planning & Permitting**	**1309 days**	**Wed 1/1/20**	**Mon 1/6/25**
3	Procurement of Turn-Key Contract	129 days	Wed 1/1/20	Mon 6/29/20
4	Corrective Measures Implementation Plan (CMIP)	516 days	Tue 6/30/20	Tue 6/21/22
5	TSCA & RCRA Permitting Documents	256 days	Tue 6/29/21	Tue 6/21/22
6	Regulatory Review & Approval	664 days	Wed 6/22/22	Mon 1/6/25
7	**Support Facility Construction**	**694 days**	**Tue 1/7/25**	**Fri 9/3/27**
8	Procurement for Facilities Construction	132 days	Tue 1/7/25	Wed 7/9/25
9	Site Grading & Site Drainage	266 days	Thu 7/10/25	Thu 7/16/26
10	Utility Installation	278 days	Fri 8/15/25	Tue 9/8/26
11	ET Cover Removal & Staging	53 days	Fri 7/17/26	Tue 9/29/26
12	Construction of Excavation & Waste Mgmt. Tents	516 days	Fri 8/29/25	Fri 8/20/27
13	Construction of Warehouses	380 days	Mon 12/22/25	Fri 6/4/27
14	Procurement for Excavation & Waste Disposal	274 days	Fri 7/17/26	Wed 8/4/27
15	Training, Functional Testing & Readiness Review	22 days	Thu 8/5/27	Fri 9/3/27
16	**Excavation & Waste Management**	**1768 days**	**Mon 9/6/27**	**Wed 6/14/34**
17	Waste Management	1653 days	Mon 9/6/27	Wed 1/4/34
18	Onsite & Offsite Laboratories	1767 days	Mon 9/6/27	Tue 6/13/34
19	**Unclassified Area (UCA) Excavation**	752 days	Mon 9/6/27	Tue 7/23/30
20	UCA Excavation Verification	66 days	Wed 7/24/30	Wed 10/23/30
21	**Classified Area (CA) Excavation**	635 days	Wed 7/24/30	Tue 12/28/32
22	CA Excavation Verification	66 days	Wed 12/29/32	Wed 3/30/33
23	Excavation Backfilling	200 days	Thu 3/31/33	Wed 1/4/34
24	D&D MWL Excavation Sprung	44 days	Thu 1/5/34	Tue 3/7/34
25	Excavation ET Cover Construction	71 days	Wed 3/8/34	Wed 6/14/34
26	**Closure**	**482 days**	**Thu 6/15/34**	**Fri 4/18/36**
27	Onsite & Offsite Laboratories	482 days	Thu 6/15/34	Fri 4/18/36
28	D&D Sprungs & Warehouses	90 days	Thu 6/15/34	Wed 10/18/34
29	Operational Area - Pre-Scraping Characterization	60 days	Thu 10/19/34	Wed 1/10/35
30	Operational Area - Scrape/Load/Disposal	200 days	Thu 1/11/35	Wed 10/17/35
31	Operational Area - Verification	66 days	Thu 10/18/35	Thu 1/17/36
32	Demobilize Administration & Onsite Laboratory Trailers	66 days	Fri 1/18/36	Fri 4/18/36
33	**Closure Reporting - TSCA & RCRA**	**1203 days**	**Thu 3/31/33**	**Mon 11/9/37**
34	Compile Data & Prepare Reports	813 days	Thu 3/31/33	Mon 5/12/36
35	Regulatory Review & Approval	390 days	Tue 5/13/36	Mon 11/9/37
36	**Long-Term Monitoring & Maintenance**	**7827 days**	**Thu 6/15/34**	**Fri 6/13/64**
37	Install Groundwater and Soil-Gas Monitoring Networks	87 days	Thu 6/15/34	Fri 10/13/34
38	Monitoring Well Install Report	66 days	Mon 10/16/34	Mon 1/15/35
39	Install Report Regulatory Review & Approval	66 days	Tue 1/16/35	Tue 4/17/35
40	Monitoring, Inspection, Maintenance & Reporting	7827 days	Thu 6/15/34	Fri 6/13/64

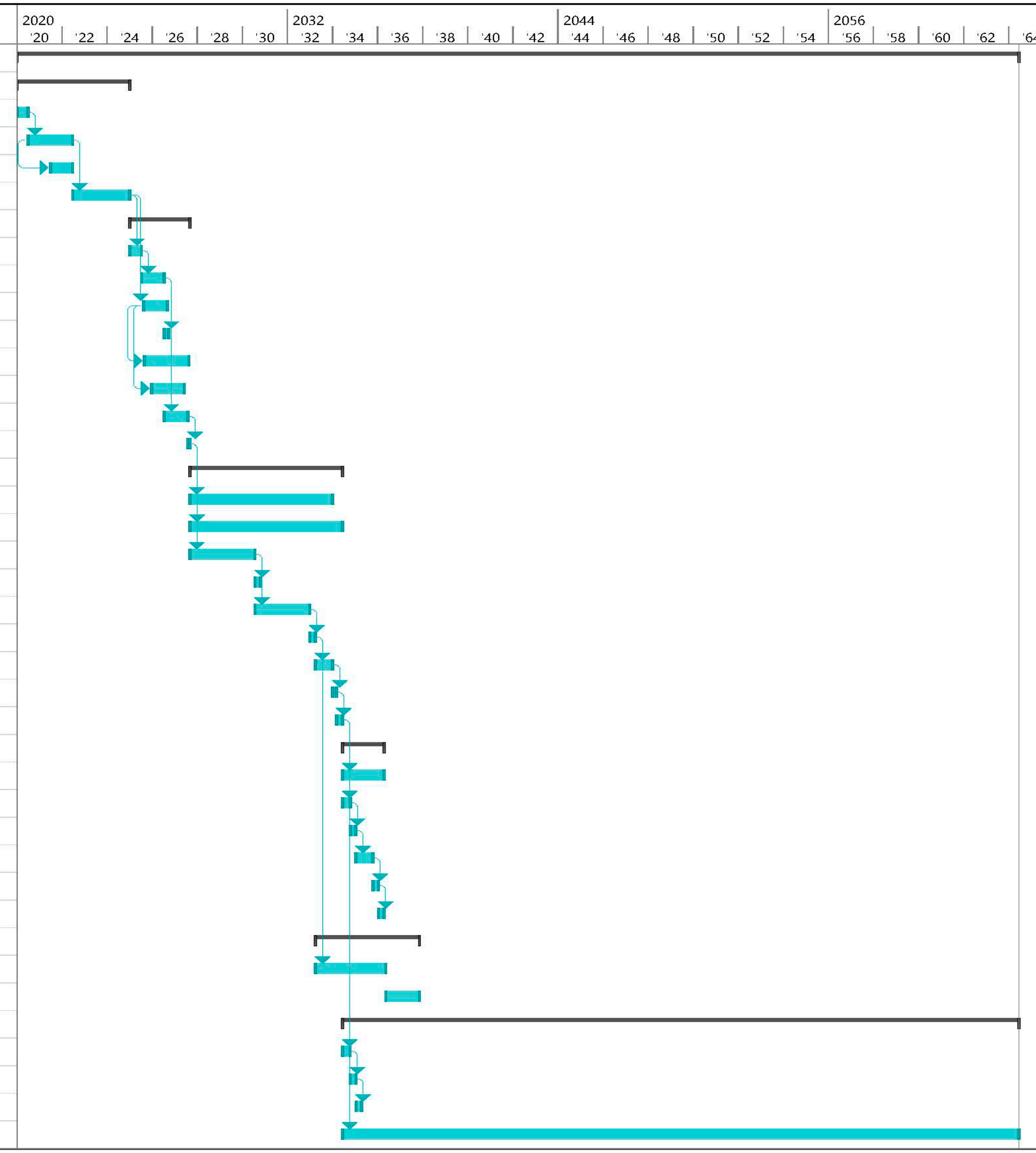


Figure 5-3
Mixed Waste Landfill Offsite Disposal Alternative Schedule

This page intentionally left blank.

Onsite Disposal Alternative

ID	Task Name	Duration	Start	Finish
1	**2018 Offsite Disposal Alternative**	**11848 days**	Wed 1/1/20	Fri 5/29/65
2	**Planning & Permitting**	**1570 days**	**Wed 1/1/20**	**Tue 1/6/26**
3	Procurement of Turn-Key Contract	129 days	Wed 1/1/20	Mon 6/29/20
4	Corrective Measures Implementation Plan (CMIP)	516 days	Tue 6/30/20	Tue 6/21/22
5	TSCA & RCRA Permitting Documents	256 days	Tue 6/29/21	Tue 6/21/22
6	Regulatory Review & Approval	925 days	Wed 6/22/22	Tue 1/6/26
7	**Support Facility Construction**	**706 days**	**Wed 1/7/26**	**Wed 9/20/28**
8	Procurement for Facilities Construction	132 days	Wed 1/7/26	Thu 7/9/26
9	Site Grading & Site Drainage	266 days	Fri 7/10/26	Fri 7/16/27
10	Utility Installation	278 days	Mon 8/17/26	Wed 9/8/27
11	ET Cover Removal & Staging	53 days	Mon 7/19/27	Wed 9/29/27
12	Construction of Excavation & Waste Mgmt. Tents	516 days	Mon 8/31/26	Mon 8/21/28
13	Construction of Onsite Disposal Cell	167 days	Fri 10/9/26	Mon 5/31/27
14	Construction of Warehouses	380 days	Tue 12/22/26	Mon 6/5/28
15	Procurement for Excavation & Waste Disposal	274 days	Mon 7/19/27	Thu 8/3/28
16	Training, Functional Testing & Readiness Review	22 days	Tue 8/22/28	Wed 9/20/28
17	**Excavation & Waste Management**	**1879 days**	**Thu 9/21/28**	**Tue 12/4/35**
18	Waste Management	1653 days	Thu 9/21/28	Mon 1/22/35
19	Onsite & Offsite Laboratories	1879 days	Thu 9/21/28	Tue 12/4/35
20	**Unclassified Area (UCA) Excavation**	752 days	Thu 9/21/28	Fri 8/8/31
21	UCA Excavation Verification	66 days	Mon 8/11/31	Mon 11/10/31
22	**Classified Area (CA) Excavation**	635 days	Mon 8/11/31	Fri 1/13/34
23	CA Excavation Verification	66 days	Mon 1/16/34	Mon 4/17/34
24	Excavation Backfilling	177 days	Tue 4/18/34	Wed 12/20/34
25	D&D MWL Excavation Sprung	44 days	Thu 12/21/34	Tue 2/20/35
26	Excavation ET Cover Construction	71 days	Wed 2/21/35	Wed 5/30/35
27	Onsite Cell ET Cover Construction	226 days	Tue 1/23/35	Tue 12/4/35
28	**Closure**	**482 days**	**Thu 5/31/35**	**Fri 4/3/37**
29	Onsite & Offsite Laboratories	482 days	Thu 5/31/35	Fri 4/3/37
30	D&D Sprungs & Warehouses	90 days	Thu 5/31/35	Wed 10/3/35
31	Operational Area - Pre-Scraping Characterization	60 days	Thu 10/4/35	Wed 12/26/35
32	Operational Area - Scrape/Load/Disposal	200 days	Thu 12/27/35	Wed 10/1/36
33	Operational Area - Verification	66 days	Thu 10/2/36	Thu 1/1/37
34	Demobilize Administration & Onsite Laboratory Trailers	66 days	Fri 1/2/37	Fri 4/3/37
35	**Closure Reporting - TSCA & RCRA**	**1203 days**	**Tue 4/18/34**	**Thu 11/25/38**
36	Compile Data & Prepare Reports	813 days	Tue 4/18/34	Thu 5/28/37
37	Regulatory Review & Approval	390 days	Fri 5/29/37	Thu 11/25/38
38	**Long-Term Monitoring & Maintenance**	**7827 days**	**Thu 5/31/35**	**Fri 5/29/65**
39	Install Groundwater and Soil-Gas Monitoring Networks	87 days	Thu 5/31/35	Fri 9/28/35
40	Monitoring Well Install Report	66 days	Mon 10/1/35	Mon 12/31/35
41	Install Report Regulatory Review & Approval	66 days	Tue 1/1/36	Tue 4/1/36
42	Monitoring, Inspection, Maintenance & Reporting	7827 days	Thu 5/31/35	Fri 5/29/65

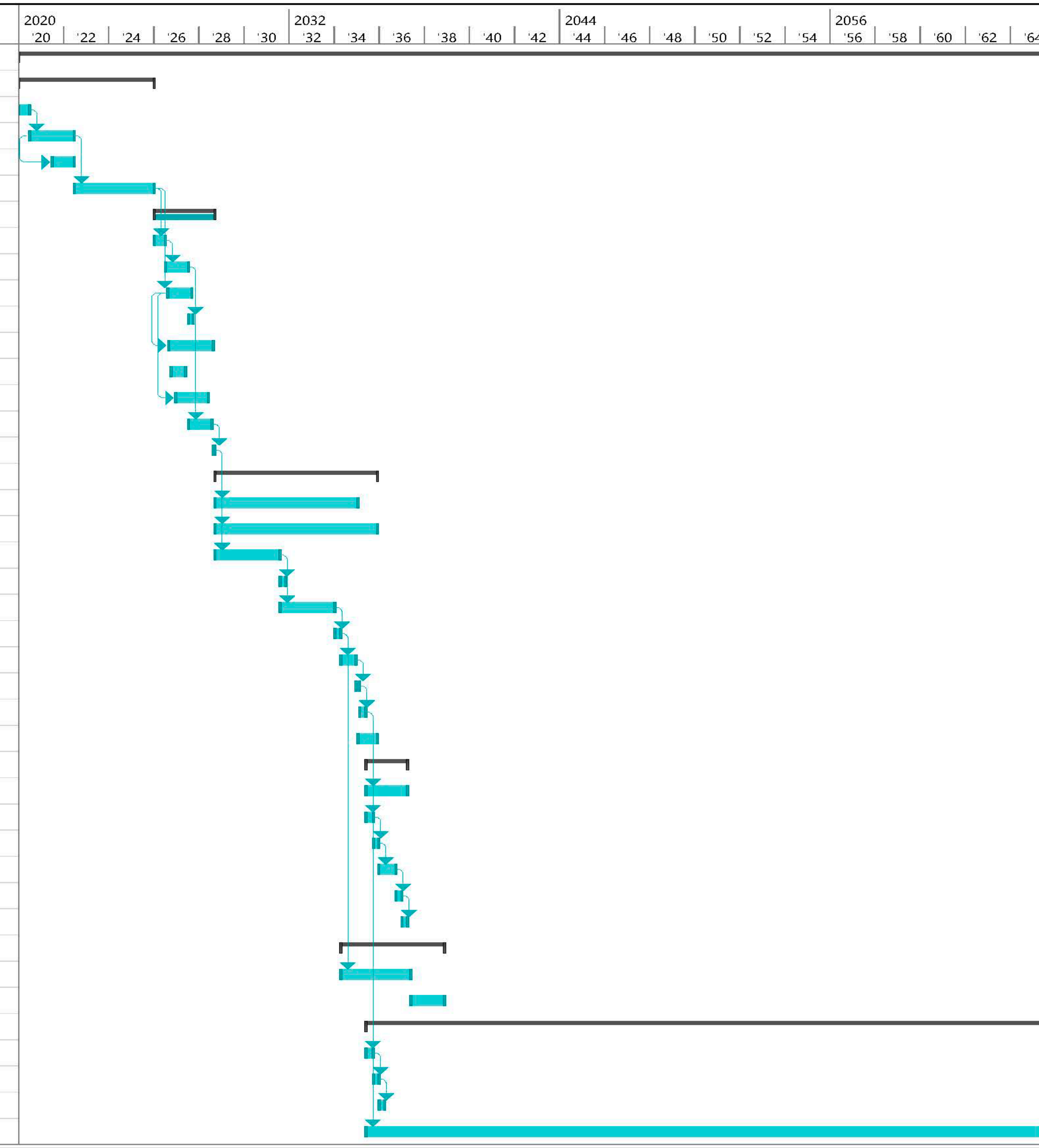


Figure 5-4
Mixed Waste Landfill Onsite Disposal Alternative Schedule

This page intentionally left blank.

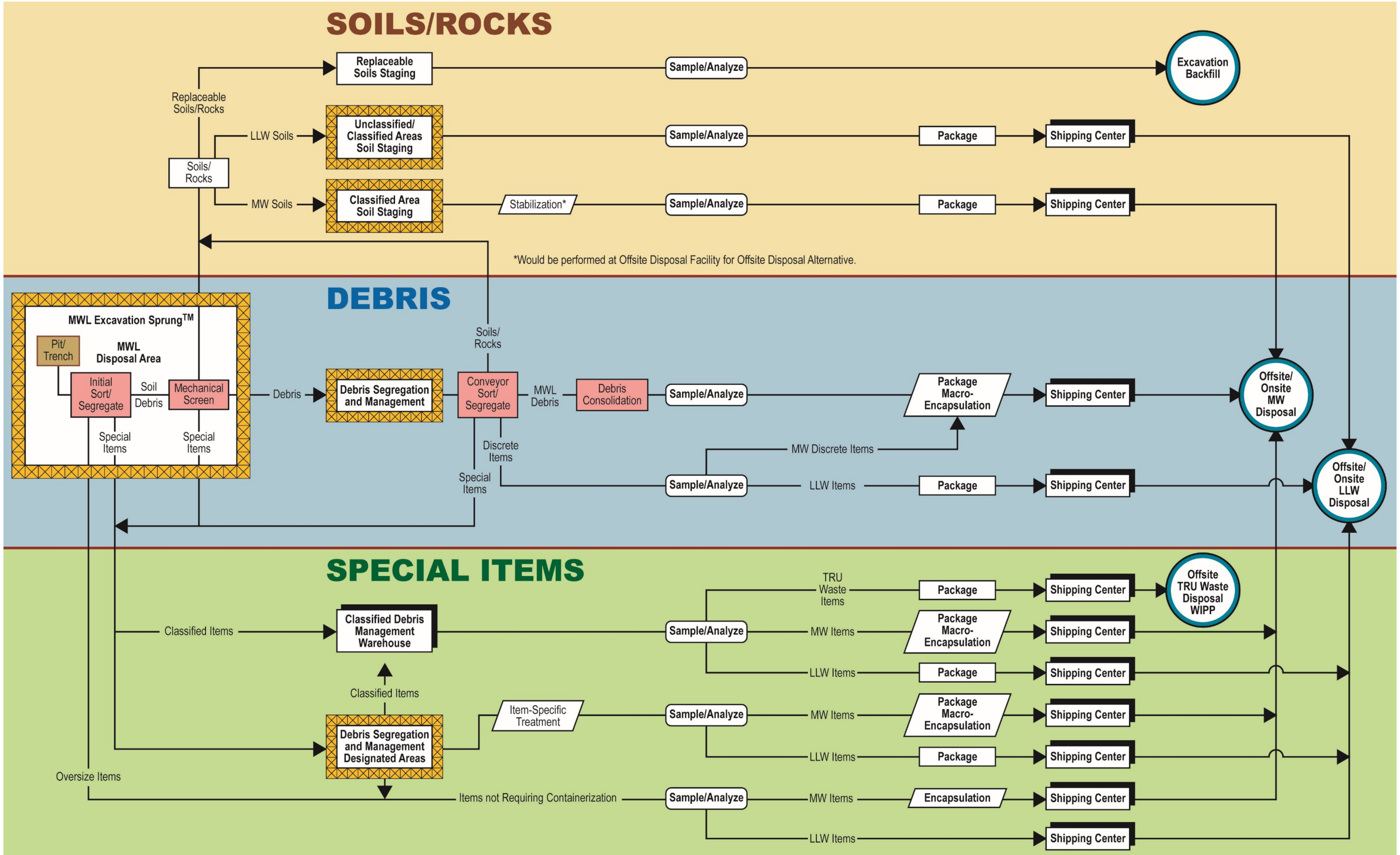


Figure 5-5
Mixed Waste Landfill Excavation Waste Management Process

Figure 5-5 – Legend

Excavated waste materials fall into one of three main processing streams; Soils/Rocks, Debris, or Special Items, represented by the colored bands in the figure. Special Items include those identified as Classified, Oversize or items requiring treatment to meet WAC.

There is only one Shipping Center. Multiple Shipping Center boxes are used to show different types of waste packages (MW, LLW, TRU) sent to the Shipping Center for transport to ultimate offsite/onsite disposal facility.

CA = Classified Area.

LLW = low-level waste.

MW = mixed waste.

MWL = Mixed Waste Landfill.

TRU = transuranic.

UCA = Unclassified Area.

WAC = Waste acceptance criteria.

WIPP = Waste Isolation Pilot Plant.

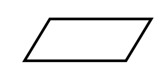
Represents no change in location of materials/items.

Represents movement of materials/items from one structure/staging area to another.

Represents excavation of materials/items from one of 7 UCA trenches or 42 CA pits.

Boxes with this border denote Sprung™ structures.

Shadow boxes denote hard-sided structures.


Indicates a treatment process performed to meet WAC.


Represents a sampling process performed to characterize debris or materials.


Represents one of four final disposition options for excavation process-generated materials.

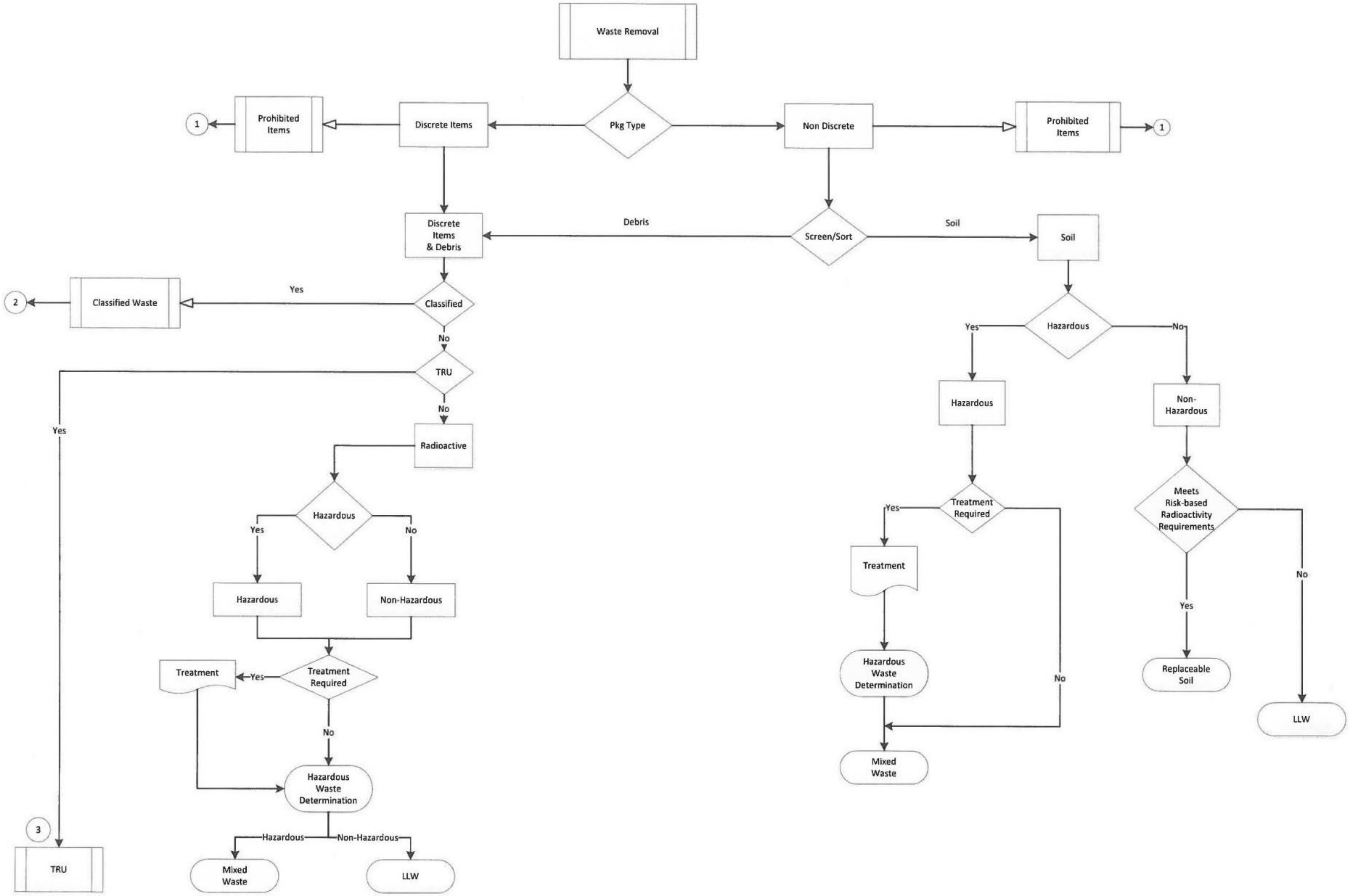


Figure 5-6
Conceptual Mixed Waste Landfill Waste Management Process (Page 1)

This page intentionally left blank.

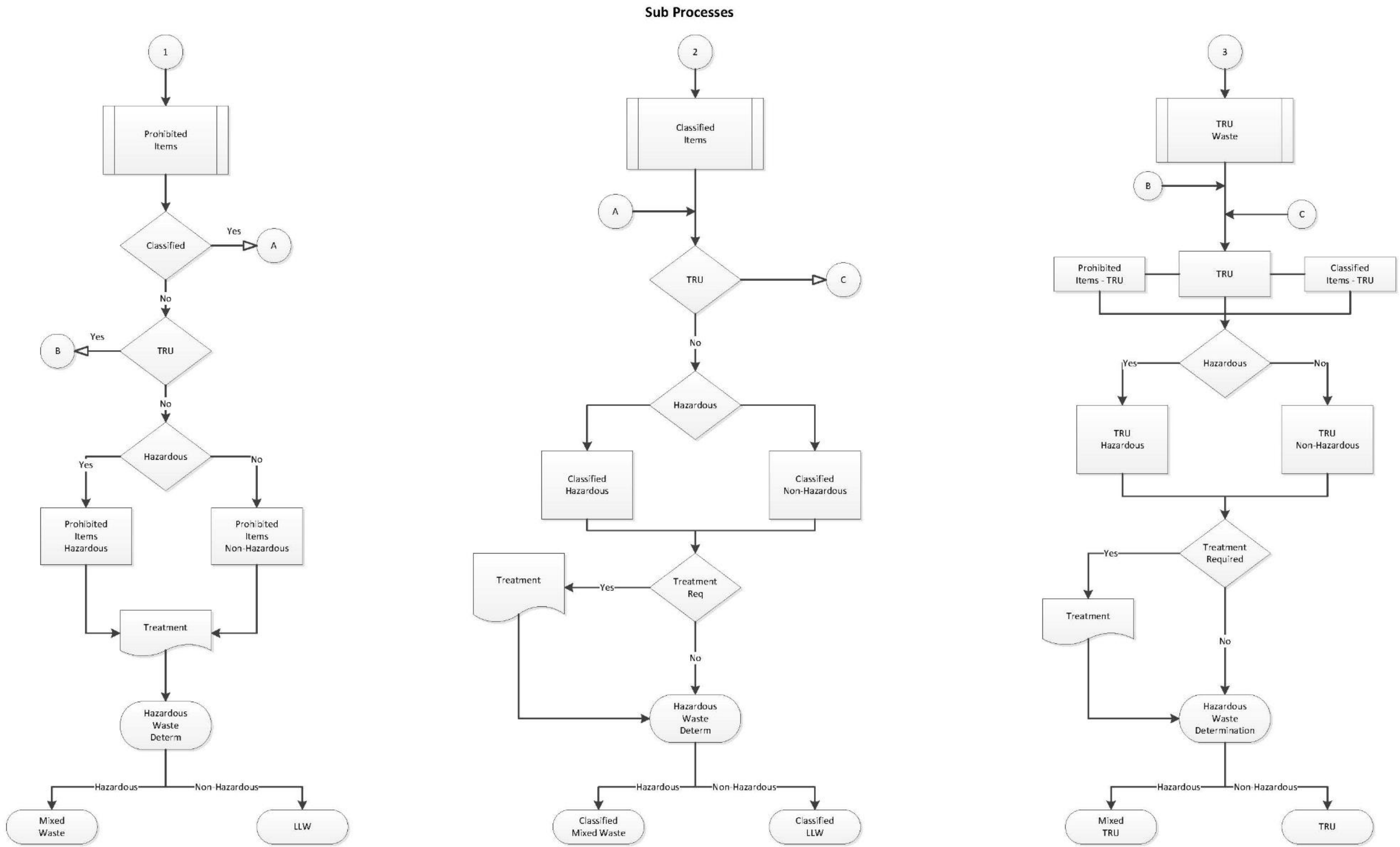


Figure 5-6
Conceptual Mixed Waste Landfill Waste Management Process (Page 2)

This page intentionally left blank.

6.0 FIVE-YEAR SUMMARY AND CONCLUSIONS

This is the first Five-Year Report for SWMU 76, MWL, as required by the NMED May 2005 Final Order that selected the remedy. As determined by the NMED (Kieling October 2011), the first five-year evaluation period began on January 8, 2014 when NMED approved the MWL LTMMP, and includes CY 2014 through CY 2017 monitoring and inspection results. Subsequent Five-Year Reports will cover a full five-year monitoring period.

Two Final Orders (NMED May 2005; February 2016) and Section 4.8.2 of the LTMMP establish the Five-Year Report requirements. Section 1.4 summarizes the specific requirements and Table 1-2 maps where they are addressed in this report.

The purpose of the Five-Year Report is to evaluate the effectiveness of the selected remedy (i.e., the ET Cover) and the likelihood of contaminants reaching groundwater. The 2014 through 2017 monitoring, inspection, and maintenance results presented in Chapter 2 of this report provide the empirical data necessary to establish current site conditions and evaluate the effectiveness of the ET Cover and associated controls. The measure of effectiveness is the protection of human health and the environment.

Based upon four years of monitoring, inspection, and maintenance under the LTMMP, MWL site conditions have improved and continue to be protective of human health and the environment. ET Cover native vegetation has matured and additional best practice measures to reduce erosion and control site drainage have been completed. MWL multi-media monitoring results are consistent with historical data and no trigger levels were exceeded. There were no indications of changing conditions that would increase the risk to site workers, the public, or indicate an increase in the likelihood of contaminants reaching groundwater.

The MWL ET Cover and associated remedy controls are in good condition and performing as designed. The inspection and maintenance results confirm the physical integrity of the ET Cover and the surface-water diversion swale, perimeter security fence and signage, survey monuments, and all monitoring networks and associated sampling equipment. ET Cover maintenance and repairs have decreased over this time as a result of successful revegetation efforts, best practice maintenance, and ET Cover and site improvements.

Fate and transport modeling updates were not required based on a comparison of the 2014 through 2017 monitoring results to the previous 2005 modeling. However, the VOC soil-vapor plume modeling was updated to address and integrate the recent 2014 through 2017 monitoring results that provide broader VOC soil-vapor spatial distribution (i.e., depths of 41.5 to 400 ft bgs) than previously available. The updated modeling provides a better understanding of plume migration and was used to reevaluate the likelihood of contaminants reaching groundwater. The spatial-temporal trends in the recent monitoring results were incorporated and captured with high confidence in the updated model, which honors the uncertainty distributions of the input parameters. Based on the updated, simplistic, one-dimensional model that conservatively maximizes transport to groundwater, soil-vapor concentrations will continue to decrease over time and are unlikely to impact groundwater.

The other main Five-Year Report requirement is to reevaluate the feasibility of MWL excavation by updating the *Complete Excavation with Offsite Disposal* remedial alternative originally

evaluated in the MWL CMS Final Report (SNL/NM May 2003). This requirement for the first Five-Year Report was expanded by the February 2016 Final Order (NMED February 2016) to include an evaluation of onsite disposal in a modern landfill that includes a RCRA Subtitle C liner system. This was the only modification to Five-Year Report requirements originally established in the NMED May 2005 Final Order and is specific to this first Five-Year Report. The evaluation of onsite disposal was not addressed in the May 2003 MWL CMS Final Report.

The 2018 feasibility evaluation updates the 2003 evaluation and includes both the offsite and onsite disposal alternatives. Advances in technology since 2003 have not fundamentally changed the excavation and waste management approach. However, radiological decay, use of a more conventional excavation approach, and a streamlined waste management approach represent significant changes. Long-term onsite storage of excavated waste was eliminated for the 2018 evaluation because there are current disposal pathways for all anticipated waste streams. The evaluation followed the same approach as presented in the 2003 MWL CMS Final Report, Appendix H.

Complete excavation with offsite and onsite disposal are remedial alternatives that could be implemented, if necessary, for the protection of human health and the environment. There is no short-term risk reduction with excavation remedies as current conditions meet the NMED guidelines for industrial land use. Long-term risk is mitigated by ongoing monitoring and the LTMMP trigger level process. The overall health and safety risk to site workers is high due to the nature of the waste, the complexity and duration of the work, and the risk of physical injury and death associated with remediation construction and transportation hazards. These factors, along with classified waste security requirements and the extensive support facilities required for excavation and waste management, result in technical implementation challenges and a high cost of implementation for both alternatives. MWL excavation and waste management inherently involve significant risk to site workers related to construction and transportation.

MWL site conditions continue to be protective of human health and the environment with multi-media monitoring, inspection, and maintenance/repair safeguards. These LTMMP activities provide the empirical data necessary to establish site conditions, evaluate the effectiveness of the ET Cover, and confirm all remedy controls are in good condition and performing as designed.

The LTMMP multi-media monitoring program is focused on the most mobile COCs and includes a trigger level process that ensures any future releases or movement of contaminants are detected and addressed in a timely manner, consistent with the LTMMP and the May 2005 Final Order requirements. Best practice measures and follow-up field investigations are being used to improve and better understand site conditions, and plan future actions to protect groundwater, if necessary. This protective approach for the MWL is established in the Permit through the incorporation of the LTMMP in Attachment M. Annual LTMM and Five-Year reporting make all information available to the public.

LTMMP monitoring parameters and frequencies have been evaluated as part of this Five-Year reporting effort; no changes are needed for the protection of human health and the environment.

7.0 REFERENCES

ASTM Standard C117, 2017. "Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing", ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, www.astm.org.

ASTM Standard C136, 2014. "Test Method for Sieve Analysis of Fine and Coarse Aggregates", ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, www.astm.org.

ASTM Standard D2487, 2017. "Standard Practice for Classification of Soils for Engineering Purposes (Unified Classification System)", ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, www.astm.org.

ASTM Standard D4318, 2017. "Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils", ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, www.astm.org.

ASTM Standard D698, 2012. "Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft^3 [600 kN-m/m^3])", ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, www.astm.org.

Beausoleil, G. L. (U.S. Department of Energy), October 2014. Letter to J.E. Kieling (New Mexico Environment Department Hazardous Waste Bureau), Request for Class 3 Modification to Module IV of Hazardous Waste Permit for Sandia National Laboratories/New Mexico, EPA ID NM5890110518, New Mexico, October 17, 2014.

Blaine, T. (New Mexico Environment Department), January 2014. Letter to G.L. Beausoleil (U.S. Department of Energy NNSA/Sandia Site Office) and S. Andrew Orrell (Sandia National Laboratories/New Mexico), "Approval, Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan, March 2012, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-12-007," January 8, 2014.

Dinwiddie, R.S. (New Mexico Environment Department), September 1997. Letter to M.J. Zamorski (U.S. Department of Energy), "Request for Supplemental Information: Background Concentrations Report, SNL/KAFB," September 24, 1997.

EPA, see U.S. Environmental Protection Agency.

Goering, T.J., G.M. Haggerty, D. Van Hart, and J.L. Peace, December 2002. "Mixed Waste Landfill Groundwater Report, 1990 through 2001, Sandia National Laboratories, Albuquerque, New Mexico," SAND2002-4098, Sandia National Laboratories, Albuquerque, New Mexico.

Ho, C.K., T.J. Goering, J.L. Peace, and M.L. Miller, November 2005. Probabilistic Performance-Assessment Modeling of the Mixed Waste Landfill at Sandia National Laboratories, SAND2005-6888, Sandia National Laboratories, Albuquerque, New Mexico.

Ho, C.K., T.J. Goering, J.L. Peace, and M.L. Miller, January 2007. Probabilistic Performance-Assessment Modeling of the Mixed Waste Landfill at Sandia National Laboratories (2nd Edition), SAND2007-0170, Sandia National Laboratories, Albuquerque, New Mexico.

Jury, W.A., W.F. Spencer, and W.J. Farmer, 1983. “Behavior Assessment Model for Trace Organics in Soil: I. Model Description,” Journal of Environmental Quality, 12(4), p. 558-564.

Jury, W.A., D. Russo, G. Streile, and H. Elabd, 1990. “Evaluation of Volatilization by Organic-Chemicals Residing Below the Soil Surface,” Water Resources Research, 26(1), p. 13-20.

Kieling, J.E. (New Mexico Environment Department), October 2011. Letter to J.P. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and S.A. Orrell (Sandia National Laboratories, New Mexico), “Notice of Approval, Mixed Waste Landfill Corrective Measures Implementation Report, January 2010, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-10-005,” October 14, 2011.

Kieling, J.E. (New Mexico Environment Department), September 2014. Letter to G. Beausoleil (U.S. Department of Energy NNSA/Sandia Site Office) and P.B. Davies (Sandia National Laboratories, New Mexico), “Approval, Installation of Three FLUTe™ Soil-Vapor Monitoring Wells (MWL-SV03, MWL-SV04, and MWL-SV05) at the Mixed Waste Landfill, September 2014, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-14-012. September 25, 2014.

Kieling, J.E. (New Mexico Environment Department), February 2016. Letter to J.P. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and P.B. Davies (Sandia National Laboratories, New Mexico), “Approval, Final Decision on Proposal to Grant Corrective Action Complete with Controls Status for Mixed Waste Landfill, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-14-014,” February 18, 2016.

Klavetter, E., August 1995. Memorandum to T. Goering and J. Peace, “BOSS Simulations of Organic Compound Transport at the MWL,” August 28, 1995, Sandia National Laboratories, Albuquerque, NM.

New Mexico Environment Department (NMED), April 2004. “Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act § 74-4-10,” prepared by the New Mexico Environment Department in the matter of Respondents U.S. Department of Energy and Sandia Corporation, Sandia National Laboratories, Bernalillo County, New Mexico, April 29, 2004.

New Mexico Environment Department (NMED), May 2005. “Final Order, State of New Mexico Before the Secretary of the Environment in the Matter of Request for a Class 3 Permit Modification for Corrective Measures for the Mixed Waste Landfill, Sandia National Laboratories, Bernalillo County, New Mexico,” EPA ID# 5890110518.” May 26, 2005.

New Mexico Environment Department (NMED), January 2015, and subsequent revisions. “Resource Conservation and Recovery Act Facility Operating Permit EPA ID Number NM5890110518 Issued to the U.S. Department of Energy/Sandia Corporation for the Sandia National Laboratories Hazardous and Mixed Waste Treatment and Storage Units and Post-Closure Care of the Corrective Action Management Unit,” January 27, 2015.

New Mexico Environment Department (NMED), February 2016. Final Order No. HWB 15-18 (P), State of New Mexico Before the Secretary of the Environment in the Matter of Proposed Permit Modification for Sandia National Laboratories, EPA ID #5890110518, To Determine Corrective Action Complete with Controls at the Mixed Waste Landfill, New Mexico Environment Department, Santa Fe, New Mexico, February 12, 2016.

NMED, see New Mexico Environment Department.

Peace, J.L., T.J. Goering, M.D. McVey, September 2002. “Report of the Mixed Waste Landfill Phase 2 RCRA Facility Investigation, Sandia National Laboratories, Albuquerque, New Mexico,” SAND2002-2997, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), September 1990. “Report of the Phase 1 RCRA Facility Investigation of the Mixed Waste Landfill,” Environmental Restoration Program, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), September 1996. “Report of the Mixed Waste Landfill Phase 2 RCRA Facility Investigation,” Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), June 1998. “Responses to New Mexico Environment Department Technical Comments on the Report of the Mixed Waste Landfill Phase 2 RCRA Facility Investigation Dated September 1996, Volume 1,” Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), May 2003. “Mixed Waste Landfill Corrective Measures Study Final Report,” Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), December 2004. “Chemical Waste Landfill Corrective Measures Study Report,” Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), November 2005. “Mixed Waste Landfill Corrective Measures Implementation Plan,” Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), August 2008. “Investigation Report on the Soil-Vapor Volatile Organic Compounds, Tritium, and Radon Sampling at the Mixed Waste Landfill,” Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), January 2010, Revision 1. “Mixed Waste Landfill Corrective Measures Implementation Report,” Environmental Restoration Project, Sandia National Laboratories, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), June 2010. “Mixed Waste Landfill Groundwater Monitoring Report, Calendar Year 2009,” Sandia National Laboratories, Albuquerque, New Mexico, June 7, 2010.

Sandia National Laboratories, New Mexico (SNL/NM), March 2012. “Long-Term Monitoring and Maintenance Plan for the Mixed Waste Landfill,” Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), June 2014. “Mixed Waste Landfill Annual Long-Term Monitoring and Maintenance Report, January 2014 – March 2014,” Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), September 2014. Installation of Three FLUTe™ Soil-Vapor Monitoring Wells (MWL-SV03, MWL-SV04, and MWL-SV05) at the Mixed Waste Landfill, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), June 2015. “Mixed Waste Landfill Annual Long-Term Monitoring and Maintenance Report, April 2014 – March 2015,” Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), June 2016. “Mixed Waste Landfill Annual Long-Term Monitoring and Maintenance Report, April 2015 – March 2016,” Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), June 2017. “Mixed Waste Landfill Annual Long-Term Monitoring and Maintenance Report, April 2016 – March 2017,” Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), June 2018. “Mixed Waste Landfill Annual Long-Term Monitoring and Maintenance Report, April 2017 – March 2018,” Sandia National Laboratories, Albuquerque, New Mexico.

SNL/NM, see Sandia National Laboratories, New Mexico.

U.S. Environmental Protection Agency (EPA), August 1993. “Module IV. Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) to RCRA for Sandia National Laboratories/New Mexico, EPA I.D. Number NM 5890880518,” U.S. Environmental Protection Agency, Region VI, Dallas, Texas. August 26, 1993.

U.S. Environmental Protection Agency (EPA), 1997. “Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination,” OSWER Directive No. 9200.4-18, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Department of Labor (DOL), 2018. “Occupational Injuries and Illnesses in the United States by Industry 2016,” Internet Version. Washington, DC.

U.S. Department of Transportation (DOT), 2018. "National Statistics, 2016, A Compilation of Motor Vehicle Crash Data from the Crash Report Sampling System, National Highway Traffic Safety Administration," Internet Version. Washington, DC.

WERC (A Consortium for Environmental Education and Technology Development), August 2001. "Independent Peer Review of the U.S. Department of Energy, Sandia National Laboratories, Mixed Waste Landfill," August 31, 2001.

WERC (A Consortium for Environmental Education and Technology Development), January 2003. "Independent Technical Peer Review of the U.S. Department of Energy, Sandia National Laboratories, Draft Corrective Measures Study, November 2002, Mixed Waste Landfill," January 31, 2003.

This page intentionally left blank.

APPENDIX A
Summary of the Mixed Waste Landfill Regulatory History

Regulatory History
Solid Waste Management Unit 76, Mixed Waste Landfill

The following summary of the Mixed Waste Landfill (MWL) history is provided in support of Chapter 1, Sections 1.2 and 1.3, which include information on the corrective action process and the two Class 3 Permit Modifications approved by the New Mexico Environment Department (NMED). The NMED May 2005 Final Order on remedy selection (NMED May 2005) determined the MWL final remedy and conditions for completing the corrective action process. The NMED February 2016 Final Order (NMED February 2016) granted the October 2014 Class 3 Permit Modification to reflect that the MWL is Corrective Action Complete with Controls. The February Final Order took effect on March 13, 2016. All controls required for the MWL are defined in the MWL Long-Term Monitoring and Maintenance Plan (LTMMP), approved by the NMED on January 8, 2014 (Blaine January 2014). The LTMMP is incorporated through reference in Attachment M of the Sandia National Laboratories/New Mexico (SNL/NM) Resource Conservation and Recovery Act Facility) Operating Permit (Permit) (Kieling February 2016; NMED January 2015, with all approved modifications). In accordance with the two Final Orders and the LTMMP, this first Five-Year Report analyzes the effectiveness of the selected remedy based on monitoring, inspection, and maintenance results for the first four calendar years under the LTMMP (2014 through 2017) and reevaluates the feasibility of MWL excavation with both offsite and onsite disposal alternatives.

Background and Operational History

The MWL is a 2.6-acre solid waste management unit (SWMU) at SNL/NM that is owned by the U.S. Department of Energy/National Nuclear Security Agency (DOE/NNSA). The MWL was used as a disposal area for low-level radioactive waste, hazardous waste, and mixed waste generated at SNL/NM research facilities and off-site locations from March 1959 to December 1988. The MWL was comprehensively investigated and continues to undergo rigorous long-term monitoring and maintenance controls.

Waste was disposed at the MWL in a 0.6-acre Classified Area, with cylindrical pits 3 to 10 feet in diameter and 15 to 25 feet deep, and in a 2-acre Unclassified Area with parallel trenches approximately 15 to 25 feet wide, 150 to 180 feet long, and 15 to 20 feet deep. A detailed MWL waste inventory summary, by pit and trench, was compiled and presented in MWL documents summarized in Section 1.0 of this report.

Regulatory Status and Corrective Action History

The MWL was designated as a SWMU by the U.S. Environmental Protection Agency and is subject to corrective action under Title 40 of the Code of Federal Regulations (CFR) Part 264 Section 101 (40 CFR §264.101). Completion of the corrective action process at the MWL is documented in the administrative record and briefly summarized below.

The MWL has been extensively studied since 1989 and groundwater monitoring has been conducted since 1990. The Phase 1 and 2 RFIs were completed from 1989 to 1995. Limited releases of contaminants, primarily tritium and volatile organic compounds in soil vapor, were identified and characterized. As documented in the Phase 2 RFI Report and confirmed by

additional investigation (SNL/NM August 2008), 25 years of groundwater monitoring, and four years of monitoring under the LTMMP, MWL site conditions continue to be protective of human health and the environment.

After a four-day public hearing in December 2004, the NMED Secretary signed the Final Order in May 2005 selecting the remedy of an engineered vegetative soil cover with a biointrusion barrier (i.e., evapotranspirative [ET] cover) combined with long-term monitoring and maintenance. In rendering this decision, the NMED Secretary determined the MWL inventory was reasonably complete and accurate; and the MWL did not contain high-level radioactive waste. The May 2005 Final Order was challenged by Citizen Action New Mexico in the New Mexico Court of Appeals. In December 2007 the Court of Appeals affirmed the May 2005 Final Order; in February 2008 the New Mexico Supreme Court denied further review.

The May 2005 Final Order included specific conditions for completing the corrective action process at the MWL (conditions are underlined). These conditions were completed as summarized below.

- <u>Corrective Measures Implementation (CMI) Plan</u> was approved by NMED in December 2008. The construction plan with specifications for the ET Cover was included along with the <u>fate & transport modeling report</u> that evaluated contaminant transport and proposed long-term monitoring triggers for continued protection of human health and the environment. Concurrently, an additional field investigation of tritium, radon, volatile organic compounds in soil vapor, and methane was completed that confirmed Phase 2 RFI results.

- <u>Corrective Measures Implementation</u> involved construction of the ET Cover, which was completed from May through September 2009 and documented in the <u>CMI Report</u>. The CMI Report was approved by NMED in October 2011.

- <u>Long-Term Monitoring and Maintenance Plan (LTMMP)</u> was submitted within 180 days of CMI Report approval, and was approved by the NMED in January 2014. The LTMMP established the physical and institutional controls implemented together with the ET Cover to ensure the long-term protection of human health and the environment. Safeguards and controls include inspection, maintenance, and <u>multi-media monitoring with trigger levels</u> that require additional action if exceeded (air, soil, soil vapor, soil moisture, groundwater, and biota); results are reported annually to NMED. Installation of three multi-sampling port soil-vapor monitoring wells required under the LTMMP was completed in September 2014.

<u>*Corrective Action Complete with Controls Determination*</u>

After completing all conditions of the May 2005 Final Order, DOE/NNSA and SNL/NM personnel submitted a request to NMED for a Class 3 Permit Modification for Corrective Action Complete with Controls status for the MWL in October 2014. The associated regulatory process included two public comment periods and a public meeting held by DOE/NNSA and SNL/NM personnel in November 2014. In response to requests from Citizen Action New Mexico and others, NMED held a four-day public hearing in July 2015.

The NMED Secretary concluded in the February 2016 Final Order that all MWL corrective action had been completed and conditions at the MWL were protective of human health and the environment. The February 2016 Final Order and NMED approval of Corrective Action Complete with Controls status for the MWL became effective in March 2016. In May 2016 DOE/NNSA and SNL/NM personnel confirmed the prior release of all historical records (as of May 2002) that delineate the contents of the MWL.

Long-Term Monitoring and Stewardship

The MWL LTMMP was fully implemented upon NMED approval and includes a comprehensive set of safeguards and controls to ensure ET Cover performance and the protection of human health and the environment. The multi-media monitoring program and trigger level process provide an early warning system for changing conditions and require timely follow-up if a trigger level is exceeded. Annual Long-Term Monitoring and Maintenance Reports are submitted to NMED by June 30th of each year that document all monitoring, inspection, and maintenance/repair activities for the previous reporting year. The LTMMP and Annual Long-Term Monitoring and Maintenance Reports are available for public access as explained in Section 1.7 of this report.

Consistent with the May 2005 and February 2016 Final Orders and LTMMP, Five-Year Reports will be submitted to NMED starting in January 2019. This is the first MWL Five-Year Report.

This page intentionally left blank.

APPENDIX B
Requirements Source Documents and Requirements Verification Matrix for the Mixed Waste Landfill Five-Year Report

Final Order, on Request for a Class 3 Permit Modification for Corrective Measures for the Mixed Waste Landfill, Sandia National Laboratories
No. HWB-SNL-04-11(M)

May 26, 2005

This page intentionally left blank.

5. Sandia shall prepare a report every 5 years, re-evaluating the feasibility of excavation and analyzing the continued effectiveness of the selected remedy. The report shall include a review of the documents, monitoring reports and any other pertinent data, and anything additional required by NMED. In each 5-year report, Sandia shall update the fate and transport model for the site with current data, and re-evaluate any likelihood of contaminants reaching groundwater. Additionally, the report shall detail all efforts to ensure any future releases or movement of contaminants are detected and addressed well before any effect on groundwater or increased risk to public health or the environment. Sandia shall make the report and supporting information readily available to the public, before it is approved by NMED. NMED shall provide a process whereby members of the public may comment on the report and its conclusions, and shall respond to those comments in its final approval of the report.

6. The Hearing Officer is granted until April 20, 2005 to submit her Report and Proposed Findings of Fact, Conclusions of Law and Proposed Order.

RON CURRY
Secretary, Environment Department

This page intentionally left blank.

Long-Term Monitoring and Maintenance Plan for the Mixed Waste Landfill, Sandia National Laboratories

Environmental Restoration Operations
Sandia National Laboratories

March 2012

This page intentionally left blank.

- Summary of any problems that either endangered or presented significant potential to endanger human health and the environment for the reporting period and what was done to mitigate such problems

- Review of the regulatory standards and screening levels that were used to develop the media-specific trigger levels presented in Section 5.2 and documentation of any changes being made through the permit modification process

The annual reporting period for long-term monitoring is defined as April 1 through March 31. The annual report is due by June 30 of each CY and will cover the previous annual reporting period. Each annual report will be made available to the public.

4.8.2 Five-Year Reevaluation Report

DOE/Sandia will also submit to NMED a report every five years reevaluating the feasibility of excavation and analyzing the continued effectiveness of the selected remedy. The report will include a review of the annual long-term monitoring and maintenance reports for that five-year period and any other pertinent data, as well as additional documentation required by NMED. The main scope of the Five-Year Reevaluation Report as defined in the Final Order (Curry May 2005) is summarized as follows:

- Reevaluate the feasibility of excavating the MWL, including a review of new excavation technologies since the MWL Corrective Measures Study (CMS) Report (SNL/NM May 2003) was approved and provide an update of waste disposal pathways. Worker and site risks associated with any newly identified excavation technologies will also be assessed and reported. In summary, the MWL CMS Report “full excavation alternative” will be reviewed, reevaluated, and updated as appropriate based upon current information.

- Analyze the continued effectiveness of the ET Cover and the likelihood of contaminants reaching groundwater using current monitoring results and any other pertinent data.

- Update, if necessary, the fate and transport model for the MWL with current data. Current monitoring results will be compared to the modeling performed in 2005. If the results indicate current conditions are not significantly different from the conditions previously modeled in 2005, the fate and transport model will not be updated. If the monitoring results fall significantly outside the range of conditions previously modeled, the fate and transport model will be updated to determine the likelihood of contaminants reaching groundwater.

- All efforts to ensure that any future releases or mobilization of contaminants are detected and addressed well before any effect on groundwater or increased risk to public health or the environment occurs will be detailed and will include a summary of the multi-media long-term monitoring program.

The first five-year reevaluation period will begin upon NMED approval of this MWL LTMMP (Kieling October 2011). The first Five-Year Reevaluation Report will be submitted to NMED five years after approval of the LTMMP and include monitoring results for the first four years under the LTMMP to allow time to prepare and submit the report. Subsequent Five-Year

Reevaluation Reports will cover a full five-year monitoring period. DOE/Sandia will make the report available to the public in accordance with the requirements in the Final Order (Curry May 2005).

4.9 Potential for Exposure

The MWL ET Cover provides a significant barrier between the surface environment and the buried wastes. The following measures have been implemented to reduce the risk of exposure from the wastes buried at the MWL:

- The ET Cover is designed to minimize the potential for the migration of precipitation into the MWL.
- Monitoring of the vadose zone will be conducted to determine whether the most mobile contaminants are migrating and pose a threat to groundwater.
- Monitoring of the air and surface soil will be conducted to determine whether there is a threat to receptors at the surface.
- Security and IC measures will be maintained to restrict access to the area.
- Federal ownership and the industrial land-use designation will prevent inappropriate use of the MWL site.
- Inspections, maintenance, and repairs (as necessary) will be performed on a regularly scheduled basis and in accordance with this LTMMP.

4.10 Potential for Emergency

Due to the current conditions at the MWL, the potential for fire, explosion, or unplanned release of radionuclides or RCRA-regulated hazardous waste or hazardous waste constituents that would significantly threaten human health or the environment is very low. In the unlikely event of an emergency, the SNL/NM Emergency Operations Center will provide coordination, resources, and appropriate emergency equipment on an as-needed basis.

Final Order, on Proposal to Grant Corrective Action Complete with Controls Status
for the Mixed Waste Landfill, Sandia National Laboratories
No. HWB-SNL-15-18(P)

February 12, 2016

This page intentionally left blank.

privilege log describing the nature of the document (letter, memo, e-mail, etc.), the identity of the person who created the record (to the extent this information is available), the date the record was created (to the extent this information is available), the legal justification for withholding the record and the identities of all of the people involved in making the determination that the record should be withheld. If Applicants determine that all historical records describing the material placed in the MWL were already disclosed, then Applicants shall affirmatively state this in writing and include the dates the records were disclosed and the identity of the person or entity who received the records. Prior disclosure of any records required to be disclosed under this Order shall not relieve the Applicants from providing the privilege log described above.

CONCLUSION

Having considered the administrative record in its entirety, including the Hearing Officer's Report and the post-report submittals; and being otherwise fully advised regarding this matter;

THE SECRETARY HEREBY ADOPTS THE HEARING OFFICER'S REPORT WITH THE FOLLOWING MODIFICATIONS:

1) The Hearing Officer's Report shall be modified to incorporate the minor modifications specified in Part A (above); and,
2) The 2005 Final Order shall be modified as follows:
    a. The Feasibility Report due in 2019 shall evaluate the following two remedies; (1) excavation, removal and appropriate disposal of all of the waste in the MWL; and (2) construction and installation of a modern landfill, which shall at a minimum include a RCRA Subtitle C liner system, an ET cover with biointrusion barrier, and appropriate post-closure monitoring and controls.

This page intentionally left blank.

Mixed Waste Landfill Five-Year Report Requirements Verification Matrix

Req#	Within Document	Requirement	Evidence
Final Order — New Mexico Environment Department (NMED) May 2005			
1	Section 5	Sandia shall prepare a report every 5 years, re-evaluating the feasibility of excavation and analyzing the continued effectiveness of the selected remedy.	Chapters 1-7 and all appendices
2	Section 5	The report shall include a review of the documents, monitoring reports and any other pertinent data, and anything additional required by NMED.	Chapter 2
3	Section 5	In each 5-year report, Sandia shall update the fate and transport model for the site with current data, and re-evaluate any likelihood of contaminants reaching groundwater.	Chapter 3
4	Section 5	Additionally, the report shall detail all efforts to ensure any future releases or movement of contaminants are detected and addressed well before any effect on groundwater or increased risk to public health or the environment.	Chapter 4
5	Section 5	Sandia shall make the report and supporting information readily available to the public, before it is approved by NMED.	Chapter 1 Sections 1.6 and 1.7
6	Section 5	NMED shall provide a process whereby members of the public may comment on the report and its conclusions, and shall respond to those comments in its final approval of the report.	Chapter 1 Section 1.6
Long-Term Monitoring and Maintenance Plan for the Mixed Waste Landfill (LTMMP) — March 2012			
7	4.8.2 Paragraph 1, Sentence 1	Department of Energy (DOE)/Sandia will also submit to NMED a report every five years reevaluating the feasibility of excavation and analyzing the continued effectiveness of the selected remedy.	Chapters 1-7 and all appendices
8	4.8.2 Paragraph 1, Sentence 2	The report will include a review of the annual long-term monitoring and maintenance reports for that five-year period and any other pertinent data, as well as additional documentation required by NMED.	Chapter 2
9	4.8.2 Paragraph 1, Sentence 3, Bullet 1	The main scope of the Five-Year Reevaluation Report as defined in the Final Order (NMED May 2005) is summarized as follows: -- Revaluate the feasibility of excavating the Mixed Waste Landfill (MWL), including a review of new excavation technologies since the MWL Corrective Measures Study (CMS) Report (SNL/NM May 2003) was approved and provide an update of waste disposal pathways. Worker and site risks associated with any newly identified excavation technologies will also be assessed and reported. In summary, the MWL CMS Report "full excavation alternative" will be reviewed, reevaluated, and updated as appropriate based upon current information.	Chapter 5, Appendix D

Mixed Waste Landfill Five-Year Report Requirements Verification Matrix (Continued)

Req#	Within Document	Requirement	Evidence
Long-Term Monitoring and Maintenance Plan for the Mixed Waste Landfill (LTMMP) — March 2012 (Continued)			
10	4.8.2 Paragraph 1, Bullet 2, Sentence 1	-- Analyze the continued effectiveness of the evapotranspirative (ET) Cover and the likelihood of contaminants reaching groundwater using current monitoring results and any other pertinent data.	Chapters 3 and 4
11	4.8.2 Paragraph 1, Bullet 3, Sentence 1	-- Update, if necessary, the fate and transport model for the MWL with current data.	Chapter 3 and Appendix C
12	4.8.2 Paragraph 1, Bullet 3, Sentence 2	Current monitoring results will be compared to the modeling performed in 2005.	Chapter 3 Section 3.2
13	4.8.2 Paragraph 1, Bullet 3, Sentences 3&4	If the results indicate current conditions are not significantly different from the conditions previously modeled in 2005, the fate and transport model will not be updated. If the monitoring results fall significantly outside the range of conditions previously modeled, the fate and transport model will be updated to determine the likelihood of contaminants reaching groundwater.	Chapter 3 Section 3.2
14	4.8.2 Paragraph 1, Bullet 4, Sentence 1	-- All efforts to ensure that any future releases or mobilization of contaminants are detected and addressed well before any effect on groundwater or increased risk to public health or the environment occurs will be detailed and will include a summary of the multi-media long-term monitoring program.	Chapters 2, 3, and 4
15	4.8.2 Paragraph 2, Sentence 1	The first five-year reevaluation period will begin upon NMED approval of this MWL LTMMP (Kieling October 2011).	Chapter 1 Sections 1.1 and 1.4

Mixed Waste Landfill Five-Year Report Requirements Verification Matrix (Concluded)

Req#	Within Document	Requirement	Evidence
Long-Term Monitoring and Maintenance Plan for the Mixed Waste Landfill (LTMMP) — March 2012 (Continued)			
16	4.8.2 Paragraph 2, Sentence 2	The first Five-Year Reevaluation Report will be submitted to NMED five years after approval of the LTMMP and include monitoring results for the first four years under the LTMMP to allow time to prepare and submit the report.	Chapter 1 Sections 1.1 and 1.4
17	4.8.2 Paragraph 2, Sentence 2	The first Five-Year Reevaluation Report will include monitoring results for the first four years under the LTMMP.	Chapter 1, Sections 1.1 and 1.4 Chapter 2
18	4.8.2 Paragraph 2, Sentence 3	Subsequent Five-Year Reevaluation Reports will cover a full five-year monitoring period.	Chapter 1 Section 1.4
19	4.8.2 Paragraph 2, Sentence 4	DOE/Sandia will make the report available to the public in accordance with the requirements in the Final Order (NMED May 2005).	Chapter 1 Sections 1.6 and 1.7
Final Order — February 2016			
20	CONCLUSION, 2)	The 2005 Final Order shall be modified as follows: The Feasibility Report due in 2019 shall evaluate the following two remedies;	Chapter 5 and Appendix D
21	CONCLUSION, 2) a. (1)	excavation, removal and appropriate disposal of all the waste in the MWL;	Chapter 5 and Appendix D
22	CONCLUSION, 2) a. (2)	construction and installation of a modern landfill, which shall at a minimum include a Resource Conservation and Recovery Act Subtitle C liner system, and ET cover with biointrusion barrier, and appropriate post-closure monitoring and controls.	Chapter 5, Appendix D

Notes: See Chapter 7 for references.

This page intentionally left blank.

APPENDIX C
Supporting Information - Updated Mixed Waste Landfill Fate & Transport Modeling

This appendix contains the updated Mathcad® program that was used to model the fate and transport of tetrachloroethene (PCE) for comparison to the 2014 through 2017 volatile organic compound (VOC) soil-vapor monitoring results as described in Chapter 3 of this report. Chapter 3 updates the fate and transport model originally presented in the Mixed Waste Landfill Corrective Measures Implementation Plan (SNL/NM November 2005, Ho et al. November 2005 and January 2007).

Prior to this Five-Year Report, the most recent version of the Mixed Waste Landfill Fate and Transport Modeling effort was provided to the New Mexico Environment Department (NMED) as part of the following submittal.

> *January 19, 2007, DOE/Sandia Responses to New Mexico Environment Department Notice Of Disapproval, Part 2 Comments: Mixed Waste Landfill Corrective Measures Implementation Plan, November 2005*

This submittal included the following SAND Report, which is the second edition of the original modeling report presented as Appendix E of the Corrective Measures Implementation Plan (SNL/NM November 2005), and incorporates changes resulting from addressing NMED Notice of Disapproval technical comments on the report.

> *Probabilistic Performance-Assessment Modeling of the Mixed Waste Landfill at Sandia National Laboratories (2nd Edition) (Ho et al. January 2007, SAND2007-0170)*

In response to NMED comment #11, supplemental information was provided as part of this submittal, including additional details regarding each of the models and software used, tests conducted to demonstrate the performance of each model, as well as model input and output files (on compact disc). The January 2007 2nd Edition Modeling Report and supplemental information is available on the NMED Hazardous Waste Bureau website:

http://www.nmenv.state.nm.us/HWB/snlperm.html

Supporting information for the Fate and Transport Modeling Update presented in Chapter 3 of this Five-Year Report is provided as follows in this appendix.

This page intentionally left blank.

Mathcad® Program Used to Model the Fate & Transport of Tetrachloroethene (PCE)

This worksheet calculates the transient advection, dispersion, and decay of PCE in the vadose zone. PCE is transported in both the aqueous and vapor phases. Local thermodynamic equilibrium is assumed so that the partitioning of PCE between the aqueous and gas phases can be expressed using Henry's Law. The half-life of PCE ranges from 9 months (EPA fact sheet) to infinity. This solution is derived in Jury et al., 1983, J. Env. Qual., 12, 558-564 and in Jury et al., 1990, WRR, 26(1), 13-20.

9/26/05: Original model for Corrective Measures Implementation Plan (SNL/NM September 2005; Ho et al., September 2005, January 2007)

4/16/18: Updated model to evaluate PCE concentrations as a function of depth for prescribed times of 26 and 58 years (possible age as of 2018). Fixed overburden for no erosion of cap. C.K.Ho

Input parameters and distributions:

Define number of realizations: $n := 100$ Molecular weight of PCE: $MW := 165.83$

$i := 1..n$

Total porosity: $\phi := \mathrm{runif}(n, .302, .445)$ $\mathrm{median}(\phi) = 0.378$

Moisture Content: $\theta_w := \mathrm{runif}(n, .053, .225)$

Gas Content: $a := \phi - \theta_w$ $\max(a) = 0.38$

Henry's Constant: $K_H := 0.42$ This is Cg/Cliq

(EPA online calculator: www.epa.gov/athens/learn2model/part-two/onsite/esthenry.htm)

Adsorption partition coefficient: $\mathrm{logK_d} := \mathrm{runif}(n, -1.4, .3)$ $K_{d_i} := \dfrac{10^{\mathrm{logK}_{d_i}}}{1000} \cdot m^3 \cdot kg^{-1}$

Liquid-Phase Diffusion Coefficient: $D_w := 9.2 \cdot 10^{-10} \cdot \dfrac{m^2}{s}$

Gas-Phase Diffusion Coefficient: $D_g := 9.5 \cdot 10^{-6} \cdot \dfrac{m^2}{s}$

See Reid et al. (1987), pp. 587, 598

Half-life: $\mathrm{log\_t_{half}} := \mathrm{runif}(n, 7.4, 17.5)$

$t_{half_i} := 10^{\mathrm{log\_t}_{half_i}} \cdot s$ $\mathrm{median}(t_{half}) = 4.202 \times 10^{12}\, s$

$\min(t_{half}) = 2.563 \times 10^{7}\, s$

Bulk density: $\rho_b := \mathrm{runif}(n, 1470, 1850) \cdot kg \cdot m^{-3}$ $\mathrm{median}(\rho_b) = 1.691 \times 10^{3}\, m^{-3} \cdot kg$

Gas Concentration: $ppb := runif(n, 5900 \cdot 2, 5900 \cdot 10 \cdot 2)$

Waste zone length: $length := 430 \cdot .3048 \cdot m$

Waste zone width: $width := 300 \cdot .3048 \cdot m$

Minimum length and width is determined by size of pit 33 (10'x10')

Maximum length and width is determined by extent of MWL.

Waste zone thickness: $L := runif(n, 10 \cdot .3048, 27 \cdot .3048) \cdot m$ $\quad mean(L) = 5.507\,m$

Thickness of clean overburden: $L_c := runif(n, 6 \cdot .3048, 16 \cdot .3048) \cdot m$

6 to 16 feet nominal; 0 minimum is due to erosion

Darcy Infiltration: $q := runif\left(n, 1.18 \cdot 10^{-11}, 6.12 \cdot 10^{-11}\right) \cdot \frac{m}{s}$

Surface boundary-layer thickness: $d_{BL} := runif(n, 0.001, 1) \cdot m$

Tortuosity Factor: $\varepsilon_w := runif(n, 0.001, 1)$

(lower bound from Millington 1959; upper bound is physical limit) $\varepsilon_g := runif(n, 0.1, 1)$

US Environmental Protection Agency. 1988. Federal guidance report no. 11: limiting values of radionuclide intake and air concentration and dose conversion factors for inhalation, submersion, and ingestion, Eckerman, K.F., A.B. Wolbarst, and A.C.B. Richardson, Washington, DC: US Environmental Protection Agency. Report No.: EPA-5201/1-88-020.

Input Parameter Distributions for sensitivity analyses:

ϕ =

	1
1	0.302
2	...

ι =

	1
1	$3.327 \cdot 10^{-4}$
2	...

$m^3 \cdot kg^{-1}$

θ_w =

	1
1	0.128
2	...

L_c =

	1
1	3.672
2	...

m

q =

	1
1	$1.549 \cdot 10^{-11}$
2	...

$m \cdot s^{-1}$

d_{BL} =

	1
1	0.15
2	...

m

ε_w =

	1
1	0.05
2	...

ε_g =

	1
1	0.796
2	...

L =

	1
1	5.184
2	...

m

t_{half} =

	1
1	$5.269 \cdot 10^{14}$
2	...

s

ppb =

	1
1	$9.823 \cdot 10^{4}$
2	$9.827 \cdot 10^{4}$
3	$1.072 \cdot 10^{5}$
4	...

Calculated Parameters

Volume of waste zone: $V_i := length \cdot width \cdot L_i$

$$Cgas_i := \frac{ppb_i}{10^9} \cdot 0.84$$

partial pressure of PCE in atmospheres (where 0.84 is the atmospheric pressure in Albuquerque)

$$C_{o_i} := \frac{Cgas_i}{0.01} \cdot \frac{MW}{1000} \cdot kg \cdot m^{-3}$$

Liquid concentration

$max(Cgas) = 9.906 \times 10^{-5}$

0.01 is Henry's constant in atm-m^3/mol

$max(C_o) = 1.643 \times 10^{-3} m^{-3} \cdot kg$

$$inventory_i := C_{o_i} \cdot V_i$$

$max(inventory) = 146.083\,kg$

$min(inventory) = 10.586\,kg$

Retardation factor: $R_{L_i} := \rho_{b_i} \cdot K_{d_i} + \theta_{w_i} + a_i \cdot K_H$

Effective Diffusion Coefficient:

$$D_{E_i} := \frac{\left(\varepsilon_{w_i} \cdot D_w + \varepsilon_{g_i} \cdot K_H \cdot D_g\right)}{R_{L_i}}$$

Effective Velocity: $V_{E_i} := \dfrac{q_i}{R_{L_i}}$

Decay constant: $\mu_i := \dfrac{\ln(2)}{t_{half_i}}$

Surface mass-transfer coefficient: $H_{E_i} := \dfrac{D_g}{d_{BL_i}} \cdot \dfrac{K_H}{R_{L_i}}$

Note: $R_L/K_H = R_G$

Concentration as a function of depth (d_{wt}):

$ndepths := 41$

$j := 1 .. ndepths$

$d_{wt_j} := (j-1) \cdot 10 \cdot .3048 \cdot m$

Depths for concentration evaluation (m): 4/16/18: Changed d_{wt} to be depths (z) for concentration evaluation*

Time: $nyears := 1000$ $nsec := nyears \cdot 365.25 \cdot 24 \cdot 3600$ $t_j := nsec \cdot s$

Parameters for system with clean overburden plus source thickness

$$exp1_{i,j} := if\left[\frac{\left[H_{E_i} \cdot \left(H_{E_i} + V_{E_i}\right) \cdot t_j + \left(H_{E_i} + V_{E_i}\right) \cdot d_{wt_j}\right]}{D_{E_i}} > 700, 700, \frac{\left[H_{E_i} \cdot \left(H_{E_i} + V_{E_i}\right) \cdot t_j + \left(H_{E_i} + V_{E_i}\right) \cdot d_{wt_j}\right]}{D_{E_i}}\right]$$

$$exp2_i := if\left[\frac{H_{E_i} \cdot \left(L_i + L_{c_i}\right)}{D_{E_i}} > 700, 700, \frac{H_{E_i} \cdot \left(L_i + L_{c_i}\right)}{D_{E_i}}\right] \qquad exp3_{i,j} := if\left(\frac{V_{E_i} \cdot d_{wt_j}}{D_{E_i}} > 700, 700, \frac{V_{E_i} \cdot d_{wt_j}}{D_{E_i}}\right)$$

$$A1_{i,j} := erfc\left[\frac{d_{wt_j} - \left(L_i + L_{c_i}\right) - V_{E_i} \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right] \qquad A2_{i,j} := erfc\left(\frac{d_{wt_j} - V_{E_i} \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right) \qquad A3_{i,j} := erfc\left[\frac{d_{wt_j} + \left(L_i + L_{c_i}\right) + V_{E_i} \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right]$$

*The d_{wt} parameter was originally the depth to water table for water table concentrations. In this updated version, the d_{wt} represents the z (depth) parameter, and, instead of time, j, the $d_{wt,j}$ term represents an array of different depths at prescribed times of 26 and 58 years to span the gas concentrations at different depths.

$$A4_{i,j} := \mathrm{erfc}\left(\frac{d_{wt_j} + V_{E_i} \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right) \qquad A5_{i,j} := \exp\left(\exp1_{i,j}\right)$$

$$A6_{i,j} := \mathrm{erfc}\left[\frac{d_{wt_j} + \left(2 \cdot H_{E_i} + V_{E_i}\right) \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right] \qquad A7_{i,j} := \mathrm{erfc}\left[\frac{d_{wt_j} + \left(L_i + L_{c_i}\right) + \left(2 \cdot H_{E_i} + V_{E_i}\right) \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right]$$

Parameters for clean overburden alone:

$$\exp2c_i := \mathrm{if}\left(\frac{H_{E_i} \cdot L_{c_i}}{D_{E_i}} > 700, 700, \frac{H_{E_i} \cdot L_{c_i}}{D_{E_i}}\right)$$

$$A1c_{i,j} := \mathrm{erfc}\left(\frac{d_{wt_j} - L_{c_i} - V_{E_i} \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right) \qquad A3c_{i,j} := \mathrm{erfc}\left(\frac{d_{wt_j} + L_{c_i} + V_{E_i} \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right)$$

$$A7c_{i,j} := \mathrm{erfc}\left[\frac{d_{wt_j} + L_{c_i} + \left(2 \cdot H_{E_i} + V_{E_i}\right) \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right]$$

Concentration with just clean overburden:

$$C_{Tc_{i,j}} := 0.5 \cdot C_{o_i} \cdot \exp\left(-\mu_i \cdot t_j\right) \cdot \left[A1c_{i,j} - A2_{i,j} + \left(1 + \frac{V_{E_i}}{H_{E_i}}\right) \cdot \exp\left(\exp3_{i,j}\right) \cdot \left(A3c_{i,j} - A4_{i,j}\right) \ldots \atop + \left(2 + \frac{V_{E_i}}{H_{E_i}}\right) \cdot A5_{i,j} \cdot \left(A6_{i,j} - \exp\left(\exp2c_i\right) \cdot A7c_{i,j}\right)\right]$$

Concentration with clean overburden plus source thickness:

$$C_{Tt_{i,j}} := 0.5 \cdot C_{o_i} \cdot \exp\left(-\mu_i \cdot t_j\right) \cdot \left[A1_{i,j} - A2_{i,j} + \left(1 + \frac{V_{E_i}}{H_{E_i}}\right) \cdot \exp\left(exp3_{i,j}\right) \cdot \left(A3_{i,j} - A4_{i,j}\right) \ldots \\ + \left(2 + \frac{V_{E_i}}{H_{E_i}}\right) \cdot A5_{i,j} \cdot \left(A6_{i,j} - \exp\left(exp2_i\right) \cdot A7_{i,j}\right) \right]$$

Combined concentration using superposition (Jury et al., 1990, WRR, 26(1), 13-20).

$$C_{T_{i,j}} := C_{Tt_{i,j}} - C_{Tc_{i,j}}$$

$$\max\left(C_T\right) = 5.581 \times 10^{-7}\,m^{-3} \cdot kg$$

$$\max\left(C_{Tt}\right) = 6.931 \times 10^{-7}\,m^{-3} \cdot kg$$

$$C_{T_{i,j}} := \text{if}\left(C_{T_{i,j}} < 0, 0, C_{T_{i,j}}\right)$$

$$\max\left(C_{Tc}\right) = 1.35 \times 10^{-7}\,m^{-3} \cdot kg$$

$$C_{g_{i,j}} := \frac{C_{T_{i,j}}}{\frac{R_{L_i}}{K_H}}$$

$$nyears = 1 \times 10^{3}$$ Definition of nyears set above

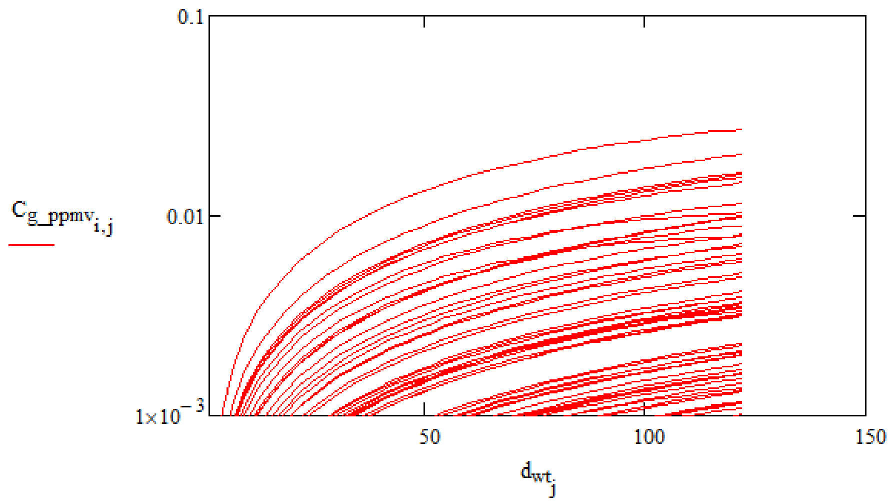
$$C_{g\_ppmv_{i,j}} := C_{g_{i,j}} \cdot \frac{\frac{8310 \cdot 293}{MW}}{84000} \cdot 10^{6}$$

This is the concentration in ppmv

$C_{g\_ppmv} =$

	1	2	3
1	0	$3.573 \cdot 10^{-5}$	$7.306 \cdot 10^{-5}$
2	0	$6.917 \cdot 10^{-6}$	$1.393 \cdot 10^{-5}$
3	0	$1.883 \cdot 10^{-5}$	$3.823 \cdot 10^{-5}$
4	0	$5.228 \cdot 10^{-6}$	$1.055 \cdot 10^{-5}$
5	0	$4.767 \cdot 10^{-6}$	...

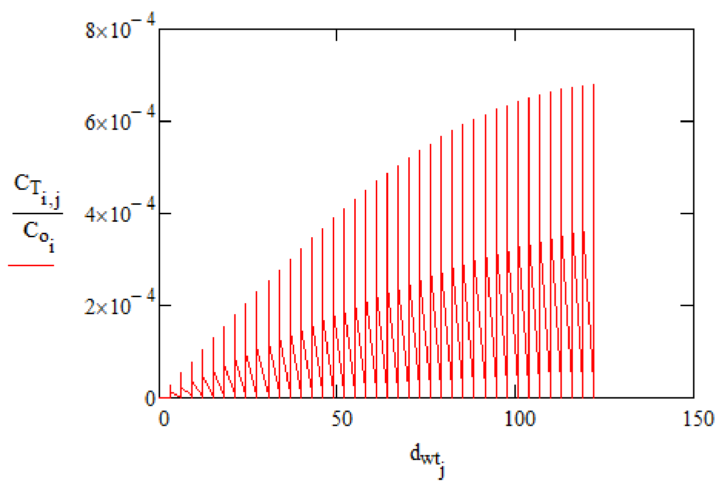
$m^{-3} \cdot kg$



$nyears = 1 \times 10^{3}$ Definition of nyears set above

$\max(C_{g\_ppmv}) = 0.027\,m^{-3} \cdot kg$

$\mathrm{mean}(C_{g\_ppmv}) = 1.637 \times 10^{-3}\,m^{-3} \cdot kg$



Mathcad® Model to Determine Groundwater Concentrations as a Function of Time

Concentration at water table as a function of time:

$ntimes := 100$

$j := 1 .. ntimes$

$nyears := 1000$

$nsec := nyears \cdot 365.25 \cdot 24 \cdot 3600$

The d_{wt} parameter can be assigned a constant value ($d_{wt,i}$) to simulate concentrations at different depths.

Time: $t_j := \frac{j}{ntimes} \cdot nsec \cdot s$

$erfc(x) := 1 - erf(x)$

$d_{wt} = $

	1
1	146.778
2	...

m

Parameters for system with clean overburden plus source thickness

$$exp1_{i,j} := if\left[\frac{\left[H_{E_i}\cdot\left(H_{E_i}+V_{E_i}\right)\cdot t_j+\left(H_{E_i}+V_{E_i}\right)\cdot d_{wt_i}\right]}{D_{E_i}} > 700, 700, \frac{\left[H_{E_i}\cdot\left(H_{E_i}+V_{E_i}\right)\cdot t_j+\left(H_{E_i}+V_{E_i}\right)\cdot d_{wt_i}\right]}{D_{E_i}}\right]$$

$$exp2_i := if\left[\frac{H_{E_i}\cdot\left(L_i+L_{c_i}\right)}{D_{E_i}} > 700, 700, \frac{H_{E_i}\cdot\left(L_i+L_{c_i}\right)}{D_{E_i}}\right] \qquad exp3_i := if\left(\frac{V_{E_i}\cdot d_{wt_i}}{D_{E_i}} > 700, 700, \frac{V_{E_i}\cdot d_{wt_i}}{D_{E_i}}\right)$$

$$A1_{i,j} := erfc\left[\frac{d_{wt_i}-\left(L_i+L_{c_i}\right)-V_{E_i}\cdot t_j}{\sqrt{4\cdot D_{E_i}\cdot t_j}}\right] \qquad A2_{i,j} := erfc\left(\frac{d_{wt_i}-V_{E_i}\cdot t_j}{\sqrt{4\cdot D_{E_i}\cdot t_j}}\right)$$

$$A4_{i,j} := erfc\left(\frac{d_{wt_i}+V_{E_i}\cdot t_j}{\sqrt{4\cdot D_{E_i}\cdot t_j}}\right) \qquad A5_{i,j} := exp\left(exp1_{i,j}\right) \qquad A3_{i,j} := erfc\left[\frac{d_{wt_i}+\left(L_i+L_{c_i}\right)+V_{E_i}\cdot t_j}{\sqrt{4\cdot D_{E_i}\cdot t_j}}\right]$$

$$A6_{i,j} := erfc\left[\frac{d_{wt_i}+\left(2\cdot H_{E_i}+V_{E_i}\right)\cdot t_j}{\sqrt{4\cdot D_{E_i}\cdot t_j}}\right] \qquad A7_{i,j} := erfc\left[\frac{d_{wt_i}+\left(L_i+L_{c_i}\right)+\left(2\cdot H_{E_i}+V_{E_i}\right)\cdot t_j}{\sqrt{4\cdot D_{E_i}\cdot t_j}}\right]$$

Parameters for clean overburden alone:

$$exp2c_i := \text{if}\left(\frac{H_{E_i} \cdot L_{c_i}}{D_{E_i}} > 700, 700, \frac{H_{E_i} \cdot L_{c_i}}{D_{E_i}}\right)$$

$$A1c_{i,j} := \text{erfc}\left(\frac{d_{wt_i} - L_{c_i} - V_{E_i} \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right) \qquad A3c_{i,j} := \text{erfc}\left(\frac{d_{wt_i} + L_{c_i} + V_{E_i} \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right)$$

$$A7c_{i,j} := \text{erfc}\left[\frac{d_{wt_i} + L_{c_i} + \left(2 \cdot H_{E_i} + V_{E_i}\right) \cdot t_j}{\sqrt{4 \cdot D_{E_i} \cdot t_j}}\right]$$

Concentration with just clean overburden:

$$C_{Tc_{i,j}} := 0.5 \cdot C_{o_i} \cdot \exp\left(-\mu_i \cdot t_j\right) \cdot \left[A1c_{i,j} - A2_{i,j} + \left(1 + \frac{V_{E_i}}{H_{E_i}}\right) \cdot \exp\left(exp3_i\right) \cdot \left(A3c_{i,j} - A4_{i,j}\right) \ldots + \left(2 + \frac{V_{E_i}}{H_{E_i}}\right) \cdot A5_{i,j} \cdot \left(A6_{i,j} - \exp\left(exp2c_i\right) \cdot A7c_{i,j}\right)\right]$$

Concentration with clean overburden plus source thickness:

$$C_{Tt_{i,j}} := 0.5 \cdot C_{o_i} \cdot \exp\left(-\mu_i \cdot t_j\right) \cdot \left[A1_{i,j} - A2_{i,j} + \left(1 + \frac{V_{E_i}}{H_{E_i}}\right) \cdot \exp\left(exp3_i\right) \cdot \left(A3_{i,j} - A4_{i,j}\right) \ldots + \left(2 + \frac{V_{E_i}}{H_{E_i}}\right) \cdot A5_{i,j} \cdot \left(A6_{i,j} - \exp\left(exp2_i\right) \cdot A7_{i,j}\right)\right]$$

Combined concentration using superposition (Jury et al., 1990, WRR, 26(1), 13-20).

$$C_{T_{i,j}} := C_{Tt_{i,j}} - C_{Tc_{i,j}}$$

$$\max(C_T) = 3.464 \times 10^{-6} m^{-3} \cdot kg$$

$$\max(C_{Tt}) = 3.974 \times 10^{-6} m^{-3} \cdot kg$$

$$C_{T_{i,j}} := \text{if}\left(C_{T_{i,j}} < 0, 0, C_{T_{i,j}}\right)$$

$$\max(C_{Tc}) = 6.647 \times 10^{-7} m^{-3} \cdot kg$$

$$\max(C_L) = 1.128 \times 10^{-5} m^{-3} \cdot kg$$

$$\text{median}(C_L) = 5.736 \times 10^{-8} m^{-3} \cdot kg$$

$$C_{L\_\mu g\_L_{i,j}} := C_{L_{i,j}} \cdot 10^{6}$$

$$\max(C_{L\_\mu g\_L}) = 11.278 m^{-3} \cdot kg$$

This is the concentration in ppb

References

Ho, C.K., T.J. Goering, J.L. Peace, and M.L. Miller, 2005. Probabilistic Performance-Assessment Modeling of the Mixed Waste Landfill at Sandia National Laboratories, SAND2005-6888, Sandia National Laboratories, Albuquerque, NM.

Ho, C.K., T.J. Goering, J.L. Peace, and M.L. Miller, 2007. Probabilistic Performance-Assessment Modeling of the Mixed Waste Landfill at Sandia National Laboratories (2nd Edition), SAND2007-0170, Sandia National Laboratories, Albuquerque, NM.

Jury, W.A., W.F. Spencer, and W.J. Farmer, 1983. Behavior Assessment Model for Trace Organics in Soil: I. Model Description, Journal of Environmental Quality, 12(4), p. 558-564.

Jury, W.A., D. Russo, G. Streile, and H. Elabd, 1990. Evaluation of Volatilization by Organic-Chemicals Residing Below the Soil Surface, Water Resources Research, 26(1), p. 13-20.

Reid, R.C., J.M. Prausnitz, and B.E. Poling, 1987. The properties of gases and liquids, 4th ed., McGraw-Hill, New York, x, 741 p.

Sandia National Laboratories, New Mexico (SNL/NM), November 2005. “Mixed Waste Landfill Corrective Measures Implementation Plan,” Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

APPENDIX D
Supporting Documentation for Evaluations of Mixed Waste Landfill Excavation with Offsite and Onsite Disposal Alternatives

APPENDIX D-1
Inventory Waste Distribution, Soil Volumes, and Excavation Site Plan (3-D CADD)

Guidelines Used for Categorizing Mixed Waste Landfill Excavated Contents and Soil for the Purpose of Disposal

The guidelines and rationale presented below were developed based upon a review of items listed in the Mixed Waste Landfill (MWL) inventory (Table D1-1) and a review of waste acceptance criteria (WAC), effective January 2018, applicable to the facilities proposed for ultimate disposition of MWL debris and soil. The same guidelines were used for ultimate disposition in an onsite engineered cell. Once categorized, the total number of items by waste category and package type was counted for each trench and the combined pits. Volume percentage estimates were calculated for each waste and package type by comparing this information to the total number of items counted for that trench or the combined pits. The volume percentages for each trench and the combined pits were then applied to the total debris volume to estimate the volume, in cubic yards, by waste and package type. This information can be found in the summary blocks following each trench and the combined pits in the *Inventory Table* (Table D1-1). The estimated volume for each trench and pit, by waste type, are summarized in the *Debris Volume Table* (Table D1-2).

“Unclassified” vs. “Classified” Areas

The MWL includes two disposal areas; the Unclassified Area (2.0 acres, 7 trenches, 1 only partially filled) and the Classified Area (0.6 acres, 41 pits, 3 which contain no waste). Figure D1-1, *Excavation Site Plan*, shows the two areas and the location of the pits and trenches. During the MWL operational period, some classified waste was disposed in the Unclassified Area trenches, and some unclassified waste was disposed in the Classified Area pits. Therefore, all contents excavated from both areas would be subject to a classification screen or check as part of the waste management process.

Package Types

During excavation, it is assumed most waste will be inseparable from adjacent items and debris. Waste removed from an MWL trench or pit would initially be separated based upon the package type (defined below). The following criteria were used to assign an anticipated package type of Discrete or Non-Discrete to items listed in the MWL inventory:

Discrete

Items that may be identified, based upon their size, weight, or other distinguishing feature, as a distinct piece of equipment or waste receptacle exceeding a defined volume were assigned the package type of Discrete. Consideration was also given to certain prohibited items in the WAC for proposed disposal facilities. Discrete items include the following:

- Items greater than or equal to the size or volume of a 32-gallon drum with the structural integrity to remain intact
- Debris held in any type of cask (e.g., lead, Hallum, helicopter, Yankee)

- Weapons that could have reactive or explosive components (e.g., Gatling gun, Polaris missile sections) due to prohibited status at proposed waste disposal facilities

- Concrete and lead bricks, due to their weight and unique shape

- Items with a distinguishable shape or substantial weight (e.g., 128 ft^2 of sheet metal, 300 lb of paraffin, 300-lb crucible, aircraft engine, hemisphere/sphere, shield doors, reactor vessel sections, gas/steel cylinders, semi-trailer carriage, piping of large dimensions)

Non-Discrete

Debris that could not be distinguished as Discrete was assigned the package type of Non-Discrete. Examples of this package type include routine miscellaneous items such as plastic, wood, paper, wire, metal, plastic bags of PPE and decontamination materials such as wipes, and various test debris.

Waste Categories

Waste categories (i.e., waste streams) were chosen based upon WAC definitions and requirements applicable to the facilities proposed for ultimate disposition. The Table D1-1 includes a column that indicates the assigned waste category for each entry.

Due to the nature of MWL disposal practices, all waste (including soil) generated from excavation of the MWL disposal areas is assumed to be radioactive (i.e., at a minimum, low-level waste). The Table D1-1 is a listing of entries for items contained in each trench or pit. Each entry has been classified into one of three waste categories described below: Low Level Waste (LLW), Mixed Waste (MW) or Transuranic (TRU) Waste. Soil excavated with MWL debris would be analyzed for radioactivity and hazardous constituents and stored appropriately for ultimate disposition as LLW or MW. It is not anticipated that any soil excavated from the MWL will meet the requirements to be categorized as TRU waste. A fourth category has been added for Replaceable Soil, which is not waste.

Low Level Waste

LLW is defined as radioactive waste that is not high-level radioactive waste, spent nuclear fuel, TRU waste, byproduct material (as defined in section 11e.(2) of the Atomic Energy Act of 1954, as amended), or naturally occurring radioactive material.

The following are examples of LLW from the MWL inventory:

- Wood, construction materials, other packaging materials, and various debris unless it is obvious that these materials have been used in conjunction with known Resource Conservation and Recovery Act (RCRA) metals (e.g., packaging materials surrounded by lead)

- High efficiency particulate air (HEPA) filters, pre-filters, vacuum filters, unless it is obvious that these materials have been used in conjunction with known RCRA metals (e.g., vacuum was used to clean lead shavings)
- Depleted uranium (DU)
- Tritium contaminated items and materials
- Items contaminated with multiple fission products (MFP)

This waste stream includes all known or suspected LLW not included in the MW or TRU waste streams described below.

Mixed Waste

MW contains both radioactive and hazardous components as defined by the Atomic Energy Act of 1954 (as amended) and the RCRA. MW shall meet the Land Disposal Restrictions (LDR) as required by the Environmental Protection Agency (EPA) in 40 CFR 268 and, in New Mexico, as adopted in 20.4.1.800 of the New Mexico Administrative Code (NMAC).

The EPA lists the following eight metals as RCRA waste: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. The following are examples of MWL inventory items categorized as MW, based primarily on the relatively common occurrence of these metals:

- Electrical components, TV cameras, and related devices because they likely contain RCRA metals in electronics/circuit boards
- Motor assemblies and other engines because they could have RCRA-listed components
- Items composed of metals paired with RCRA-listed metals (e.g., aluminum ladder with a lead ballast)
- Items containing brass due to potential lead in the alloy (per SNL waste management practices)
- Heating elements because they likely contain RCRA-listed metals (e.g., chromium in coils)
- Air conditioners because they could contain hydrochlorofluorocarbons (HCFCs) and RCRA-listed metals in coils
- Casks or containers with lead shielding, or specified for shipping (assumed to contain lead for shielding)
- Sealed sources because they are likely to contain RCRA-listed metal components

- Routine operational and/or miscellaneous decontamination waste because they likely contain RCRA-listed metals

- Items containing oils and/or solvents

Although lead is not considered hazardous under RCRA when used specifically for radiation shielding, if lead is present or inferred based on the inventory description, the item was categorized as MW for this evaluation.

This waste stream includes all items that were assigned a package type of “non-discrete.” The decision to take this conservative approach is explained in Section 5.3.4.4 of the main report, and is consistent with SNL waste management practices.

TRU Waste

TRU waste is defined as waste (i.e., items or debris) known or suspected of containing elements with atomic numbers greater than 92 and half-lives greater than 20 years, in concentrations greater than 100 nanocuries per gram (nCi/g) of alpha-emitting isotopes.

As stated earlier in this summary, excavated waste will largely be inseparable from adjacent debris. Therefore, only discrete items would be managed separately as potential TRU waste based on the waste characterization process. Although the probability of generating waste that meets the “greater than 100 nCi/g of alpha-emitting isotopes” requirement for TRU waste is very low, for the purposes of this evaluation, items that could potentially meet the definition of TRU waste have been categorized as such. Only one such item was identified in Pit SP-2 of the Classified Area (Table D1-1).

Replaceable Soil

Replaceable soil is defined as soil excavated from the MWL that can be returned to the excavation based upon characterization sample results meeting risk-based criteria. Soil excavated to expose the waste and perform the operation safely that are not from the disposal areas (e.g., three-foot soil cover over the trenches) would be stockpiled separately from contaminated soil and sampled to confirm the soil meets risk-based levels. Replaceable soil would be used as backfill material after completing the excavation.

Table D1-1
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
Unclassified Area Trenches						
Trench A	**1,331**	Differential Amplifiers	X			Non-Discrete
A		thermocouples	X			Non-Discrete
A		compressors	X			Non-Discrete
A		MFP and tritium-contaminated fume hoods, ducting, motors, fans, and plenums	X			Non-Discrete
A		TV cameras, tripods, and telemetry components	X			Non-Discrete
A		MFP-contaminated cooling systems, coils, surge tanks (5 ft. D x 11 ft. H), piping, pumps, couplings, and valves		X		Discrete
A		experimental stainless steel canisters	X			Non-Discrete
A		17 each 55-gallon drums containing MFP-contaminated demineralizer resin		X		Discrete
A		2 each 55-gallon drums of MFP contaminated concrete		X		Discrete
A		empty oxygen cylinders		X		Discrete
A		boxes of fluorescent light bulbs	X			Non-Discrete
A		roll-up door and associated equipment from a TA-5 KIVA		X		Discrete
A		shield door from reactor pit	X			Discrete
A		voltage controlled oscillators, calibrators, and gyros	X			Non-Discrete
A		irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components	X			Non-Discrete
A		tritium luminary dials	X			Non-Discrete
A		military radium altimeters and gauges	X			Non-Discrete
A		Ni-63 tube	X			Non-Discrete
A		parachute	X			Non-Discrete
A		Sr-90 nuclear cells	X			Non-Discrete
A		flash heating equipment and associated parts	X			Non-Discrete
A		MFP-contaminated L-shaped aluminum chassis	X			Non-Discrete
A		DU in graphite matrix	X			Non-Discrete
A		stainless steel ducting	X			Non-Discrete
A		61 each spark gap tubes (100 mrem/hr on contact)	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
A		aluminum sleeve with lead ballast	X			Non-Discrete
A		tritium beds and valves	X			Non-Discrete
A		shock jigs with tubes	X			Non-Discrete
A		31 each 0.5 Ci Kr-85 tubes and cells	X			Non-Discrete
A		one each 20 ft. X 2 ft. diameter heat exchanger, coolant pumps, piping and valving	X			Discrete
A		air conditioners	X			Non-Discrete
A		tritium targets (10ci each) and tubes (100 mCi each)	X			Non-Discrete
A		wooden ladder	X			Non-Discrete
A		MFP, DU, and tritium-contaminated vacuum cleaners	X			Non-Discrete
A		vacuum pumps and skids	X			Non-Discrete
A		stainless steel sample tubes	X			Non-Discrete
A		irradiated metal samples (5 rem/hr on contact)	X			Discrete
A		ion generators	X			Non-Discrete
A		5-gallons of oil absorbed on vermiculite in sealed A/N can	X			Non-Discrete
A		128 ft^2 of sheet metal		X		Discrete
A		300 lb. of paraffin	X			Discrete
A		12 each skids of MFP contaminated-concrete blocks, MFP-contaminated lead bricks	X			Discrete
A		2,600 kg DU	X			Non-Discrete
A		943 ft^3 of TA-5 routine operational and miscellaneous decontamination waste	X			Non-Discrete

	MW	LLW	TRU	Discrete/ Non-Discrete Items	Total Counted
Trench A Total Items	**38**	**6**	**0**	**11 / 33**	**44**
% of total debris volume	**86%**	**14%**	**0%**	**25% / 75%**	**100%**
Debris Volume (cy)	**1145**	**186**	**0**	**333 / 998**	**1331**

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
Trench B	**1475**	HEPA filters, fiberglass filters, final and prefilters	X			Non-Discrete
B		MFP, DU and tritium-contaminated vacuum cleaners	X			Non-Discrete
B		cables	X			Non-Discrete
B		ultra-sonic air samplers	X			Non-Discrete
B		irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components	X			Non-Discrete
B		MFP and tritium-contaminated fume hoods, ducting, motors, fans, and plenums	X			Non-Discrete
B		boxes of fluorescent light bulbs	X			Non-Discrete
B		sanding disks	X			Non-Discrete
B		neutron generator tubes	X			Non-Discrete
B		backing plates from TA-5 experimental apparatus	X			Non-Discrete
B		packing materials and wooden shipping crates	X			Non-Discrete
B		metal drums from Nevada Test Site containing DU		X		Discrete
B		alpha contaminated gas bottles	X			Non-Discrete
B		empty liquid scintillation vials	X			Non-Discrete
B		Ta-182 contaminated platinum-tungsten scrap	X			Non-Discrete
B		heater elements	X			Non-Discrete
B		10 Ci tritium targets	X			Non-Discrete
B		neutron generator magnets	X			Non-Discrete
B		14 each empty steel gas cylinders contaminated with DU		X		Discrete
B		9 each MFP-contaminated ceramic tubes	X			Non-Discrete
B		1.5 gallons of solvents absorbed on vermiculite in sealed A/N cans	X			Non-Discrete
B		6 each small storage cabinets	X			Non-Discrete
B		vacuum system components including water circulators, valves, diffusion pumps, fittings, gas analyzers, and vacuum pumps	X			Non-Discrete
B		gas sample bottles from Nevada Test Site	X			Non-Discrete
B		tritium-contaminated tools	X			Non-Discrete
B		DU metal shavings and cuttings	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
B		Victoreen Sr-90 ion chambers	X			Non-Discrete
B		glove box and work bench	X			Non-Discrete
B		demineralizer vessel from reactor	X			Non-Discrete
B		neutron radiograph equipment	X			Non-Discrete
B		thermal reflecting rings	X			Non-Discrete
B		micro scales	X			Non-Discrete
B		Kr-85 light sources	X			Non-Discrete
B		11 kg deuterium containing 0.25 Ci of tritium	X			Non-Discrete
B		1-gallon toluene absorbed on vermiculite in sealed A/N can	X			Non-Discrete
B		static meter	X			Non-Discrete
B		Ta-182 pellets	X			Non-Discrete
B		demineralization and radiography tubes	X			Non-Discrete
B		1,326 ft3 of TA-5 routine operational and miscellaneous decontamination waste	X			Non-Discrete

	MW	LLW	TRU	Discrete/ Non-Discrete Items	Total Counted
Trench B Total Items	**37**	**2**	**0**	**2 / 37**	**39**
% of total debris volume	**95%**	**5%**	**0%**	**5% / 95%**	**100%**
Debris Volume (cy)	**1401**	**74**	**0**	**74 / 1401**	**1475**

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
Trench C	**1192**	Nuclear fuel shipping cask, cleanup debris		X		Discrete
C		tritium and C-14 labeled amino acids and tritium labeled uridine	X			Non-Discrete
C		scrap metal contaminated with DU from burn test	X			Non-Discrete
C		7.1 Ci tritium pellets	X			Non-Discrete
C		uranyl nitrate	X			Non-Discrete
C		dining car test hardware	X			Non-Discrete
C		MFP, DU, and tritium-contaminated vacuum cleaners	X			Non-Discrete
C		vacuum hose contaminated during cleaning of thorium cloth and thorium cloth debris	X			Non-Discrete
C		concrete crucibles used in reactor safety studies	X			Non-Discrete
C		Kr-85 particle size analyzer	X			Non-Discrete
C		1,000 lead bricks contaminated with tritium and Na-22	X			Discrete
C		43 MFP-contaminated lead bricks	X			Discrete
C		73 each integrated circuits	X			Non-Discrete
C		Ba-133 reactor bolts	X			Non-Discrete
C		flexible glove box ducting	X			Non-Discrete
C		2 each mechanical vacuum pumps	X			Non-Discrete
C		Sr-90 contaminated carpet	X			Non-Discrete
C		Cs-137 spark gaps	X			Non-Discrete
C		Na-22 cleanup materials, source holders, and shield (1.5 rem/hr on contact)		X		Discrete
C		DU-contaminated waste containers	X			Non-Discrete
C		tritium-contaminated vacuum system and power supply	X			Non-Discrete
C		DU billet, hemisphere, and sphere		X		Discrete
C		Pu-238 contaminated hood exhaust hose	X			Non-Discrete
C		Co-60 debris from trailer used to support nuclear fuel shipping cask	X			Non-Discrete
C		MFP-contaminated hot exhaust system prefilters, HEPA filters, and absolute pressure filters	X			Non-Discrete
C		containerized DU residue, turnings, metal workings, and cuttings	X			Non-Discrete
C		surge voltage arrester	X			Non-Discrete
C		tritium-contaminated pump	X			Non-Discrete
C		irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components	X			Non-Discrete
C		wooden shipping crates	X			Non-Discrete
C		13 each Po-210 contaminated static eliminators	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
C		one each 62 mCi Se-75 source and one each 1.0 mCi Ta-182 source in sealed A/N can	X			Non-Discrete
C		tritium-contaminated fume hood and exhaust plenum	X			Non-Discrete
C		2.0 kg deuterium absorbed on vermiculite in sealed A/N can	X			Non-Discrete
C		12 each 55 gallon drums of MFP-contaminated spent demineralizer resin		X		Discrete
C		DU-contaminated Lucite table	X			Non-Discrete
C		4 each TV cameras	X			Non-Discrete
C		tritium-contaminated ion pump	X			Non-Discrete
C		1-gallon tritium-contaminated acetone solidified with Safe-T-Set	X			Non-Discrete
C		24 kg Li-6 fluoride	X			Non-Discrete
C		4 each irradiated high speed cameras, lenses, and one telescope	X			Non-Discrete
C		one each 0.1 mCi Ra-226/Be source encapsulated in concrete filled A/N can	X			Non-Discrete
C		2 each DU-contaminated glove boxes	X			Non-Discrete
C		32.1 Ci tritium	X			Non-Discrete
C		377 kg DU	X			Non-Discrete
C		Trace Eu-152, Ba-133, I-129, Na-22, Sr-90, Ni-63, Tc-99, Gd-153, Ag-110m, Pm-147, Sr-85, Sb-125, Ta-182, Ge-68, Mn-54, and Fe-55	X			Non-Discrete
C		1,159 ft3 of TA-5 routine operational and miscellaneous decontamination waste	X			Non-Discrete

	MW	LLW	TRU	Discrete/ Non-Discrete Items	Total Counted
Trench C Total Items	**43**	**4**	**0**	**6 / 41**	**47**
% of total debris volume	**91%**	**9%**	**0%**	**13% / 87%**	**100%**
Debris Volume (cy)	**1085**	**107**	**0**	**155 / 1037**	**1192**

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
Trench D	**3332**	Compensator and cables from TA-1	X			Non-Discrete
D		tritium-contaminated water and erbium tritide powder	X			Non-Discrete
D		DU-contaminated rocket motors	X			Discrete
D		broken Ra-226 source in plastic holder	X			Non-Discrete
D		corroded and broken 6-ft aluminum step ladder	X			Non-Discrete
D		13 each 55 gallon drums containing MFP-contaminated spent demineralizer resin		X		Discrete
D		DU residue, turnings, metal workings, and cuttings	X			Non-Discrete
D		MFP-contaminated tape recorders, transmitters, and video cameras	X			Non-Discrete
D		MFP-contaminated compensated ion chamber	X			Non-Discrete
D		irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators and other miscellaneous electrical components	X			Non-Discrete
D		4 each aluminum TA-5 KIVA doors from reactor		X		Discrete
D		PEG housing and lid from Nevada Test Site	X			Non-Discrete
D		MFP-contaminated fuel holsters	X			Non-Discrete
D		ultra filters and ultra filter plenums	X			Non-Discrete
D		MFP-contaminated hot exhaust system prefilters, absolute pressure filters, and plenums	X			Non-Discrete
D		HEPA filters	X			Non-Discrete
D		MFP-contaminated conduit and sheet metal	X			Non-Discrete
D		2 each sealed Cr-57 sources	X			Non-Discrete
D		TA-1 Bldg. 802 construction materials and scrap	X			Non-Discrete
D		MFP-, DU-, and tritium-contaminated vacuum cleaners	X			Non-Discrete
D		TA-5 liquid waste disposal system drain pipes	X			Non-Discrete
D		Cypress packaging materials from Nevada Test Site	X			Non-Discrete
D		Ming Vaso rad test debris from Nevada Test Site	X			Non-Discrete
D		Snap 27 test debris	X			Non-Discrete
D		Hudson Moon cleanup and packaging materials from Nevada Test Site	X			Non-Discrete
D		Mint Leaf packaging and clean-up materials from Nevada Test Site	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
D		Diana Mist packaging and cleanup materials from Nevada Test Site	X			Non-Discrete
D		Thoria cleanup and packaging materials from Nevada Test Site	X			Non-Discrete
D		old KIVA floor including sheet-rock, wood and miscellaneous waste from installation of new KIVA floor	X			Non-Discrete
D		MFP-contaminated spent demineralizer columns and cartridges	X			Non-Discrete
D		Thoria crucibles and tubing	X			Non-Discrete
D		old reactor boiler with associated radiators, piping, and valves		X		Discrete
D		activated reactor stainless steel support tower, cryostat tube and head	X			Non-Discrete
D		empty thorium impact capsules	X			Non-Discrete
D		empty wooden shipping crates for fuel elements	X			Non-Discrete
D		tritium-contaminated power supply, balance, volt meter, ammeter, bridge, vacuum pump, microscope mount, plug-in units, and glass tubes	X			Non-Discrete
D		neutron radiography tube and beam catcher	X			Non-Discrete
D		ultra-sonic bath and power unit	X			Non-Discrete
D		obsolete Bell Labs experimental core tube (10 rem/hr on contact)		X		Discrete
D		2,315 ft^3 of TA-5 routine operational and miscellaneous decontamination waste	X			Non-Discrete

	MW	LLW	TRU	Discrete/ Non-Discrete Items	Total Counted
Trench D Total Items	**36**	**4**	**0**	**5 / 35**	**40**
% of total debris volume	**90%**	**10%**	**0%**	**13% / 87%**	**100%**
Debris Volume (cy)	**2999**	**333**	**0**	**433 / 2899**	**3332**

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
Trench E	**1155**	38 each 55-gallon drums of MFP-contaminated spent demineralizer resin		X		Discrete
E		7 each 55-gallon drums from Three Mile Island containing MFP-contaminated cables, instruments, and electronic components	X			Discrete
E		11 each Po-210 contaminated static eliminators	X			Non-Discrete
E		10 gallons Cs-137 solution solidified with Safe-T-Set in sealed A/N can	X			Non-Discrete
E		oil from lapidary shop solidified with soil in sealed A/N can	X			Non-Discrete
E		irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components	X			Non-Discrete
E		6 each irradiated 9 ft. X 10 in. X 9 in. long dia. stainless steel storage tubes and holding rings	X			Non-Discrete
E		activated top and bottom reactor vessel sections		X		Discrete
E		motor assembly	X			Non-Discrete
E		gatling gun cask		X		Discrete
E		hydraulic pumps	X			Non-Discrete
E		ion pumps	X			Non-Discrete
E		steel frame and motor assembly from TA-5 KIVA door	X			Non-Discrete
E		burned wood from weapons experiment	X			Non-Discrete
E		2 each burned empty 55-gallon drums	X			Non-Discrete
E		MFP-contaminated vacuum pumps	X			Non-Discrete
E		obsolete and old test equipment and materials used in reactor fuel tests	X			Non-Discrete
E		DU-contaminated glove box	X			Non-Discrete
E		HEPA filters from hot exhaust plenum	X			Non-Discrete
E		DU-contaminated vacuum and filtering system bracket and assembly	X			Non-Discrete
E		DU-contaminated machine shop cabinets, work tables filters, and ground cloths	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
E		4 each TV cameras	X			Non-Discrete
E		45 Ci neutron generator tubes	X			Non-Discrete
E		DU-contaminated crucibles	X			Non-Discrete
E		janitorial barrels	X			Non-Discrete
E		vacuum pumps	X			Non-Discrete
E		file cabinets	X			Non-Discrete
E		70 lb. thoria-contaminated soil	X			Non-Discrete
E		tritium-contaminated ion pump	X			Non-Discrete
E		one damaged DU-contaminated shake table or vibrator for sieving powdered DU	X			Non-Discrete
E		10,000 lb. of decommissioned reactor debris from extensive modifications to the reactor including ventilation ducts, conduit, PVC, nuts and bolts, hot water radiators, metal support parts, concrete, insulation, cable, air blowers, camera equipment, light bulbs, metal stands, electronic equipment, vacuum cleaners, pumps, coveralls, lumber, scaffolding, tables, chairs, gauges, regulators, valves, glove boxes, and stainless steel	X			Non-Discrete
E		2,500 ft^3 of DU-contaminated soil	X			Non-Discrete
E		plywood ventilation duct	X			Non-Discrete
E		Mettler balance	X			Non-Discrete
E		Sartorius balance	X			Non-Discrete
E		fume hood	X			Non-Discrete
E		Magniwhirl bath	X			Non-Discrete
E		lab furnace	X			Non-Discrete
E		obsolete fire alarm system and associated electrical equipment	X			Non-Discrete
E		scrap wire	X			Non-Discrete
E		11 each 55-gallon drums numbered 1 through 11: drums 1 through 3 contain 18 nanocuries/gram alpha emitters, drums 4 through 11 contain 8 nanocuries/gram alpha emitters		X		Discrete
E		2 kg thorium	X			Non-Discrete
E		8 kg DU	X			Non-Discrete
E		122 Ci tritium	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
E		Trace amounts of Ce-144, K-40, Zr-95, Nb-95, Sr-85, Eu-152, Eu-155, Ni-63, and Po-210	X			Non-Discrete
E		119 each 55-gallon drums of radioactive waste from Inhalation Toxicology Research Institute		X		Discrete
E		13 plywood boxes of radioactive waste from Inhalation Toxicology Research Institute (ITRI)	X			Non-Discrete
E		1,093 ft^3 TA-5 routine operational and miscellaneous decontamination waste	X			Non-Discrete

	MW	LLW	TRU	Discrete/ Non-Discrete Items	Total Counted
Trench E Total Items	**43**	**5**	**0**	**6 / 42**	**48**
% of total debris volume	**90%**	**10%**	**0%**	**13% / 87%**	**100%**
Debris Volume (cy)	**1039**	**116**	**0**	**150 / 1005**	**1155**

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
Trench F	**1995**	Tritium and DU-contaminated glove boxes	X			Non-Discrete
F		11 concrete blocks from U-238 melt		X		Discrete
F		U-contaminated concrete blocks and large steel plates used in a penetrator test		X		Discrete
F		ducting	X			Non-Discrete
F		stainless steel	X			Non-Discrete
F		steel plates from penetration tests	X			Non-Discrete
F		6 each 55-gallon poly drums containing MFP-contaminated spent demineralizer resin		X		Discrete
F		aircraft engine	X			Discrete
F		weapons components	X			Non-Discrete
F		MFP-contaminated weapons components	X			Non-Discrete
F		4 each drums from White Sands Missile Range		X		Discrete
F		soil from cask site	X			Non-Discrete
F		DU-contaminated crushed gravel	X			Non-Discrete
F		lathe	X			Non-Discrete
F		wooden shipping crates	X			Non-Discrete
F		steel cladding and zirconium insulation	X			Non-Discrete
F		dilute nitric acid neutralized with $CaCO_3$, Na_2CO_3, and $NaHCO_3$ and solidified with yellow powder material	X			Non-Discrete
F		Electro-glo electropolishing agent solution with concentrated phosphoric acid neutralized with Na_2CO_3 and NaOH and solidified with yellow powder material	X			Non-Discrete
F		lab benches	X			Non-Discrete
F		metal table	X			Non-Discrete
F		two each glove boxes	X			Non-Discrete
F		resin beds	X			Non-Discrete
F		oscillatron scope cameras with thorium lenses	X			Non-Discrete
F		HEPA and prefilters	X			Non-Discrete
F		MFP-contaminated Hallum cask - 19ft long x 3 ft. diameter, 40 tons. Consists of two stainless steel cylinders separated by 8.5 inches of lead shielding in the annulus	X			Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
F		MFP-contaminated Helicopter cask - weighs 3 tons. The interior cavity is 4 inches in diameter and 17.5 inches high surrounded by 10 inches of lead	X			Discrete
F		Yankee Cask - 13 ft. long X 5 ft. diameter, 37 tons; consists of two stainless steel cylinders separated by 8.5 inches of lead shielding in the annulus.	X			Discrete
F		MFP-contaminated cask - IF-100 is 13 ft. long x 32 inches in diameter and weighs 22 tons. The cask consists of two stainless steel cylinders separated by 8.5 inches of lead shielding in the annulus.	X			Discrete
F		MFP-contaminated cask - IF-200 is 13 ft. long x 3 ft. in diameter weighing 25 tons. The cask consists of two stainless steel cylinders separated by 8.5 inches of lead shielding in the annulus	X			Discrete
F		Semi-tractor trailer or "carriage" contaminated with Cs-137.		X		Discrete
F		792 ft^3 TA-5 routine operational and miscellaneous decontamination waste	X			Non-Discrete

	MW	LLW	TRU	Discrete/ Non-Discrete Items	Total Counted
Trench F Total Items	**26**	**5**	**0**	**11 / 20**	**31**
% of total debris volume	**84%**	**16%**	**0%**	**35% / 65%**	**100%**
Debris Volume (cy)	**1676**	**319**	**0**	**698 / 1297**	**1995**

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Trench	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
Trench G	**1062**	GAP II disassembly room including uni-strut, filter housings, filters	X			Non-Discrete
G		one vacuum cleaner	X			Non-Discrete
G		DF I, II, III, and IV experimental packages without fuel sections	X			Non-Discrete
G		Thorium and uranium alloyed aluminum Polaris missile sections		X		Discrete
G		aircraft engine	X			Discrete
G		1 kg Th-232 as Mg-Th from crash test at small sled track	X			Non-Discrete
G		3 each glove boxes	X			Non-Discrete
G		one Mettler balance and fume hood contaminated with fission products	X			Non-Discrete
G		MFP-contaminated concrete	X			Non-Discrete
G		2 each 55-gallon poly drums containing MFP-contaminated spent demineralizer resin		X		Discrete
G		3 each resin beds with trace Co-60	X			Non-Discrete
G		fluorescent light bulbs	X			Non-Discrete
G		HEPA and prefilters	X			Non-Discrete
G		MFP contaminated TV camera	X			Non-Discrete
G		25 each 55-gallon 17H drums with Ir-192 tracer in sand		X		Discrete
G		3 each 54-in. diameter cylinders [2 in wooden crates and 1 in cardboard] with HK-31 skin material		X		Discrete
G		1,000 yd^3 of dirt from the reactor berm removal	X			Non-Discrete
G		581 ft^3 TA-5 routine operational and miscellaneous decontamination waste	X			Non-Discrete

Notes on Classified Area Trenches:
Trench G was only partially filled (to ~ 20%). It was then backfilled.

	MW	LLW	TRU	Discrete/ Non-Discrete Items	Total Counted
Trench G Total Items	**14**	**4**	**0**	**5 / 13**	**18**
% of total debris volume	**78%**	**22%**	**0%**	**28% / 72%**	**100%**
Debris Volume (cy)	**828**	**234**	**0**	**297 / 765**	**1062**

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
Classified Area Pits						
Pit SP-1	**16**	2 each depleted tritium beds	X			Non-Discrete
SP-1		3-gallons NaOH	X			Non-Discrete
SP-1		3-gallons acid waste	X			Non-Discrete
SP-1		1 poly bottle uranium solution	X			Non-Discrete
SP-1		out-dated standard solutions	X			Non-Discrete
SP-1		30-gallons tritium water	X			Non-Discrete
SP-1		miscellaneous chemicals with beta/gamma contamination	X			Non-Discrete
SP-1		4 kg enriched lithium	X			Non-Discrete
SP-1		4 kg Li-6	X			Non-Discrete
SP-1		408 grams U-235	X			Non-Discrete
Pit SP-2	**91**	Plutonium arc tunnel, 4 ft x 4 ft x 10 ft long with a 2 ft x 2 ft x 5 ft central section. Glove boxes are attached at each end. Approximately 20, Pu-238 microspheres (ranging from 2 to 20 micrometers in diameter) remained in the tunnel when it was buried in 1968			X	Discrete
Pit SP-3	**46**	Be catcher - contained fine particles of Be and DU when buried in 1968	X			Non-Discrete
Pit SP-4	**33**	Nuclear reactor vessel plates - 6 ft. sections used in fission product and Co-60 activation studies (2 rem/hr. on contact)		X		Discrete
Pit SP-5	**52**	10,000 Ci Co-60 source - 12 stainless steel rods, 12 in. long x 0.5 in. diameter, each containing 8 cobalt metal pellets. Each cobalt pellet is 0.5 in. long. The pellets are located in the center of each rod with 4 in. of lead as shielding filling each end. Each cobalt rod contained 840 Ci in 1961. The Co-60 source was removed from service in 1987. The Co-60 source was buried in a 6.7ft^3 lead burial cask which was encased in a 24 yd^3 concrete burial cask. The original 10,000 Ci source will have decayed to 76 Ci as of 1998 or 6.4 Ci per rod	X			Discrete
Pit 1	**9**	DU-contaminated weapons components	X			Non-Discrete
Pit 2	**9**	DU-contaminated debris bed	X			Non-Discrete
2		DU-contaminated weapons components	X			Non-Discrete
Pit 3a	**9**	DU-contaminated weapons components, 22 kg DU	X			Non-Discrete
Pit 3b	**9**	DU-contaminated Mark III missile sections		X		Discrete
Pit 4	**13**	DU-contaminated weapons components	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
Pit 5	**9**	DU-contaminated weapons components	X			Non-Discrete
Pit 6	**9**	DU-contaminated weapons components	X			Non-Discrete
Pit 7	**13**	DU-contaminated weapons components, 846 kg DU	X			Non-Discrete
Pit 8	**9**	DU-contaminated weapons components	X			Non-Discrete
Pit 9	**70**	DU-contaminated weapons components	X			Non-Discrete
Pit 10	**70**	DU-contaminated weapons components, 178 kg DU	X			Non-Discrete
Pit 11	**70**	7 Nevada Test Site test shapes, 42 kg DU	X			Non-Discrete
Pit 12	**70**	Neutron generator tubes, 1 kg thorium, 103 kg DU	X			Non-Discrete
Pit 13	**70**	One each 1,800 Ci Co-60 source sealed in a lead and steel burial cask encapsulated in two truckloads of concrete	X			Discrete
13		one each 98 microCi Ra-226 source	X			Non-Discrete
13		one each 1.3 microCi Ra-226 source	X			Non-Discrete
13		two each 5.0 microCi Ra-226 sources	X			Non-Discrete
13		one each 1.0 microCi Ra-226 source encapsulated in concrete filled A/N can	X			Non-Discrete
Pit 14	**101**	one each sealed 5.0 microCi Po-210 source and source holder	X			Non-Discrete
14		one each sealed 1.0 microCi Po-210 source	X			Non-Discrete
14		miscellaneous uranium and beryllium waste	X			Non-Discrete
14		Cypress test debris from Nevada Test Site	X			Non-Discrete
14		DU-contaminated vacuum cleaner	X			Non-Discrete
14		3 Ci tritium water	X			Non-Discrete
14		100 mCi tritium oxide	X			Non-Discrete
14		Pu-238, Po-210, and tritium-contaminated miscellaneous operational and lab waste	X			Non-Discrete
14		tritium-contaminated pumps and valves	X			Non-Discrete
14		Pu-238 contaminated air sampler	X			Non-Discrete
14		Neutron generator tubes, 1 kg thorium, 103 kg DU	X			Non-Discrete
14		a large weapon shell (18 megaton WWII vintage)		X		Discrete
14		DU-contaminated weapons components	X			Non-Discrete
14		178 kg DU	X			Non-Discrete
Pit 15	**101**	one each 102.1 microCi Ra-226/Be source and one each 5.5 microCi source in a encapsulated in concrete-filled 55-gallon drum		X		Discrete
15		fume hood filters and filter housings	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
15		reactor fuel element ends (5 rem/hr. on contact)		X		Discrete
15		Cypress test debris from Nevada Test Site	X			Non-Discrete
15		neutron generator tubes and targets	X			Non-Discrete
15		DU-contaminated weapons components	X			Non-Discrete
15		Pershing missile debris	X			Non-Discrete
15		167 kg DU	X			Non-Discrete
15		49 grams U-235	X			Non-Discrete
15		30 Ci tritium	X			Non-Discrete
Pit 16	**70**	one each sealed 2.5 Ci Co-60 source encapsulated in a concrete-filled lead cask	X			Discrete
16		two each non-functional 1.5 mCi Ra-226 ionization alphatron gauges encapsulated in a concrete filled A/N can	X			Non-Discrete
16		nine each Ba-133 reactor bolts	X			Non-Discrete
16		2 each 52 Ci Co-60 pencils encapsulated in a lead-lined concrete-filled 55-gallon drum	X			Discrete
16		2 each 10.0 microCi Ra-226/Be sources in lead container encapsulated in a concrete-filled 5-gallon A/N can	X			Non-Discrete
16		one each 1,000 Ci Co-60 source encapsulated in a lead-lined concrete-filled 55-gallon drum	X			Discrete
16		ionization chambers and current regulators	X			Non-Discrete
16		one each 0.8 mCi Kr-85 source encapsulated in a concrete-filled A/N can	X			Non-Discrete
16		one each 40 mCi Am-241 source encapsulated in a concrete-filled A/N can	X			Non-Discrete
16		one each 18.9 Ci Kr-85 nuclear battery in a steel tube encapsulated in a concrete-filled A/N can	X			Non-Discrete
16		SER reactor control rod guides encapsulated in a lead lined concrete filled A/N can (50 rem/hr. on contact)	X			Discrete
16		thorium metal scrap	X			Non-Discrete
16		one each Sb-124 source projectile (10 rem/hr. on contact)		X		Discrete
16		20 each 5.0 microCi Ra-226/Be sources in lead container encapsulated in concrete-filled A/N can	X			Non-Discrete
16		2 kg thorium oxide	X			Non-Discrete
16		2,390 kg DU	X			Non-Discrete
16		75 Ci tritium	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
Pit 17	**70**	Casseto and "Triga" parts from Nevada Test Site	X			Non-Discrete
17		one each 0.5 mCi Ra-226/Be source one each 36 Ci Co-60 source, and one each 6.0 Ci Sr-90 source each in a lead container encapsulated in concrete-filled 55-gallon drum	X			Discrete
17		11 each Kr-85 cells (8.1 mCi total)	X			Non-Discrete
17		2 each uranium carbide nose cones	X			Non-Discrete
17		uranium and zirconium scrap in a 55-gallon drum		X		Discrete
17		30 Ci tritium lab waste in brass tube	X			Non-Discrete
17		neutron generator tubes	X			Non-Discrete
17		dummy DU reservoir	X			Non-Discrete
17		DU scrap and machine parts	X			Non-Discrete
17		test specimens brazed to aluminum	X			Non-Discrete
17		fusing and firing assemblies	X			Non-Discrete
17		DU-contaminated weapon components	X			Non-Discrete
17		3 kg thorium oxide	X			Non-Discrete
17		457 kg DU	X			Non-Discrete
Pit 18	**70**	Pu-238 contaminated paper, gloves, small equipment, components, wire, and sockets	X			Non-Discrete
18		12 each spark gap tubes	X			Non-Discrete
18		7 each 10 microCi Ra-226/Be sources in a lead container encapsulated in concrete-filled 55-gallon drum	X			Discrete
18		Pu-238 contaminated vacuum pump	X			Non-Discrete
18		radioactive rock	X			Non-Discrete
18		electrical cables from junction box	X			Non-Discrete
18		reactor fuel element ends (5 rem/hr on contact)		X		Discrete
18		neutron generator tubes	X			Non-Discrete
18		Pershing missile test debris	X			Non-Discrete
18		DU-contaminated weapons components	X			Non-Discrete
18		155 mm gun projectile with a Sb-124 source		X		Discrete
18		762 kg DU	X			Non-Discrete
18		45 Ci tritium	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
Pit 19	**70**	Tritium-contaminated buckets, clothing, swipes, rags, paper, work gloves, vacuum cleaner, and decontamination materials	X			Non-Discrete
19		reactor fuel element ends (5 rem/hr. on contact)		X		Discrete
19		one each Sb-124 source projectile (10 rem/hr. on contact)		X		Discrete
19		neutron generator tubes	X			Non-Discrete
19		scrap metal, DU-contaminated muffle furnace	X			Non-Discrete
19		irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components	X			Non-Discrete
19		one each 3.5 microCi Co-60 source and one each 4.1 microCi Co-60 source in a lead container encapsulated in concrete-filled 55-gallon drum	X			Discrete
19		Pershing missile test debris	X			Non-Discrete
19		tritium bed	X			Non-Discrete
19		scrap iron	X			Non-Discrete
19		Pu-238/239 contaminated filters	X			Non-Discrete
19		621 kg DU	X			Non-Discrete
19		60 Ci tritium	X			Non-Discrete
Pit 21	**70**	two each 3.4 microCi Co-60 sources, one each 31.8 microCi Sr-90 source, one each 100 microCi Co-60 source, one each leaking Sb-124 source and one each spent Cs-137 source in a lead container encapsulated in concrete-filled 55-gallon drum	X			Discrete
21		Nevada Test Site irradiated material	X			Non-Discrete
21		DU-contaminated paper, towels, and poly bottles	X			Non-Discrete
21		plutonium oxide-contaminated filters, towels, tape, paper, cleaning and decontamination materials	X			Non-Discrete
21		4 each irradiated thermal batteries	X			Non-Discrete
21		oil diffusion pump and baffle	X			Non-Discrete
21		irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage, regulators, and other miscellaneous electrical components	X			Non-Discrete
21		neutron generator tubes	X			Non-Discrete
21		Pershing missile test debris	X			Non-Discrete
21		DU-contaminated weapons components	X			Non-Discrete
21		16 kg thorium	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
21		1,731 kg DU	X			Non-Discrete
21		0.1 grams Pu-238	X			Non-Discrete
21		30 Ci tritium	X			Non-Discrete
Pit 24	**70**	Hudson Moon and "Mint Leaf" test debris from Nevada Test Site	X			Non-Discrete
24		3 each 500 microCi Ra-226 ionization alphatron gauges encapsulated in a concrete-filled A/N can	X			Non-Discrete
24		one each 45 Ci Co-60 source in a lead shield housing	X			Non-Discrete
24		irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components	X			Non-Discrete
24		reactor fuel element ends (5 rem/hr. on contact)		X		Discrete
24		tritium-contaminated General Electric vacuum system, trigger gauge, transducers, hoods, vacuum pump, and panels	X			Non-Discrete
24		Pu-238, Pu-239, U-235, and U-238 contaminated glove box, gamma probe, and stereo microscope	X			Non-Discrete
24		neutron generator tubes	X			Non-Discrete
24		Pershing missile test debris	X			Non-Discrete
24		DU-contaminated weapons debris	X			Non-Discrete
24		140 kg DU	X			Non-Discrete
24		60 Ci tritium	X			Non-Discrete
Pit 25	**70**	Stainless steel sample cylinders		X		Discrete
25		tritium-contaminated flexible vent	X			Non-Discrete
25		Pu-239 contaminated microscope slide and slide clamps	X			Non-Discrete
25		Hudson Moon test debris from Nevada Test Site	X			Non-Discrete
25		irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components	X			Non-Discrete
25		one each 3.5 Ci Ir-192 source encapsulated in concrete-filled 5-gallon A/N can	X			Non-Discrete
25		Ta-182 wire, needles, and foil in lead pigs	X			Non-Discrete
25		4 each 10 microCi Ra-226/Be sources in a lead container encapsulated in concrete-filled 55-gallon drum	X			Discrete
25		one each 30 Ci Ir-192 source encapsulated in concrete-filled 10-gallon A/N can	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
25		Ba-133 reactor bolts	X			Non-Discrete
25		DU ballast, machine chips, cuttings, and turnings	X			Non-Discrete
25		head filters and prefilters	X			Non-Discrete
25		DU-contaminated penetration vehicles	X			Non-Discrete
25		one each Pu-238 contaminated stereo microscope, glove box, balance, and manipulator arm	X			Non-Discrete
25		reactor fuel element ends (5 rem/hr. on contact)		X		Discrete
25		DU-contaminated ceramic base plates and electric furnace	X			Non-Discrete
25		irradiated scrap nickel and reactor material	X			Non-Discrete
25		DU-contaminated sputtering shield, O-rings, and steel wool	X			Non-Discrete
25		15 each irradiated fission chambers	X			Non-Discrete
25		Be-contaminated glove box and balance	X			Non-Discrete
25		irradiated floor and exhaust hood coverings	X			Non-Discrete
25		tritium-contaminated ion pump	X			Non-Discrete
25		MFP-contaminated transistors, diodes, resistors, circuits, paper, and plastic	X			Non-Discrete
25		one each iridium iriditron, one each 11.6 microCi Ra-226 dew pointer in brass cylinder one each DU aft simulator	X			Discrete
25		neutron generator tubes	X			Non-Discrete
25		SRAM missile test debris	X			Non-Discrete
25		DU-contaminated weapons components	X			Non-Discrete
25		1,431 kg DU	X			Non-Discrete
25		76.5 Ci tritium	X			Non-Discrete
Pit 26	**70**	Co-57 contaminated cleanup debris	X			Non-Discrete
26		DU machine chips, turnings, cuttings	X			Non-Discrete
26		irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components	X			Non-Discrete
26		5 each carbon rings	X			Non-Discrete
26		DU-contaminated cloth, towels, and paper	X			Non-Discrete
26		MFP-contaminated machining wastes	X			Non-Discrete
26		4 each 4.0 Ci Co-60 sources in a lead container encapsulated in concrete-filled 55-gallon drum	X			Discrete
26		100 microCi Na-22	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
26		DU-contaminated Pershing missile debris	X			Non-Discrete
26		DU-contaminated Sierra Army Depot debris	X			Non-Discrete
26		18 each 1.8 microCi Ra-226 ionization alphatron gauges encapsulated in concrete-filled 32-gallon A/N can		X		Discrete
26		Ta-182 wires in a lead pig	X			Non-Discrete
26		3 each Victoreen Sr-90 ion chambers	X			Non-Discrete
26		DU-contaminated penetration ballast, noses, and aft simulators	X			Non-Discrete
26		5 each sealed 389 microCi Ba-133 sources	X			Non-Discrete
26		5 each sealed 160 microCi Ra-226 sources	X			Non-Discrete
26		2 each sealed 10 microCi Ra-226 check sources	X			Non-Discrete
26		2 each sealed 2.2 microCi Cs-137 check sources	X			Non-Discrete
26		3 each sealed 4.6 microCi Co-60 solution in glass ampules	X			Non-Discrete
26		one each sealed 1.0 microCi Sr-90 solution in a glass ampule	X			Non-Discrete
26		one each sealed 0.6 microCi Kr-85 gas in a glass ampule	X			Non-Discrete
26		firing and fusing sets	X			Non-Discrete
26		DU-contaminated weapons components	X			Non-Discrete
26		5,525 kg DU	X			Non-Discrete
26		88.5 Ci tritium	X			Non-Discrete
Pit 27	**70**	one each DU nose ballast	X			Non-Discrete
27		one each tritium-contaminated shipping container	X			Non-Discrete
27		DU plates	X			Non-Discrete
27		3 each empty steel gas cylinders		X		Discrete
27		tritium targets	X			Non-Discrete
27		2 each DU penetrators	X			Non-Discrete
27		enriched uranium tensile bars alloyed with Fe-50	X			Non-Discrete
27		1 kg thorium oxide	X			Non-Discrete
27		neutron generator tubes	X			Non-Discrete
27		155 mm gun debris	X			Non-Discrete
27		3,246 kg DU	X			Non-Discrete
27		81 Ci tritium	X			Non-Discrete
Pit 28	**70**	6 each 55-gallon drums containing DU debris		X		Discrete
28		Cs-137 contaminated debris in sealed A/N can	X			Non-Discrete
28		one each 100 microCi Victoreen Sr-90 ion chamber	X			Non-Discrete
28		10 each irradiated headers	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
28		DU-contaminated tapered cantilever and double cantilever	X			Non-Discrete
28		neutron generator tubes	X			Non-Discrete
Pit 30	**4**	20 each 0.4 Ci neutron activated aluminum reflector plates encapsulated in concrete	X			Non-Discrete
30		4 each 187 Ci Co-60 neutron activated stainless steel tubes encapsulated in concrete	X			Non-Discrete
30		activated stainless steel pipe containing reactor instrumentation (1,000 rem/hr on contact)		X		Discrete
30		thoria capsules and fragments	X			Non-Discrete
Pit 31	**70**	Cs-137 contaminated reactor waste in sealed A/N can	X			Non-Discrete
31		8 each DU ballast plugs	X			Non-Discrete
31		DU machine chips, turnings, and cuttings	X			Non-Discrete
31		19 each highly oxidized DU plates	X			Non-Discrete
31		miscellaneous operational and cleanup wastes including towels, paper, packing material, wire, gloves, and tape	X			Non-Discrete
31		one each 10 microCi Ra-226 ionostat	X			Non-Discrete
31		one each 45 mCi Kr-85 ion generator	X			Non-Discrete
31		prefilters from exhaust systems	X			Non-Discrete
31		one each 4 mCi Ra-226/Be source	X			Non-Discrete
31		4 each DU plates	X			Non-Discrete
31		3 each uranium/zirconium samples	X			Non-Discrete
31		one each 16 mCi Se-75 source in steel block	X			Non-Discrete
31		2 each 55-gallon drums contaminated with DU oxide		X		Discrete
31		quartz cloth contaminated with thorium	X			Non-Discrete
31		1-gallon toluene absorbed on vermiculite in sealed A/N can	X			Non-Discrete
31		Neutron generator tubes and targets	X			Non-Discrete
31		DU-contaminated weapons test debris	X			Non-Discrete
31		Pershing missile test debris	X			Non-Discrete
31		2,460 kg DU	X			Non-Discrete
31		27.7 Ci tritium	X			Non-Discrete
Pit 32	**70**	two pints deuterium water absorbed on vermiculite in sealed 2-gallon A/N can	X			Non-Discrete
32		one each 150 mCi Ta-182 source in lead pig	X			Non-Discrete
32		2 each Ta-182 plugs removed from a rain erosion rocket in sealed A/N can	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
32		neutron generator tubes and targets	X			Non-Discrete
32		DU-contaminated inner shield assembly	X			Non-Discrete
32		Ra-226, Na-22, Ba-133, Co-60, Co-57, Mo-54, mixed isotopes (1.0 mCi) in lead pig	X			Non-Discrete
32		6 each 1.0 mCi Se-75 sources in lead pig	X			Non-Discrete
32		6kg DU-contaminated lithium tetra-borate	X			Non-Discrete
32		10 each Po-210 static eliminators	X			Non-Discrete
32		25 each obsolete 240 milliCi Po-210 static eliminators	X			Non-Discrete
32		one each 300 milliCi Ra-226 source in sealed A/N can	X			Non-Discrete
32		one each 1.0 microCi Sm-151 source in sealed A/N can	X			Non-Discrete
32		one each 0.1 mCi Pm-147 source in a sealed A/N can	X			Non-Discrete
32		tritium-contaminated glove box	X			Non-Discrete
32		549 kg DU	X			Non-Discrete
32		55.6 Ci tritium	X			Non-Discrete
32		Trace Gd-153, Eu-152, Ce-144, Sr-85, Ba-133, Ag- 110m, Tc-199, Ni-63, Na-22, and Pm-147	X			Non-Discrete
Pit 33	**70**	one each 24 kg DU sphere	X			Non-Discrete
33		one each 86 Ci Co-60 source in 4,000 lb. lead cask	X			Discrete
33		15 each 70 mCi Co-60 sources, one each1.0 mCi Pm- 147 source, one each 350 mCi Se-75 source, 15 each 85 mCi Cs-137 sources, and 10 each 25 mCi Ra-226 sources encapsulated in concrete-filled 55-gallon drums		X		Discrete
33		thorium-contaminated quartz cloth	X			Non-Discrete
33		200 grams uranium hydride	X			Non-Discrete
33		one each 50 Ci Kr-85 source encapsulated in a concrete-filled A/N can	X			Non-Discrete
33		activated stainless steel roller plate	X			Non-Discrete
33		TA-5 hot cell decontamination debris	X			Non-Discrete
33		one each irradiated balance	X			Non-Discrete
33		fuel element	X			Non-Discrete
33		cladding and associated parts from reactor instrumented fuel elements, vacuum system, filters, and tools (2 rem/hr. on contact)		X		Discrete
33		irradiated, disassembled pressure vessel and crucible		X		Discrete
33		tritium targets and tubes	X			Non-Discrete
33		Three Mile Island radiation detector	X			Non-Discrete

Table D1-1 (Continued)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
33		1.6 kg Be	X			Non-Discrete
33		2,125 kg DU	X			Non-Discrete
33		822 Ci tritium	X			Non-Discrete
33		1 kg thorium	X			Non-Discrete
Pit 34	**70**	one each 110 Ci Co-60 radiography source encapsulated in concrete-filled A/N can	X			Non-Discrete
34		one each ultra sonic thermometer consisting of a stainless steel tube loaded with copper, cobalt, tantalum, thoria, nickel, and iron (15 rem/hr on contact)	X			Discrete
34		activated stainless steel tubing (2 rem/hr on contact)		X		Discrete
34		obsolete experimental equipment and parts (3 rem/hr on contact)		X		Discrete
34		one each Cs-137 contaminated WESF capsule	X			Non-Discrete
34		neutron generator tubes and targets	X			Non-Discrete
34		U-238 contaminated soil from burn test	X			Non-Discrete
34		200 grams activated silver	X			Non-Discrete
34		firing sets	X			Non-Discrete
34		uranyl nitrate coatings of foil	X			Non-Discrete
34		trough assembly used in fuel element cleanup	X			Non-Discrete
34		1,676 kg DU	X			Non-Discrete
34		328 Ci tritium	X			Non-Discrete
Pit 35	**70**	Neutron generator tubes and targets	X			Non-Discrete
35		neutron activated brass	X			Non-Discrete
35		4 each 55-gallon drums DU from White Sands Missile Range		X		Discrete
35		one each activated stainless steel containment canister	X			Non-Discrete
35		Be-contaminated weapon components	X			Non-Discrete
35		3 each sources for Beta scope	X			Non-Discrete
35		crucible	X			Non-Discrete
35		stainless steel ion sources and tubes	X			Non-Discrete
35		686 kg DU	X			Non-Discrete
35		203 Ci tritium	X			Non-Discrete
Pit 36	**70**	Neutron generator tubes and targets	X			Non-Discrete
36		STI experiment package	X			Non-Discrete
36		GAP II upper can	X			Non-Discrete
36		DF 4 outer can	X			Non-Discrete
36		one each 55-gallon drum containing ST-2 hardware without fuel section		X		Discrete
36		one each microcomputer	X			Non-Discrete

Table D1-1 (Concluded)
Mixed Waste Landfill Inventory, Distribution, Packaging Type

Pit	Debris Vol (cy)	Description of Contents	MW	LLW	TRU	Package Type
36		irradiated diodes, transistors, capacitors, resistors, circuit boards, voltage regulators, and other miscellaneous electrical components	X			Non-Discrete
36		thermocouple wire from the ACRR core	X			Non-Discrete
36		3 each activated stainless steel containment canisters wrapped in polyethylene sheeting	X			Non-Discrete
36		one each weapon shipping and handling container	X			Non-Discrete
36		thorium-contaminated Polaris missile sections		X		Discrete
36		rings from reactor fuel elements (1.7 rem/hr on contact)		X		Discrete
36		4 each 55 gallon drums containing wastes contaminated with fission products		X		Discrete
36		2 each large wooden boxes	X			Non-Discrete
36		673 kg DU	X			Non-Discrete
36		13.1 kg lithium	X			Non-Discrete
Pit U-1	**70**	1,589 kg DU in chips, machine turnings, shavings, cuttings, residue, and scrap	X			Non-Discrete
Pit U-2	**70**	5,119 kg DU in chips machine turnings, shavings, cuttings, residue, and scrap	X			Non-Discrete
U-2		one each irradiated melt chamber	X			Non-Discrete
U-2		one each copper crucible containing DU scrap	X			Non-Discrete
Pit U-3	**70**	1,114 kg DU in chips, machine turnings, shavings, cuttings, residue, and scrap	X			Non-Discrete
U-3		1,000 lb. of burn site DU-contaminated soil and debris	X			Non-Discrete
U-3		one each DU-contaminated 300 lb. crucible		X		Discrete

Notes on Unclassified Area Pits:
Pit numbers 20, 22, 23, and 29 were never assigned so do not exist.
Pit 37 was empty when visually inspected on 1/7/1997 so is not listed in this table.
Pits UC-1 and UC-2 collapsed after excavation and were abandoned so are not listed in this table.

	MW	**LLW**	**TRU**	**Discrete/ Non-Discrete Items**	**Total Counted**
All Pits Total Items	**286**	**30**	**1**	**46 / 271**	**317**
% of total debris volume	**90.22%**	**9.46%**	**0.32%**	**15% / 85%**	**100%**
Debris Volume (cy)	**1997**	**209**	**7**	**321 / 1892**	**2213**

Table D1-2
Mixed Waste Landfill Estimated Debris Volumes

Area	MW (cy)	LLW (cy)	TRU Waste (cy)	Totals (cy)	Discrete Packaging (cy)	Non-Discrete Packaging (cy)
Unclassified Area						
Trench A	1,145	186	0	1,331	333	998
Trench B	1,401	74	0	1,475	74	1,401
Trench C	1,085	107	0	1,192	155	1,037
Trench D	2,999	333	0	3,332	433	2,899
Trench E	1,039	116	0	1,155	150	1,005
Trench F	1,676	319	0	1,995	698	1,297
Trench G	828	234	0	1,062	297	765
Total Trenches	10,173	1,369	0	11,542	2,140	9,402
Classified Area						
Total Pits	1,997	209	7	2,213	321	1,892
Total Volumes	**12,170**	**1,578**	**7**	**13,755**	**2,461**	**11,294**

Notes:
cy = Cubic yard(s).
LLW = Low-level waste.
MW = Mixed waste.
TRU = Transuranic waste.

Table D1-3
Mixed Waste Landfill Estimated Excavated Soil & Concrete Volumes

Area	Soil MW (cy)	Soil LLW (cy)	Soil Replaceable (cy)	Concrete Cover MW (cy)
Unclassified Area				
Trench A	0	2,955	1,792	0
Trench B	0	2,949	1,589	0
Trench C	0	2,527	1,420	0
Trench D	0	6,956	2,737	0
Trench E	0	3,817	1,871	0
Trench F	0	5,797	2,259	0
Trench G	0	5,645	1,823	0
Total Trenches	0	30,646	13,491	0
Unclassified Area NDA	0	0	638	0
Total Unclassified Area	0	30,646	14,129	0
Classified Area				
All Pits	18,905	11,848	4,049	395
Classified Area NDA	0	0	152	0
Total Classified Area	18,905	11,848	4,201	395
Total Soil Volumes	**18,905**	**42,494**	**18,330**	**395**

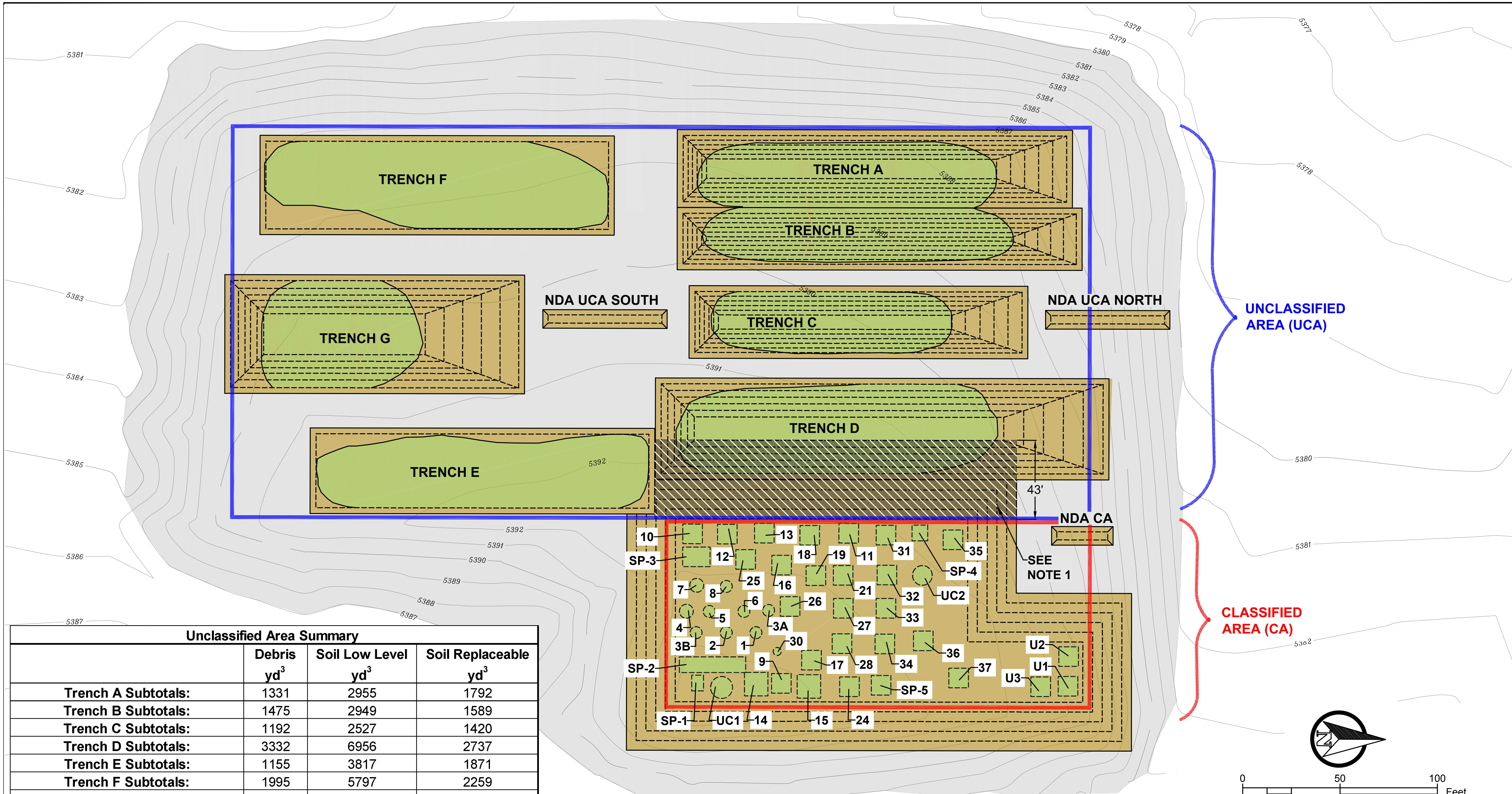
Notes:
cy = Cubic yard(s).
LLW = Low-level waste.
MW = Mixed waste.
NDA = Non-Designated Area.
TRU = Transuranic waste.

Table D1-4
Mixed Waste Landfill Evapotranspirative Cover Volumes

Name	Soil (cy)[a]	Rock (cy)[a]
Subgrade (soil)	7,700	0
Biointrusion Layer (rock)	0	6,800
Biointrusion Layer void space and thin overlying soil layer (soil)	2,600	0
Native Soil Layer (soil)	17,300	0
Topsoil Layer (soil)	5,400	0
Total	**33,000**	**6,800**

Notes:
[a]Volumes are in-place compacted soil and rock volumes.
cy = Cubic yards.

Mixed Waste Landfill Excavation Site Plan for Unclassified & Classified Areas



Unclassified Area Summary	Debris yd^3	Soil Low Level yd^3	Soil Replaceable yd^3
Trench A Subtotals:	1331	2955	1792
Trench B Subtotals:	1475	2949	1589
Trench C Subtotals:	1192	2527	1420
Trench D Subtotals:	3332	6956	2737
Trench E Subtotals:	1155	3817	1871
Trench F Subtotals:	1995	5797	2259
Trench G Subtotals:	1062	5645	1823
NDA Subtotals (North and South):	0	0	638
Totals:	**11542**	**30646**	**14129**

Classified Area Summary	Debris yd^3	Soil Mixed yd^3	Concrete Cover Mixed yd^3	Soil Low Level yd^3	Soil Replaceable yd^3
All Pits	2213	18905	395	11848	4049
NDA Area	0	0	0	0	152
Total	2213	18905	395	11848	4201

LEGEND

NDA - NON-DESIGNATED AREA
CONCEPTUAL EXCAVATION CONTOUR
EXCAVATION AREAS
LOCATION OF WASTE TRENCH/PITS

NOTES

1. 4049 yd^3 OF REPLACEABLE SOIL REMOVED FOR ACCESS TO CLASSIFIED AREA.

FIGURE D1-1
EXCAVATION SITE PLAN
Mixed Waste Landfill

Sandia National Laboratories
BGI Banda Group International, LLC
amec foster wheeler

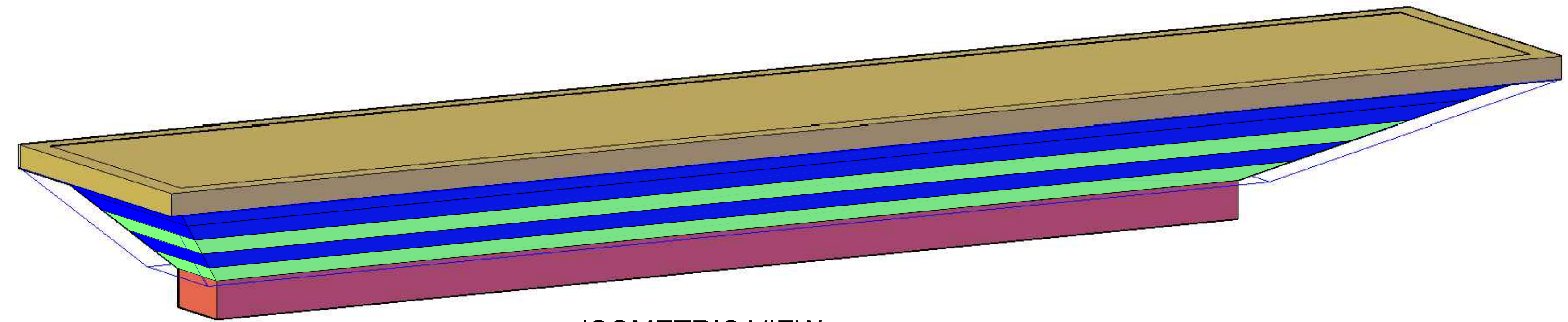
P:\consulting\projects\16\16-517-00066Mixed Waste Landfill Re-evaluation\Concept\TRENCH DRAWINGS_Version 2.0\3D models_Trenches

LEGEND

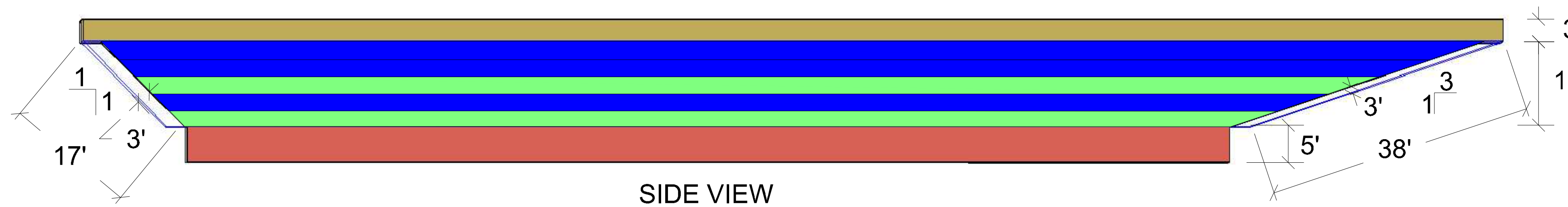
- 3' SOIL COVER
- 5' BOTTOM OVER EXCAVATION
- SOIL= 60% OF TRENCH VOLUME
- DEBRIS = 40% OF TRENCH VOLUME

} CORE SIDES ENDS

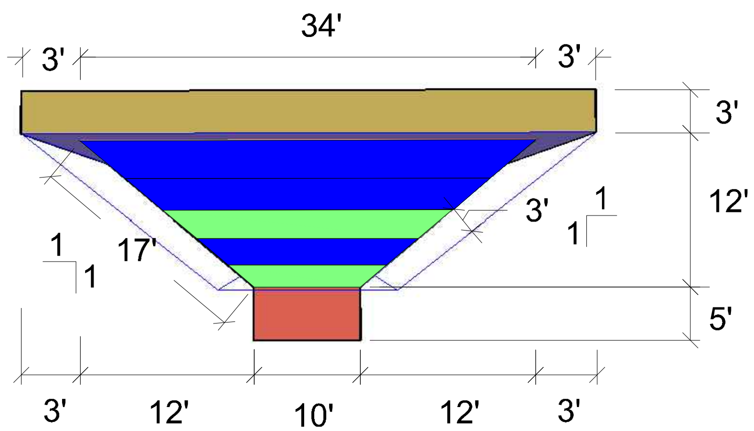
- 3' SIDE & END SLOPE OVER EXCAVATION
- NTS NOT TO SCALE



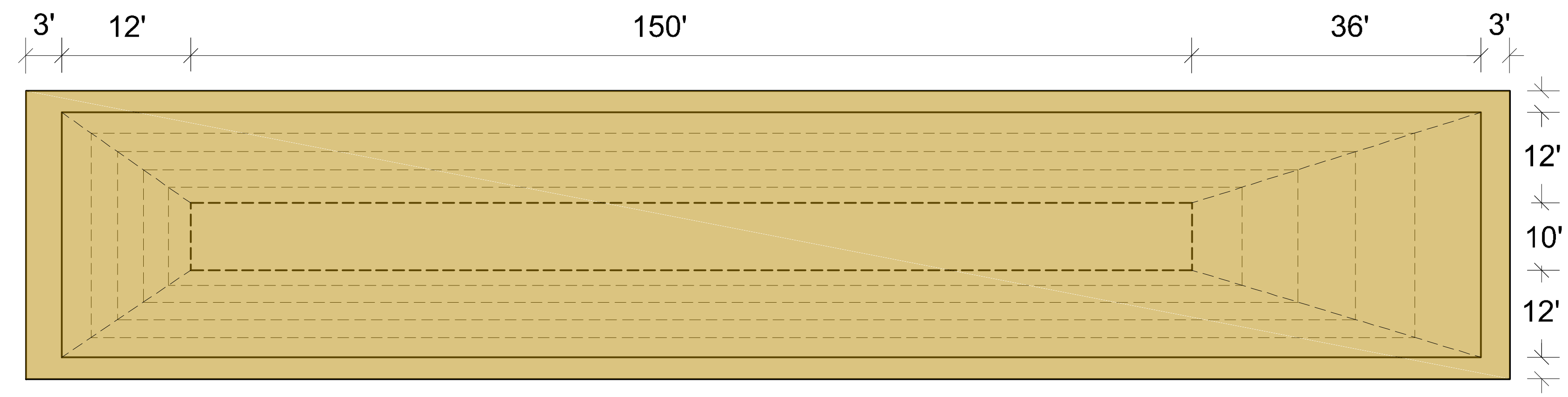
ISOMETRIC VIEW
NTS



SIDE VIEW
NTS



FRONT VIEW
NTS



PLAN VIEW
NTS

	Length (ft)	Width (ft)	Area (ft^2)	Depth (ft)	Cover (ft)	Side Slope	End Slope	Debris yd^3	Soil Low Level yd^3	Soil Replaceable yd^3
Trench A	150	34	5100	15	3	1:1	3:1			
Core	150	10	1500	12				267	520	
2 Sides & South End	358		180	12				955	1862	
North End		34	216	12				109	212	
Cover	150	34	5100	3						737
Over Excavation										
Bottom	150	10	1500	5					361	
2 Sides & South End	340		51							835
North End		40	114							220
						Trench A Subtotals:		**1331**	**2955**	**1792**

Note 1: Soil expansion factor of 1.3 applied to soil voulme

Note 2: Common wall between Trenches A & B were adjusted 2 feet. Trench A was excavated and backfilled prior to Trench B excavation. Trench B excavation encroached on Trench A west side. 2 feet removed from Trench A east side and added Trench B west side.

VOLUMES ESTIMATES TABLE

FIGURE D1-2
TRENCH A
UNCLASSIFIED AREA
Mixed Waste Landfill

Sandia National Laboratories

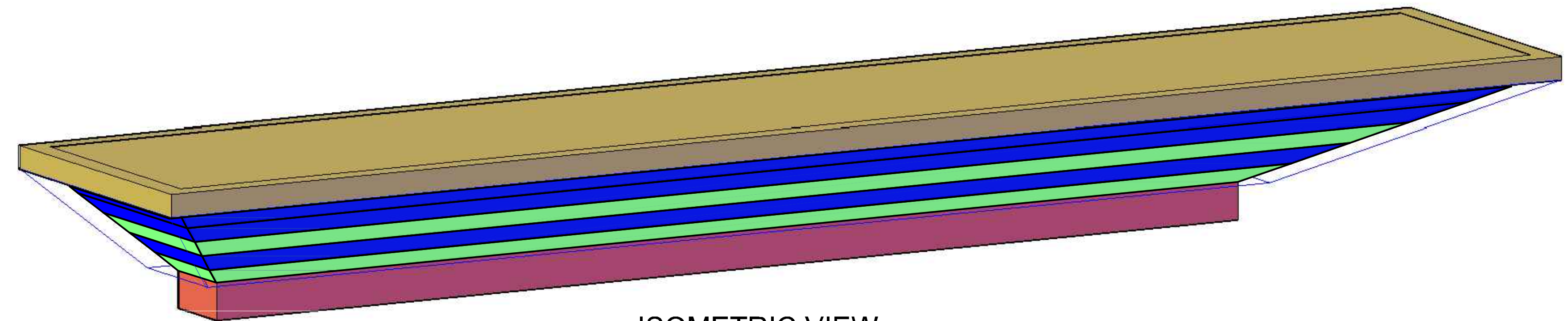
BGI Banda Group International, LLC

amec foster wheeler

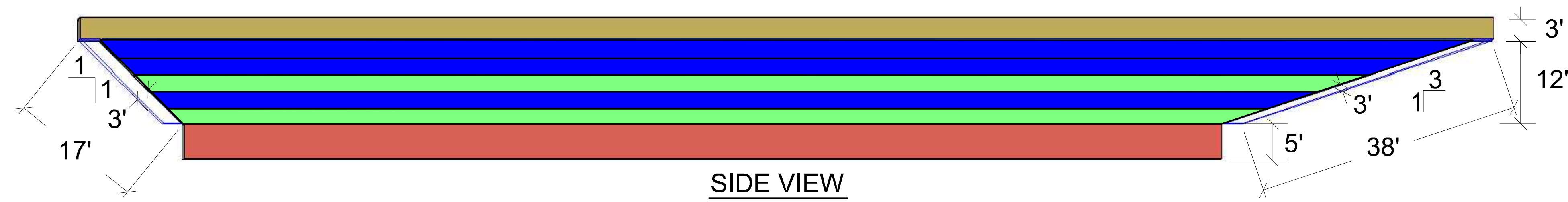
P:\consulting\projects\16\16-517-00066.Mixed Waste Landfill Re-evaluation\Concept\TRENCH DRAWINGS_Version 2.0\3D models_Trenches\A_TRENCH

LEGEND

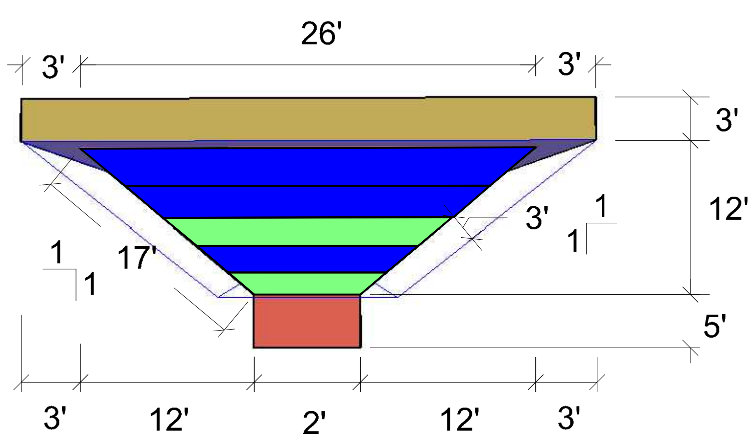
- 3' SOIL COVER
- 5' BOTTOM OVER EXCAVATION
- SOIL= 60% OF TRENCH VOLUME } CORE SIDES ENDS
- DEBRIS = 40% OF TRENCH VOLUME } CORE SIDES ENDS
- 3' SIDE & END SLOPE OVER EXCAVATION
- NTS NOT TO SCALE



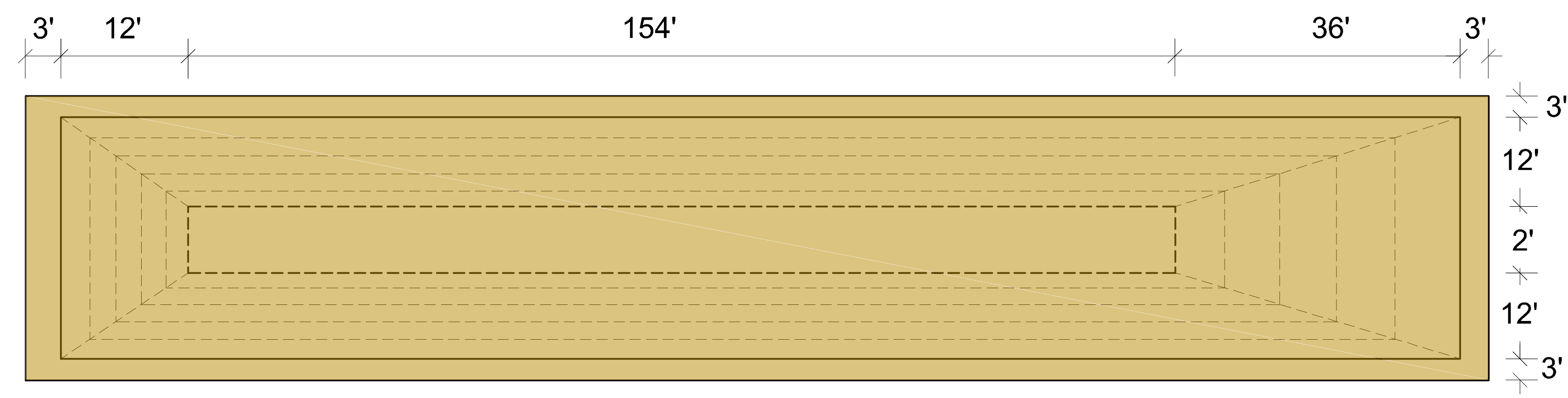
ISOMETRIC VIEW
NTS



SIDE VIEW
NTS



FRONT VIEW
NTS



PLAN VIEW
NTS

	Length (ft)	Width (ft)	Area (ft^2)	Depth (ft)	Cover (ft)	Side Slope	End Slope	Debris yd^3	Soil Low Level yd^3	Soil Replaceable yd^3
Trench B	154	26	4004	15	3	1:1	3:1			
Core	154	2	308	12				55	107	
2 Sides & South End	358		252	12				1337	2606	
North End		26	216	12				83	162	
Cover	154	26	4004	3						578
Over Excavation										
Bottom	154	2	308	5					74	
2 Sides & South End	340		51							835
North End		32	114							176
							Trench B Subtotals:	**1475**	**2949**	**1589**

Note 1: Soil expansion factor of 1.3 applied to soil voulme.

Note 2: Common wall between Trenches A & B were adjusted 2 feet. Trench A was excavated and backfilled prior to Trench B excavation. Trench B excavation encroached on Trench A west side. 2 feet removed from Trench A east side and added Trench B west side.

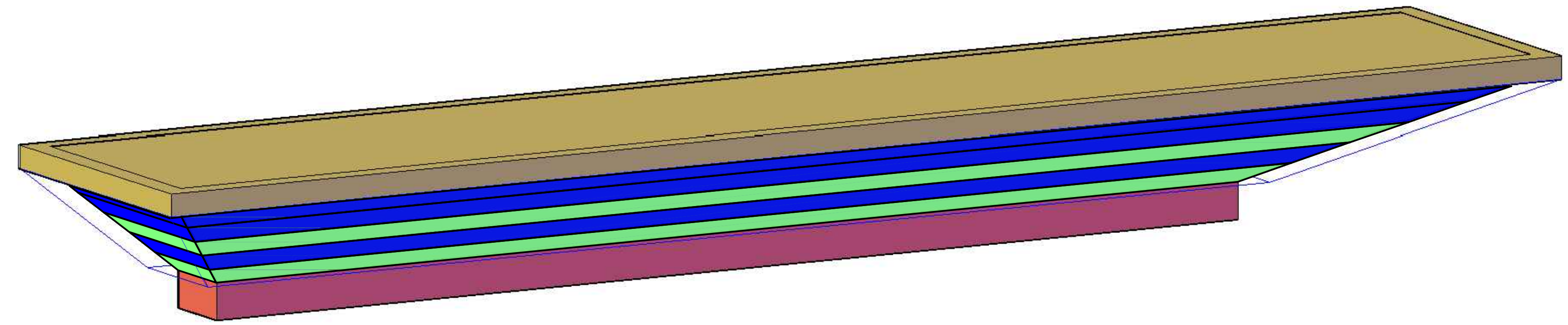
VOLUMES ESTIMATES TABLE

FIGURE D1-3
TRENCH B
UNCLASSIFIED AREA
Mixed Waste Landfill

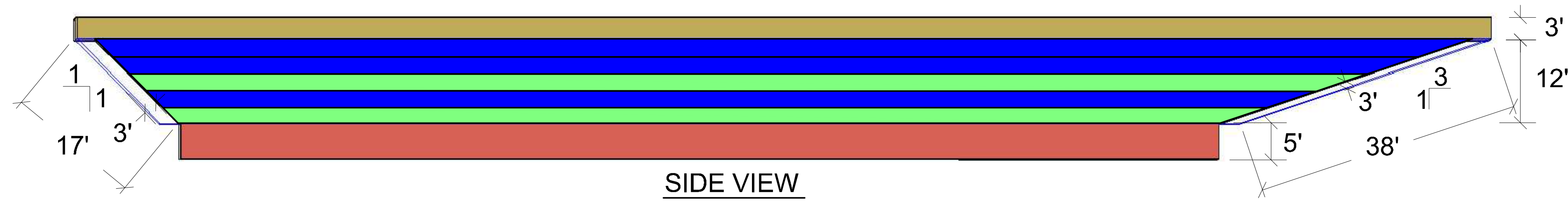
Sandia National Laboratories
BGI Banda Group International, LLC
amec foster wheeler

LEGEND

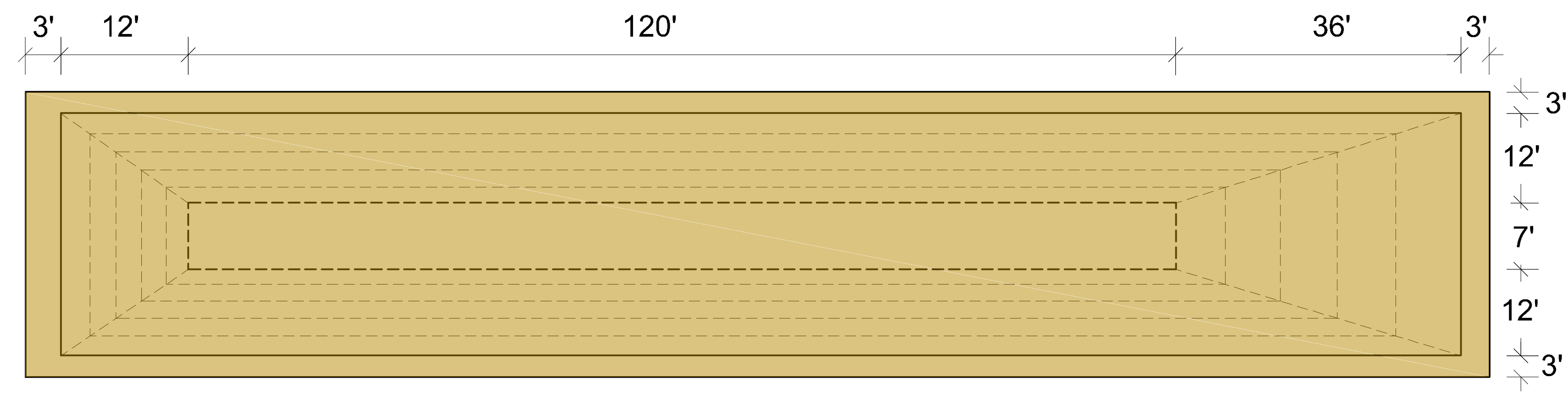
- 3' SOIL COVER
- 5' BOTTOM OVER EXCAVATION
- SOIL= 60% OF TRENCH VOLUME } CORE SIDES ENDS
- DEBRIS = 40% OF TRENCH VOLUME } CORE SIDES ENDS
- 3' SIDE & END SLOPE OVER EXCAVATION
- NTS NOT TO SCALE



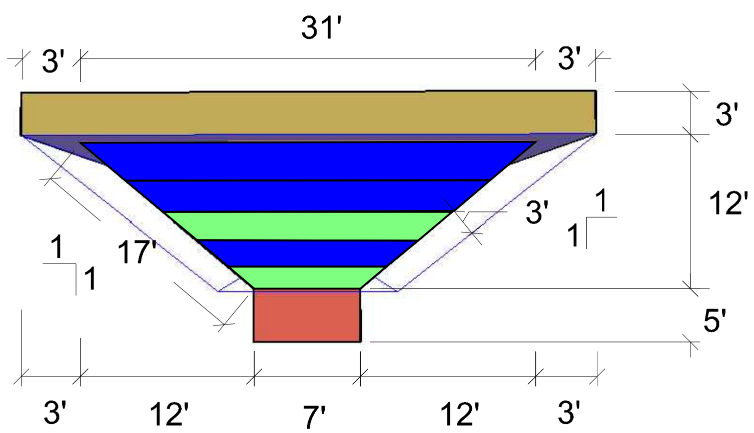
ISOMETRIC VIEW
NTS



SIDE VIEW
NTS



PLAN VIEW
NTS



FRONT VIEW
NTS

	Length (ft)	Width (ft)	Area (ft^2)	Depth (ft)	Cover (ft)	Side Slope	End Slope	Debris yd^3	Soil Low Level yd^3	Soil Replaceable yd^3
Trench C	120	31	3720	15	3	1:1	3:1			
Core	120	7	840	12				149	291	
2 Sides & South End	295		216	12				944	1841	
North End		31	216	12				99	193	
Cover	120	31	3720	3						537
Over Excavation										
Bottom	120	7	840	5					202	
2 Sides & South End	277		51							680
North End		37	114							203
							Trench C Subtotals:	**1192**	**2527**	**1420**

Note: Soil expansion factor of 1.3 applied to soil voulme.

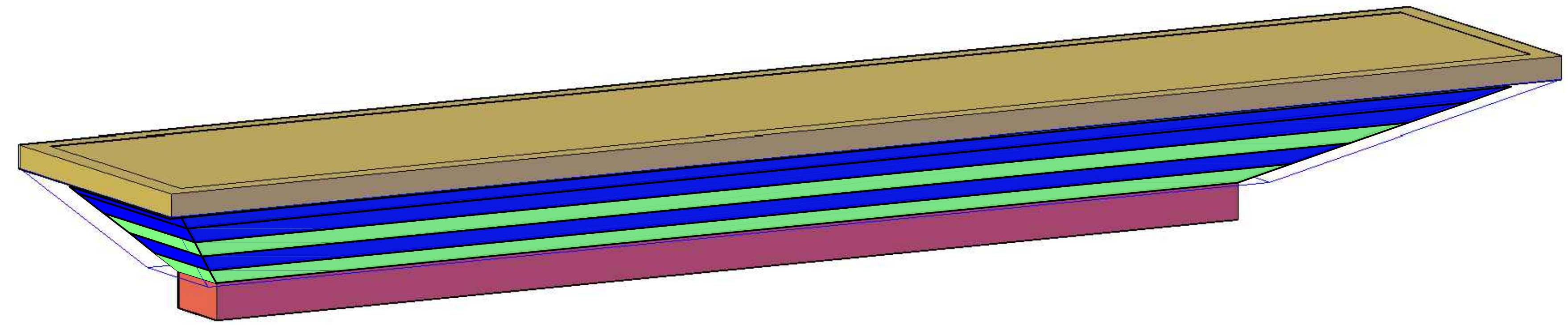
VOLUMES ESTIMATES TABLE

FIGURE D1-4
TRENCH C
UNCLASSIFIED AREA
Mixed Waste Landfill

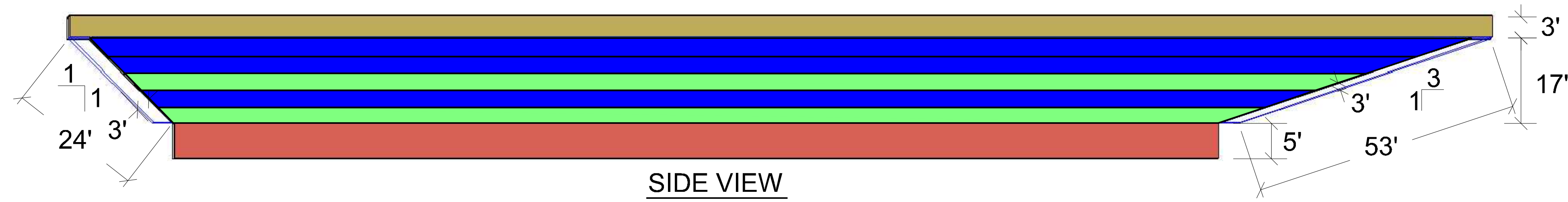
Sandia National Laboratories
BGI Banda Group International, LLC
amec foster wheeler

LEGEND

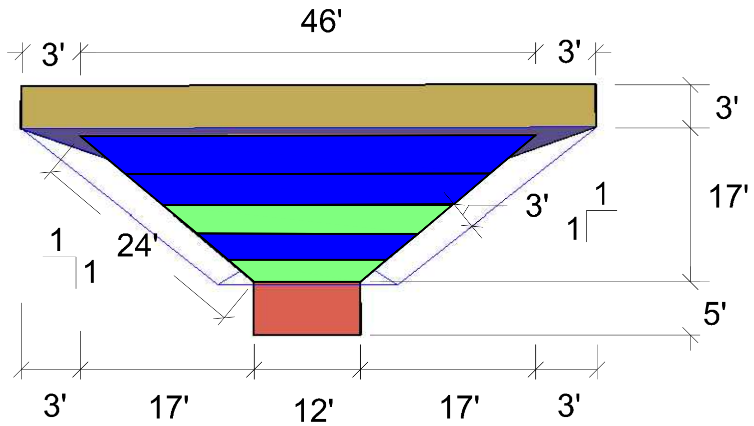
- 3' SOIL COVER
- 5' BOTTOM OVER EXCAVATION
- SOIL= 60% OF TRENCH VOLUME } CORE SIDES ENDS
- DEBRIS = 40% OF TRENCH VOLUME
- 3' SIDE & END SLOPE OVER EXCAVATION
- NTS NOT TO SCALE



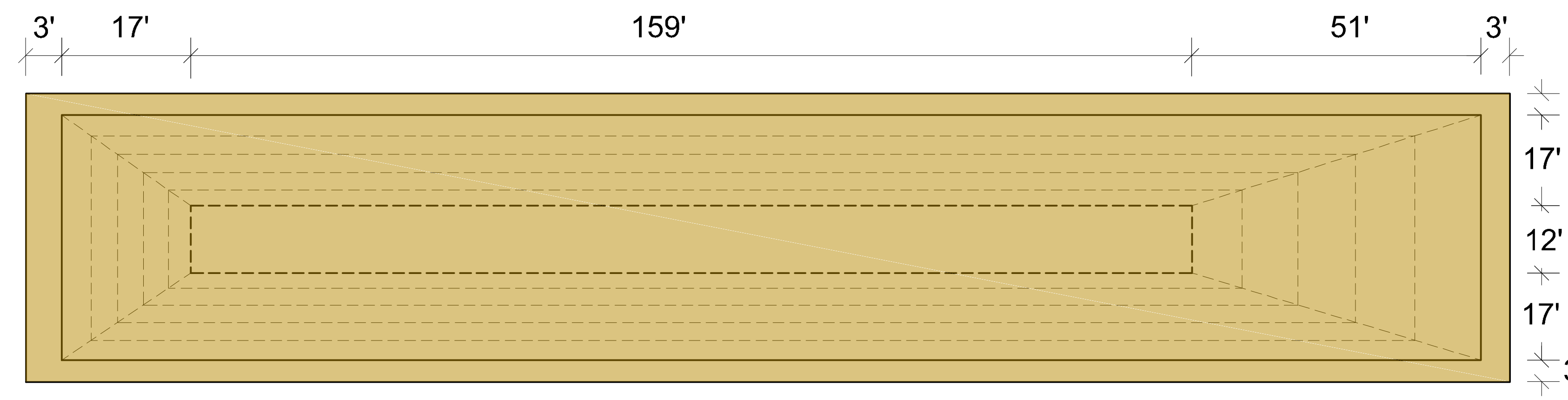
ISOMETRIC VIEW
NTS



SIDE VIEW
NTS



FRONT VIEW
NTS



PLAN VIEW
NTS

	Length (ft)	Width (ft)	Area (ft^2)	Depth (ft)	Cover (ft)	Side Slope	End Slope	Debris yd^3	Soil Low Level yd^3	Soil Replaceable yd^3
Trench D	159	46	7314	20	3	1:1	3:1			
Core	159	12	1908	17				481	937	
2 Sides & South End	398		433.5	17				2556	4984	
North End		46	433.5	17				295	576	
Cover	159	46	7314	3						1056
Over Excavation										
Bottom	159	12	1908	5					459	
2 Sides & South End	370		72							1283
North End		52	159							398
					Trench D Subtotals:			**3332**	**6956**	**2737**

Note: Soil expansion factor of 1.3 applied to soil voulme.

VOLUMES ESTIMATES TABLE

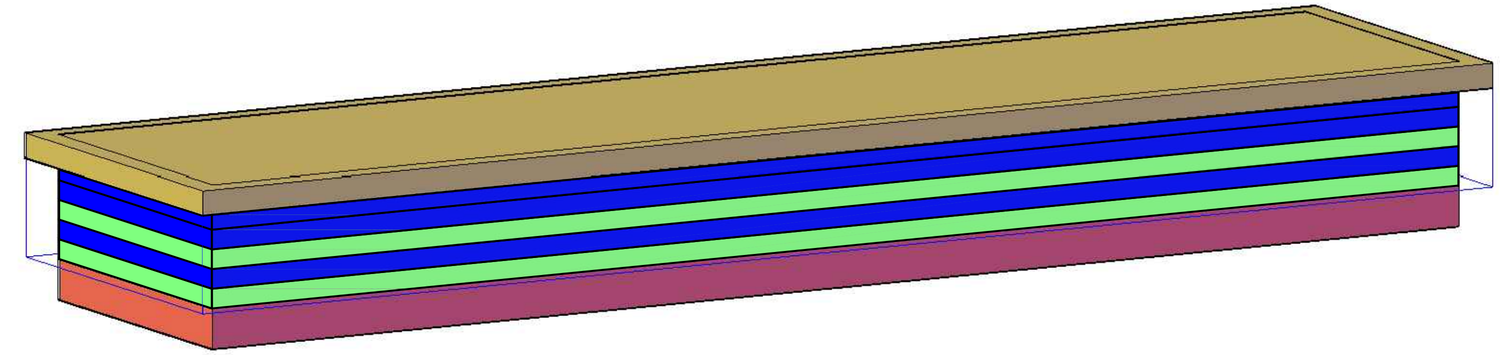
FIGURE D1-5
TRENCH D
UNCLASSIFIED AREA
Mixed Waste Landfill

Sandia National Laboratories
BGI Banda Group International, LLC
amec foster wheeler

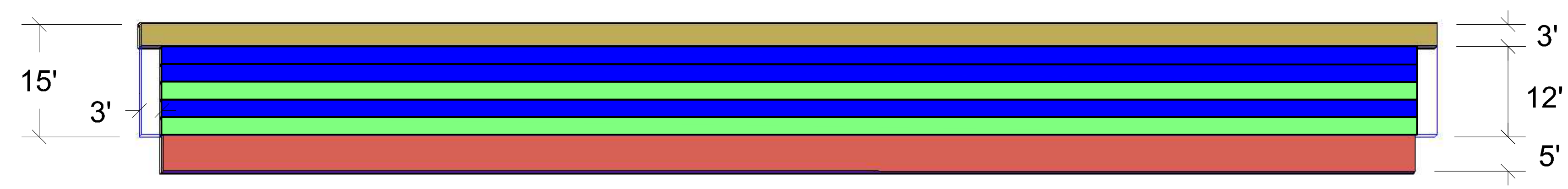
P:\consulting\projects\16\16-517-00066.Mixed Waste Landfill Re-evaluation\Concept\TRENCH DRAWINGS_Version 2.0\3D models_Trenches\D_TRENCH

LEGEND

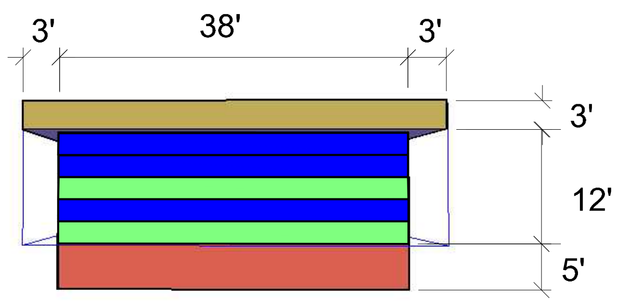
- 3' SOIL COVER
- 5' BOTTOM OVER EXCAVATION
- SOIL= 60% OF TRENCH VOLUME } CORE
- DEBRIS = 40% OF TRENCH VOLUME } CORE
- 3' SIDE & END SLOPE OVER EXCAVATION
- NTS NOT TO SCALE



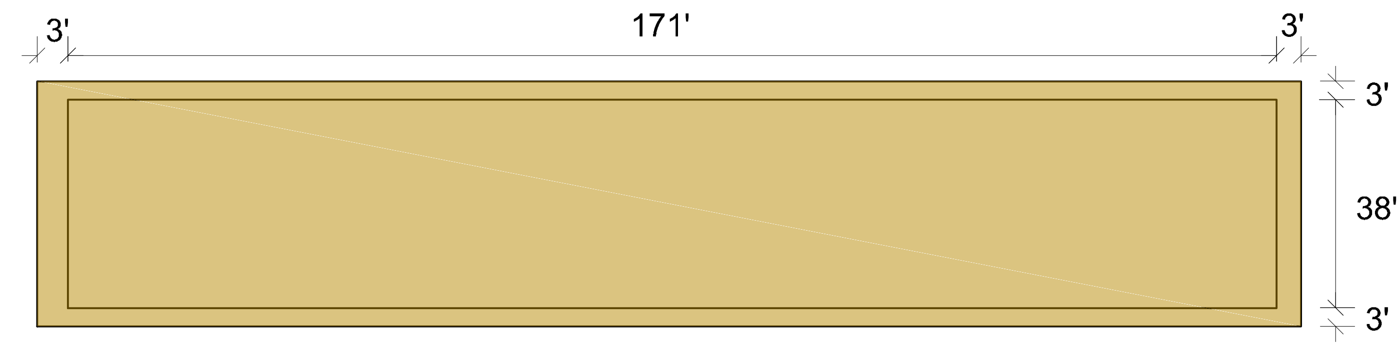
ISOMETRIC VIEW
NTS



SIDE VIEW
NTS



FRONT VIEW
NTS



PLAN VIEW
NTS

	Length (ft)	Width (ft)	Area (ft^2)	Depth (ft)	Cover (ft)	Side Slope	End Slope	Debris yd^3	Soil Low Level yd^3	Soil Replaceable yd^3
Trench E	171	38	6498	15	3	NA	NA			
Core	171	38	6498	12				1155	2253	
2 Sides				12				0	0	
2 Ends				12				0	0	
Cover	171	38	6498	3						939
Over Excavation										
Bottom	171	38	6498	5					1564	
2 Sides	348	3	45	15						754
2 Ends	82	3	45	15						178
						Trench E Subtotals:		**1155**	**3817**	**1871**

Note: Soil expansion factor of 1.3 applied to soil voulme.

VOLUMES ESTIMATES TABLE

FIGURE D1-6
TRENCH E
UNCLASSIFIED AREA
Mixed Waste Landfill

Sandia National Laboratories

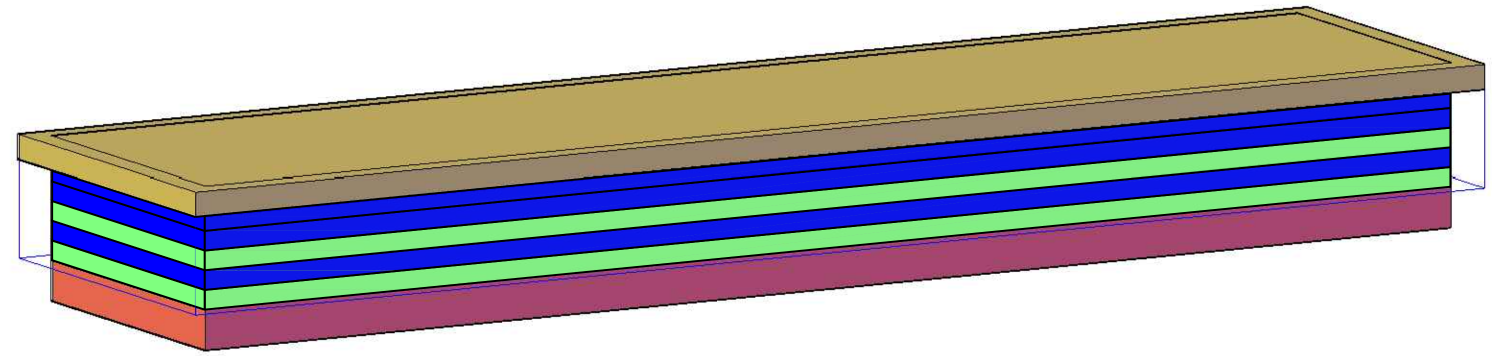
BGI Banda Group International, LLC

amec foster wheeler

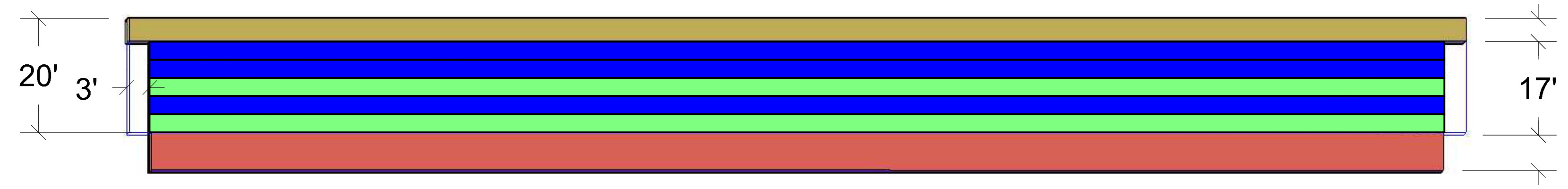
P:\consulting\projects\16\16-517-00066.Mixed Waste Landfill Re-evaluation\Concept\TRENCH DRAWINGS_Version 2.0\3D models_Trenches\E_TRENCH

LEGEND

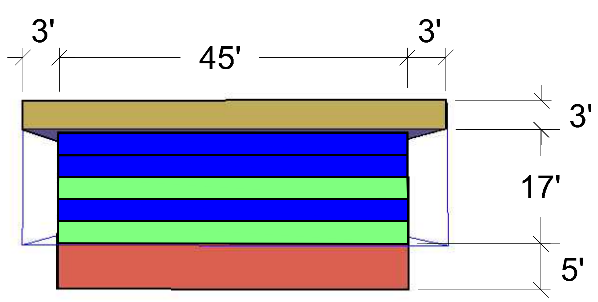
- 3' SOIL COVER
- 5' BOTTOM OVER EXCAVATION
- SOIL= 60% OF TRENCH VOLUME } CORE
- DEBRIS = 40% OF TRENCH VOLUME } CORE
- 3' SIDE & END SLOPE OVER EXCAVATION
- NTS NOT TO SCALE



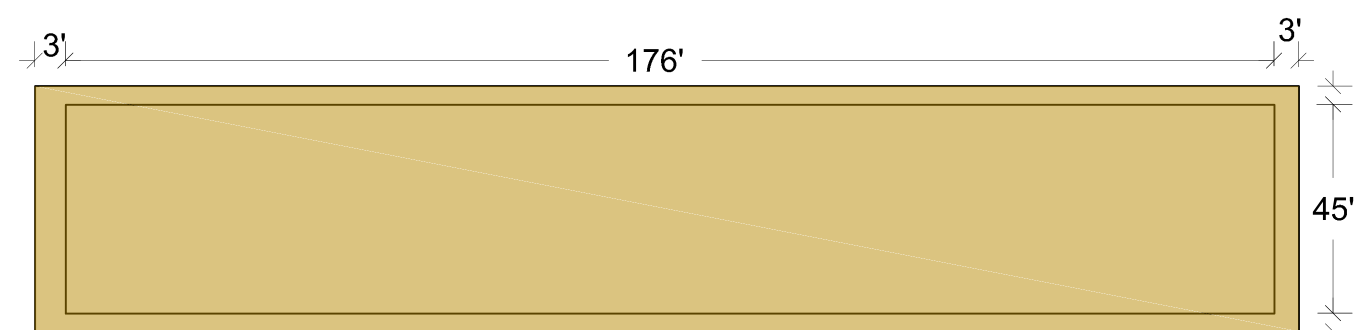
ISOMETRIC VIEW
NTS



SIDE VIEW
NTS



FRONT VIEW
NTS



PLAN VIEW
NTS

	Length (ft)	Width (ft)	Area (ft^2)	Depth (ft)	Cover (ft)	Side Slope	End Slope	Debris yd^3	Soil Low Level yd^3	Soil Replaceable yd^3
Trench F	176	45	7920	20	3	NA	NA			
Core	176	45	7920	17				1995	3890	
2 Sides				17				0	0	
2 Ends				17				0	0	
Cover	176	45	7920	3						1144
Over Excavation										
Bottom	176	45	7920	5					1907	
2 Sides	358	3	51	17						879
2 Ends	96	3	51	17						236
						Trench F Subtotals:		**1995**	**5797**	**2259**

Note: Soil expansion factor of 1.3 applied to soil voulme.

VOLUMES ESTIMATES TABLE

FIGURE D1-7
TRENCH F
UNCLASSIFIED AREA
Mixed Waste Landfill

Sandia National Laboratories
BGI Banda Group International, LLC
amec foster wheeler

LEGEND

3' SOIL COVER

5' BOTTOM OVER EXCAVATION

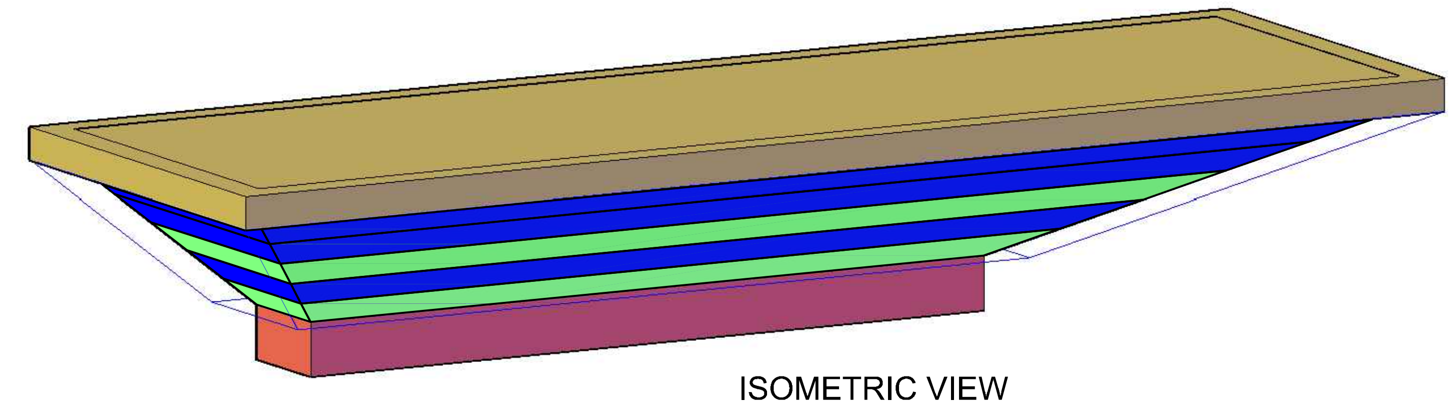
SOIL= 80% OF TRENCH VOLUME

DEBRIS = 20% OF TRENCH VOLUME (TRENCH PARTIALLY FILLED TO 20% FULL. IT WAS THEN BACKFILLED)

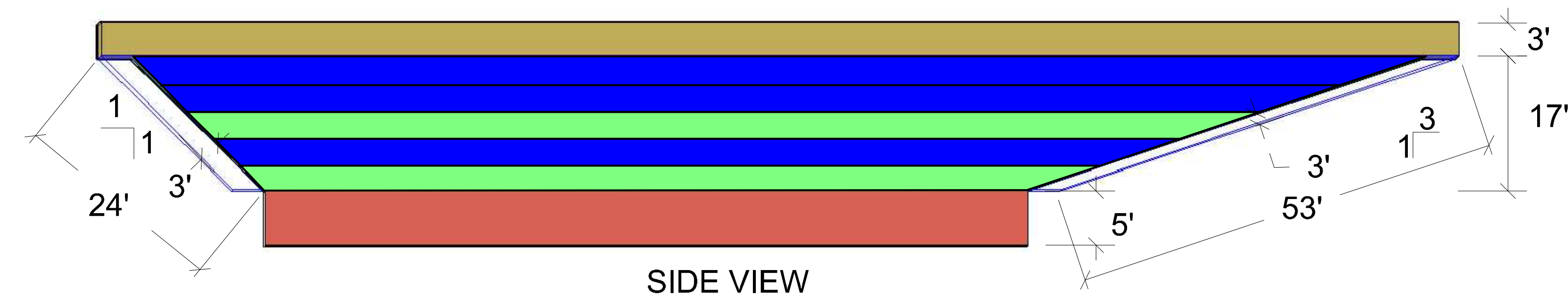
} CORE SIDES ENDS

3' SIDE & END SLOPE OVER EXCAVATION

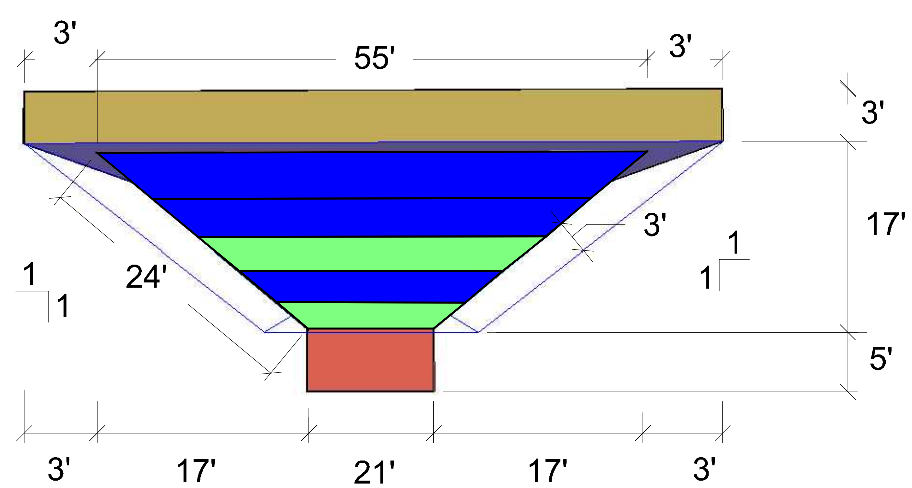
NTS NOT TO SCALE



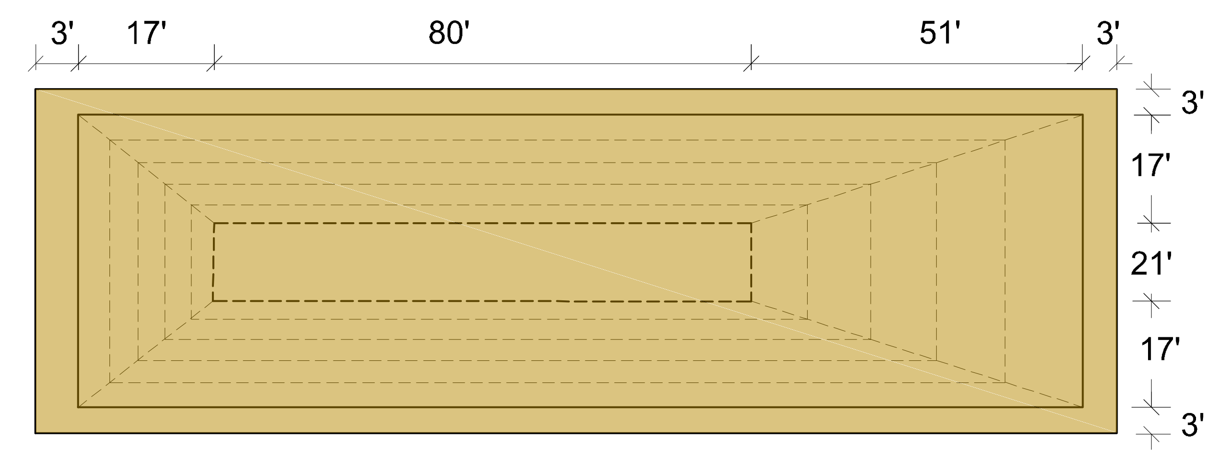
ISOMETRIC VIEW
NTS



SIDE VIEW
NTS



FRONT VIEW
NTS



PLAN VIEW
NTS

	Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	Cover (ft)	Side Slope	End Slope	Debris yd³	Soil Low Level yd³	Soil Replaceable yd³
Trench G	80	55	4400	20	3	1:1	3:1			
Core	80	21	336	17				85	165	
2 Sides & South End	249		433.5	17				800	4158	
North End		55	433.5	17				177	918	
Cover	80	55	4400	3						636
Over Excavation										
Bottom	80	21	1680	5					404	
2 Sides & South End	221		72							766
North End		55	159							421
						Trench G Subtotals:		**1062**	**5645**	**1823**

Note 1: Trench G was only partially filled ~20% full and was then backfilled.

Note 2: Soil expansion factor of 1.3 applied to soil volume.

VOLUMES ESTIMATES TABLE

FIGURE D1-8
TRENCH G
UNCLASSIFIED AREA
Mixed Waste Landfill

Sandia National Laboratories

BGI Banda Group International, LLC

amec foster wheeler

Classified Area										
Pit	Length (ft)	Width (ft)	Diameter (ft)	Area (ft²)	Total Depth (ft)	Soil Cover (ft)	Concrete Cover (ft)	Debris yd³	Concrete Cover yd³	Soil Cover yd³
U1	10	10	NA	100	25	3	3	70	11	11
U2	10	10	NA	100	25	3	3	70	11	11
U3	10	10	NA	100	25	3	3	70	11	11
31	10	10	NA	100	25	3	3	70	11	11
32	10	10	NA	100	25	3	3	70	11	11
33	10	10	NA	100	25	3	3	70	11	11
34	10	10	NA	100	25	3	3	70	11	11
35	10	10	NA	100	25	3	3	70	11	11
36	10	10	NA	100	25	3	3	70	11	11
30	NA	NA	4	13	15	3	3	4	1	1
28	10	10	NA	100	25	3	3	70	11	11
27	10	10	NA	100	25	3	3	70	11	11
SP-4	8	8	NA	64	20	3	3	33	7	7
SP-5	10	10	NA	100	20	3	3	52	11	11
SP-3	10	14	NA	140	15	3	3	46	16	16
SP-2	34	8	NA	272	15	3	3	91	30	30
SP-1	8	6	NA	48	15	3	3	16	5	5
1	NA	NA	6	28	15	3	3	9	3	3
2	NA	NA	6	28	15	3	3	9	3	3
3A	NA	NA	6	28	15	3	3	9	3	3
3B	NA	NA	6	28	15	3	3	9	3	3
4	NA	NA	7	38	15	3	3	13	4	4
5	NA	NA	6	28	15	3	3	9	3	3
6	NA	NA	6	28	15	3	3	9	3	3
7	NA	NA	7	38	15	3	3	13	4	4
8	NA	NA	6	28	15	3	3	9	3	3
9	10	10	NA	100	25	3	3	70	11	11
10	10	10	NA	100	25	3	3	70	11	11
11	10	10	NA	100	25	3	3	70	11	11
12	10	10	NA	100	25	3	3	70	11	11
13	10	10	NA	100	25	3	3	70	11	11
14	12	12	NA	144	25	3	3	101	16	16
15	12	12	NA	144	25	3	3	101	16	16
16	10	10	NA	100	25	3	3	70	11	11
17	10	10	NA	100	25	3	3	70	11	11
18	10	10	NA	100	25	3	3	70	11	11
19	10	10	NA	100	25	3	3	70	11	11
21	10	10	NA	100	25	3	3	70	11	11
24	10	10	NA	100	25	3	3	70	11	11
25	10	10	NA	100	25	3	3	70	11	11
26	10	10	NA	100	25	3	3	70	11	11
UC1[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
UC2[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
37[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTALS yd³								2213	395	395

Notes: NA = Not Applicable. If a diameter is provided, pit is cylindrical and length & width do not apply

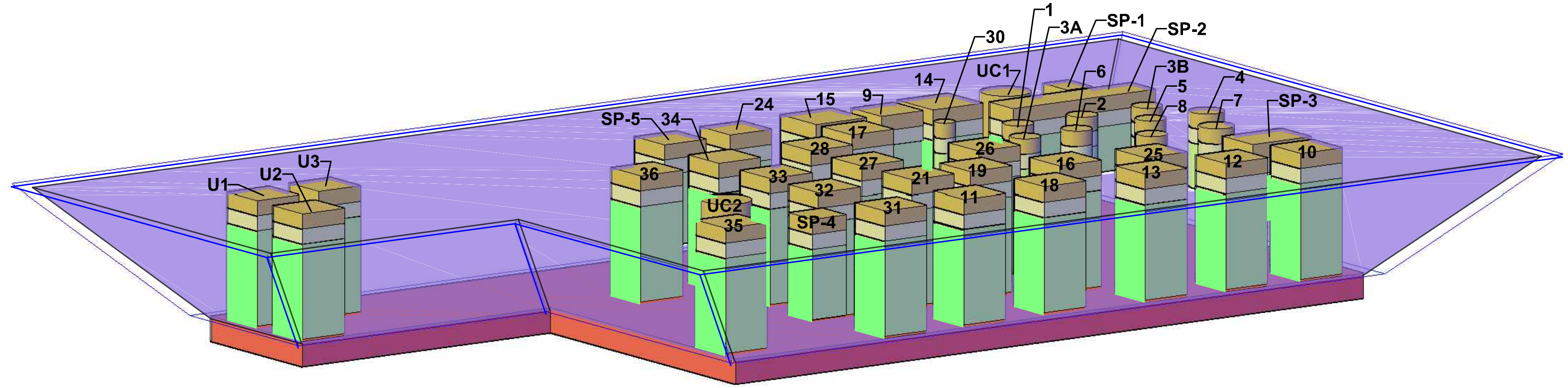
[a] Pits UC1 and UC2 collapsed after excavation and were abandoned, no waste was placed in these pits

[b] Pit 37 was empty and backfilled on 1/8/1997 with clean fill soil from the site

Classified Area Summary Table					
Area	Debris yd³	Soil Mixed yd³	Concrete Mixed yd³	Soil Low Level yd³	Soil Replaceable yd³
Pits	2,213				
Soil Surrounding Pits		14,776			
Cover			395	2,477	
Over Excavation					
Bottom		4,129			
Sides/Ends				9,371	
Excavation for Non-Designated Area (NDA) in Northwest Corner and Access to Pits[a]					
NDA Area					152
West Side[b]					4,049
Total	**2,213**	**18,905**	**395**	**11,848**	**4,201**

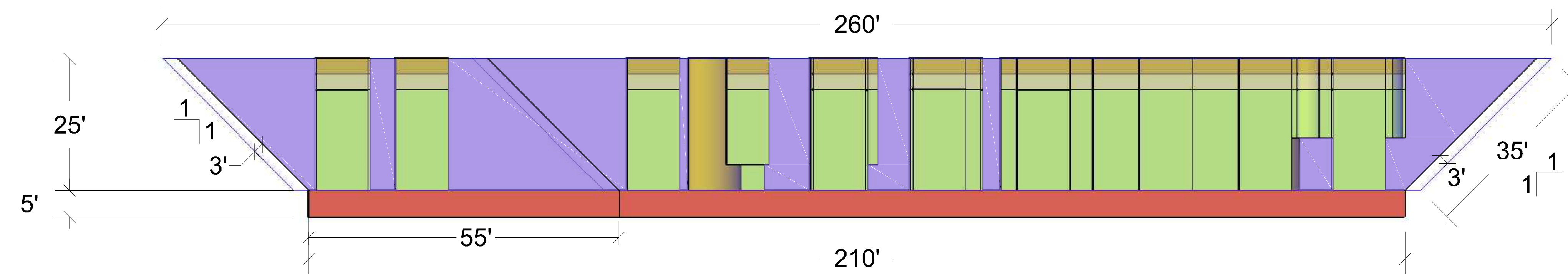
[a] NDA and West Side excavation areas not shown on drawing, see Figure D1-1

[b] West Side is the area between the Trench D excavation and the western edge of the Pits that will be removed to access the Classified Pit area; see Figure D1-1



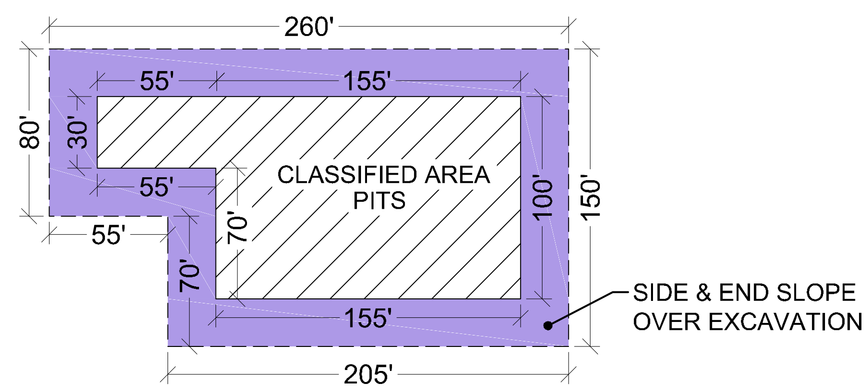
ISOMETRIC VIEW

NTS



SIDE VIEW

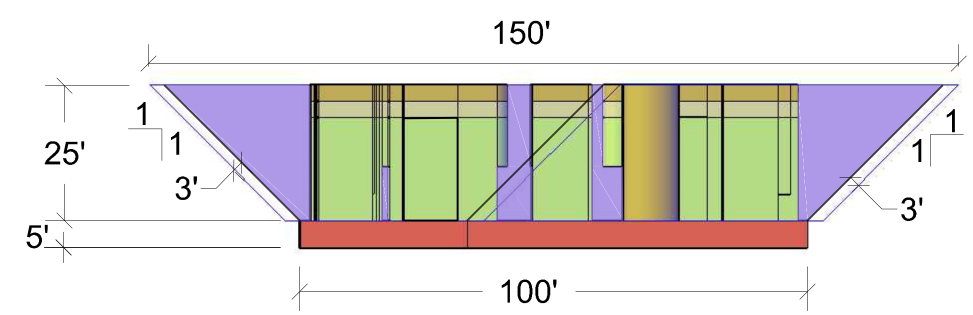
NTS



PLAN VIEW

CLASSIFIED AREA DIMENSIONS

NTS



FRONT VIEW

NTS

NOTES

1. 3' SOIL COVER ONLY SHOWN OVER PITS; IT EXTENDS ACROSS THE CLASSIFIED AREA.

LEGEND

- 3' SOIL COVER
- 3' CONCRETE COVER
- DEBRIS IN PITS
- 5' BOTTOM OVER EXCAVATION
- SOIL SURROUNDING PITS AND SIDE & END SLOPE OVER EXCAVATION
- 3' SIDE & END SLOPE OVER EXCAVATION
- NTS NOT TO SCALE

FIGURE D1-9

PITS

CLASSIFIED AREA

Mixed Waste Landfill

Sandia National Laboratories

BGI Banda Group International, LLC

amec foster wheeler

APPENDIX D-2
Radiological, Construction, & Transportation Risk Assessment

This appendix contains information supporting the risk screening assessment presented in Chapter 5, Section 5.3.3 of the main report.

The radiological risk screening assessment summarized in Chapter 5, Section 5.3.3.1 of the main report for the *Future Excavation* alternative was originally presented in the Mixed Waste Landfill Corrective Measures Study (CMS) Final Report (SNL/NM May 2003). Additional information for this risk screening assessment is available in the CMS Final Report, Section 4.3.4.3 and Appendix I.

The construction risk for remediation activities associated with the offsite and onsite disposal alternatives evaluated in Chapter 5, Section 5.3.3.2 is based on workhours for field technicians, equipment operators, and survey crew personnel. Workhours were estimated from the project schedules presented in Figure 5-3 for the offsite disposal alternative and Figure 5-4 for the onsite disposal alternative of the main report, and from the RACER™ reports included in Appendix D4. Field labor workhours for all remediation construction activities associated with Support Facility Construction (Phase 2) through Closure (Phase 4) activities were totaled and converted to Full-Time Equivalents (FTEs) for this screening assessment, with 2000 workhours being equal to one FTE. The workhour totals for the offsite and onsite disposal alternatives are summarized in Tables D2-1 and D2-2, respectively.

The evaluation of transportation risk for the offsite and onsite disposal alternatives evaluated in Chapter 5, Section 5.3.3.3 is based on transportation mileage associated with project activities conducted on public roads. Roundtrip mileage and related assumptions associated with waste disposal and obtaining borrow fill material needed to complete the project are summarized in Chapter 5, Section 5.3.3.3. A breakout of the transportation mileage totals for the offsite and onsite disposal alternatives are detailed in Tables D2-3 and D2-4, respectively.

This page intentionally left blank.

Table D2-1
Offsite Disposal Alternative - Field Labor Workhours Summary

Work Phase/(Task)	**Field Technician Crew Size**	**Duration Years**	**Duration Work Days**	**Total Field Technician Work Hours**	**Comments**
Phase 2 Support Facility Construction (Site Grading & Drainage) **to** **Phase 4 Closure** (Operational Area – Scrape, Load, Disposal)	20	10.3	2,680	428,800	20 technicians @ 2,680 days, 8 hours per day 2,680 x 8 x 20 = 428,800 total workhours
Phase 4 Closure (Operational Area – Verification) **to** **Phase 4 Closure** (Demobilize Admin & Lab Trailers)	10	0.5	132	10,560	10 technicians @ 132 days, 8 hours per day 132 x 8 x 10 = 10,560 total workhours
OFFSITE DISPOSAL ALTERNATIVE - Phase 2 through Phase 4 Totals	**--**	**10.8**	**2,812**	**439,360**	**Total Field Technician Workhours**
Phase 2 & Phase 3 Equipment Operator & Field Labor Hours (see Table D2-1 Supplemental)				**123,112**	--
OFFSITE ALTERNATIVE GRAND TOTAL				**562,472**	One Full-Time Equivalent (FTE) = 2000 hours Total = 281 FTEs

Notes:
See Table D2-1 Supplemental for detailed breakout of field labor hours that are in addition to the contractor field technicians performing various tasks throughout the project.

Table D2-1 Supplemental
Offsite Disposal Alternative - Phase 2 & Phase 3 Additional Field Labor Hours

Work Phase/(Task – Technology/Assembly)	**Equipment Operator Hours**	**Extra Technician Hours**	**Survey Crew Hours**	**TOTAL**
Phase 2 Task 12 (Additional Equipment & Operators)	19,440	--	--	19,440
Phase 3 Task 01 (Waste Management – Sorting, Processing, Staging)	10,400	--	--	10,400
Phase 3 Task 03 (UCA Excavation – Excavation)	16,080	--	--	16,080
Phase 3 Task 03 (UCA Excavation - Sorting, Processing, Staging)	30,080	--	--	30,080
Phase 3 Task 05 (CA Excavation – Excavation)	20,480	--	--	20,480
Phase 3 Task 05 (CA Excavation - Sorting, Processing, Staging)	25,400	--	--	25,400
Phase 3 Task 07 (Excavation Backfill & Compaction – Replaceable & Supplemental)	--	--	624	624
Phase 3 Task 09 (Excavation ET Cover Construction - Capping)	--	--	608	608
GRAND TOTAL				**123,112**

Notes:
This table summarizes field labor assigned by RACER® for equipment operators, and extra field technicians and survey crews needed for specific Phase 2 and 3 tasks. This field labor is in addition to the contractor field technicians performing various tasks throughout the project.
CA = Classified Area.
ET = Evapotranspirative Cover.
UCA = Unclassified Area.

Table D2-2
Onsite Disposal Alternative - Field Labor Workhours Summary

Work Phase/(Task)	**Field Technician Crew Size**	**Duration Years**	**Duration Work Days**	**Total Field Technician Work Hours**	**Comments**
Phase 2 Support Facility Construction (Site Grading & Drainage) **to** **Phase 4 Closure** (Operational Area – Scrape, Load, Disposal)	20	10.8	2,803	448,480	20 technicians @ 2,803 days 8 hours per day 2,803 x 8 x 20 = 448,480 total workhours
Phase 4 Closure (Operational Area – Verification) **to** **Phase 4 Closure** (Demobilize Admin & Lab Trailers)	10	0.5	132	10,560	10 technicians @ 132 days 8 hours per day 132 x 8 x 10 = 10,560 total workhours
ONSITE DISPOSAL ALTERNATIVE - Phase 2 through Phase 4 Totals	**--**	**11.3**	**123**	**459,040**	Reflects longer Phase 2 (12 additional work days) and Phase 3 (111 additional work days) schedule relative to Offsite Disposal Alternative
Phase 2 & Phase 3 Equipment Operator & Field Labor Hours (see Table D2-2 Supplemental below)				**254,530**	
ONSITE ALTERNATIVE GRAND TOTAL				**713,570**	One Full-Time Equivalent (FTE) = 2000 hours Total = 357 FTEs

Notes:
See Table D2-2 Supplemental for detailed breakout of field labor hours that are in addition to the contractor field technicians performing various tasks throughout the project.

Table D2-2 Supplemental
Onsite Disposal Alternative - Phase 2 & Phase 3 Additional Field Labor Hours

Work Phase/(Task – Technology/Assembly)	**Equipment Operator Hours**	**Extra Technician Hours**	**Survey Crew Hours**	**TOTAL**
Phase 2 Task 13 (Additional Equipment & Operators)	19,440	--	--	19,440
Phase 3 Task 01 (Waste Management – Sorting, Processing, Staging)	10,400	--	--	10,400
Phase 3 Task 01 (Waste Management – Waste Placement Onsite Cell)	13,000	6,240	1,040	20,280
Phase 3 Task 03 (UCA Excavation – Excavation)	16,080	--	--	16,080
Phase 3 Task 03 (UCA Excavation – Sorting, Processing, Staging)	30,080	--	--	30,080
Phase 3 Task 03 (UCA Excavation – Waste Placement Onsite Cell)	37,596	18,048	3,008	58,652
Phase 3 Task 05 (CA Excavation – Excavation)	23,480	--	--	23,480
Phase 3 Task 05 (CA Excavation – Sorting, Processing, Staging)	25,400	--	--	25,400
Phase 3 Task 05 (UCA Excavation – Waste Placement Onsite Cell)	31,750	15,240	2,544	49,534
Phase 3 Task 07 (Excavation Backfill & Compaction – Replaceable & Supplemental)	--	--	576	576
Phase 3 Task 09 (Excavation ET Cover Construction - Capping)	--	--	608	608
GRAND TOTAL				**254,530**

Notes:
This table summarizes field labor assigned by RACER® for equipment operators, and extra field technicians and survey crews needed for specific Phase 2 and 3 tasks. This field labor is in addition to the contractor field technicians performing various tasks throughout the project.
CA = Classified Area.
ET = Evapotranspirative Cover.
UCA = Unclassified Area.

Table D2-3
Offsite Disposal Alternative Transportation Risk Mileage Summary

Work Phase	Waste Stream/Task	Waste Management Nevada Test Site Roundtrips/Mileage RT mileage = 1,650	Waste Management EnergySolutions Roundtrips/Mileage RT mileage = 1,450	Excavation Backfilling Borrow Fill Trips/Mileage RT mileage = 30	OFFSITE DISPOSAL ALTERNATIVE TOTAL MILEAGE
Excavation & Waste Management	All Excavated Soil & Debris LLW and MW	2,923 / 4,822,950	1,073 / 1,555,850	--	6,378,800
	PPE	82 / 135,300	--	--	135,300
	HEPA Filters	129 / 212,850	--	--	212,850
	Excavation Backfilling	--	--	4,197 / 125,910	125,910
Excavation & Waste Management Subtotals		**5,171,100**	**1,555,850**	**125,910**	**6,852,860**
Closure	PPE	8 / 13,200	--	--	13,200
	D&D Sprung™ Fabric	41 / 67,650	--	--	67,650
	D&D Waste (2 warehouses & container storage canopy)	3,251 / 5,364,150	--	--	5,364,150
	Operational Area Soil	760 / 1,254,000	--	--	1,254,000
	Equipment	4 / 6,600	--	--	6,600
Closure Subtotals		**6,705,600**	**--**	**--**	**6,705,600**
GRAND TOTALS		**11,876,700**	**1,555,850**	**125,910**	**13,558,460**

Notes:
Transuranic waste transportation mileage not included, which is less than 1,000 miles.

Table D2-4
Onsite Disposal Alternative Transportation Risk Mileage Summary

		Waste Management	Excavation Backfilling	Onsite Cell ET Cover	ONSITE DISPOSAL ALTERNATIVE
Work Phase	**Waste Stream/Task**	**Nevada Test Site Roundtrips/Mileage** RT = 1,650 miles	**Borrow Fill Trips/Mileage** [30 miles RT]	**Borrow Fill Trips/Mileage** [30 miles RT]	**TOTAL MILEAGE**
Excavation & Waste Management	PPE	87 / 143,550	--	--	143,550
	HEPA Filters	129 / 212,850	--	--	212,850
	Excavation Backfilling	--	2,841 / 85,230	--	85,230
	Onsite Cell ET Cover	--	--	5,403 / 162,090	162,090
Excavation & Waste Management Subtotals		**356,400**	**85,230**	**162,090**	**603,720**
Closure	PPE	8 / 13,200	--	--	13,200
	D&D Sprung™ Fabric	41 / 67,650	--	--	67,650
	D&D Waste (2 warehouses & container storage canopy)	3,251 / 5,364,150	--	--	5,364,150
	Operational Area Soil	760 / 1,254,000	--	--	1,254,000
	Equipment	4 / 6,600			6,600
Closure Subtotals		**6,705,600**	**--**	**--**	**6,705,600**
GRAND TOTALS		**7,062,000**	**85,230**	**162,090**	**7,309,320**

Notes:
Transuranic waste transportation not included, which is less than 1,000 miles

APPENDIX D-3
Mixed Waste Landfill
Technical & Costing Assumptions
Offsite & Onsite Disposal Alternatives

TABLE OF CONTENTS

List of Tables

Global Assumptions

These assumptions supplement the information provided in Chapter 5 of this report. Refer to Chapter 5 in the main report for additional information.

1. Project funding would be sufficient to acquire the number and type of personnel and equipment required for completion of work within the scheduled timeframes. Approach would include a turn-key design-build contract to allow for the most time-efficient project execution.

2. Consistent with the 2003 evaluation, this evaluation assumes a risk-based approach designed to meet industrial land-use at completion. While this may meet the definition of clean closure, as NMED has not finalized clean closure levels for the site, this evaluation assumes that the excavated site would require reinstallation of the current ET Cover over the backfilled excavation. Monitoring, inspection, and maintenance requirements similar to current practices are also assumed for the MWL excavation site (i.e., groundwater and soil-gas monitoring, ET Cover and site inspections, and routine maintenance based on inspections).

3. Although polychlorinated biphenyls and asbestos are not directly listed in the MWL inventory, there are items listed (e.g., fluorescent ballasts and building materials) that likely contain Toxic Substances Control Act (TSCA)-regulated constituents. Approach would include TSCA permitting.

4. Work would be performed 40 hours per week, 52 weeks per year. Work would begin in calendar year 2020, after receipt of New Mexico Environment Department (NMED) direction to excavate. Schedules displaying the start/finish date and duration (i.e., number of work days) for each of the six major work phases and associated tasks are provided for Offsite and Onsite disposal alternatives in the main report Figures 5-3 and 5-4, respectively. These schedules form the basis for the updated cost estimate for excavation and the two disposal alternatives.

5. Onsite disposal alternative schedule is approximately one year longer than Offsite disposal alternative schedule to accommodate a public hearing anticipated for the onsite engineered cell permitting process as illustrated in Figure D3-1. The timeframes for development and regulatory approval represent best-case scenarios and regulatory acceptance of a risk-based remediation approach.

6. Whenever possible, tasks would be performed concurrently, rather than in sequence, to minimize the time for project execution (e.g., compliance with applicable permit requirements from multiple regulations such as the Resource Conservation and Recovery Act [RCRA] and TSCA would be performed in parallel with Corrective Measures Implementation Plan [CMIP] development and regulatory review and approval).

7. Internal Sandia National Laboratory (SNL) and U.S. Department of Energy (DOE) requirements (e.g., National Environmental Policy Act implementing procedures, coordination with SNL Facilities to meet design and construction specifications) would be performed within the Planning & Permitting and Support Facility Construction phase timeframes.

8. Costs associated with waste management are included in the corresponding work phase (i.e., Phase 3 Excavation & Waste Management and Phase 4 Closure); they are not broken out in a separate waste management phase.

9. Most equipment and operator costs were assigned by Remedial Action Cost Engineering and Requirements (RACER®) software. If not available through RACER®, estimated costs for equipment were obtained through vendor quotations, vendor catalogs, and web-based research.

10. Equipment that would be more expensive to return for unused periods of time than the rental fee for the same time period would be retained onsite for use in future tasks. As a cost-saving measure, because of the long project duration, some equipment would be purchased rather than rented.

11. Contractor staff would acquire DOE clearances for this project.

12. Excavation and waste management activities within the Sprungs™ would be performed in Level B personal protective equipment (PPE) with supplied air full-face respirators. All other work will be performed in Level D PPE (e.g., excavation backfilling and evapotranspirative [ET] Cover construction). Decontamination of equipment and personnel would be performed throughout excavation and waste management tasks in Level C PPE.

13. No onsite long-term storage would be necessary as all waste would have a disposal pathway.

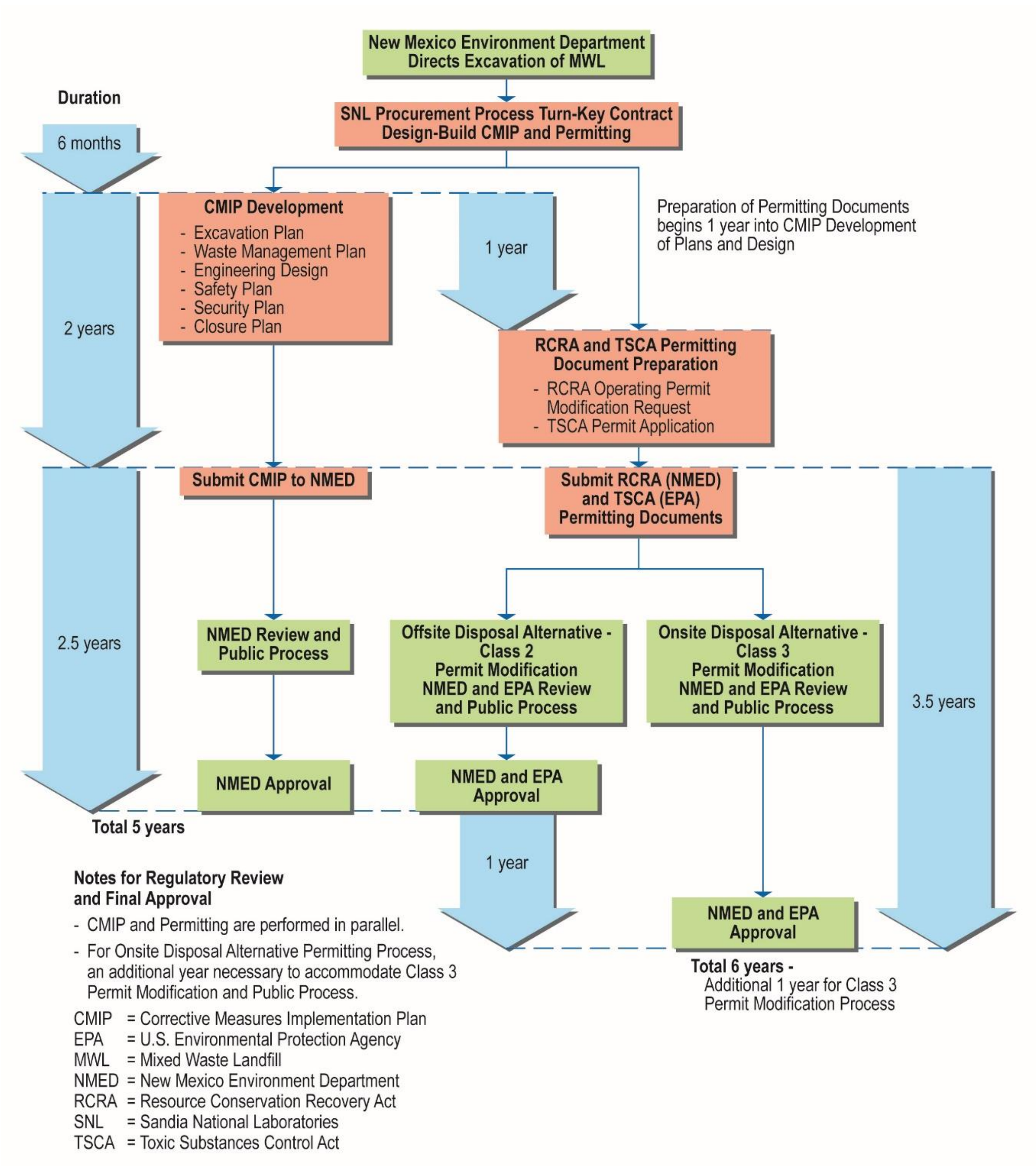


Figure D3-1
Phase 1 Planning & Permitting Process

RACER® Software Notes

RACER® Version 11.4.63.0 is the primary software used to estimate costs for labor and equipment for this reevaluation. RACER® is a cost estimating software that was developed under the direction of the U.S. Air Force for estimating environmental investigation and cleanup costs. RACER® has been used to estimate over $10 billion of environmental projects and current users include the U.S. Departments of Defense, Energy, and Interior as well as the U.S. Environmental Protection Agency. The software provides the detail of a definitive engineer's estimate but can also be used at early rough-order-of-magnitude stages of cost estimating. RACER® was used for consistency with the 2003 Mixed Waste Landfill (MWL) Corrective Measures Study Final Report, which used an earlier version to estimate project costs. RACER® reports detailing costs for labor, equipment, and materials, are provided in Appendix D4.

Hierarchy of Operations within RACER®

Phase – Offsite and Onsite Disposal Alternatives are broken into six work phases.

- Task – Each phase includes one or more tasks that correspond to the disposal alternative schedule.
    - Technology – Each task is comprised of one or more technologies (i.e., subtasks).
        - Assembly – Each assembly represents a combination of materials, labor and/or equipment needed to complete the respective technology.

RACER® Acronyms and Abbreviations

ACR = acres
BCY = bank cubic yards
CY = cubic yards
EA = each
ECY = expanded cubic yards
HR = hours
LCY = loose cubic yards
LF = linear feet
LS = lump sum
MI = miles
MO = months
SF = square feet
SY = square yards
TRU = transuranic waste

Additional Notes

1. Costs for construction elements not available in RACER® were obtained from RSMeans data from Gordian® (RSMeans), a localized construction cost database considered to be the construction industry standard. RSMeans data was entered into RACER® to produce a single set of cost reports for each disposal alternative.

2. The number of hours shown for the Contractor Labor Management technology in each work phase are based upon multiplying the task duration (days) by 8 hours/day.

3. The number of working days to complete each task corresponds to the duration shown in the Offsite or Onsite Alternative schedule (main report Figures 5-3, and 5-4, respectively).

4. An SNL Professional Labor Management technology is included in each phase to account for SNL oversight management costs. The Remedial Action Complexity for each technology was selected as High due to complexity of the project.

5. Wherever applicable, a Contractor Labor Management technology is included in each phase, to cover primary contractor labor management costs. For purposes of this evaluation, all work activities are assigned to the primary contractor.

6. The labor unit cost for SNL Oversight Labor was estimated for each phase by applying a factor of 75% to the combined labor unit costs for contractor professional labor categories (e.g., Project Manager, Senior Staff Engineer).

7. Labor and equipment costs for equipment requiring a specially trained and qualified operator (e.g., the 100-ton crane used to extract oversize or extremely heavy items from the MWL) are included with the equipment in the corresponding technology/assembly.

8. Labor costs for equipment not requiring a specially trained and qualified operator are covered by phase-specific contractor labor (i.e., field technicians) so the RACER®-assigned labor charge was not included in the corresponding technology/assembly.

9. With the exception of Phase 2, additional equipment deemed necessary for completion of a task, beyond the RACER®-assigned equipment, is shown within each technology.

10. Units (HR, DAY, MO, YR) for rented equipment were based upon the lowest period of time needed to complete the related task(s).

11. In this document, the terms “tents,” “tent structures,” and “Sprung(s)™” are synonymous. “Tent structures” is RACER® terminology and “tent(s)” is a shortened version, “Sprung(s)™” refers to a specific brand of tent and is used here for descriptive purposes.

12. Several Transportation & Disposal technologies in Phase 3 include assembly #33171016 with a sub bid cost of $401.50 per cubic yard (cy) and an extended cost of $0. This is a RACER®-assigned assembly for Nevada National Security Site (NNSS) waste disposal but, since there is currently no charge for SNL/NM waste disposal at NNSS due to DOE facility agreements, a quantity of 0 cy was used.

This page intentionally left blank.

Offsite Disposal Alternative

Technical & Costing Assumptions

This page intentionally left blank.

Phase 1. Planning & Permitting

Estimated start date: 1/1/2020
Estimated duration: 5 years

Phase 1 Tasks:

- Procurement of Turn-Key Contract (01)
- Corrective Measures Implementation Plan (CMIP) (02)
- Preparation of TSCA & RCRA Permitting Documents (03)
- Regulatory Review & Approval (04)
- SNL Professional Labor Management (05)
- Contractor Labor Management (06)

Phase 1 includes the tasks that must be performed prior to breaking ground on construction of project support facilities and before excavation of the MWL could begin. Completion of the CMIP and Permitting process through final regulatory approval is the determining factor for the duration of this phase, which includes preparation of design elements and documents needed to submit a CMIP, a RCRA permit modification request, and a TSCA permit application to the NMED and the Environmental Protection Agency (EPA), respectively. Phase 1 would begin upon receipt of direction from the NMED for excavation of the MWL and would end when approval of the CMIP and permit modification requests is received.

Procurement of Turn-Key Contract (01)

Estimated start date: 1/1/2020
Estimated duration: 6 months

Procurement of a turn-key contract by SNL for design-build effort to allow for the most efficient project execution schedule. Includes only Other Direct Costs (ODCs), such as administrative support for the procurement process. SNL labor covered in Task 05. Design tasks are included in Task 02.

Assumptions related to this task:

- Includes project scheduling and cost engineering at the oversight level.
- SNL would expedite the procurement process in a six month period.

CMIP (02)

Estimated start date: 6/30/2020
Estimated duration: 2 years

This task includes development of a comprehensive set of documents that would be compiled in the CMIP addressing all excavation, waste management, engineering design, closure, and post-closure/long-term monitoring and maintenance (LTMM) requirements. The CMIP would provide the technical basis and information needed for the RCRA and TSCA permitting processes. Engineering design included in the CMIP would address excavation, all support facilities and site layout, security measures and controls, and waste management operations. CMIP documents are listed below.

- Site-Specific Work Plan (Excavation Plan)
- Engineering Design
- Health and Safety Plan/Radiation Protection Plan
- Waste Management Plan

- Sampling and Analysis Plan
- Security Plan
- QA/QC Plan
- Closure Plan
- Long-Term Monitoring & Maintenance Plan (LTMMP)
- Installation Plan for post-excavation monitoring network

Assumptions related to this task:
- The CMIP would implement a risk-based approach under RCRA and TSCA designed to meet industrial land-use requirements.
- The waste management plan would include a waste characterization sampling & analysis plan that meets disposal facility waste acceptance criteria (WAC) and a RCRA Contained-In Determination approach for excavation and project-generated waste.

Preparation of TSCA and RCRA Permitting Documents (03)
Estimated start date: 6/29/2021
Estimated duration: 1 year

Permitting documents would address all the relevant CMIP design and project execution scope, including a closure plan for excavation and waste management operations and an LTMMP. See Figure D3-1 for a graphic depiction of the permitting process.

Assumptions related to this task:
- RCRA and TSCA permitting documents would address all applicable requirements (e.g., Excavation Sampling & Analysis Plan would address all applicable constituents of concern and risk-based cleanup standards).
- RCRA permitting process would include a minimum Class 2 Modification to the SNL RCRA Operating Permit that covers waste treatment (e.g., stabilization) and project waste management operations.
- Would incorporate a risk-based approach as described above for CMIP.
- Preparation would begin 1 year after start of CMIP development to allow for completion of initial planning and design necessary for the permitting process.
- Permitting documents would be submitted to the NMED and EPA concurrently with CMIP.

Regulatory Review & Approval of Permit Submittals (04)
Estimated start date: 6/22/2022
Estimated duration: 2.5 years

This task includes NMED review, DOE/SNL personnel response to NMED technical comments, required public notification process, resolution of regulatory technical comments, and regulatory approval from NMED.

Assumptions related to this task:
- CMIP and RCRA/TSCA permitting documents would be approved at the same time.
- Two sets of technical comments would be received from NMED that require formal response prior to final approval.

SNL Professional Labor Management (05)
Estimated start date: 1/1/2020
Estimated duration: 5 years

Lump-sum SNL labor cost for turn-key design-build procurement effort and project oversight for the Planning & Permitting Phase, including submittal, response, public process, and approval of the CMIP and permitting documents.

Contractor Labor Management (06)
Estimated start date: 6/30/2020
Estimated duration: 4.5 years

Includes all contractor labor to perform Planning & Permitting Phase activities.

Labor rates were selected by RACER®. Where a specific labor category was not available within RACER®, the equivalent RACER® labor category is listed in parentheses.

- Senior Project Manager (at 20%)
- Project Manager (at 50%)
- (2) Senior Staff Engineers
- (3) Staff Engineers
- QA/QC Officer
- Certified Industrial Hygienist/Certified Health Physicist (CIH/CHP) (Certified Industrial Hygienist)
- (2) Secretarial/Administrative
- (2) Drafting/CADD

Assumptions related to this task:

- No contractor labor included for Procurement of Turn-Key Contract (Task 01).
- Contractor labor for RCRA & TSCA Permitting Documents (Task 03) is covered in CMIP (Task 02).
- Contractor labor estimated to be 50% of the duration for Regulatory Review & Approval (Task 04).

Phase 2. Support Facility Construction

Estimated start date: 1/7/2025
Estimated duration: 2.7 years

Phase 2 Tasks:

- Procurement for Facilities Construction (01)
- Site Grading & Site Drainage (02)
- Utility Installation (03)
- ET Cover Removal & Staging (04)
- Construction of Excavation & Waste Management Tents (05)
- Construction of Warehouses (06)
- Limited Area Gate (07)
- Procurement for Excavation & Waste Disposal (08)
- Training, Functional Testing & Readiness Review (09)
- SNL Professional Labor Management (10)

- Contractor Labor Management (11)
- Additional Equipment & Operators (12)
- Administrative & Onsite Laboratory Equipment (13)

Phase 2 covers activities for construction of site infrastructure and support structures needed for excavation and waste management project operations. This phase also covers acquisition and set-up of portable buildings for onsite laboratory operations and procurement of a contract for offsite laboratory services. At the end of Phase 2, all physical systems and contracts would be in-place and ready for MWL excavation to begin. See main report Figure 5-1 for support facility layout, dimensions, and additional details.

Procurement for Facilities Construction (01)
Estimated start date: 1/7/2025
Estimated duration: 6 months

Procurement of contracts for site grading & drainage, utilities, and construction of support facilities. Includes only ODCs; contractor professional labor is covered in Task 11.

Assumptions related to this task:

- Turn-key contractor would expedite the procurement process to allow for the most efficient execution of support facility construction and preparation for excavation and waste management.

Site Grading & Site Drainage (02)
Estimated start date: 7/10/2025
Estimated duration: 1 year
Technologies:

- Clear & Grub
- Cut-Fill / Rough Grading
- Storm Sewer
- Finish Grading
- Access Roads
- Parking Lots
- Construct Administrative Facility Pads
- Construct Laboratory Facility Pad
- Construct Replaceable Soils Staging Area
- Construct MWL ET Cover Materials Staging Area

Assumptions related to this task:

- A total of 72 acres would be cleared and grubbed.
- Site grading & site drainage would include areas for Sprungs™, administration and laboratory areas, soil staging areas, parking lot, and access roads.
- Parking lot would be a gravel pad (152 feet [ft] x 205 ft), adequate for 80 parking spaces.
- Roads would be 2-lane gravel. Total of 6,950 linear feet.
- Replaceable Soil Staging Area would be 250 ft x 450 ft with a capacity of 32,000 cy.
- MWL ET Cover Materials Staging Area would be 300 ft x 500 ft with a capacity of 55,000 cy.

- Soil and materials staging areas would be graded, leveled, and finished with a 6-inch base of compacted coarse material.
- Stormwater controls (silt fencing, soil berms, etc.) would be installed around the perimeter of the soil and materials staging areas.

Utility Installation (03)
Estimated start date: 8/15/2025
Estimated duration: 1 year
Technologies:
- Sanitary Sewer
- Water Distribution/Fire Protection
- Overhead Electrical Distribution
- Communications

Installation/tie-in of all utilities needed for project operations.

Assumptions related to this task:
- Tie-ins to existing utilities would be within 2,800 feet from the MWL facility.
- One 5 kilovolt 3-phase primary overhead line would be installed for electrical supply.
- Telephone and internet service would be installed in all trailers.
- One 6-inch water supply line would be installed with 6 fire hydrants.
- One 8-inch reinforced plastic pipe would be installed for sewer.

ET Cover Removal and Staging (04)
Estimated start date: 7/17/2026
Estimated duration: 2 months
Technologies:
- Subgrade Soil
- Bio-Intrusion Layer (Rock)
- Overlay Soil
- Native Soil Layer
- Topsoil Layer

Removal and staging of existing MWL ET Cover materials in MWL ET Cover Materials Staging Area for reuse in construction of new excavation ET Cover in Phase 3 Task 09. See Appendix D1, Table D1-4 for details on soil and rock volumes.

Assumptions related to this task:
- Removal rate and volumes based on experience from 2009 installation of ET Cover.
- Prior to ET Cover removal, SNL personnel would complete decommissioning of the existing monitoring well networks.

Construction of Excavation and Waste Management Tents (05)
Estimated start date: 8/29/2025
Estimated duration: 2 years
Technologies:
- 200 ft x 550 ft Tent Structure
- 300 ft x 500 ft Tent Structure (3)
- 350 ft x 550 ft Tent Structure

- 400 ft x 650 ft Tent Structure
- Demolition, Fencing
- Fencing

Acquisition and construction of six Sprungs™ that would be used in excavation and management of MWL materials. Construction costs determined using RSMeans. Also includes demolition of current MWL perimeter fencing and installation of new perimeter fencing.

Assumptions related to this task:

- Structures would be built with dimensions/capacities shown in main report Figure 5-1.
- Each Sprung™ would be equipped with ventilation system for five air exchanges per hour through a high efficiency particulate air (HEPA) filter bank. Initial filter installation is included. Quarterly filter change-out and disposal are included in Phases 3 and 4.
- Perimeter fence would be 8-ft industrial grade chain link and hazardous waste signage; installation of Limited Area gate covered in Phase 2, Task 07.

Construction of Warehouses (06)
Estimated start date: 12/22/2025
Estimated duration: 1.5 years
Technologies:

- 200 ft x 200 ft High Bay Warehouse
- 250 ft x 250 ft High Bay Warehouse
- 200 ft x 200 ft Container Storage Canopy

This task includes construction of two metal warehouses and a covered container storage area that would be used for waste management.

Assumptions related to this task:

- Classified Debris Management warehouse would be a metal high-bay building with concrete floor with safety and security systems to meet classified waste storage requirements (i.e. Vault-Type Room).
- Shipping Center would be a metal high-bay building with concrete floor and gravel staging area/front entrance.
- Container Storage Area would be a metal canopy (no walls) with a gravel floor.
- Includes cost of building materials and security system for Classified Debris Management Warehouse.

Limited Area Gate (07)
Estimated start date: 12/22/2025
Estimated duration: 6 months
Technology:

- Limited Area Gate Design & Construction

Design and installation of gate meeting Limited Area security requirements that would be incorporated into the perimeter security fence as the single point of ingress/egress (main report Figure 5-1). Construction of perimeter fencing included in Phase 2, Task 05
Note: This task is not shown in the project schedule (main report Figure 5-3).

Assumptions related to this task:

- Work would be performed under a contract secured by the primary (turn-key) contractor.
- Includes all costs associated with design, materials, and installation; based on SNL costs for TA-IV vehicle gate.

Procurement for Excavation & Waste Disposal (08)
Estimated start date: 7/17/2026
Estimated duration: 1 year

Procurement of contracts for Phase 3 and 4 work, including offsite analytical laboratory and waste transportation and disposal of all waste, and for acquisition of specialized excavation equipment that requires a long lead time. Since this is a procurement task, the only costs would be for SNL Professional Labor Management and Contractor Labor Management, which are included, respectively, in Tasks 10 and 11. Therefore, there are no costs associated with this task.

Assumptions related to this task:

- Includes procurement of services and equipment to support Phases 3 and 4. All costs associated with these services and equipment are included in Phase 3 and Phase 4.
- All waste would be disposed at NNSS, except for mixed waste (MW) soil.
- Stabilization and disposal of MW soil would be performed at Energy Solutions in Clive, Utah.

Training, Functional Testing & Readiness Review (09)
Estimated start date: 8/5/2027
Estimated duration: 1 month

This task includes training of personnel performing excavation, waste management, and closure activities. Functional testing and readiness review would include final testing of equipment and support facilities, final walk-through inspections of all support facilities, and documentation of readiness review for excavation and waste management operations. The only costs would be for SNL Professional Labor Management and Contractor Labor Management, which are included, respectively, in Tasks 10 and 11. Therefore, there are no costs associated with this task.

Assumptions related to this task:

- Wherever possible, preparation for functional testing and readiness would be integrated throughout the facility construction process (e.g., calibration of onsite analytical laboratory equipment performed as part of the preceding task).

SNL Professional Labor Management (10)
Estimated start date: 1/7/2025
Estimated duration: 2.7 years

Lump-sum labor cost for SNL oversight and support for the Support Facility Construction Phase.

Contractor Labor Management (11)
Estimated start date: 1/7/2025
Estimated duration: 2.7 years

Includes all contractor labor to perform Phase 2 activities, including management and oversight of all construction activities.

Labor rates were selected by RACER®. Where a specific labor assembly was not available within RACER®, the equivalent RACER® labor assembly is listed in parentheses.

- Senior Project Manager (at 50%)
- Project Manager
- Site Manager (Senior Staff Engineer)
- Assistant Site Manager (Senior Staff Engineer)
- (2) Waste Management Coordinators (Staff Engineers)
- CIH/CHP (Certified Industrial Hygienist)
- Health and Safety Officer
- QA/QC Officer
- (20) Field Technicians

Assumptions related to this task:

- Senior Project Manager, Project Manager, and Senior Staff Engineers would support Tasks 01-09 and Task 13 in this phase.
- All other positions would support all tasks except the two procurement tasks (Task 01 and 08).
- Overlap of start and finish dates for construction tasks would allow for efficient use of resources. Personnel would shift between activities in one or more tasks, as needed.

Additional Equipment & Operators (12)
Estimated start date: 7/10/2025
Estimated duration: 2.2 years

RACER® includes equipment for each selected technology, based upon the Phase 2 tasks described above. The wide range of work in Phase 2 would require several additional pieces of equipment not captured by the RACER® defaults. For all equipment, rates for the equipment and operators were assigned by RACER® and are shown in the reports in Appendix D4.

Assumptions related to this task:

- Number of hours for each piece of equipment are based upon duration of the related task(s) where it would be used.
- Equipment with no operator (i.e., Labor Unit Cost) would be operated by a contractor field technician.

Administrative & Laboratory Equipment (13)
Estimated start date: 6/4/2027
Estimated duration: 3 months

The following portable buildings would be mobilized for the administration area:

Administrative Facilities

- (1) Administration Trailer with lunchroom, reception area, bathrooms, and three private offices;
- (1) Shower Trailer with separated shower areas for men and women, bathrooms, and lockers;
- (3) Office Trailers with two private offices and an open space for up to four desks.
- (10) Conex boxes for personnel decontamination facilities, tool storage, and air refill station (with costs to replace the block portion of the air refill station four times throughout the project).

Onsite Laboratory

- Acquisition and set-up of five portable buildings for Onsite Laboratory; includes the following specialized construction to meet applicable EPA and State requirements.
    - Installation of a vented hood system in each laboratory trailer, chemical-resistant laboratory countertops, cabinets and drawers, workstations, laboratory and computer equipment, and organization of supplies.
- An equipment calibration area would be set up in the Radiological Laboratory trailer.

Assumptions related to this task:

- Portable administrative and laboratory buildings would be leased so costs would be incurred in this phase and also in Phases 3 and 4.
- Estimates for supplies needed for the Chemical Laboratory, the Radiological Laboratory, and the HazCat Laboratory based on 8.6 years of operations (includes costs for operations during Phases 3 & 4).
- Laboratory equipment and supplies would be purchased and are costed as a lump-sum for the entire project in this task.
- Equipment assumed necessary for onsite laboratory operations based upon the list developed for the evaluation prepared in 2003 with costs escalated by 30% (15 years difference, for net present value cost, times 2% increase per year).
- Costs for laboratory equipment include the purchase of an integrated data management system for chemical QA/QC that automates the analytical process and provides a reporting and web-based publishing system.
- A separate data management system would be developed, in-house, for tracking debris and containerized waste and for health and safety tracking.

Phase 3. Excavation & Waste Management

Estimated start date: 9/6/2027
Estimated duration: 6.8 years

Phase 3 Tasks:

- Waste Management (01)
- Onsite & Offsite Laboratories (02)
- Unclassified Area (UCA) Excavation (03)
- UCA Excavation Verification (04)
- Classified Area (CA) Excavation (05)
- CA Excavation Verification (06)
- Excavation Backfilling (07)
- D&D MWL Excavation Sprung™ (08)

- Excavation ET Cover Construction (09)
- SNL Professional Labor Management (10)
- Contractor Labor Management (11)
- Administration Facilities (12)

Phase 3 includes excavation of the UCA and CA and all associated waste management activities; screening, sorting, segregation, characterization, treatment (as necessary), packaging, and offsite disposal. Figure 5-5 of the main report (Mixed Waste Landfill Excavation Waste Management Process) illustrates the location of operations and transfer of materials performed in this phase. Verification of completed excavation, backfilling of the UCA and CA, and decommissioning and demolition (D&D) of the Excavation Sprung™ would also occur in this phase, followed by construction of the ET Cover over the MWL excavation.

Waste Management (01)
Estimated start date: 9/6/2027
Estimated duration: 6.3 years
Technologies:

- Transportation and Disposal, PPE
- Transportation and Disposal, Sprung™ HEPA Filters
- Transportation and Disposal, Conveyor System
- Transportation and Disposal, Hydraulic Baler/Logger
- Sorting, Processing, Staging
- Intermodal Containers Purchase

Waste management is performed throughout excavation of the UCA and CA. Task 01 covers labor and equipment costs for waste management activities conducted after completion of Task 05 and all packaging-transportation-disposal of Phase 3 and Phase 4 project-generated waste including PPE and HEPA filters removed quarterly from Sprungs™ and warehouses. This task also includes the cost for purchase of 50, 20-cy Intermodal containers for transportation of scraped soil, project-generated waste, and D&D Sprung™ fabric and debris to NNSS in Phases 3 and 4. Project-generated waste volumes are displayed in Table D3-1. Waste management costs for all UCA and CA excavated waste (screening through disposal) are included in Phase 3, Task 03 and Task 05.

Assumptions related to this task:

- The duration of this task would extend one year beyond completion of Task 05.
- Other than a waste characterization fee, there would be no cost for disposal of low-level waste (LLW) or MW at NNSS. Costs shown are for preparation of waste, waste-type-specific containers, liners (when required), labor and equipment for loading of waste into containers and loading containers for shipment, and transportation of waste to the appropriate disposal/treatment facility.
- Intermodal containers would be filled to 90% capacity (18 cy) when used, and decontaminated and recycled when no longer needed.
- Waste transportation costs are based on mileage between SNL and the appropriate disposal/treatment facility.
- Loading and transportation of one Intermodal waste container per month (total of 82 loads) of PPE waste generated during Phase 3.
- Loading and transportation of one Intermodal container of PPE waste every two months (total of 8 loads) of PPE waste generated during Phase 4.

- 8 ft x 8 ft x 1 ft HEPA filters would be exchanged quarterly in each of the Sprungs™ and warehouses (total of 2,322 cy). Includes costs for disposal of HEPA filters for the entire duration of the Waste Management Task (Phase 3, Task 01, 1,653 days or 76 months). After completion of this task, the facilities would no longer require ventilation.
- Includes the purchase and installation of an overhead crane for the Debris Segregation & Management Sprung™.
- Covers transportation and disposal at NNSS of the Debris Segregation & Management Sprung™ conveyor system and hydraulic baler/compactor. Purchase of these two pieces of equipment is covered in Task 03.

Table D3-1
Project-Generated Waste – Offsite Disposal Alternative

Waste Type	Volume of Waste (cy)	Disposal Facility	Container Type	Container Volume (cy)	No. of Containers/Loads
HEPA Filters	2,322	NNSS	Intermodal	18	129
PPE	1,620	NNSS	Intermodal	18	90
Total	3,943				219

Notes:
cy = Cubic yards.
HEPA = High efficiency particulate air.
NNSS = Nevada National Security Site.
No. = Number.
PPE = Personal protective equipment.

Onsite & Offsite Laboratories (02)
Estimated start date: 9/6/2027
Estimated duration: 6.8 years
Technologies:
- Onsite Laboratory
- Offsite Laboratory

Onsite Laboratory
Onsite Laboratory activities would include operation of equipment and related software to provide and manage analytical reports for soil and debris characterization. The laboratory would be capable of performing both chemical and radiological analysis. The HazCat Laboratory would perform basic laboratory tests to determine the physical properties and the hazard classification of any debris or containerized waste excavated from the UCA and CA. Calibration of equipment used for field sampling would also be performed. Laboratory personnel would also be responsible for maintaining the quality assurance/quality control (QA/QC) and sample tracking data management systems.

Assumptions related to this task:
- To characterize the hazardous constituents in soil, the following EPA SW846 Methods would be used:
  - RCRA Metals by EPA SW846 Method 6020 for ICP/MS;
  - Hexavalent Chromium by EPA SW846 Method 7196A for UV-Vis;
  - TSCA regulated PCBs by EPA SW846 Method 8082 for GC/ECD;
  - RCRA VOCs by EPA SW846 Method 8260B for GC/MS with Purge & Trap; and
  - RCRA SVOCs by EPA SW846 Method 8270C for GC/MS.

- To characterize the radiological constituents in the soil, the following analyses would be completed:
  - Gamma Spectroscopy to measure gamma-emitting radionuclides; and
  - Liquid Scintillation Counting to measure tritium, gross alpha, and gross beta rates.
- Only Onsite Laboratory cost shown in the RACER® report for this task is for rental of 5 laboratory trailers. Cost for laboratory equipment is included in Phase 2, Task 13. Cost for laboratory personnel are included in Phase 3, Task 11.

<u>Offsite Laboratory</u>
This technology includes all costs associated with offsite analysis of samples. The Offsite Laboratory would be under contract to perform analyses and provide reports for QA/QC. Verification samples would be used to determine when the excavation meets industrial risk-based levels. The Offsite Laboratory would also perform all analysis of decontamination water samples.

Assumptions related to this task:
- For Phase 3, the Offsite Laboratory would analyze a duplicate of 10% of excavation soil samples and 100% of the verification samples.
- The Offsite Laboratory would analyze 100% of the decontamination water samples. One sample would be collected per month for the duration of the Phase 3 (82 months).
- Based upon the calculations below, a total of 677 samples would need to be analyzed through the contracted Offsite Laboratory.

Assumptions and Calculations to determine the number of offsite analyses needed:
QA/QC Soil Sample Analyses
- A duplicate soil sample would be collected for offsite analysis for 10% of all Onsite Laboratory soil samples.
- One onsite soil sample would be collected for every 100 cy of excavated soil.
- A 20% re-sample contingency has been included.
- Number of Onsite Laboratory soil samples includes the following:
  - *UCA*
    Total Soil Volume = 44,775 cy x 1 sample/100 cy = 448 samples
  - *CA*
    Total Soil & Concrete Volume = 35,349 cy x 1 sample/100 cy = 354 samples
  - Total number of Onsite Laboratory soil samples = 448 + 354 = 802
- Number of Offsite Laboratory QA/QC analyses:
  = 10% of onsite soil samples (80) + 20% resample (16)
  = 80 + 16 = 96 soil samples for Offsite Laboratory QA/QC analysis

Verification Sample Analyses
- Verification samples would be collected on a 25-foot grid within the excavated areas. The excavated area was defined as the entire area within the MWL Excavation Sprung™.
- All verification samples would be analyzed at the Offsite Laboratory.
- A 20% re-sample contingency has been added.
- Number of verification samples includes the following:
  - *Verification sampling within excavated areas*
    Total Area = 400 ft x 650 ft = 260,000 square feet (ft^2)
    For 25-foot grid, assume one sample per 625 ft^2
    Number of samples = 260,000 ft^2 / 625 ft^2 = 416 samples

- Total Number of Verification Samples
  = excavated area samples (416) + 20% resample (83)
  = 416 + 83 = 499 verification samples

Decontamination Water Samples

- One sample would be collected for every month of operations.
- 6.8-year (82 months) Phase 3 operational period.
- Number of samples
  6.8 years X 12 months/year = 82 decontamination water samples

Total number of samples for Offsite Laboratory analysis:

QA/QC (soil piles & QC)	96
Verification (excavation & QC)	499
Decontamination Water	82
Total =	677

UCA Excavation (03)
Estimated start date: 9/6/2027
Estimated duration: 2.9 years
Technology Elements:

- Excavation
- Sorting, Processing, Staging
- Transportation & Disposal Soil – Low Level Waste
- Transportation & Disposal Debris – Low Level Waste
- Transportation & Disposal Debris – Mixed Waste

This task includes UCA excavation and the management of all excavated UCA waste through final disposal. See Sections 5.3.4.2 and 5.3.4.4 of this report for more detailed information.

Assumptions related to this task:
Excavation and Sorting, Processing, Staging

- Assumptions for trench dimensions, slopes, excavation approach, and debris/soil volumes for each trench can be found in Appendix D1, Figures D1-1 through D1-8.
- A 100-ton crane was included for 6 months to lift the five large, heavy shipping casks in Trench F. Due to drag and assuming a safety factor of 2, a 100-ton crane was selected.
- Most debris sorting, segregation, characterization, and packaging would be performed in the Debris Segregation & Management Sprung™ equipped with a radial stacking conveyor and overhead bridge crane, remote handler unit (robotic), and a hydraulic baler (for debris consolidation). Purchase cost of this equipment is included in Sorting, Processing, Staging assembly; this equipment would also be available for Task 01 and Task 05.
- Debris sorting and segregation would be performed by trained contractor waste management technicians working under the supervision of SNL Derivative Classifiers to ensure the proper identification and handling of classified items/debris.
- A radiography unit that could provide X-ray images of drums would be available for the duration of UCA excavation (35 months) to support waste characterization. Rental cost is included in Sorting, Processing, Staging assembly.

Transportation & Disposal

- Discrete items specifically identified as LLW would be packaged in 744 Boxes and shipped to NNSS for disposal.
- MW debris would be packaged in Macroboxes and shipped to NNSS for disposal.
- Classified debris would be properly labeled, but packaged the same as unclassified MW or LLW debris and disposed at NNSS. Declassification treatment (“sanitization”) would not be required for classified items.
- Other than a waste characterization fee, there would be no cost for disposal of LLW (soil and debris) or MW (debris) at NNSS. Estimated costs are for waste-type-specific containers, liners (when required), labor and equipment for packaging and loading containers, and transportation.
- Waste transportation costs are based upon mileage between SNL and NNSS (865 miles one way).
- All MW and LLW debris disposal at NNSS costed as unclassified; amount of classified items/debris is unknown and only cost difference is related to transportation (two Q-cleared drivers required for classified waste shipments), resulting in a small cost difference.

UCA Excavation Verification (04)
Estimated start date: 7/24/2030
Estimated duration: 3 months
Technology Element:

- Soil Sampling

This task includes the collection of in situ soil samples from the UCA excavation after completion, and review of analytical results to verify they meet industrial risk-based levels.

Assumptions related to this task:

- Samples would be collected on a 25-foot grid from the floor and sidewalls of the excavation and analyzed for all constituents of concern at the Offsite Laboratory.
- UCA Excavation Verification activities would be performed concurrently with the start of CA Excavation.
- No additional excavation would be required following verification sampling.
- Number of samples and offsite analytical costs are included in Task 02.
- SNL Oversight and Contractor labor included in Tasks 10 and 11, respectively.

CA Excavation (05)
Estimated start date: 7/24/2030
Estimated duration: 2.4 years
Technology Elements:

- Excavation
- Sorting, Processing, Staging
- Transportation & Disposal Soil – Low Level Waste
- Transportation & Disposal Soil – Mixed Waste Soil
- Transportation & Disposal Soil – Mixed Waste Concrete
- Transportation & Disposal Debris – Low Level Waste
- Transportation & Disposal Debris – Mixed Waste
- Transportation & Disposal Debris – TRU Waste

This task includes CA excavation and the management of all excavated CA waste through final disposal. See Sections 5.3.4.3 and 5.3.4.4 of this report for more detailed information.

Assumptions related to this task:
<u>Excavation and Sorting, Processing, Staging</u>

- Assumptions for pit dimensions, excavation approach, and debris/soil volumes can be found in Appendix D1, Figures D1-1 and D1-9. The 2003 evaluation assumed a 3:1 slope. This reevaluation assumes a 1:1 slope due to soil type and limited entry in excavation.
- Remote-operations approach would be available at the start of CA excavation and include the following equipment: remote-operated hydraulic excavator, wheel loader, and remote-control on/off for the mechanical screen.
- A 100-ton crane was included for 6 months to lift large, heavy source packages such as the cobalt-60 source in Pit SP-5.
- Most debris sorting, segregation, characterization, and packaging would be performed in the Debris Segregation & Management Sprung™ equipped with a radial stacking conveyor and overhead bridge crane, remote handler unit (robotic), and a hydraulic baler (for debris consolidation). Purchase cost of this equipment included in Task 03 Sorting, Processing, Staging assembly.
- Debris sorting and segregation would be performed by trained contractor waste management technicians working under the supervision of SNL Derivative Classifiers to ensure the proper identification and handling of classified items/debris.
- A radiography unit that could provide X-ray images of drums would be available for the duration of CA excavation (29 months) to support waste characterization. Rental cost included in Task 05 Sorting, Processing, Staging assembly.

<u>Transportation & Disposal</u>

- Discrete items specifically identified as LLW would be packaged in 744 Boxes and shipped to NNSS for disposal.
- MW debris would be packaged in Macroboxes and shipped to NNSS for disposal.
- Other than a waste characterization fee, there would be no cost for disposal of LLW (soil and debris) or MW (debris) at NNSS. Estimated costs are for waste-type-specific containers, liners (when required), labor and equipment for packaging and loading containers, and transportation.
- MW soil & concrete would be shipped to Energy Solutions in Clive, Utah, for stabilization and disposal (725 miles one way). NNSS does not accept untreated MW soil & concrete.
- Classified items/debris would be properly labeled, but packaged the same as unclassified MW or LLW debris and disposed at NNSS. Declassification treatment ("sanitization") would not be required for classified items.
- If identified, transuranic (TRU) waste debris would be packaged in standard waste boxes (SWBs) and shipped to the Waste Isolation Pilot Plant (WIPP). Costs included are for initial waste characterization. No costs included for waste characterization to meet certification requirements, or disposal at WIPP.

<u>CA Excavation Verification (06)</u>
Estimated start date: 12/29/2032
Estimated duration: 3 months
Technology Element:

- Soil Sampling

This task includes collection of in situ soil samples from the CA excavation and review of analytical results to verify they meet industrial risk-based levels.

Assumptions related to this task:

- Samples would be collected on a 25-foot grid, from the floor and sidewalls of the excavation and analyzed for all constituents of concern at the Offsite Laboratory.
- All samples collected for verification purposes would be sent to the Offsite Laboratory for analysis.
- No additional excavation will be required following verification sampling.
- Number of samples and offsite analytical costs are included in Task 02.
- SNL Oversight and Contractor labor included in Tasks 10 and 11, respectively.

Note: Upon completion of this verification task, Phase 5 would begin (main report Figure 5-3). As time permits contractor staff would begin compiling excavation and waste management data into final closure reports in parallel with ongoing activities.

Excavation Backfilling (07)
Estimated start date: 3/31/2033
Estimated duration: 9 months
Technologies:

- Excavation Backfill & Compaction – Replaceable
- Excavation Backfill & Compaction – Supplemental

Following verification of both the UCA and CA, the excavated area would be backfilled in preparation for construction of the ET Cover. In preparation for backfilling, all excavation and waste management equipment in the Excavation Sprung™ would be decontaminated as needed and demobilized/dispositioned. Table D3-2 provides information about replaceable soil and supplemental backfill material volumes, and the information used to determine the time needed for backfill operations.

Assumptions related to this task:

- 93,879 cy represents the total debris and soil volume excavated from the MWL.
- Rock screened and segregated from excavated soils would be placed as a marker layer on the excavation floor as the first step in backfilling.
- Replaceable soils excavated from the UCA and CA would be used first.
- Backfill brought in from offsite would be clean fill from a borrow area within 15 miles of the site to complete backfilling to grade; 30 miles roundtrip.
- Fill would be placed in lifts, compacted, and tested for density and moisture.

Table D3-2
MWL Excavation Backfilling – Offsite Disposal Alternative

Description	Volume (cy)	Truckload Volume (cy)	Truckloads Needed	Loads/ Day	Total Days	Total Weeks[a]
Replaceable Soils[b,c]	18,330	18	1,018	50	20	
Supplemental Backfill Material	75,549	18	4,197	30	140	
Totals	93,879	18	5,216	--	160	32
Additional time for compaction testing, surveying, lift approval, etc.[d]						8
Total duration for excavation backfilling						40

Notes:
93,879 cy volume represents the total excavated debris and soil volume from the MWL.
[a]Based on a 5-day work week.
[b]Replaceable Soils volume includes an expansion factor of 1.3 applied to excavated volume.
[c]All soils removed from the MWL and categorized as "replaceable soil" will be used as ET excavation backfill material.
[d]Additional time for compaction testing, surveying, lift approval, etc. calculated as 25% of the Total Weeks value.
cy = Cubic yards.
MWL = Mixed Waste Landfill.

D&D MWL Excavation Sprung™ (08)
Estimated start date: 1/5/2034
Estimated duration: 2 months
Technology:
- Demolition – 400 x 650 Tent Structure

D&D of the MWL Excavation Sprung™ would be performed following backfilling of the excavation to provide the additional room need for Excavation ET Cover installation.

Assumptions related to this task:
- Fabric generated from D&D of the MWL Excavation Sprung™ would be managed, packaged, and disposed as LLW. Metal frames would be surveyed and released for offsite recycling.
- Waste management costs for all tent fabric from the six Sprungs™ are included in Phase 4, Task 02.

MWL Excavation ET Cover Construction (09)
Estimated start date: 3/8/2034
Estimated duration: 3 months
Technologies:
- Capping
- Fencing

The ET Cover removed in Phase 2, Task 04 would be re-constructed over the MWL excavation using the same materials. Table D3-3 shows the volumes and associated estimated duration for each type of material.

Assumptions related to this task:

- Materials removed from the existing MWL ET Cover would be screened, staged, and re-used in construction of the new ET Cover (see Table D3-3 for cover layers and volumes).
- Fill would be placed in lifts, compacted, and tested for density and moisture.
- Biointrusion rock layer would be placed and compacted using a tracked dozer.
- No supplemental soil or rock would be needed for ET Cover construction.
- Includes costs for seeding the ET Cover and installation of a temporary above-ground supplemental watering system to facilitate revegetation of the ET Cover with native vegetation.
- Three-strand barbed wire fence would be installed around the completed ET Cover with three access gates and signage.
- Thin Overlay Soil and Native Soil Layer are combined in the RACER® report under assembly #33080506 with a total volume of 25,870 cy.

Note: Upon completion of this ET Cover construction task, Long-Term Monitoring & Maintenance (Phase 6), would begin (main report Figure 5-3). Initial tasks would include Installation of Groundwater and Soil-Vapor Monitoring Networks and ET Cover and site controls inspections (Phase 6, Tasks 01 and 04).

Table D3-3
MWL Excavation ET Cover Construction – Offsite Disposal Alternative

Description	Volume (cy)	Truckload Volume (cy)	Truckloads Needed	Loads/ Day	Total Days	Total Weeks[a]
Subgrade Soil[b]	10,010	18	556	50	11	
Bioinstrusion Layer (Rock)	6,800	18	378	50	8	
Thin Overlay Soil[b]	3,380	18	188	50	4	
Native Soil Layer[b]	22,490	18	1,249	50	25	
Topsoil Layer[b]	7,020	18	390	50	8	
Totals	49,700		2,761	--	56	11
Additional time needed for compaction testing, surveying, lift approval, etc.[c]						3
Total duration for ET Cover construction						14

Notes:
[a]Based on a 5-day work week.
[b]Volume from MWL Corrective Measures Implementation Report, includes an expansion factor of 1.3 for soil.
[c]Additional time for compaction testing, surveying, lift approval, etc. calculated as 25% of the Total Weeks value.
cy = Cubic yards.
ET = Evapotranspirative.
MWL = Mixed Waste Landfill.

SNL Professional Labor Management (10)
Estimated start date: 9/6/2027
Estimated duration: 6.8 years

Lump-sum labor cost for SNL oversight and support for the Excavation & Waste Management Phase. This would include SNL Derivative Classifiers training and working with contractor waste management technicians to ensure the proper identification and handling of classified items/debris.

Contractor Labor Management (11)
Estimated start date: 9/6/2027
Estimated duration: 6.8 years

Includes all contractor labor to perform Excavation & Waste Management Phase activities, including management and oversight of all work performed. Also includes contract personnel for operation of Onsite Laboratory and oversight/review of Offsite Laboratory analytical data.

The following contractor personnel were included for all Phase 3 tasks except for the Onsite Laboratory (see below). Labor rates were selected by RACER®. Where a specific labor category (Assembly) was not available within RACER®, the equivalent RACER® labor category is listed in parentheses.

- Senior Project Manager (at 50%)
- Project Manager
- Site Manager (Senior Staff Engineer)
- Assistant Site Manager (Senior Staff Engineer)
- (2) Waste Management Coordinators (Staff Engineers)
- Certified Industrial Hygienist/Certified Health Physicist (CIH/CHP) (Certified Industrial Hygienist)
- Health and Safety Officer
- QA/QC Officer
- (20) Field Technicians

Assumptions related to contractor labor management staffing:

- Contractor personnel listed above would be in-place for the entire duration of this phase and would shift between tasks, as needed.
- Costs for oversite of Offsite Laboratory are covered by contractor labor associated with Phase 3 tasks.

Onsite Laboratory Staffing
The staff would consist of the following personnel. Where a specific labor category was not available within RACER®, the equivalent RACER® labor category is listed in parentheses.

- Laboratory Manager (Project Manager)
- Data/Document Control Manager (Project Engineer)
- Laboratory QA/QC (QA/QC Officer)
- QA/QC Technician (Staff Engineer)
- (4) Chemical Analysts (Staff Engineers)
- (2) Radiological Assessment Analysts (Staff Engineers)
- (2) Chemical and Radiological Laboratories Support Staff (Staff Engineers)
- (3) Technicians to support the HazCat Laboratory (Field Technicians)

Assumptions related to Onsite Laboratory staffing:

- The staff would be reduced by 1 QA/QC Technician, 2 Chemical Analysts, 1 Radiological Assessment Analyst, 1 Laboratory Support Person, and 3 HazCat Technicians following completion of Excavation Backfilling (Phase 3, Task 07).

Administration Facilities (12)
Estimated start date: 9/6/2027
Estimated duration: 6.8 years

This task covers the Phase 3 rental costs for the five administrative trailers and 10 conex boxes used for storage of equipment/supplies. The five Onsite Laboratory trailers are costed in Task 02.

Phase 4. Closure
Estimated start date: 6/15/2034
Estimated duration: 1.8 years

Phase 4 Tasks:
- Onsite & Offsite Laboratories (01)
- D&D Sprungs™ & Warehouses (02)
- Operational Area – Pre-Scraping Characterization (03)
- Operational Area – Scrape/Load/Disposal (04)
- Operational Area – Verification (05)
- Demobilize Administration & Onsite Laboratory Trailers (06)
- SNL Professional Labor Management (07)
- Contractor Labor Management (08)
- Administration Facilities (09)

This phase would include all activities related to project closeout, including decontamination, demolition, and demobilization of equipment, site facilities and infrastructure, not needed for LTMM. This phase also includes Onsite and Offsite Laboratory activities for soil and debris analyses associated with scraping and verification of the operational area and management of D&D materials through final disposal. By the end of this phase all excavation and waste management infrastructure would be removed and the site would be graded for proper drainage and reseeded. Phase 5 and Phase 6 task work would be performed in parallel with work in this phase (main report Figure 5-3).

Onsite & Offsite Laboratories (01)
Estimated start date: 6/15/2034
Estimated duration: 1.8 years
Technology Elements:
- Onsite Laboratory
- Offsite Laboratory

Onsite Laboratory
The Onsite Laboratory would analyze in situ soil samples taken from the waste management and staging areas (i.e., operational area outside the MWL Excavation Sprung™, excluding the Shipping Center, Container Storage Area, and Administrative/Laboratory area) for pre-scraping waste characterization. Onsite Laboratory personnel would continue to maintain data management systems for QA/QC and sample tracking and transfer this information prior to demobilization of the Onsite Laboratory (Task 06).

Offsite Laboratory

The Offsite Laboratory would analyze in situ verification samples collected following scraping of the operational area to confirm it meets industrial risk-based levels. During Phase 4 no offsite QA/QC soil samples would be analyzed for the onsite soil or debris samples, including onsite soil samples associated with operational area scraping waste characterization. By this point enough onsite/offsite split data would be collected and evaluated to establish the quality of onsite analytical results.

Assumptions related to this task:

- No labor hours for Onsite Laboratory personnel during Phase 4, Task 05 or Task 06.
- Onsite Laboratory cost for this task is for rental of 5 laboratory trailers. Costs for Phase 4 laboratory equipment and supplies are included in Phase 2, Task 13. Cost for laboratory personnel are included in Phase 4, Task 08.
- Number of samples that would be sent to the Offsite Laboratory for analysis during Phase 4 are summarized below:
    - 22 decontamination water samples for 22-month duration (one sample/month).
    - 1,043 soil samples for operational area verification
        - The total square footage of operational area = 2,172,601 ft^2
        - For 50-foot grid, assume one sample per 2,500 ft^2
        - Number of samples = 2,172,601 ft^2 / 2,500 ft^2 = 869 samples
        - 869 samples x 20% re-sample (174) = 1,043 samples

D&D Sprungs™ & Warehouses (02)
Estimated start date: 6/15/2034
Estimated duration: 4 months
Technology Elements:

- Demolition – 300 ft x 500 ft Tent Structures (3)
- Demolition – 350 ft x 550 ft Tent Structure
- Demolition – 200 ft x 550 ft Tent Structure
- Transportation & Disposal Tent Structure Fabric
- Demolition – 200 ft x 200 ft Warehouse
- Demolition – 200 ft x 200 ft Canopy
- Demolition – 250 ft x 250 ft Shipping Center (Warehouse)
- Transportation & Disposal – 200 ft x 200 ft Warehouse
- Transportation – 200 ft x 200 ft Canopy
- Transportation – 250 ft x 250 ft Shipping Center (Warehouse)

This task includes D&D of the Debris Segregation & Management and Soil Storage Sprungs™, Classified Debris Management and Shipping Center warehouses, Container Storage Area (metal roof, no walls, gravel pad), roads, and site perimeter fence. Table D3-4 shows volume and types of waste generated in this phase.

Assumptions related to this task:

- The total volume of D&D waste materials, excluding scraped soil, generated in this task is estimated at 59,249 cy.
- Costs for waste management and disposal are included in the respective technologies for this task.
- Removal of Sprung™ gravel pads is included in Phase 4, Task 04.
- Metal fencing material and all Sprung™ frames would be surveyed, released, and recycled.

Table D3-4
D&D Waste Volumes – Offsite Disposal Alternative

Waste Type	Volume of Waste (cy)	Disposal Facility	Container Type	Container Volume (cy)	No. of Containers	No. of Loads
Soil (Scraped)						
Low Level Waste	13,679	NNSS	Intermodal	18	760	760
D&D Waste						
Tent Fabric	730	NNSS	Intermodal	18	41	41
Tent Frames	NA	NA	NA	NA	NA	NA
Classified Debris Management Warehouse	35,556	NNSS	Intermodal	18	1,975	1,975
Container Storage Canopy	4,444	NNSS	Intermodal	18	247	247
Shipping Center	18,519	NNSS	Intermodal	18	1,029	1,029
Hydraulic Baler/Logger	--	NNSS	Flat Bed Trailer	--	--	2
Conveyor System	--	NNSS	Flat Bed Trailer	--	--	2
Total	72,928					

Notes:
cy = Cubic yards.
D&D = Decommissioning and demolition.
NA = Not applicable.
NNSS = Nevada National Security Site.
No. = Number.

Operational Area – Pre-Scraping Characterization (03)
Estimated start date: 10/19/2034
Estimated duration: 3 months
Technology:
- Soil Sampling

Soil samples would be collected on a 50-foot grid across the 2,172,601 ft^2 operational area and analyzed for all constituents of concern at the Onsite Laboratory to characterize the soil for disposal at NNSS prior to scraping.

Assumptions related to this task:
- Number of Onsite Laboratory samples = 2,172,601 ft^2 / 2,500 ft^2 = 869 samples; no QA/QC Offsite Laboratory split samples for Phase 4.
- Areas under the Shipping Center warehouse, Container Storage Area (Covered), and the administration and Onsite Laboratory trailers would be considered clean and would not be sampled.
- Labor costs for this task are included in Phase 4, Task 08.

Operational Area – Scrape/Load/Disposal (04)
Estimated start date: 1/11/2035
Estimated duration: 9 months
Technologies:
- Excavation (Scraping & Loading)
- Offsite Transportation and Waste Disposal

Following Tasks 02 and 03, the operational area (i.e., area outside the MWL Excavation Sprung™ excluding the Container Storage Area, Shipping Center, and Administrative/Laboratory trailers – total of 2,172,601 ft^2) would be scraped to remove residual contamination. The top two inches would be scraped from the surface and stockpiled, packaged, loaded, and transported to NNSS for disposal.

Assumptions related to this task:

- Scraped soil would be previously characterized as LLW during Task 03 and would be sufficient to meet NNSS WAC.
- Total volume of soil and gravel generated from this task is estimated at 13,679 cy (760 Intermodal containers).

Operational Area – Verification (05)
Estimated start date: 10/18/2035
Estimated duration: 3 months
Technology:

- Soil Sampling

Soil samples would be collected and sent to the Offsite Laboratory for analysis to verify the scraped operational area meets industrial risk-based levels.

Assumptions related to this task:

- Verification samples would be collected on a 50-foot grid within the operational area – see Task 01 assumptions for number of samples and total area sampled).
- Areas under Shipping Center, Container Storage Area, and the administration and laboratory trailers would be considered clean and would not be sampled.
- It is assumed that no additional scraping would be required following verification sampling.
- Labor costs for this task are included in Phase 4, Task 08.
- Offsite Laboratory analytical costs are included in Phase 4, Task 01.

Demobilize Administration & Onsite Laboratory Trailers (06)
Estimated start date: 1/18/2036
Estimated duration: 3 months
Technologies:

- Administration Facilities
- Revegetation

Trailers used for administrative offices and the Onsite Laboratory would be demobilized. Gravel under the trailers and in the parking area around the trailers would be graded for drainage purposes – no scraping or verification sampling would be required in this area.

Assumptions related to this task:

- Mobile buildings would consist of 10 trailers used for offices, showers, and Onsite Laboratory and 10 conex boxes used for storage of project supplies.
- Trailers/conex storage boxes would be removed from the site by the vendor after demobilization.

- Laboratory equipment and remaining supplies would be decontaminated, as necessary, and reapplied through the SNL Reapplication Center.
- The area would be seeded for revegetation after grading (estimated 60 acres for entire support facility area).

SNL Professional Labor Management (07)
Estimated start date: 6/15/2034
Estimated duration: 1.8 years

Lump-sum labor cost for SNL oversight and support for the Closure Phase.

Contractor Labor Management (08)
Estimated start date: 6/15/2034
Estimated duration: 1.8 years

Includes all contractor labor to perform Closure Phase activities, including management and oversight of all work performed. Also includes contract personnel for operation of Onsite Laboratory and oversight/review of Offsite Laboratory analytical data.

The following contractor personnel were assumed for Phase 4 tasks. Labor rates were selected by RACER®. Where a specific labor category was not available within RACER®, the equivalent RACER® labor category is listed in parentheses.

- Senior Project Manager (at 50%)
- Project Manager
- Site Manager (Senior Staff Engineer)
- Assistant Site Manager (Senior Staff Engineer)
- (2) Waste Management Coordinators (Staff Engineers)
- Certified Industrial Hygienist/Certified Health Physicist (CIH/CHP) (Certified Industrial Hygienist)
- Health and Safety Officer
- QA/QC Officer
- (20) Field Technicians

Assumptions related to this task:
- Staffing would be reduced from Phase 3 levels following completion of Phase 4, Task 04.
- Throughout Phase 4 tasks, contract personnel would shift from one task to another on an as-needed basis for efficiency purposes.

Onsite Laboratory Staffing:
The staff would consist of the following personnel. Where a specific labor category was not available within RACER®, the equivalent RACER® labor category is listed in parentheses.
- Laboratory Manager (Project Manager)
- Data/Document Control Manager (Project Engineer)
- Laboratory QA/QC (QA/QC Officer)
- (2) Chemical Analysts (Staff Engineers)
- Radiological Assessment Analysts (Staff Engineers)
- Chemical and Radiological Laboratories Support Staff (Staff Engineer)

Assumptions related to Onsite Laboratory staffing:

- The Phase 4 Onsite Laboratory staff would be reduced from the level assumed for Phase 3 due to processing fewer samples in the Onsite Laboratory for closure activities compared to excavation operations.

Administration Facilities (09)
Estimated start date: 6/15/2034
Estimated duration: 1.8 years

This task covers the Phase 4 rental costs for the five administrative trailers and 10 conex boxes used for storage of equipment/supplies, until the time they are demobilized in Task 06. The five Onsite Laboratory trailers are costed in Phase 4, Task 01.

Phase 5. Closure Reporting – TSCA & RCRA
Estimated start date: 3/31/2033
Estimated duration: 4.6 years

Phase 5 Tasks:

- Compile Data & Prepare Reports (01)
- Regulatory Review & Approval (02)
- SNL Professional Labor Management (03)
- Contractor Labor Management (04)

The closure reporting phase includes collecting and compiling all data and results documenting excavation, waste management, and closure D&D activities into two separate closure reports; one for submittal to the NMED (RCRA requirements) and one for submittal to the EPA (TSCA requirements). Project completion and the full transition to LTMM status would be achieved upon regulatory approval of both reports. As shown in the project schedule (main report Figure 5-3) and explained in Section 5.3.4.8, the closure reporting effort would start during Phase 3 after completion of Task 06 and conclude after completion of Phase 4. The turn-key contract put into place during Phase 1 would end with the completion of Phase 5.

Compile Data & Prepare Reports (01)
Estimated start date: 3/31/2033
Estimated duration: 3.1 years

This task would involve the documentation of Phase 3 & 4 work activities and the incorporation of all final verification analytical results into two reports; one for submittal to the NMED (RCRA requirements) and one for submittal to the EPA (TSCA requirements). The two Closure Reports would be very similar and include a final LTMMP as an appendix that would be based upon the original LTMMP submitted with the CMIP and Permitting documents in Phase 1. The final LTMMP would include a summary of LTMM activities performed since completion of the Excavation ET Cover (Phase 3, Task 09). Reports would be submitted for regulatory review & approval upon completion of this task.

Assumptions related to this task:

- The data needed to support closure reporting requirements would be collected and prepared by the contractor professional labor as it becomes available during Phases 3

and 4 to facilitate gaining approval from NMED and EPA as soon as possible after completion of Phase 4 closure activities.
- Most of the labor costs associated with this task are covered under SNL Professional Labor Management and Contractor Labor technologies for Phases 3 and 4. Closure Reporting would be completed as part of Phase 5. See Tasks 03 and 04 for labor assumptions.

Regulatory Review & Approval (02)
Estimated start date: 5/13/2036
Estimated duration: 1.5 years

This task involves NMED and EPA regulatory review and approval of the closure reports, including all activities (e.g., requests for additional information, public meetings, etc.) related to the process. The task would end upon receipt of approval from both regulatory agencies.

Assumptions related to this task:
- The closure reports would be very similar and submitted to NMED and EPA at the same time.
- During the regulatory review, one set of technical comments would be received from NMED and EPA requiring a formal response; the formal response would be prepared by the contractor professional staff with SNL oversight and input.
- Both closure reports would be approved after regulatory review of technical comment responses.
- Costs associated with this task are covered under SNL Professional Labor Management and Contractor Labor Management technologies for Phase 5.

SNL Professional Labor Management (03)
Estimated start date: 4/18/2036
Estimated duration: 1.6 years

Lump-sum labor cost for SNL oversight and support for the Closure Reporting Phase.

Assumptions related to this task:
- SNL personnel would work closely with contractor personnel on preparation of the two reports.
- Labor costs were estimated based upon the 1.6-year duration for Phase 5 that extends beyond Phase 4; the first 3 years of Phase 5 Task 01 would be covered under SNL Professional Labor Management in Phases 3 and 4.
- Assumes SNL professional labor would only be needed for half the duration of Task 02 to allow for time to work with the contractor professional staff preparing responses to regulatory comments received while the reports are in the regulatory review process.

Contractor Labor Management (04)
Estimated start date: 4/18/2036
Estimated duration: 1.6 years
Technology:
  - Site Closeout Documentation

Includes all contractor labor to perform Phase 5 activities.

The following contractor personnel were assumed for Phase 5 tasks. Labor rates were selected by RACER®. Where a specific labor assembly was not available within RACER®, the equivalent RACER® assembly is listed in parentheses.

- Senior Project Manager (at 50%)
- Project Manager
- Site Manager (Senior Staff Engineer)
- Assistant Site Manager (Senior Staff Engineer)
- (2) Waste Management Coordinators (Staff Engineers)
- Certified Industrial Hygienist/Certified Health Physicist (CIH/CHP) (Certified Industrial Hygienist)
- Health and Safety Officer
- QA/QC Officer

Assumptions related to this task:

- Only professional contractor labor categories would be required for this phase.
- Labor costs were estimated based upon a 1.6-year duration for Phase 5 that extends beyond Phase 4; the first 3 years of Phase 5 Task 01 would be covered under Contractor Labor Management in Phases 3 and 4.
- Cost assumes contractor professional labor would only be needed for half the duration of Task 02 to prepare responses to regulatory comments received during the regulatory review time period.

Phase 6. Long-Term Monitoring & Maintenance
Estimated start date: 6/15/2034
Estimated duration: 30 years

Phase 6 Tasks:

- Install Groundwater and Soil-Gas Monitoring Networks (01)
- Monitoring Well Installation Report (02)
- Installation Report Regulatory Review & Approval (03)
- Monitoring, Inspection, Maintenance & Reporting (04)

The LTMM phase would begin after completion of Phase 3, Task 09 following the requirements in the LTMMP included in the CMIP and Permitting documents approved at the end of Phase 1. In addition to the installation of groundwater and soil-gas monitoring well networks, activities would include routine monitoring, inspection, and maintenance of the Excavation ET Cover, storm-water diversion structures, perimeter fencing and survey monuments, and all monitoring networks and associated sampling equipment. Phase 6 activities would continue for 30 years.

All Phase 6 activities would be performed by SNL personnel and contractors under the SNL, New Mexico (SNL/NM) Long-Term Stewardship (LTS) program since the turn-key contract would end concurrently with the end of Phase 5 tasks.

Install Groundwater and Soil-Gas Networks (01)
Estimated start date: 6/15/2034
Estimated duration: 4 months
Technology:

- Labor/Equipment/Materials

This task would include installation of the groundwater monitoring network, consisting of four groundwater monitoring wells (one hydraulically upgradient, background well, and 3 hydraulically downgradient wells) and the VOC soil-gas monitoring network consisting of three perimeter multi-sampling port wells.

Assumptions related to this task:

- Costs based upon recent well installation projects for SNL/NM environmental sites in the LTS program.
- Monitoring well installation plan would be included in the CMIP and approved during Phase 1.
- Materials/Equipment assembly includes contractor labor costs (i.e., drilling contractor) for this task.

Monitoring Well Install Report (02)
Estimated start date: 10/16/2034
Estimated duration: 3 months
Technology:

- Labor Costs

This task covers the required report that must be submitted to NMED to document monitoring well installation activities performed in Task 01 (see Section 5.3.4 7 of main report). NMED review and approval is required for all LTMM monitoring wells.

Assumptions related to this task:

- Costs based upon recent SNL/NM monitoring well installation projects for regulated environmental sites in the LTS program.

Install Report Regulatory Review & Approval (03)
Estimated start date: 1/16/2035
Estimated duration: 3 months
Technology:

- Labor Costs

This task covers activities related to the review and approval process for the report submitted to NMED as part of Task 02.

Assumptions related to this task:

- The monitoring well installation report would be approved by the NMED without technical comments; this is a no cost task.

Monitoring, Inspection, Maintenance & Reporting (04)
Estimated start date: 6/15/2034
Estimated duration: 30 years
Technology:

- Labor/Equipment/Materials

This task includes costs for the routine monitoring, inspection, maintenance, and reporting activities that would be required by the LTMMP. Monitoring would include groundwater and soil-vapor monitoring. Inspection, maintenance, and repair requirements would apply to the Excavation ET Cover, storm-water diversion structures, perimeter fencing and survey

monuments, and all monitoring networks and associated sampling equipment. LTMM activities would continue for 30 years, and would be documented in annual LTMM reports submitted to NMED for review and approval each year.

Assumptions for this task:

- Groundwater monitoring would be conducted at a semiannual frequency, and soil-gas monitoring would be conducted at an annual frequency for the 30-year period.
- LTMM reports would be prepared and submitted to NMED on an annual basis.
- LTMM scope and level of effort based upon experience at the Chemical Waste Landfill and MWL.
- Includes costs for all LTMM activities, including support activities such as monitoring sample analysis at an offsite laboratory and data validation of all groundwater and soil-gas results.
- Does not include costs for infrastructure (e.g., field office, 90-day waste accumulation area, emergency equipment), materials and specialized equipment (e.g., specialized sampling truck, drums for purge water, vacuum pump for soil-gas monitoring) as they would be available under the existing LTS program.

This page intentionally left blank.

Onsite Disposal Alternative

Technical & Costing Assumptions

This page intentionally left blank.

Phase 1. Planning & Permitting

Estimated start date: 1/1/2020
Estimated duration: 6 years

Phase 1 Tasks:

- Procurement of Turn-Key Contract (01)
- Corrective Measures Implementation Plan (CMIP) (02)
- Preparation of TSCA & RCRA Permitting Documents (03)
- Regulatory Review & Approval (04)
- SNL Professional Labor Management (05)
- Contractor Labor Management (06)

Phase 1 includes the tasks that must be performed prior to breaking ground on construction of project support facilities and before excavation of the MWL could begin. Completion of the CMIP and Permitting process through final regulatory approval is the determining factor for the duration of this phase, which includes preparation of design elements and documents needed to submit a CMIP, a RCRA permit modification request and a TSCA permit application to the NMED and the EPA, respectively. Phase 1 would begin upon receipt of direction from NMED for excavation of the MWL and would end when approval of the CMIP and permit modification requests is received.

Procurement of Turn-Key Contract (01)
Estimated start date: 1/1/2020
Estimated duration: 6 months

Procurement of a turn-key contract by SNL for design-build effort to allow for the most efficient project execution schedule. Includes only ODCs, SNL labor is covered in Task 05. Design tasks are included in Task 02.

Assumptions related to this task:

- Includes project scheduling, and cost engineering at the oversight level.
- SNL would expedite the procurement process in a six month period.

CMIP (02)
Estimated start date: 6/30/2020
Estimated duration: 2 years

This task includes development of a comprehensive set of documents that would be compiled in the CMIP addressing all excavation, waste management, engineering design, closure, and post-closure/LTMM requirements. The CMIP would provide the technical basis and information needed for the RCRA and TSCA permitting processes. Engineering design included in the CMIP would address excavation, all support facilities and site layout, security measures and controls, and waste management operations. CMIP documents are listed below.

- Site-Specific Work Plan (Excavation Plan)
- Engineering Design including onsite cell with RCRA Subtitle C liner system and ET Cover
- Health and Safety Plan/Radiation Protection Plan
- Waste Management Plan
- Sampling and Analysis Plan

- Security Plan
- QA/QC Plan
- Closure Plan for MWL Excavation and Onsite Cell
- LTMMP for MWL Excavation and Onsite Cell
- Installation Plan for post-excavation monitoring network

Assumptions related to this task:

- The CMIP would implement a risk-based approach under RCRA and TSCA designed to meet industrial land-use requirements.
- The waste management plan would include a waste characterization sampling & analysis plan that meets disposal facility WAC and includes a Contained-In Determination approach.

Preparation of TSCA and RCRA Permitting Documents (03)
Estimated start date: 6/29/2021
Estimated duration: 1 year

Permitting documents would address all the relevant CMIP design and project execution scope, including a closure plan for excavation and waste management operations and an LTMMP for the MWL Excavation and the Onsite Cell ET Covers. See Figure D3-1 for a graphic depiction of the permitting process.

Assumptions related to this task:

- RCRA and TSCA permitting documents would address all applicable requirements (e.g., Excavation Sampling & Analysis Plan would address all applicable constituents of concern and risk-based cleanup standards).
- RCRA permitting process would include a Class 3 Modification to the SNL RCRA Operating Permit that covers waste treatment (e.g., stabilization), project waste management operations, and design/construction/disposal in an onsite cell.
- Would incorporate a risk-based approach as described above for CMIP.
- Preparation would begin 1 year after start of CMIP development to allow for completion of initial planning and design necessary for the permitting process.
- Permitting documents would be submitted to NMED and EPA concurrently with CMIP.

Regulatory Review & Approval of Permit Submittals (04)
Estimated start date: 6/22/2022
Estimated duration: 3.5 years

This task includes NMED initial review, DOE/SNL personnel response to NMED technical comments, required public notification process, resolution of regulatory technical comments, and final regulatory approval from NMED.

Assumptions related to this task:

- CMIP and RCRA/TSCA permitting documents would be approved at the same time.
- Two sets of technical comments would be received from NMED that require formal response prior to final approval.
- Would require a public hearing for the Class 3 RCRA Permit modification request.

SNL Professional Labor Management (05)
Estimated start date: 1/1/2020
Estimated duration: 6 years

Lump-sum SNL labor cost for turn-key design-build procurement effort and project oversight for the Planning & Permitting Phase, including submittal, response, public process, and approval of the CMIP and permitting documents.

Contractor Labor Management (06)
Estimated start date: 6/30/2020
Estimated duration: 5.5 years

Includes all contractor labor to perform Planning & Permitting Phase activities.

Labor rates were selected by RACER®. Where a specific labor category was not available within RACER®, the equivalent RACER® labor category is listed in parentheses.

- Senior Project Manager (at 20%)
- Project Manager (at 50%)
- (2) Senior Staff Engineers
- (3) Staff Engineers
- QA/QC Officer
- Certified Industrial Hygienist/Certified Health Physicist (CIH/CHP) (Certified Industrial Hygienist)
- (2) Secretarial/Administrative
- (2) Drafting/CADD

Assumptions related to this task:

- No contractor labor included for Procurement of Turn-Key Contract (Task 01).
- Contractor labor for TSCA & RCRA Permitting Documents (Task 03) is covered in CMIP (Task 02).
- Contractor labor estimated to be 50% of the duration for Regulatory Review & Approval (Task 04).

Phase 2. Support Facility Construction

Estimated start date: 1/7/2026
Estimated duration: 2.7 years

Phase 2 Tasks:

- Procurement for Facilities Construction (01)
- Site Grading & Site Drainage (02)
- Utility Installation (03)
- ET Cover Removal & Staging (04)
- Construction of Excavation & Waste Management Tents (05)
- Construction of Onsite Disposal Cell (06)
- Construction of Warehouses (07)
- Limited Area Gate (08)
- Procurement for Excavation & Waste Disposal (09)
- Training, Functional Testing & Readiness Review (10)

- SNL Professional Labor Management (11)
- Contractor Labor Management (12)
- Additional Equipment & Operators (13)
- Administrative & Onsite Laboratory Equipment (14)

Phase 2 covers activities for construction of site infrastructure and support structures needed for excavation and waste management project operations. This phase also covers acquisition and set-up of portable buildings for onsite laboratory operations and procurement of a contract for offsite laboratory services. At the end of Phase 2, all physical systems and contracts would be in-place and ready for MWL excavation to begin. See main report Figure 5-2 for support facility layout, dimensions, and additional details.

Procurement for Facilities Construction (01)
Estimated start date: 1/7/2026
Estimated duration: 6 months

Procurement of contracts for site grading & drainage, utilities, and construction of support facilities including the onsite engineered cell. Includes only ODCs, contractor professional labor is covered in Task 12.

Assumptions related to this task:

- Turn-key contractor would expedite the procurement process to allow for the most efficient execution of support facility construction and preparation for excavation and waste management.

Site Grading & Site Drainage (02)
Estimated start date: 7/10/2026
Estimated duration: 1 year
Technologies:

- Clear & Grub
- Cut-Fill / Rough Grading
- Storm Sewer
- Finish Grading
- Access Roads
- Parking Lots
- Construct Administrative Facility Pads
- Construct Laboratory Facility Pad
- Construct Replaceable Soils Staging Area
- Construct MWL ET Cover Materials Staging Area
- Construct Onsite Cell Excavated Soils Staging Area

Assumptions related to this task:

- A total of 96 acres would be cleared and grubbed.
- Site grading & site drainage would include areas for Sprungs™, administration and laboratory areas, soil staging areas, onsite cell excavated soil staging area, parking lot, and access roads.
- Parking lot would be a gravel pad (152 ft x 205 ft), adequate for 80 parking spaces.
- Roads would be 2-lane gravel. Total of 9,291 linear feet.
- Replaceable Soil Staging Area would be 250 ft x 450 ft with a capacity of 32,000 cy.

- MWL ET Cover Materials Staging Area would be 300 ft x 500 ft with a capacity of 55,000 cy.
- Disposal Cell Excavated Soil Staging Area would be 600 ft x 300 ft with a capacity of 66,000 cy.
- Soil and materials staging areas would be graded, leveled, and finished with a 6-inch base of compacted coarse material.
- Stormwater controls (silt fencing, soil berms, etc.) would be installed around the perimeter of the soil and materials staging areas.

Utility Installation (03)
Estimated start date: 8/17/2026
Estimated duration: 1 year
Technologies:

- Sanitary Sewer
- Water Distribution/Fire Protection
- Overhead Electrical Distribution
- Communications

Installation/tie-in of all utilities needed for project operations.

Assumptions related to this task:

- Tie-ins to existing utilities would be within 2,800 feet from the MWL facility
- One 5 kilovolt 3-phase primary overhead line would be installed for electrical supply.
- Telephone and internet service would be installed in all trailers.
- One 6-inch water supply line would be installed with 6 fire hydrants.
- One 8-inch reinforced plastic pipe would be installed for sewer line.

ET Cover Removal and Staging (04)
Estimated start date: 7/19/2027
Estimated duration: 2 months
Technologies:

- Subgrade Soil
- Bio-Intrusion Layer (Rock)
- Overlay Soil
- Native Soil Layer
- Topsoil Layer

Removal and staging of existing MWL ET Cover materials in MWL ET Cover Materials Staging Area for reuse in construction of new excavation ET Cover in Phase 3 Task 09. See Appendix D1, Table D1-4 for details on soil and rock volumes.

Assumptions related to this task:

- Removal rate and volumes based on experience from 2009 installation of ET Cover.
- Prior to ET Cover removal, SNL personnel would complete decommissioning of the existing monitoring well networks.

Construction of Excavation and Waste Management Tents (05)
Estimated start date: 8/31/2026
Estimated duration: 2 years
Technologies:

- 200 ft x 550 ft Tent Structure
- 300 ft x 500 ft Tent Structure (3)
- 350 ft x 550 ft Tent Structure
- 400 ft x 650 ft Tent Structure
- Demolition, Fencing
- Fencing

Acquisition and construction of six Sprungs™ that would be used in excavation and management of MWL materials. Construction costs determined using RSMeans. Also includes demolition of current MWL perimeter fencing and installation of new perimeter fencing.

Assumptions related to this task:

- Structures would be built with dimensions/capacities shown in main report Figure 5-2.
- Each Sprung™ would be equipped with ventilation system for five air exchanges per hour through a HEPA filter bank. Initial filter installation is included. Quarterly filter change-out and disposal are included in Phases 3 and 4.
- Perimeter fence would be 8-ft industrial grade chain link and hazardous waste signage; installation of Limited Area gate covered in Phase 2, Task 08.

Construction of Onsite Disposal Cell (06)
Estimated start date: 10/9/2026
Estimated duration: 7 months
Technologies:

- Fencing
- Administrative Facility
- Cell Construction

Construction of Onsite Cell, Administrative Facility, perimeter fencing, and related utilities shown in main report Figure 5-2 and according to specifications in the conceptual design drawings in Figure D3-2 located at the end of this appendix.

Assumptions related to this task:

- Security fencing for Onsite Cell would be 3,250 linear feet of 3-strand barbed wire with hazardous waste signage.
- Construction of 24 ft x 20 ft metal Administrative Building.
- Excavation and construction of Onsite Cell per Figure D3-2 Conceptual Design, including two different soil moisture monitoring systems and a leachate collection system that would be used for long-term monitoring of the Disposal Cell (Phase 6).

Construction of Warehouses (07)
Estimated start date: 12/22/2026
Estimated duration: 1.5 years
Technologies:

- 200 ft x 200 ft High Bay Warehouse
- 250 ft x 250 ft High Bay Warehouse
- 200 ft x 200 ft Container Storage Canopy

This task includes construction of two metal warehouses and a covered container storage area that would be used for waste management.

Assumptions related to this task:

- Classified Debris Management warehouse would be a metal high-bay building with concrete floor with safety and security systems to meet classified waste storage requirements (i.e. Vault-Type Room).
- Shipping Center would be a metal high-bay building with concrete floor and gravel staging area/front entrance.
- Container Storage Area would be a metal canopy (no walls) with a gravel floor.
- Includes cost of building materials and security system for Classified Debris Management Warehouse.

Limited Area Gate (08)
Estimated start date: 12/22/2026
Estimated duration: 6 months
Technology:

- Limited Area Gate Design & Construction

Design and installation of gate meeting Limited Area security requirements that would be incorporated into the perimeter security fence as the single point of ingress/egress (main report Figure 5-2). Construction of perimeter fencing included in Phase 2, Task 05.
Note: This task is not shown in the project schedule (main report Figure 5-4).

Assumptions related to this task:

- Work would be performed under a contract secured by the primary (turn-key) contractor.
- Includes all costs associated with design, materials, and installation; based on SNL costs for Technical Area - IV vehicle gate.

Procurement for Excavation & Waste Disposal (09)
Estimated start date: 7/19/2027
Estimated duration: 1 year

Procurement of contracts for Phase 3 and 4 work, including offsite analytical laboratory, onsite treatment of MW soil and placement of excavated waste in the Onsite Cell. Also includes acquisition of specialized excavation equipment that requires a long lead time. Since this is a procurement task, the only costs would be for SNL Professional Labor Management and Contractor Labor Management, which are included, respectively, in Tasks 11 and 12. Therefore, there are no costs associated with this task.

Assumptions related to this task:

- Includes procurement of services and equipment to support Phases 3 and 4. All costs associated with these services and equipment are included in Phase 3 and Phase 4.

Training, Functional Testing & Readiness Review (10)
Estimated start date: 8/22/2028
Estimated duration: 1 month

This task includes training of personnel performing excavation, waste management, and closure activities. Functional testing and readiness review would include final testing of equipment and

support facilities, final walk-through inspections of all support facilities, and documentation of readiness review for excavation and waste management operations. The only costs would be for SNL Professional Labor Management and Contractor Labor Management, which are included, respectively, in Tasks 11 and 12. Therefore, there are no costs associated with this task.

Assumptions related to this task:

- Wherever possible, preparation for functional testing and readiness would be integrated throughout the facility construction process (e.g., calibration of onsite analytical laboratory equipment performed as part of the preceding task).

SNL Professional Labor Management (11)
Estimated start date: 1/7/2025
Estimated duration: 2.7 years

Lump-sum labor cost for SNL oversight and support for the Support Facility Construction Phase.

Contractor Labor Management (12)
Estimated start date: 1/7/2026
Estimated duration: 2.7 years

Includes all contractor labor to perform Phase 2 activities, including management and oversight of all construction activities.

Labor rates were selected by RACER®. Where a specific labor assembly was not available within RACER®, the equivalent RACER® labor assembly is listed in parentheses.

- Senior Project Manager (at 50%)
- Project Manager
- Site Manager (Senior Staff Engineer)
- Assistant Site Manager (Senior Staff Engineer)
- (2) Waste Management Coordinators (Staff Engineers)
- Certified Industrial Hygienist/Certified Health Physicist (Certified Industrial Hygienist)
- Health and Safety Officer
- QA/QC Officer
- (20) Field Technicians

Assumptions related to this task:

- Senior Project Manager, Project Manager, and Senior Staff Engineers would support Tasks 01-10 and Task 14 in this phase.
- All other positions would support all tasks except the two procurement tasks (Task 01 and 09).
- Overlap of start and finish dates for construction tasks would allow for efficient use of resources. Personnel would shift between activities in one or more tasks, as needed.

Additional Equipment & Operators (13)
Estimated start date: 7/10/2026
Estimated duration: 2.2 years

RACER® includes equipment for each selected technology, based upon the Phase 2 tasks described above. The wide range of work in Phase 2 would require several additional pieces of

equipment not captured by the RACER® defaults. For all equipment, rates for the equipment and operators were assigned by RACER® and are shown in the reports in Appendix D4.

Assumptions related to this task:

- Number of hours for each piece of equipment are based upon duration of the related task(s) where it would be used.
- Equipment with no operator (i.e., Labor Unit Cost) would be operated by a contractor field technician.

Administrative & Laboratory Equipment Facilities (14)
Estimated start date: 6/5/2028
Estimated duration: 3 months

The following portable buildings would be mobilized for the administration area:

Administrative Facilities

- (1) Administration Trailer with lunchroom, reception area, bathrooms, and three private offices;
- (1) Shower Trailer with separated shower areas for men and women, bathrooms, and lockers;
- (3) Office Trailers with two private offices and an open space for up to four desks.
- (10) Conex boxes for personnel decontamination facilities, tool storage, and air refill station (with costs to replace the block portion of the air refill station four times throughout the project).

Onsite Laboratory

- Acquisition and set-up of five portable buildings for Onsite Laboratory; includes the following specialized construction to meet applicable EPA and State requirements.
  - Installation of a vented hood system in each laboratory trailer, chemical-resistant laboratory countertops, cabinets and drawers, workstations, laboratory and computer equipment, and organization of supplies.
- An equipment calibration area would be set up in the Radiological Laboratory trailer.

Assumptions related to this task:

- Portable administrative and laboratory buildings would be leased so costs would be incurred in this phase and also in Phases 3 and 4.
- Estimates for supplies needed for the Chemical Laboratory, the Radiological Laboratory, and the HazCat Laboratory based on 8.6 years of operations (includes costs for operations during Phases 3 & 4).
- Laboratory equipment and supplies would be purchased and are costed as a lump-sum for the entire project in this task.
- Equipment assumed necessary for onsite laboratory operations based upon the list developed for the evaluation prepared in 2003 with costs escalated by 30% (15 years difference, for net present value cost, times 2% increase per year).
- Costs for laboratory equipment include the purchase of an integrated data management system for chemical QA/QC that automates the analytical process and provides a reporting and web-based publishing system.
- A separate data management system would be developed, in-house, for tracking debris and containerized waste and for health and safety tracking.

Phase 3. Excavation & Waste Management

Estimated start date: 9/21/2028
Estimated duration: 7.2 years

Phase 3 Tasks:

- Waste Management (01)
- Onsite & Offsite Laboratories (02)
- Unclassified Area (UCA) Excavation (03)
- UCA Excavation Verification (04)
- Classified Area (CA) Excavation (05)
- CA Excavation Verification (06)
- Excavation Backfilling (07)
- D&D MWL Excavation Sprung™ (08)
- Excavation ET Cover Construction (09)
- Onsite Cell ET Cover Construction (10)
- SNL Professional Labor Management (11)
- Contractor Labor Management (12)
- Administration Facilities (13)

Phase 3 includes excavation of the UCA and CA and all associated waste management activities; screening, sorting, segregation, characterization, treatment (as necessary), packaging, and onsite disposal. Figure 5-5 of the main report (Mixed Waste Landfill Excavation Waste Management Process) illustrates the location of operations and transfer of materials performed in this phase. Verification of completed excavation, backfilling of the UCA and CA, and D&D of the Excavation Sprung™ would also occur in this phase, followed by construction of the ET Cover over the MWL excavation and the ET Cover over the Onsite Cell.

<u>Waste Management (01)</u>
Estimated start date: 9/21/2028
Estimated duration: 6.3 years
Technologies:

- Transportation and Disposal, PPE
- Transportation and Disposal, Sprung™ HEPA Filters
- Transportation and Disposal, Conveyor System
- Transportation and Disposal, Hydraulic Baler/Logger
- Sorting, Processing, Staging
- Waste Placement Onsite Cell
- Intermodal Containers Purchase

Waste management is performed throughout excavation of the UCA and CA. Task 01 covers labor and equipment costs for waste management activities conducted after completion of Task 05 and all packaging-transportation-disposal of Phase 3 and Phase 4 project-generated waste including PPE and HEPA filters removed quarterly from Sprungs™ and warehouses. Project-generated waste volumes are displayed in Table D3-5. Waste management costs for excavated waste (screening through placement in the Onsite Cell) processed within the UCA and CA Excavation task durations are included in Phase 3, Task 03 and Task 05. Costs for packaging, movement, and placement of remaining excavated waste after completion of Task 05 is included in this task. This task also includes the cost for purchase of 50, 20-cy Intermodal

containers for transportation of scraped soil, project-generated waste, and D&D Sprung™ fabric and debris to NNSS in Phases 3 and 4.

Assumptions related to this task:

- The duration of this task would extend one year beyond completion of Task 05.
- Other than a waste characterization fee, there would be no cost for disposal of project-generated LLW or MW at NNSS. Costs shown are for preparation of waste, waste-type-specific containers, liners (when required), labor and equipment for loading of waste into containers and loading containers for shipment, and transportation of waste to the appropriate disposal/treatment facility.
- Intermodal containers would be filled to 90% capacity (18 cubic yards) when used, and decontaminated and recycled when no longer needed.
- Waste transportation costs for project-generated waste are based on mileage between SNL and the appropriate disposal/treatment facility.
- Loading and transportation of one Intermodal waste container per month (total of 87 loads) of PPE waste generated during Phase 3.
- Loading and transportation of one Intermodal container of PPE waste every two months (total of 8 loads) of PPE waste generated during Phase 4.
- 8 ft x 8 ft x 1 ft HEPA filters would be exchanged quarterly in each of the Sprungs™ and warehouses (total of 2,322 cy). Includes costs for disposal of the Sprung™ HEPA filters for the entire duration of the Waste Management Task (Phase 3, Task 01, 1,653 days or 76 months). After completion of this task, the facilities would no longer require ventilation.
- Cost for disposal of tent fabric from D&D of the MWL Excavation Management Sprung™ is included in Phase 4, Task 02.
- Includes the purchase and installation of an overhead crane for the Debris Segregation & Management Sprung™.
- Covers transportation and disposal at NNSS of the Debris Segregation & Management Sprung™ conveyor system and hydraulic baler/compactor. Purchase of these two pieces of equipment is covered in Task 03.

Table D3-5
Project-Generated Waste – Onsite Disposal Alternative

Waste Type	Volume of Waste (cy)	Disposal Facility	Container Type	Container Volume (cy)	No. of Containers/Loads
HEPA Filters	2,322	NNSS	Intermodal	18	129
PPE	1,710	NNSS	Intermodal	18	95
Total	4,032				224

Notes:
cy = Cubic yards.
HEPA = High efficiency particulate air.
NNSS = Nevada National Security Site.
No. = Number.
PPE = Personnel protective equipment.

Onsite & Offsite Laboratories (02)
Estimated start date: 9/21/2028
Estimated duration: 7.2 years
Technologies:
- Onsite Laboratory
- Offsite Laboratory

Onsite Laboratory
Onsite Laboratory activities would include operation of equipment and related software to provide and manage analytical reports for soil and debris characterization. The laboratory would be capable of performing both chemical and radiological analysis. The HazCat Laboratory would perform basic laboratory tests to determine the physical properties and the hazard classification of any debris or containerized waste excavated from the UCA and CA. Calibration of equipment used for field sampling would also be performed. Laboratory personnel would also be responsible for maintaining the QA/QC and sample tracking data management systems.

Assumptions related to this task:
- To characterize the hazardous constituents in soil, the following EPA SW846 Methods would be used:
    - RCRA Metals by EPA SW846 Method 6020 for ICP/MS;
    - Hexavalent Chromium by EPA SW846 Method 7196A for UV-Vis;
    - TSCA regulated PCBs by EPA SW846 Method 8082 for GC/ECD;
    - RCRA VOCs by EPA SW846 Method 8260B for GC/MS with Purge & Trap; and
    - RCRA SVOCs by EPA SW846 Method 8270C for GC/MS.
- To characterize the radiological constituents in the soil, the following analyses would be completed:
    - Gamma Spectroscopy to measure gamma-emitting radionuclides; and
    - Liquid Scintillation Counting to measure tritium, gross alpha, and gross beta rates.
- Only Onsite Laboratory cost shown in the RACER® report for this task is for rental of 5 laboratory trailers. Cost for laboratory equipment is included in Phase 2, Task 14. Cost for laboratory personnel are included in Phase 3, Task 11.

Offsite Laboratory
This technology includes all costs associated with offsite analysis of samples. The Offsite Laboratory would be under contract to perform analyses and provide reports for QA/QC. Verification samples would be used to determine when the excavation meets industrial risk-based levels. The Offsite Laboratory would also perform all analysis of decontamination water samples.

Assumptions related to this task:
- For Phase 3, the Offsite Laboratory would analyze a duplicate of 10% of excavation soil samples and 100% of the verification samples.
- The Offsite Laboratory would analyze 100% of the decontamination water samples. One sample would be collected per month for the duration of the Phase 3 (87 months).
- Based upon the calculations below, a total of 682 samples would need to be analyzed through the contracted Offsite Laboratory.

Assumptions and Calculations to determine the number of offsite analyses needed:
QA/QC Soil Sample Analyses

- A duplicate soil sample would be collected for offsite analysis for 10% of all Onsite Laboratory soil samples.
- One onsite soil sample would be collected for every 100 cy of excavated soil.
- A 20% re-sample contingency has been included.
- Number of Onsite Laboratory soil samples includes the following:
  - *UCA*
    Total Soil Volume = 44,775 cy x 1 sample/100 cy = 448 samples
  - *CA*
    Total Soil & Concrete Volume = 35,349 cy x 1 sample/100 cy = 354 samples
  - Total number of Onsite Laboratory soil samples = 448 + 354 = 802
- Number of Offsite Laboratory QA/QC analyses:
  = 10% of onsite soil samples (80) + 20% resample (16)
  = 80 + 16 = 96 soil samples for Offsite Laboratory QA/QC analysis

Verification Sample Analyses

- Verification samples would be collected on a 25-foot grid within the excavated areas. The excavated area was defined as the entire area within the MWL Excavation Sprung™.
- All verification samples would be analyzed at the Offsite Laboratory.
- A 20% re-sample contingency has been added.
- Number of verification samples includes the following:
  - *Verification sampling within excavated areas*
    Total Area = 400 ft x 650 ft = 260,000 ft^2
    For 25-foot grid, assume one sample per 625 ft^2
    Number of samples = 260,000 ft^2 / 625 ft^2 = 416 samples
- Total Number of Verification Samples
  = excavated area samples (416) + 20% resample (83)
  = 416 + 83 = 499 verification samples

Decontamination Water Samples

- One sample would be collected for every month of operations.
- 7.2-year (87 months) Phase 3 operational period.
- Number of samples
  7.2 years X 12 months/year = 87 decontamination water samples

Total number of samples for Offsite Laboratory analysis:

QA/QC (soil piles & QC)	96
Verification (excavation & QC)	499
Decontamination Water	87
Total =	682

UCA Excavation (03)
Estimated start date: 9/21/2028
Estimated duration: 2.9 years
Technology Elements:

- Excavation
- Sorting, Processing, Staging
- Load-out Soil – Low Level Waste

- Containerize/Load-out Debris – Low Level Waste
- Containerize/Load-out Debris – Mixed Waste
- Waste Placement Onsite Cell

This task includes UCA excavation and the management of all excavated UCA waste through placement in the Onsite Cell. See Sections 5.3.4.2 and 5.3.4.4 of this report for more detailed information.

Assumptions related to this task:

Excavation and Sorting, Processing, Staging

- Assumptions for trench dimensions, slopes, excavation approach, and debris/soil volumes for each trench can be found in Appendix D1, Figures D1-1 through D1-8.
- A 100-ton crane was included for 6 months to lift the five large, heavy shipping casks in Trench F. Due to drag and assuming a safety factor of 2, a 100-ton crane was selected.
- Most debris sorting, segregation, characterization, and packaging would be performed in the Debris Segregation & Management Sprung™ equipped with a radial stacking conveyor and overhead bridge crane, remote handler unit (robotic), and a hydraulic baler (for debris consolidation). Purchase cost of this equipment is included in Sorting, Processing, Staging assembly; this equipment would also be available for Task 01 and Task 05.
- Debris sorting and segregation would be performed by trained contractor waste management technicians working under the supervision of SNL Derivative Classifiers to ensure the proper identification and handling of classified items/debris.
- A radiography unit that could provide X-ray images of drums would be available for the duration of UCA excavation (35 months) to support waste characterization. Rental cost included in Sorting, Processing, Staging assembly.

Load, Containerize, Waste Placement in Onsite Cell

- Discrete items specifically identified as LLW would be packaged in 744 Boxes for disposal in the Onsite Cell.
- MW debris would be packaged in Macroboxes for disposal in the Onsite Cell.
- Classified debris would be properly labeled, but packaged and disposed the same as unclassified MW or LLW debris in the Onsite Cell. Declassification treatment (“sanitization”) would not be required for classified items.
- All UCA LLW (soil and debris) and MW (debris) would be disposed in the Onsite Cell.
- Estimated costs included for waste-type-specific containers, liners (when required), labor and equipment for packaging and loading containers, and movement of waste for placement in the Onsite Cell.

UCA Excavation Verification (04)
Estimated start date: 8/11/2031
Estimated duration: 3 months
Technology Element:

- Soil Sampling

This task includes the collection of in situ soil samples from the UCA excavation after completion, and review of analytical results to verify they meet industrial risk-based levels.

Assumptions related to this task:

- Samples would be collected on a 25-foot grid from the floor and sidewalls of the excavation and analyzed for all constituents of concern at the Offsite Laboratory.
- UCA Excavation Verification activities would be performed concurrently with the start of CA Excavation.
- No additional excavation would be required following verification sampling.
- Number of samples and offsite analytical costs are included in Task 02.
- SNL Oversight and Contractor labor included in Tasks 11 and 12, respectively.

CA Excavation (05)
Estimated start date: 8/11/2031
Estimated duration: 2.4 years
Technology Elements:

- Excavation
- Sorting, Processing, Staging
- Load-out Soil – Low Level Waste
- Transport/Place Onsite Cell Soil – Mixed Waste
- Transport/Place Onsite Cell Concrete – Mixed Waste
- Transport/Place Onsite Cell Debris – Low Level Waste
- Transport/Place Onsite Cell Debris – Mixed Waste
- Transportation & Disposal Debris – TRU Waste
- Stabilization
- Waste Placement Onsite Cell

This task includes CA excavation and the management of all excavated CA waste through final disposal. See Sections 5.3.4.3 and 5.3.4.4 of this report for more detailed information.

Assumptions related to this task:
Excavation and Sorting, Processing, Staging

- Assumptions for pit dimensions, excavation approach, and debris/soil volumes can be found in Appendix D1, Figures D1-1 and D1-9.
- Remote-operations approach would be available at the start of CA excavation and include the following equipment: remote-operated hydraulic excavator, wheel loader, and remote-control on/off for the mechanical screen.
- A 100-ton crane was included for 6 months to lift large, heavy source packages such as the cobalt-60 source in Pit SP-5.
- Most debris sorting, segregation, characterization, and packaging would be performed in the Debris Segregation & Management Sprung™ equipped with a radial stacking conveyor and overhead bridge crane, remote handler unit (robotic), and a hydraulic baler (for debris consolidation). Purchase cost of this equipment included in Task 03 Sorting, Processing, Staging assembly.
- Debris sorting and segregation would be performed by trained contractor waste management technicians working under the supervision of SNL Derivative Classifiers to ensure the proper identification and handling of classified items/debris.
- A radiography unit that could provide X-ray images of drums would be available for the duration of CA excavation (29 months) to support waste characterization. Rental cost included in Task 05 Sorting, Processing, Staging assembly.

Load, Containerize, Waste Placement in Onsite Cell

- Discrete items specifically identified as LLW would be packaged in 744 Boxes for disposal in the Onsite Cell.
- MW debris would be packaged in Macroboxes for disposal in the Onsite Cell.
- MW soil would be stabilized onsite prior to placement in the Onsite Cell.
- Classified items/debris would be properly labeled, but packaged and disposed the same as unclassified MW or LLW debris for disposal in the Onsite Cell. Declassification treatment ("sanitization") would not be required for classified items.
- All CA LLW (soil and debris) and MW (soil and debris) would be disposed in the Onsite Cell.
- Estimated costs included for waste-type-specific containers, liners (when required), labor and equipment for packaging and loading containers, and movement of waste for placement in the Onsite Cell.
- If identified, TRU waste debris would be packaged in SWBs and shipped to WIPP. Costs included are for initial waste characterization. No costs included for waste characterization to meet certification requirements, or disposal at WIPP.

CA Excavation Verification (06)
Estimated start date: 1/16/2034
Estimated duration: 3 months
Technology Element:

- Soil Sampling

This task includes collection of in situ soil samples from the CA excavation and review of analytical results to verify they meet industrial risk-based levels.

Assumptions related to this task:

- Samples would be collected on a 25-foot grid, from the floor and sidewalls of the excavation and analyzed for all constituents of concern at the Offsite Laboratory.
- All samples collected for verification purposes would be sent to the Offsite Laboratory for analysis.
- No additional excavation will be required following verification sampling.
- Number of samples and offsite analytical costs are included in Task 02.
- SNL Oversight and Contractor labor included in Tasks 11 and 12, respectively.

Note: Upon completion of this verification task, Phase 5 would begin (main report Figure 5-4). As time permits contractor staff would begin compiling excavation and waste management data into final closure reports in parallel with ongoing activities.

Excavation Backfilling (07)
Estimated start date: 4/18/2034
Estimated duration: 9 months
Technologies:

- Excavation Backfill & Compaction – Replaceable
- Excavation Backfill & Compaction – Supplemental

Following verification of both the UCA and CA, the excavated area would be backfilled in preparation for construction of the ET Cover. In preparation for backfilling, all excavation and waste management equipment in the Excavation Sprung™ would be decontaminated as needed and demobilized/dispositioned. Table D3-6 provides information about replaceable soil

and supplemental backfill material volumes, and the information used to determine the time needed for backfill operations.

Assumptions related to this task:

- 93,879 cy represents the total debris and soil volume excavated from the MWL.
- Rock screened and segregated from excavated soils would be placed as a marker layer on the excavation floor as the first step in backfilling.
- Replaceable soils excavated from the UCA and CA would be used first.
- Backfill brought in from offsite would be clean fill from a borrow area within 15 miles of the site to complete backfilling to grade; 30 miles roundtrip.
- Fill would be placed in lifts, compacted, and tested for density and moisture.

Table D3-6
MWL Excavation Backfilling – Onsite Disposal Alternative

Description	**Volume (cy)**	**Truckload Volume (cy)**	**Truckloads Needed**	**Loads/ Day**	**Total Days**	**Total Weeks[a]**
Replaceable Soils[b,c]	18,330	18	1,018	50	20	
Soils from Disposal Cell[b]	24,409	18	1,356	50	27	
Offsite Backfill Material[b]	51,140	18	2,841	30	95	
Totals	93,879	18	5,216		142	28
Additional time for compaction testing, surveying, lift approval, etc.[d]						7
Total duration for excavation backfilling						35

Notes:
93,879 yd^3 volume represents the total excavated debris and soil volume from the MWL.
[ca]Based on a 5-day work week.
[b]Replaceable Soils volume includes an expansion factor of 1.3 applied to excavated volume.
[c]All soils removed from the MWL and categorized as "replaceable soil" will be used as ET excavation backfill material.
[d]Additional time for compaction testing, surveying, lift approval, etc. calculated as 25% of the Total Weeks value.
cy = Cubic yards.
ET = Evapotranspirative.
MWL = Mixed Waste Landfill.

D&D MWL Excavation Sprung™ (08)
Estimated start date: 12/21/2034
Estimated duration: 2 months
Technology:

- Demolition – 400 x 650 Tent Structure

D&D of the MWL Excavation Sprung™ would be performed following backfilling of the excavation to provide the additional room needed for ET Cover installation.

Assumptions related to this task:

- Fabric generated from D&D of the MWL Excavation Sprung™ would be managed, packaged, and disposed as LLW. Metal frames would be surveyed and released for offsite recycling.
- Waste management costs for all tent fabric from the six Sprungs™ are included in Phase 4, Task 02.

MWL Excavation ET Cover Construction (09)
Estimated start date: 2/21/2035
Estimated duration: 3 months
Technologies:
- Capping
- Fencing

The ET Cover removed in Phase 2, Task 04 would be re-constructed over the MWL excavation using the same materials. Table D3-7 shows the volumes and associated estimated duration for each type of material.

Assumptions related to this task:
- Materials removed from the existing MWL ET Cover would be screened, staged, and re-used in construction of the new Excavation ET Cover (see Table D3-7 for cover layers and volumes).
- Fill would be placed in lifts, compacted, and tested for density and moisture.
- Biointrusion rock layer would be placed and compacted using a tracked dozer.
- No supplemental soil or rock would be needed for ET Cover construction.
- Includes costs for seeding the ET Cover and installation of a temporary above-ground supplemental watering system to facilitate revegetation with native vegetation.
- Three-strand barbed wire fence would be installed around the completed ET Cover with three access gates and signage.
- Thin Overlay Soil and Native Soil Layer are combined in the RACER® report under assembly #33080506 with a total volume of 25,870 cy.

Note: Upon completion of this Excavation ET Cover construction task, Long-Term Monitoring & Maintenance (Phase 6), would begin (main report Figure 5-3). Initial tasks would include Installation of Groundwater and Soil-Vapor Monitoring Networks and ET Cover and site controls inspections (Phase 6, Tasks 01 and 04).

Table D3-7
MWL Excavation ET Cover Construction – Onsite Disposal Alternative

Description	Volume (cy)	Truckload Volume (cy)	Truckloads Needed	Loads/ Day	Total Days	Total Weeks[a]
Subgrade Soil[b]	10,010	18	556	50	11	
Bioinstrusion Layer (Rock)	6,800	18	378	50	8	
Thin Overlay Soil[b]	3,380	18	188	50	4	
Native Soil Layer[b]	22,490	18	1,249	50	25	
Topsoil Layer[b]	7,020	18	390	50	8	
Totals	49,700		2,761	--	56	11
Additional time needed for compaction testing, surveying, lift approval, etc.[c]						3
Total duration for ET Cover construction						14

Notes:
[a]Based on a 5-day work week.
[b]Volume from MWL Corrective Measures Implementation Report, includes an expansion factor of 1.3 for soil.
[c]Additional time for compaction testing, surveying, lift approval, etc. calculated as 25% of the Total Weeks value.

cy = Cubic yards.
MWL = Mixed Waste Landfill.
ET = Evapotranspirative.

Onsite Cell ET Cover Construction (10)

Estimated start date: 1/23/2035
Estimated duration: 9 months
Technologies:

- Capping

Following completion of the Waste Placement in Onsite Cell technology in Task 01, an ET Cover would be constructed over the Onsite Cell. Table D3-8 shows the volumes, materials types, and estimated construction duration for each ET Cover layer. The Onsite Cell ET Cover conceptual design is shown in Figure D3-2.

Assumptions related to this task:

- All materials would be brought in from an offsite borrow area within 15 miles of the site; 30 miles roundtrip.
- Soil fill would be placed in lifts, compacted, and tested for density and moisture.
- Biointrusion rock layer would be placed and compacted using a tracked dozer.
- Includes costs for seeding the Onsite Cell ET Cover and installation of a temporary above-ground supplemental watering system to facilitate revegetation of the ET Cover with native vegetation.
- Subliner Soil and Native Soil Layer are combined in the RACER® report under assembly #33080506 with a total volume of 29,822 cy.

Table D3-8
Onsite Cell ET Cover Construction

Description	Volume (cy)	Truckload Volume (cy)	Truckloads Needed	Loads/ Day	Total Days	Total Weeks[a]
Subliner Soil - General Fill[b]	7,644	18	425	30	14	
Subgrade Soil[b]	49,513	18	2,751	30	92	
Bioinstrusion Layer (Rock)	6,795	18	378	30	13	
Native Soil Layer (soil)[b]	22,218	18	1,234	30	41	
Topsoil Layer (soil)[b]	10,639	18	591	30	20	
Mulch/Gravel Layer[b]	432	18	24	30	1	
Totals	97,241	--	5,403	--	181	36
Additional time needed for compaction testing, surveying, lift approval, etc.[c]						9
Total duration for Onsite Cell ET Cover construction						45

Notes:
[a]Based on a 5-day work week.
[b]Volume based on Figure D3-2 , includes an expansion factor of 1.3 for soil.
[c]Additional time for compaction testing, surveying, lift approval, etc. calculated as 25% of the Total Weeks value.
cy = Cubic yards.
ET = Evapotranspirative.

SNL Professional Labor Management (11)

Estimated start date: 9/21/2028
Estimated duration: 7.2 years

Lump-sum labor cost for SNL oversight and support for the Excavation & Waste Management Phase. This would include SNL Derivative Classifiers training and working with contractor waste management technicians to ensure the proper identification and handling of classified items/debris.

Contractor Labor Management (12)
Estimated start date: 9/21/2028
Estimated duration: 7.2 years

Includes all contractor labor to perform Excavation & Waste Management Phase activities, including management and oversight of all work performed. Also includes contract personnel for operation of Onsite Laboratory and oversight/review of Offsite Laboratory analytical data.

The following contractor personnel were included for all Phase 3 tasks except for the Onsite Laboratory (see below). Labor rates were selected by RACER®. Where a specific labor category (Assembly) was not available within RACER®, the equivalent RACER® labor category is listed in parentheses.

- Senior Project Manager (at 50%)
- Project Manager
- Site Manager (Senior Staff Engineer)
- Assistant Site Manager (Senior Staff Engineer)
- (2) Waste Management Coordinators (Staff Engineers)
- Certified Industrial Hygienist/Certified Health Physicist (Certified Industrial Hygienist)
- Health and Safety Officer
- QA/QC Officer
- (20) Field Technicians

Assumptions related to contractor labor management staffing:

- Contractor personnel listed above would be in-place for the entire duration of this phase and would shift between tasks, as needed.
- Costs for oversite of Offsite Laboratory are covered by contractor labor associated with Phase 3 tasks.

Onsite Laboratory Staffing
The staff would consist of the following personnel. Where a specific labor category was not available within RACER®, the equivalent RACER® labor category is listed in parentheses.

- Laboratory Manager (Project Manager)
- Data/Document Control Manager (Project Engineer)
- Laboratory QA/QC (QA/QC Officer)
- QA/QC Technician (Staff Engineer)
- (4) Chemical Analysts (Staff Engineers)
- (2) Radiological Assessment Analysts (Staff Engineers)
- (2) Chemical and Radiological Laboratories Support Staff (Staff Engineers)
- (3) Technicians to support the HazCat Laboratory (Field Technicians)

Assumptions related to Onsite Laboratory staffing:

- The staff would be reduced by 1 QA/QC Technician, 2 Chemical Analysts, 1 Radiological Assessment Analyst, 1 Laboratory Support Person, and 3 HazCat Technicians following completion of Excavation Backfilling (Phase 3,Task 07).

Administration Facilities (13)
Estimated start date: 9/21/2028
Estimated duration: 7.2 years

This task covers the Phase 3 rental costs for the five administrative trailers and 10 conex boxes used for storage of equipment/supplies. The five Onsite Laboratory trailers are costed in Task 02.

Phase 4. Closure
Estimated start date: 5/31/2035
Estimated duration: 1.8 years

Phase 4 Tasks:

- Onsite & Offsite Laboratories (01)
- D&D Sprungs™ & Warehouses (02)
- Operational Area – Pre-Scraping Characterization (03)
- Operational Area – Scrape/Load/Disposal (04)
- Operational Area – Verification (05)
- Demobilize Administration & Onsite Laboratory Trailers (06)
- SNL Professional Labor Management (07)
- Contractor Labor Management (08)
- Administration Facilities (09)

This phase would include all activities related to project closeout, including decontamination, demolition, and demobilization of equipment, site facilities and infrastructure, not needed for LTMM. This phase also includes Onsite and Offsite Laboratory activities for soil and debris analyses associated with scraping and verification of the operational area and management of D&D materials through ultimate disposal at NNSS. By the end of this phase all excavation and waste management infrastructure would be removed and the site would be graded for proper drainage and reseeded. Phase 5 and Phase 6 task work would be performed in parallel with work in this phase (main report Figure 5-3).

Onsite & Offsite Laboratories (01)
Estimated start date: 5/31/2035
Estimated duration: 1.8 years
Technology Elements:

- Onsite Laboratory
- Offsite Laboratory

Onsite Laboratory
The Onsite Laboratory would analyze in situ soil samples taken from the waste management and staging areas (i.e., operational area outside the MWL Excavation Sprung™, excluding the Shipping Center, Container Storage Area, and Administrative/Laboratory area) for pre-scraping waste characterization. Onsite Laboratory personnel would continue to maintain data management systems for QA/QC and sample tracking and transfer this information prior to demobilization of the Onsite Laboratory (Task 06).

Offsite Laboratory
The Offsite Laboratory would analyze in situ verification samples collected following scraping of the operational area to confirm it meets industrial risk-based levels. During Phase 4 no offsite QA/QC soil samples would be analyzed for the onsite soil or debris samples, including onsite soil samples associated with operational area scraping waste characterization. By this point

enough onsite/offsite split data would be collected and evaluated to establish the quality of onsite analytical results.

Assumptions related to this task:

- No labor hours for Onsite Laboratory personnel during Phase 4, Task 05 or Task 06.
- Onsite Laboratory cost for this task is for rental of 5 laboratory trailers. Costs for Phase 4 laboratory equipment and supplies are included in Phase 2, Task 13. Cost for laboratory personnel are included in Phase 4, Task 08.
- Number of samples that would be sent to the Offsite Laboratory for analysis during Phase 4 are summarized below:
  - 22 decontamination water samples for 22-month duration (one sample/month).
  - 1,043 soil samples for operational area verification
    - The total square footage of operational area = 2,172,601 ft^2
    - For 50-foot grid, assume one sample per 2,500 ft^2
    - Number of samples = 2,172,601 ft^2 / 2,500 ft^2 = 869 samples
    - 869 samples x 20% re-sample (174) = 1,043 samples

D&D Sprungs™ & Warehouses (02)
Estimated start date: 5/31/2035
Estimated duration: 4 months
Technology Elements:

- Demolition – 300 ft x 500 ft Tent Structures (3)
- Demolition – 350 ft x 550 ft Tent Structure
- Demolition – 200 ft x 550 ft Tent Structure
- Transportation & Disposal Tent Structure Fabric
- Demolition – 200 ft x 200 ft Warehouse
- Demolition – 200 ft x 200 ft Canopy
- Demolition – 250 ft x 250 ft Shipping Center (Warehouse)
- Transportation & Disposal – 200 ft x 200 ft Warehouse
- Transportation – 200 ft x 200 ft Canopy
- Transportation – 250 ft x 250 ft Shipping Center (Warehouse)

This task includes D&D of the Debris Segregation & Management and Soil Storage Sprungs™, Classified Debris Management and Shipping Center warehouses, Container Storage Area (metal roof, no walls, gravel pad), roads, and site perimeter fence. Table D3-9 shows volume and types of waste generated in this phase.

Assumptions related to this task:

- The total volume of waste materials generated in this task is estimated at 59,249 cy.
- Costs for waste management and disposal are included in the respective technologies for this task.
- Removal of Sprung™ gravel pads is included in Phase 4, Task 04.
- Metal fencing material and all Sprung™ frames would be surveyed, released, and recycled.

Table D3-9
D&D Waste Volumes – Onsite Disposal Alternative

Waste Type	Volume of Waste (cy)	Disposal Facility	Container Type	Container Volume (cy)	No. of Containers	No. of Loads
Soil (Scraped)						
Low Level Waste	13,679	NNSS	Intermodal	18	760	760
D&D Waste						
Tent Fabric	730	NNSS	Intermodal	18	41	41
Tent Frames	NA	NA	NA	NA	NA	NA
Classified Debris Management Warehouse	35,556	NNSS	Intermodal	18	1,975	1,975
Container Storage Canopy	4,444	NNSS	Intermodal	18	247	247
Shipping Center	18,519	NNSS	Intermodal	18	1,029	1,029
Hydraulic Baler/Logger	--	NNSS	Flat Bed Trailer	--	--	2
Conveyor System	--	NNSS	Flat Bed Trailer	--	--	2
Total	72,928					

Notes:
cy = Cubic yards.
D&D = Decommissioning and demolition.
NA = Not applicable.
NNSS = Nevada National Security Site.
No. = Number.

Operational Area – Pre-Scraping Characterization (03)
Estimated start date: 10/4/2035
Estimated duration: 3 months
Technology:

- Soil Sampling

Soil samples would be collected on a 50-foot grid across the 2,172,601 ft^2 operational area and analyzed for all constituents of concern at the Onsite Laboratory to characterize the soil for disposal at NNSS prior to scraping.

Assumptions related to this task:

- Number of Onsite Laboratory samples = 2,172,601 ft^2 / 2,500 ft^2 = 869 samples; no QA/QC Offsite Laboratory split samples for Phase 4.
- Areas under the Shipping Center warehouse, Container Storage Area (Covered), the administration and Onsite Laboratory trailers, and the Onsite Cell Staging Area would be considered clean and would not be sampled.

Operational Area – Scrape/Load/Disposal (04)
Estimated start date: 12/27/2035
Estimated duration: 9 months
Technologies:

- Excavation (Scraping & Loading)
- Offsite Transportation and Waste Disposal

Following Tasks 02 and 03, the operational area (i.e., area outside the MWL Excavation Sprung™ excluding the Container Storage Area, Shipping Center, and Administrative/Laboratory trailers – total of 2,172,601 ft^2) would be scraped to remove residual contamination. The top two inches would be scraped from the surface and stockpiled, packaged, loaded, and transported to NNSS for disposal.

Assumptions related to this task:

- Scraped soil would be previously characterized as LLW during Task 03 and would be sufficient to meet NNSS WAC.
- Total volume of soil and gravel generated from this task is estimated at 13,679 cy (760 Intermodal containers).

Operational Area – Verification (05)
Estimated start date: 10/2/2036
Estimated duration: 3 months
Technology:

- Soil Sampling

Soil samples would be collected and sent to the Offsite Laboratory for analysis to verify the scraped operational area meets industrial risk-based levels.

Assumptions related to this task:

- Verification samples would be collected on a 50-foot grid within the operational area – see Task 01 assumptions for number of samples and total area sampled.
- Areas under Shipping Center, Container Storage Area, and the administration and laboratory trailers would be considered clean and would not be sampled.
- It is assumed that no additional scraping would be required following verification sampling.
- Offsite Laboratory analytical costs are included in Phase 4, Task 01.

Demobilize Administration & Onsite Laboratory Trailers (06)
Estimated start date: 1/2/2037
Estimated duration: 3 months
Technologies:

- Administration Facilities
- Revegetation

Trailers used for administrative offices and the Onsite Laboratory would be demobilized. Gravel under the trailers and in the parking area around the trailers would be graded for drainage purposes – no scraping or verification sampling would be required in this area.

Assumptions related to this task:

- Mobile buildings would consist of 10 trailers used for offices, showers, and Onsite Laboratory and 10 conex boxes used for storage of project supplies.
- Trailers/conex storage boxes would be removed from the site by the vendor after demobilization.
- Laboratory equipment and remaining supplies would be decontaminated, as necessary, and reapplied through the SNL Reapplication Center.
- The area would be seeded for revegetation after grading (estimated 60 acres for entire support facility area).

SNL Professional Labor Management (07)
Estimated start date: 5/31/2035
Estimated duration: 1.8 years

Lump-sum labor cost for SNL oversight and support for the Closure Phase.

Contractor Labor Management (08)
Estimated start date: 5/31/2035
Estimated duration: 1.8 years

Includes all contractor labor to perform Closure Phase activities, including management and oversight of all work performed. Also includes contract personnel for operation of Onsite Laboratory and oversight/review of Offsite Laboratory analytical data.

The following contractor personnel were assumed for Phase 4 tasks. Labor rates were selected by RACER®. Where a specific labor category was not available within RACER®, the equivalent RACER® labor category is listed in parentheses.

- Senior Project Manager (at 50%)
- Project Manager
- Site Manager (Senior Staff Engineer)
- Assistant Site Manager (Senior Staff Engineer)
- (2) Waste Management Coordinators (Staff Engineers)
- CIH/CHP (Certified Industrial Hygienist)
- Health and Safety Officer
- QA/QC Officer
- (20) Field Technicians - reduces to (10) after Task 04 is completed

Assumptions related to this task:

- Staffing would be reduced from Phase 3 levels following completion of Phase 4, Task 04.
- Throughout Phase 4 tasks, contract personnel would shift from one task to another on an as-needed basis for efficiency purposes.

Onsite Laboratory Staffing
The staff would consist of the following personnel. Where a specific labor category was not available within RACER®, the equivalent RACER® labor category is listed in parentheses.

- Laboratory Manager (Project Manager)
- Data/Document Control Manager (Project Engineer)
- Laboratory QA/QC (QA/QC Officer)
- (2) Chemical Analysts (Staff Engineers)
- Radiological Assessment Analysts (Staff Engineers)
- Chemical and Radiological Laboratories Support Staff (Staff Engineer)

Assumptions related to Onsite Laboratory staffing:

- The Phase 4 Onsite Laboratory staff would be reduced from the level assumed for Phase 3 due to processing fewer samples in the Onsite Laboratory for closure activities compared to excavation operations.

Administration Facilities (09)
Estimated start date: 5/31/2035
Estimated duration: 1.8 years

This task covers the Phase 4 rental costs for the five administrative trailers and 10 Conex boxes used for storage of equipment/supplies, until the time they are demobilized in Task 06. The five Onsite Laboratory trailers are costed in Phase 4, Task 01.

Phase 5. Closure Reporting – TSCA & RCRA
Estimated start date: 4/18/2034
Estimated duration: 4.6 years

Phase 5 Tasks:
- Compile Data & Prepare Reports (01)
- Regulatory Review & Approval (02)
- SNL Professional Labor Management (03)
- Contractor Labor Management (04)

The closure reporting phase includes collecting and compiling all data and results documenting excavation, waste management, and closure D&D activities into two separate closure reports; one for submittal to the NMED (RCRA requirements) and one for submittal to the EPA (TSCA requirements). Project completion and the full transition to LTMM status would be achieved upon regulatory approval of both reports. As shown in the project schedule (main report Figure 5-3) and explained in Section 5.3.4.8, the closure reporting effort would start during Phase 3 after completion of Task 06 and conclude after completion of Phase 4. The turn-key contract put into place during Phase 1 would end with the completion of Phase 5.

Compile Data & Prepare Reports (01)
Estimated start date: 4/18/2034
Estimated duration: 3.1 years

This task would involve the documentation of Phase 3 & 4 work activities and the incorporation of all final verification analytical results into two reports; one for submittal to the NMED (RCRA requirements) and one for submittal to the EPA (TSCA requirements). The two Closure Reports would be very similar and include a final LTMMP as an appendix that would be based upon the original LTMMP submitted with the CMIP and Permitting documents in Phase 1. The final LTMMP would include a summary of LTMM activities performed since completion of the Excavation ET Cover (Phase 3, Task 09). Reports would be submitted for regulatory review & approval upon completion of this task.

Assumptions related to this task:
- The data needed to support closure reporting requirements would be collected and prepared by the contractor professional labor as it becomes available during Phases 3 and 4 to facilitate gaining approval from NMED and EPA as soon as possible after completion of Phase 4 closure activities.
- Most of the labor costs associated with this task are covered under SNL Professional Labor Management and Contractor Labor Management technologies for Phases 3 and 4. Closure Reporting would be completed as part of Phase 5. See Tasks 03 and 04 for Phase 5 labor assumptions.

Regulatory Review & Approval (02)
Estimated start date: 5/29/2037
Estimated duration: 1.5 years

This task involves NMED and EPA regulatory review and approval of the closure reports, including all activities (e.g., requests for additional information, public meetings, etc.) related to the process. The task would end upon receipt of approval from both regulatory agencies.

Assumptions related to this task:

- The closure reports would be very similar and submitted to NMED and EPA at the same time.
- During the regulatory review, one set of technical comments would be received from NMED and EPA requiring a formal response; the formal response would be prepared by the contractor professional staff with SNL oversight and input.
- Both closure reports would be approved after regulatory review of technical comment responses.

SNL Professional Labor Management (03)
Estimated start date: 4/3/2037
Estimated duration: 1.6 years

Lump-sum labor cost for SNL oversight and support for the Closure Reporting Phase.

Assumptions related to this task:

- SNL personnel would work closely with contractor personnel on preparation of the two reports.
- Labor costs were estimated based upon the 1.6-year duration for Phase 5 that extends beyond Phase 4; the first 3 years of Phase 5 Task 01 would be covered under SNL Professional Labor Management in Phases 3 and 4.
- Assumes SNL professional labor would only be needed for half the duration of Task 02 to allow for time to work with the contractor professional staff preparing responses to regulatory comments received while the reports are in the regulatory review process.

Contractor Labor Management (04)
Estimated start date: 4/3/2037
Estimated duration: 1.6 years
Technology:

- Site Closeout Documentation

Includes all contractor labor to perform Phase 5 activities.

The following contractor personnel were assumed for Phase 5 tasks. Labor rates were selected by RACER®. Where a specific labor assembly was not available within RACER®, the equivalent RACER® assembly is listed in parentheses.

- Senior Project Manager (at 50%)
- Project Manager
- Site Manager (Senior Staff Engineer)
- Assistant Site Manager (Senior Staff Engineer)
- (2) Waste Management Coordinators (Staff Engineers)
- CIH/CHP (Certified Industrial Hygienist)

- Health and Safety Officer
- QA/QC Officer

Assumptions related to this task:

- Only professional contractor labor categories would be required for this phase.
- Labor costs were estimated based upon a 1.6-year duration for Phase 5 that extends beyond Phase 4; the first 3 years of Phase 5 Task 01 would be covered under Contractor Labor Management in Phases 3 and 4.
- Cost assumes contractor professional labor would only be needed for half the duration of Task 02 to prepare responses to regulatory comments received during the regulatory review time period.

Phase 6. Long-Term Monitoring & Maintenance
Estimated start date: 5/31/2035
Estimated duration: 30 years

Phase 6 Tasks:

- Install Groundwater and Soil-Gas Monitoring Networks (01)
- Monitoring Well Installation Report (02)
- Installation Report Regulatory Review & Approval (03)
- Monitoring, Inspection, Maintenance & Reporting (04)

The LTMM phase would begin after completion of Phase 3, Task 09 following the requirements in the LTMMP included in the CMIP and Permitting documents approved at the end of Phase 1. In addition to the installation of groundwater and soil-gas monitoring well networks, activities would include routine monitoring, inspection, and maintenance of the Excavation ET Cover and the Onsite Cell ET Cover, storm-water diversion structures, perimeter fencing and survey monuments, and all monitoring networks and associated sampling equipment. Phase 6 activities would continue for 30 years.

All Phase 6 activities would be performed by SNL personnel and contractors under the SNL/NM LTS program since the turn-key contract would end concurrently with the end of Phase 5 tasks.

<u>Install Groundwater and Soil-Gas Networks (01)</u>
Estimated start date: 5/31/2035
Estimated duration: 4 months
Technology:

- Labor/Equipment/Materials

This task would include installation of the groundwater monitoring network, consisting of four groundwater monitoring wells (one hydraulically upgradient, background well, and 3 hydraulically downgradient wells) and the VOC soil-gas monitoring network consisting of three perimeter multi-sampling port wells for monitoring the MWL excavation.

Assumptions related to this task:

- Costs based upon recent well installation projects for SNL/NM environmental sites in the LTS program.
- Monitoring well installation plan would be included in the CMIP and approved during Phase 1.

- Materials/Equipment assembly includes contractor labor costs (i.e., drilling contractor) for this task.
- Costs based upon recent SNL/NM monitoring well installation projects for regulated environmental sites in the LTS program.

Monitoring Well Install Report (02)
Estimated start date: 10/1/2035
Estimated duration: 3 months
Technology:
  - Labor Costs

This task covers the required report that must be submitted to NMED to document monitoring well installation activities performed in Task 01 (see Section 5.3.4 7 of main report). NMED review and approval is required for all LTMM monitoring wells.

Assumptions related to this task:
- Costs based upon recent SNL/NM monitoring well installation reports for regulated environmental sites in the LTS program.

Install Report Regulatory Review & Approval (03)
Estimated start date: 1/1/2036
Estimated duration: 3 months
Technology:
  - Labor Costs

This task covers activities related to the review and approval process for the report submitted to NMED as part of Task 02.

Assumptions related to this task:
- The monitoring well installation report would be approved by the NMED without technical comments; this is a no cost task.

Monitoring, Inspection, Maintenance & Reporting (04)
Estimated start date: 5/31/2035
Estimated duration: 30 years
Technology:
  - Labor/Equipment/Materials

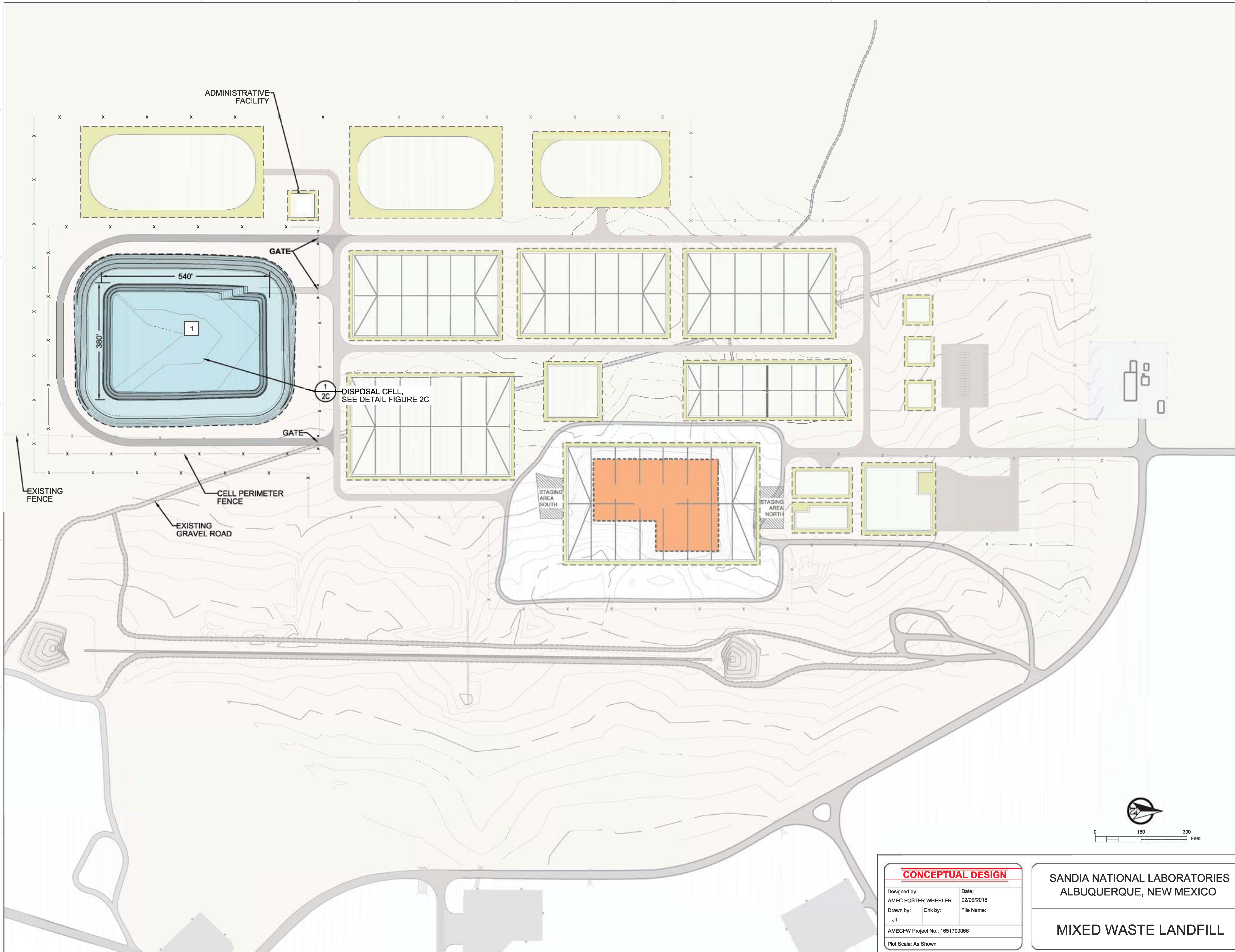
This task includes costs for the routine monitoring, inspection, maintenance, and reporting activities that would be required by the LTMMP. Monitoring would include groundwater, soil-vapor, and soil-moisture monitoring. Inspection, maintenance, and repair requirements would apply to the Excavation ET Cover and the Onsite Cell ET Cover, and associated storm-water diversion structures, perimeter fencing and survey monuments, and all monitoring networks and associated sampling equipment. Quarterly leachate collection and removal from under the Onsite Cell would also be included. LTMM activities would continue for 30 years, and would be documented in annual LTMM reports submitted to NMED for review and approval each year.

Assumptions for this task:
- Groundwater and soil-moisture monitoring would be conducted at a semiannual frequency, and soil-gas monitoring would be conducted at an annual frequency for the 30-year period.

- Leachate collection/removal would be performed on a quarterly basis.
- LTMM reports would be prepared and submitted to NMED on an annual basis; monitoring, inspection, and maintenance of both ET Covers and leachate removal results would be integrated into one annual report.
- LTMM scope and level of effort based upon experience at the Chemical Waste Landfill, MWL, and Corrective Action Management Unit.
- Includes costs for all LTMM activities, including support activities such as monitoring sample analysis at an offsite laboratory and data validation of all groundwater and soil-gas results.
- Does not include costs for infrastructure (e.g., field office, 90-day waste accumulation area, emergency equipment), materials and specialized equipment (e.g., specialized sampling truck, drums for purge water, vacuum pump for soil-gas monitoring) as they would be available under the existing LTS program.

Figure D3-2. Onsite Engineered Cell Conceptual Design Drawings

This page intentionally left blank.



LEGEND

PROPOSED SUPPORT FACILITIES ACCESS ROADS & PARKING/STAGING AREAS (GRAVEL)

PROPOSED SUPPORT FACILITIES PERIMETER FENCE (8-FOOT)

SYMBOL

1 — DETAIL NO.

C1 — SHEET SHOWN (& SHEET TAKEN)

KEYED NOTES

1 PROPOSED DISPOSAL CELL. 66,000 CUBIC YARD CAPACITY FILLED TO ≈ 5' BELOW SURFACE GRADE.

CONCEPTUAL DESIGN

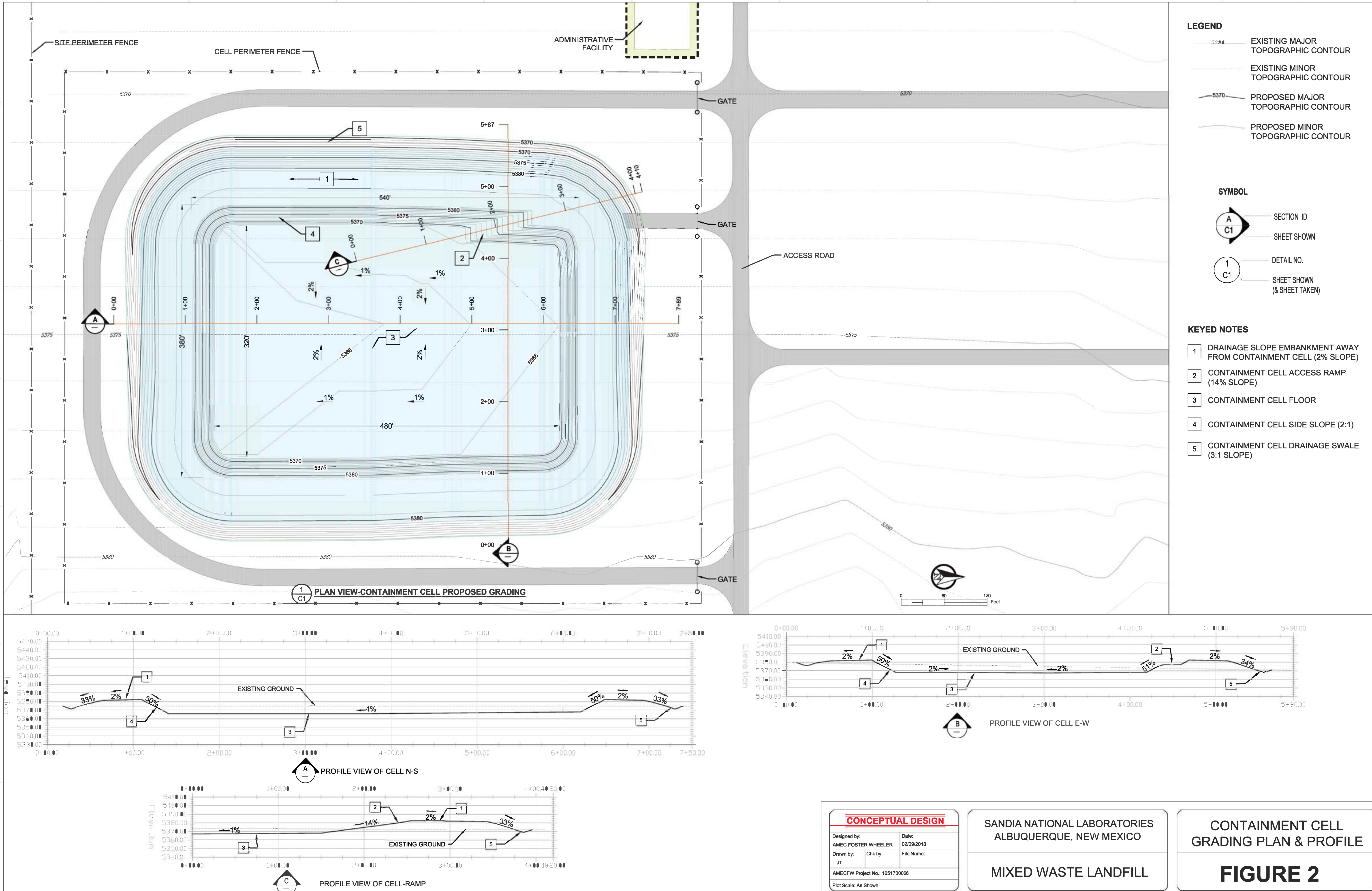
Designed by: AMEC FOSTER WHEELER
Date: 02/09/2018
Drawn by: JT
Chk by:
File Name:
AMECFW Project No.: 1651700066
Plot Scale: As Shown

SANDIA NATIONAL LABORATORIES
ALBUQUERQUE, NEW MEXICO

MIXED WASTE LANDFILL

PROPOSED CONTAINMENT CELL PLAN

FIGURE 1



CONCEPTUAL DESIGN

Designed by: AMEC FOSTER WHEELER | Date: 02/09/2018

Drawn by: JT | Chk by: | File Name:

AMECFW Project No.: 1651700066

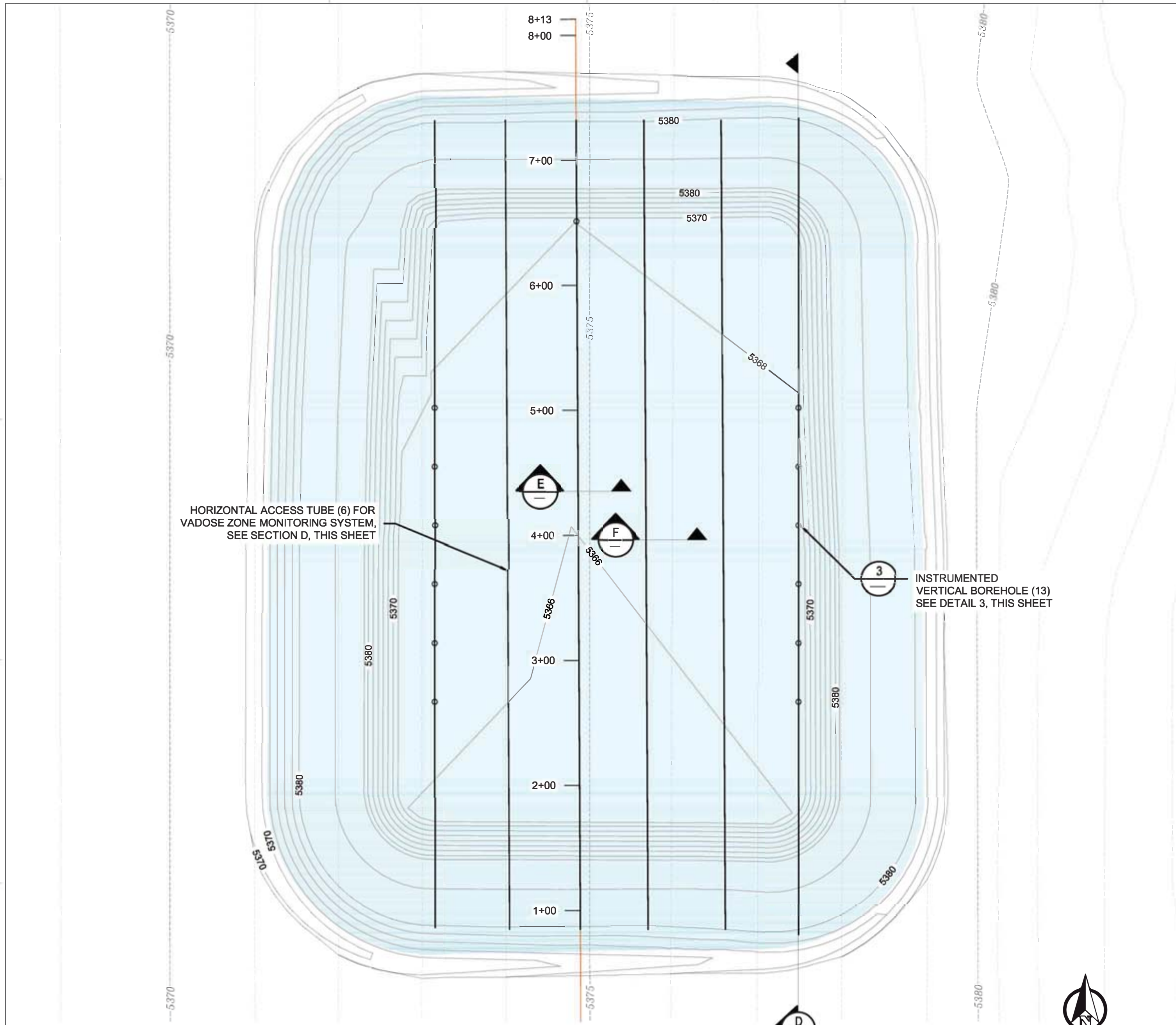
Plot Scale: As Shown

SANDIA NATIONAL LABORATORIES
ALBUQUERQUE, NEW MEXICO

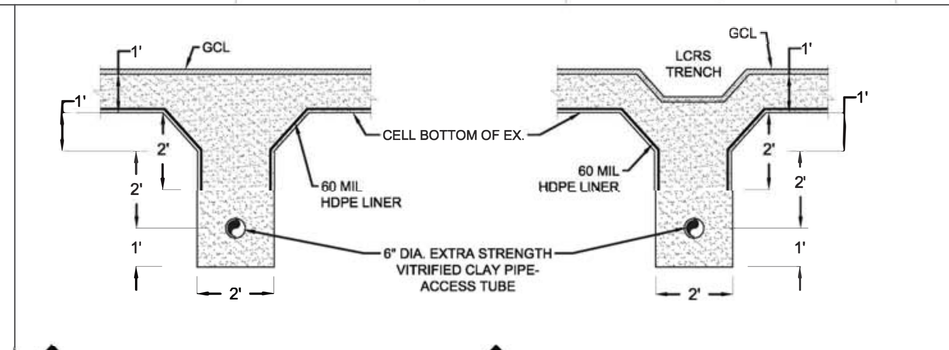
MIXED WASTE LANDFILL

CONTAINMENT CELL GRADING PLAN & PROFILE

FIGURE 2

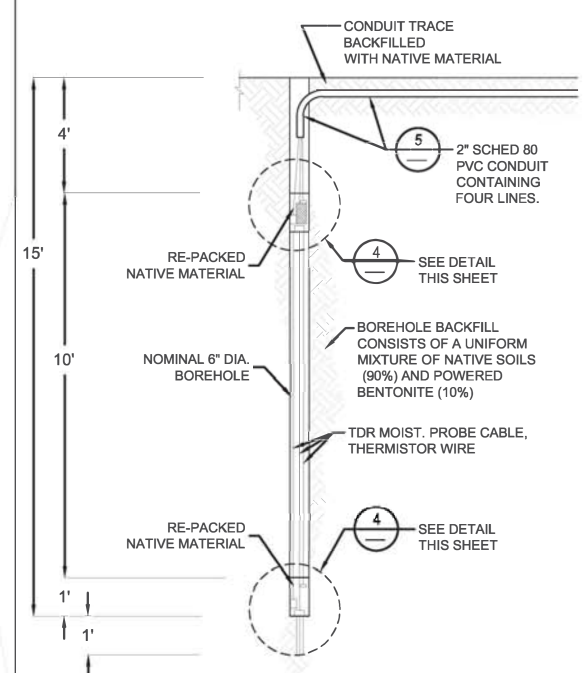


2 VADOSE ZONE MONITORING SYSTEM
PLAN VIEW

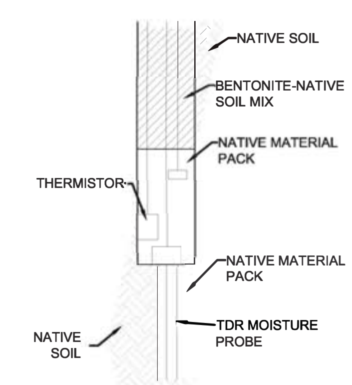


F ACCESS TUBE TRENCH DETAIL (TYP)
SECTION VIEW, NTS

E ACCESS TUBE BELOW LCRS TRENCH DETAIL
SECTION VIEW, NTS



3 INSTRUMENTED VERTICAL BOREHOLE DETAIL (TYP)
NTS



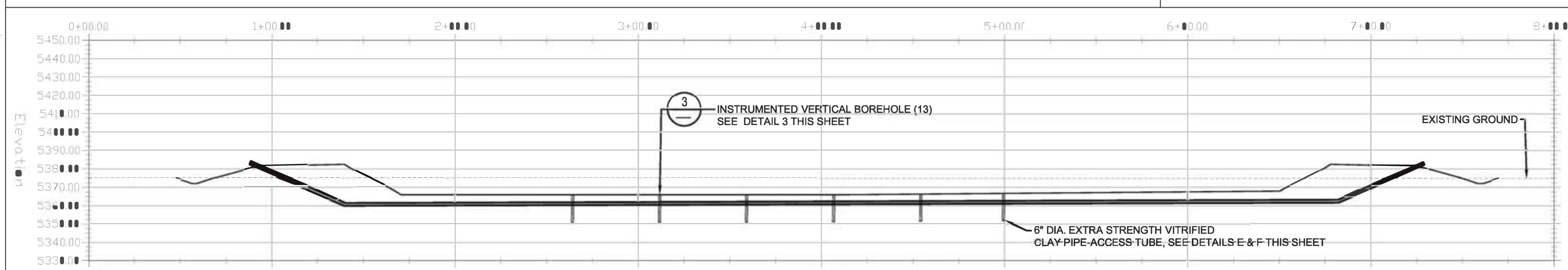
4 VSA SAMPLING PACKAGE DETAIL
NTS

LEGEND

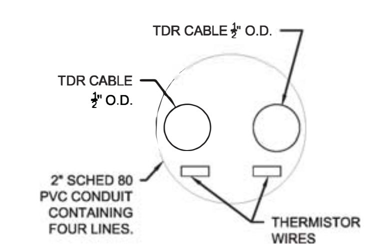
- SELECT SOIL
- GRAVEL
- SOIL/ GENERAL FILL
- CLAY
- GEOCOMPOSITE DRAINAGE NET
- SAND
- GCL
- TOP SOIL
- 60 mil HDPE LINER
- 5390 EXISTING MAJOR TOPOGRAPHIC CONTOUR
- EXISTING MINOR TOPOGRAPHIC CONTOUR
- 5370 PROPOSED MAJOR TOPOGRAPHIC CONTOUR
- PROPOSED MINOR TOPOGRAPHIC CONTOUR

SYMBOL

- A / C1 — SECTION ID / SHEET SHOWN
- 1 / C1 — DETAIL NO. / SHEET SHOWN (& SHEET TAKEN)



D ACCESS TUBE PROFILE
VERTICAL & HORIZONTAL SCALE: 1"=40'



5 VSA PVC CONDUIT DETAIL
NTS

ABBREVIATIONS

NTS	NOT TO SCALE
GCL	GEOSYNTHETIC CLAY LINER
HDPE	HIGH-DENSITY POLYETHYLENE
LCRS	LEACHATE COLLECTION AND REMOVAL SYSTEM
TDR	TIME-DOMAIN REFLECTOMETER
PVC	POLYVINYL CHLORIDE
VSA	VERTICAL SENSOR ARRAY

CONCEPTUAL DESIGN

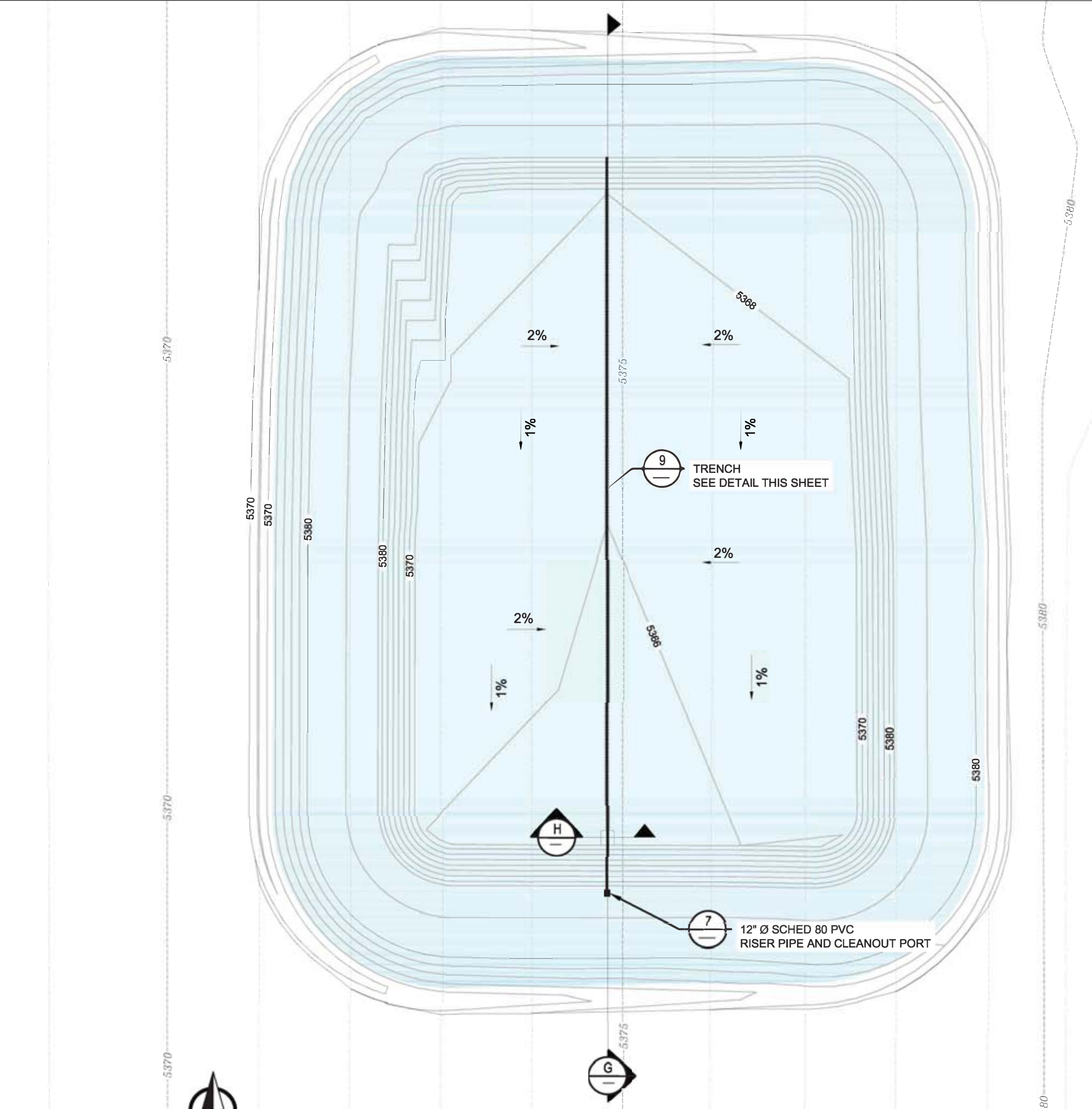
Designed by: AMEC FOSTER WHEELER	Date: 02/09/2018
Drawn by: JT / Chk by:	File Name:
AMECFW Project No.: 1651700066	
Plot Scale: As Shown	

SANDIA NATIONAL LABORATORIES
ALBUQUERQUE, NEW MEXICO

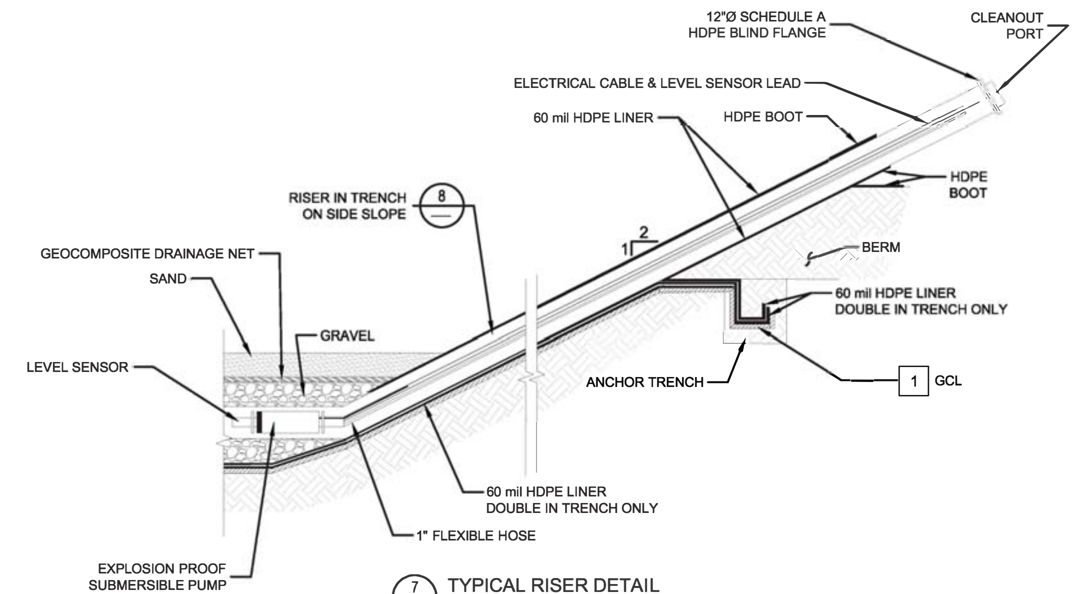
MIXED WASTE LANDFILL

CONTAINMENT CELL
VADOSE MONITORING SYSTEM
DETAILS

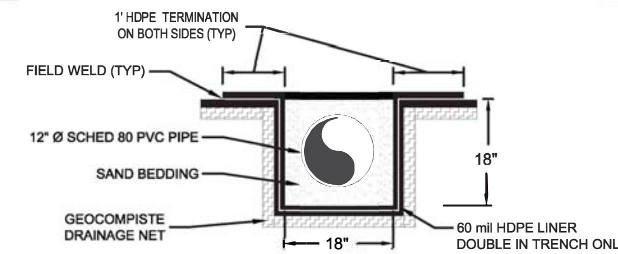
FIGURE 3



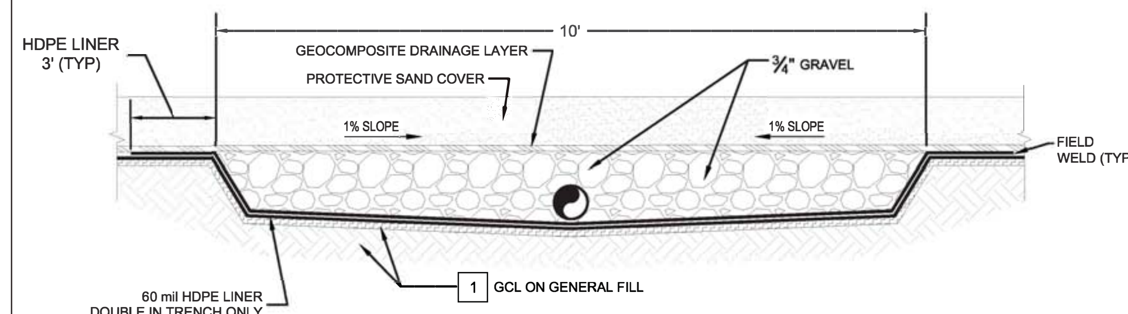
6 CONTAINMENT CELL
PLAN VIEW



7 TYPICAL RISER DETAIL
NTS



8 RISER SIDE SLOPE TRENCH DETAIL
NTS



H TYPICAL LEACHATE SUMP CROSS SECTION
NTS

LEGEND

- SELECT SOIL
- GRAVEL
- SOIL/ GENERAL FILL
- CLAY
- GEOCOMPOSITE DRAINAGE NET
- SAND
- GCL
- TOP SOIL
- 60 mil HDPE LINER

SYMBOL

- A / C1: SECTION ID, SHEET SHOWN
- 1 / C1: DETAIL NO., SHEET SHOWN (& SHEET TAKEN)

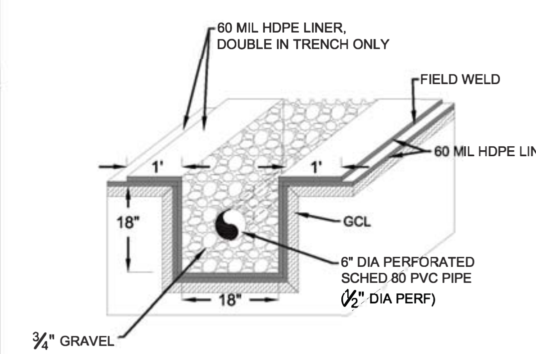
- 5380 EXISTING MAJOR TOPOGRAPHIC CONTOUR
- EXISTING MINOR TOPOGRAPHIC CONTOUR
- 5370 PROPOSED MAJOR TOPOGRAPHIC CONTOUR
- PROPOSED MINOR TOPOGRAPHIC CONTOUR

ABBREVIATIONS

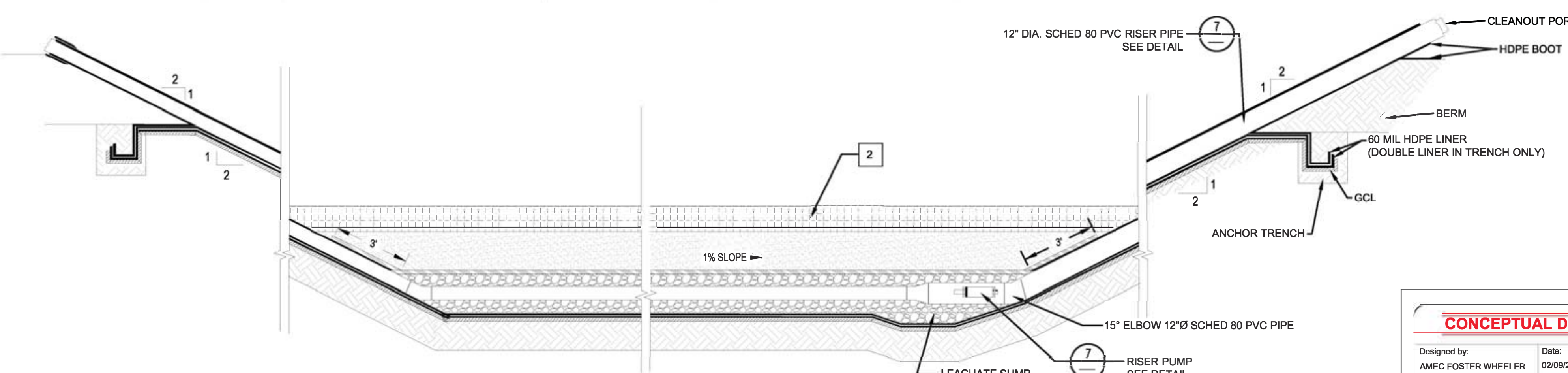
NTS	NOT TO SCALE
GCL	GEOSYNTHETIC CLAY LINER
HDPE	HIGH-DENSITY POLYETHYLENE
LCRS	LEACHATE COLLECTION AND REMOVAL SYSTEM
TDR	TIME-DOMAIN REFLECTOMETER
PVC	POLYVINYL CHLORIDE
VSA	VERTICAL SENSOR ARRAY

KEYED NOTES

1. USE GEOSYNTHETIC CLAY LINER.
2. SELECT SOIL MAY BE REPLACEABLE SOILS.



9 LEACHATE COLLECTION TRENCH DETAIL
NTS



G CONTAINMENT CELL LONGITUDINAL CROSS SECTION
NTS

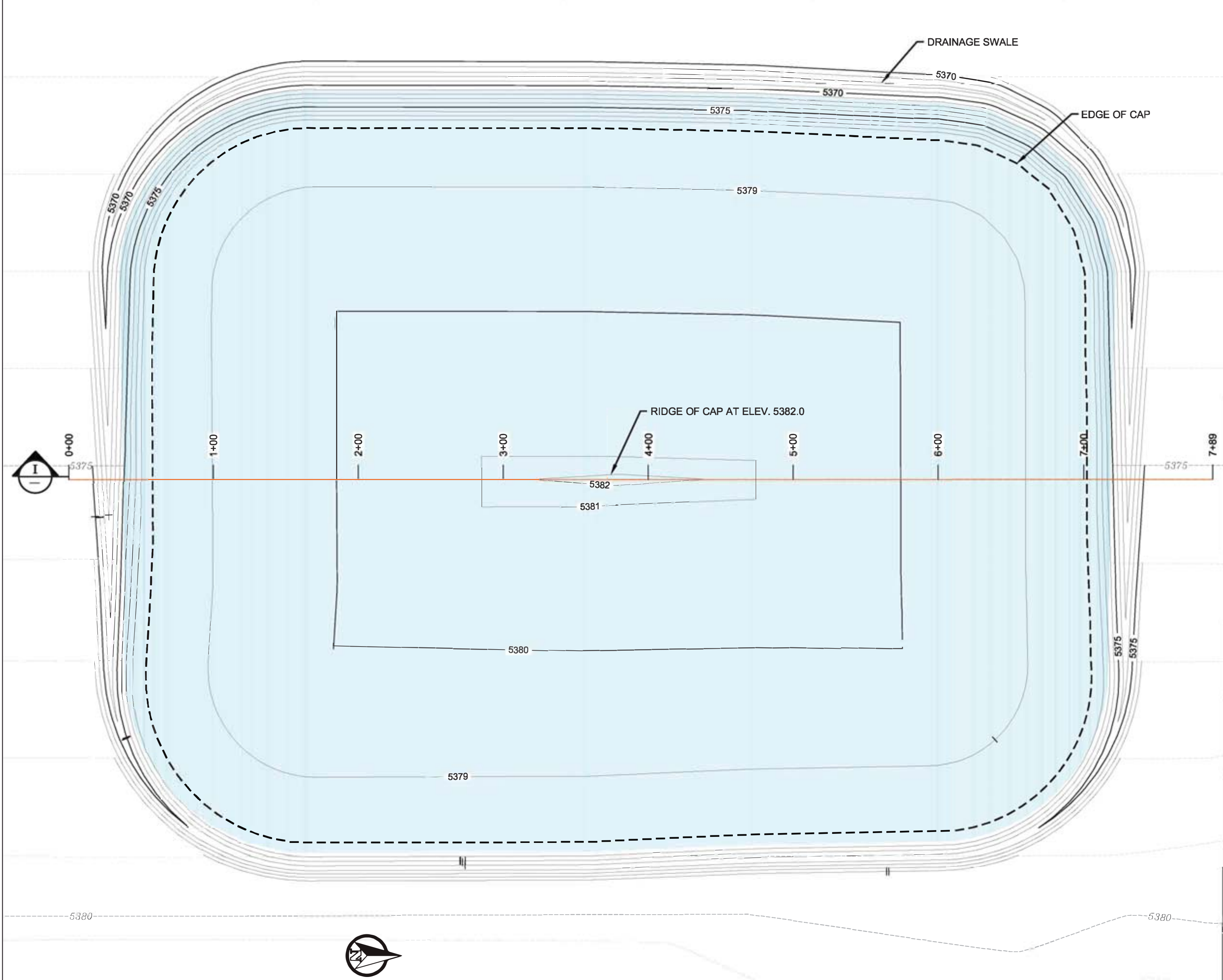
CONCEPTUAL DESIGN	
Designed by: AMEC FOSTER WHEELER	Date: 02/09/2018
Drawn by: JT / Chk by:	File Name:
AMECFW Project No.: 1651700066	
Plot Scale: As Shown	

SANDIA NATIONAL LABORATORIES
ALBUQUERQUE, NEW MEXICO

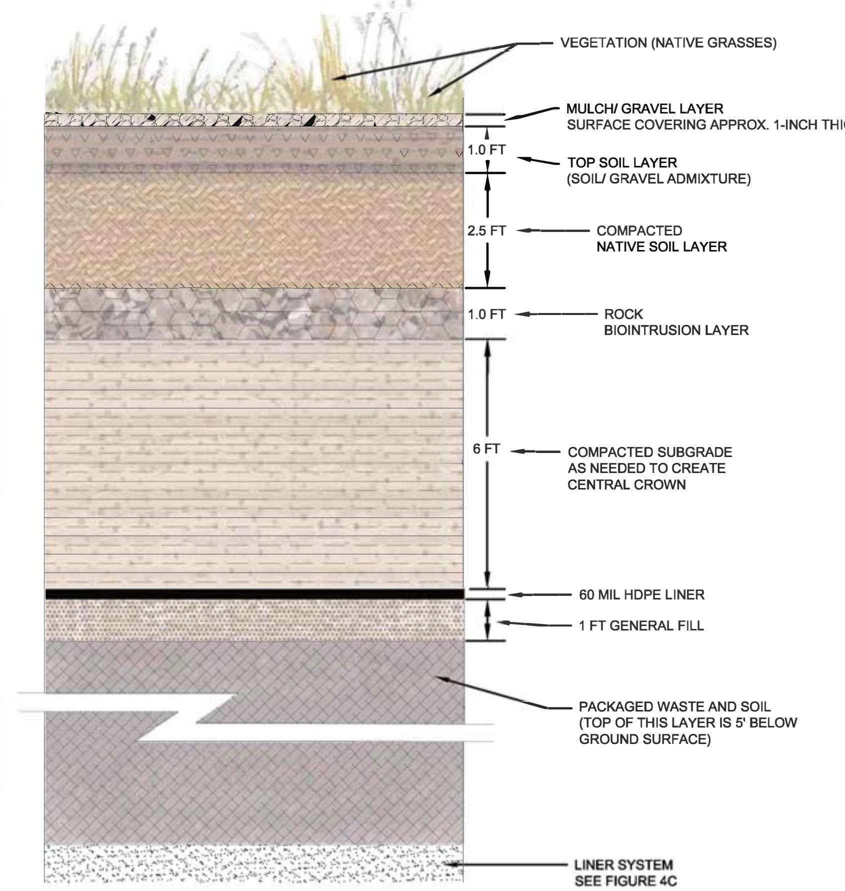
MIXED WASTE LANDFILL

CONTAINMENT CELL DETAILS

FIGURE 4



10 PLAN VIEW-CONTAINMENT CELL CAP



NOTE: THICKNESSES SHOWN ARE MINIMUM LAYER THICKNESSES AN MAY BE INCREASED TO ACHIEVE FINAL DESIRED SURFACE SLOPES.

12 **SCHEMATIC PROFILE OF THE MWL EVAPOTRANSPIRATIVE COVER**
NTS

LEGEND

- EXISTING MAJOR TOPOGRAPHIC CONTOUR
- EXISTING MINOR TOPOGRAPHIC CONTOUR
- PROPOSED MAJOR TOPOGRAPHIC CONTOUR
- PROPOSED MINOR TOPOGRAPHIC CONTOUR
- EDGE OF CAP

SYMBOL

A / C1 — SECTION ID / SHEET SHOWN

1 / C1 — DETAIL NO. / SHEET SHOWN (& SHEET TAKEN)

ABBREVIATIONS

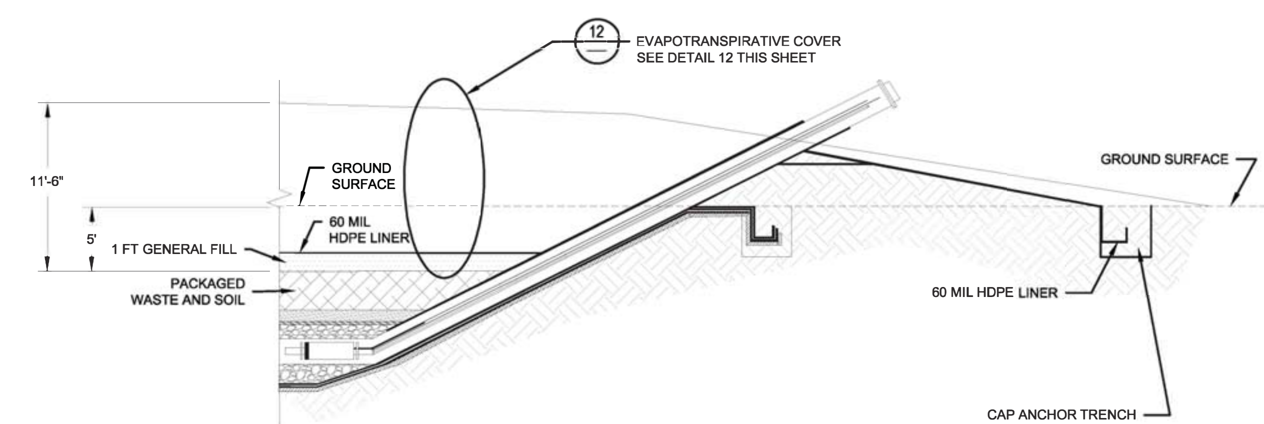
NTS	NOT TO SCALE
HDPE	HIGH-DENSITY POLYETHYLENE

NOTES

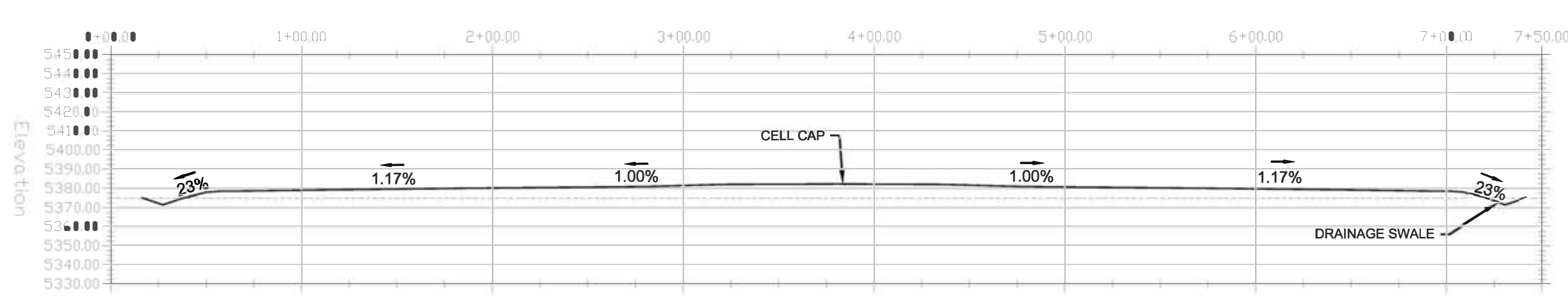
1. THE ENTIRE ET COVER SYSTEM HAS AN APPROXIMATE THICKNESS OF 11'-6" (STARTING WITH 1' OF GENERAL FILL GOING ALL THE WAY TO TOP OF THE GRAVEL/MULCH LAYER).
2. COVER WILL BE REVEGETATED WITH NATIVE GRASS SEED AND MULCHED TO PROMOTE GROWTH.

   THE FOLLOWING SEED MIXTURE SHALL BE USED FOR COVER :

SPECIES	(LB/ACRE PURE LIVE SEED)
GALLETA GRASS	8.0
BLACK GRAMA	6.0
SPIKE DROPSEED	3.0
RING MUHLY	3.0
TOTAL RATE:	20 LB/ACRE



11 **LINER ANCHOR TRENCH OF THE EVAPOTRANSPIRATIVE COVER**
NTS



I PROFILE VIEW OF CELL N-S

CONCEPTUAL DESIGN	
Designed by: AMEC FOSTER WHEELER	Date: 02/09/2018
Drawn by: JT / Chk by:	File Name:
AMECFW Project No.: 1651700066	
Plot Scale: As Shown	

SANDIA NATIONAL LABORATORIES
ALBUQUERQUE, NEW MEXICO

MIXED WASTE LANDFILL

CONTAINMENT CELL CAP

FIGURE 5

APPENDIX D-4
RACER® Cost Reports

Offsite Disposal Alternative
Cost Summary Report
Phase 1-6 Cost Reports

Onsite Disposal Alternative
Cost Summary Report
Phase 1-6 Cost Reports

Offsite Disposal Alternative
Cost Reports

This page intentionally left blank.

Offsite Disposal Alternative
Cost Summary Report

Phase	Direct Cost	Markups	Total Cost
1 Planning & Permitting	$8,946,486	$16,411,383	$25,357,870
2 Support Facility Construction	$57,375,540	$39,116,555	$96,492,095
3 Excavation & Waste Management	$192,720,257	$142,056,856	$334,777,113
4 Closure	$27,334,356	$23,625,555	$50,959,912
5 Closure Reporting - TSCA & RCRA	$2,156,097	$3,977,466	$6,133,563
6 Long-Term Monitoring & Maintenance	$6,251,000	$7,475,257	$13,726,257
Total Project Cost	$294,783,737	$232,663,073	$527,446,809
		***Escalation**	$129,687,858
		Escalated Project Cost	$657,134,668

*Collective escalation factor of 1.252 applied to adjust for start dates of each work phase.

Phase 1 Planning & Permitting

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Procurement of Turn Key Contract	$7,890							$3,886	$11,775
(System Defaults)		$0	$0	$1,933	$786	$0	$1,167		
02 Corrective Measures Implementation Plan (CMIP)	$41,568							$20,472	$62,040
(System Defaults)		$0	$0	$10,184	$4,140	$0	$6,148		
03 TSCA & RCRA Permitting Documents	$10,732							$5,285	$16,017
(System Defaults)		$0	$0	$2,629	$1,069	$0	$1,587		
04 Regulatory Review & Approval	$8,341							$4,108	$12,449
(System Defaults)		$0	$0	$2,044	$831	$0	$1,234		
05 SNL Professional Labor Management	$3,383,392							$6,241,520	$9,624,912
(System Defaults)		$0	$0	$4,645,397	$642,303	$0	$953,820		
06 Contractor Labor Management	$5,494,565							$10,136,111	$15,630,676
(System Defaults)		$0	$0	$7,544,037	$1,043,088	$0	$1,548,986		
Total Phase Cost	$8,946,486	$0	$0	$12,206,224	$1,692,217	$0	$2,512,942	$16,411,383	$25,357,870

Total Phase Cost $25,357,870

	Direct Cost	Markups	Total
Total Phase Cost	$8,946,486	$16,411,383	$25,357,870

Task Documentation:

Task Type:	Design
Task Name:	01 Procurement of Turn Key Contract
Description:	Procurement of Turn Key Contract
Approach:	Ex Situ
Start Date:	January, 2020
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $11,775.31

Technologies:

Technology: Remedial Design

Element: Project Planning

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Costs	1.00	LS	7,889.63	0.00	0.00	0.00	$7,889.63	True

Total Element Cost:	$7,889.63
Total 1st Year Tech Cost:	$7,889.63
Total Phase Element Cost	$7,889.63

Task Documentation:

Task Type:	Design
Task Name:	02 Corrective Measures Implementation Plan (CMIP)
Description:	Corrective Measures Implementation Plan (CMIP)
Approach:	Ex Situ
Start Date:	July, 2020
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $62,039.86

Technologies:

Technology: Remedial Design

Element: Project Planning

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Costs	1.00	LS	41,567.58	0.00	0.00	0.00	$41,567.58	True

Total Element Cost:	$41,567.58
Total 1st Year Tech Cost:	$41,567.58
Total Phase Element Cost	$41,567.58

Task Documentation:

Task Type:	Design
Task Name:	03 TSCA & RCRA Permitting Documents
Description:	TSCA & RCRA Permitting Documents
Approach:	Ex Situ
Start Date:	July, 2021
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $16,017.22

Technologies:

Technology: Remedial Design

Element: Project Planning

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Costs	1.00	LS	10,731.76	0.00	0.00	0.00	$10,731.76	True

Total Element Cost:	$10,731.76
Total 1st Year Tech Cost:	$10,731.76
Total Phase Element Cost	$10,731.76

Task Documentation:

Task Type:	Design
Task Name:	04 Regulatory Review & Approval
Description:	Regulatory Review & Approval
Approach:	Ex Situ
Start Date:	July, 2022
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $12,448.79

Technologies:

Technology: Remedial Design

Element: Prefinal Design

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Costs	1.00	LS	8,340.87	0.00	0.00	0.00	$8,340.87	True

Total Element Cost:		$8,340.87

Element: Final Design

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	0.00	$0.00	True

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$8,340.87
Total Phase Element Cost	$8,340.87

Task Documentation:

Task Type:	Design
Task Name:	05 SNL Professional Labor Management
Description:	Professional Labor Management
Approach:	Ex Situ
Start Date:	January, 2020
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $9,624,912.40

Technologies:

Technology: Remedial Design

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	3,383,391.96	0.00	0.00	$3,383,391.96	False

Total Element Cost:	$3,383,391.96
Total 1st Year Tech Cost:	$3,383,391.96
Total Phase Element Cost	$3,383,391.96

Task Documentation:

Task Type: Design
Task Name: 06 Contractor Labor Management
Description: Contractor Labor Management

Approach: Ex Situ
Start Date: June, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $15,630,676.12

Technologies:

Technology: Remedial Design

Element: Project Planning

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager	1,357.00	HR	0.00	99.66	0.00	0.00	$135,238.62	True
33220102	Project Manager	3,392.00	HR	0.00	91.65	0.00	0.00	$310,876.80	True

Technology: Remedial Design

33220104	Senior Staff Engineer	13,568.00	HR	0.00	98.77	0.00	0.00	$1,340,111.36	True
33220106	Staff Engineer	20,352.00	HR	0.00	83.34	0.00	0.00	$1,696,135.68	True
33220110	QA/QC Officer	6,784.00	HR	0.00	65.35	0.00	0.00	$443,334.40	True
33220111	Certified Industrial Hygienist	6,784.00	HR	0.00	86.30	0.00	0.00	$585,459.20	True
33220158	Secretarial/ Administrative	13,568.00	HR	0.00	39.02	0.00	0.00	$529,423.36	False
33220159	Draftsman/CADD	13,568.00	HR	0.00	33.46	0.00	0.00	$453,985.28	False

Total Element Cost:	$5,494,564.70
Total 1st Year Tech Cost:	$5,494,564.70
Total Phase Element Cost	$5,494,564.70

Phase 2 Support Facility Construction

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Procurement for Facilities Construction	$41,567							$20,472	$62,039
(System Defaults)		$0	$0	$10,184	$4,140	$0	$6,148		
02 Site Grading & Site Drainage	$1,150,514							$472,932	$1,447,434
(System Defaults)		$0	$0	$232,900	$96,592	$0	$143,439		
03 Utility Installation	$419,800							$206,754	$626,555
(System Defaults)		$0	$0	$102,851	$41,812	$0	$62,091		
04 ET Cover Removal & Staging	$95,246							$46,909	$142,155
(System Defaults)		$0	$0	$23,335	$9,486	$0	$14,087		
05 Construction of Excavation & Waste Mgmt. Tents	$24,751,900							$12,190,459	$36,942,360
(System Defaults)		$0	$0	$6,064,216	$2,465,289	$0	$3,660,955		
06 Construction of Warehouses	$8,921,287							$3,169,621	$12,090,908
(System Defaults)		$0	$0	$1,164,555	$806,867	$0	$1,198,198		
07 Limited Area Gate	$464,727							$113,807	$578,534
(System Defaults)		$0	$0	$17,867	$38,608	$0	$57,332		
08 Procurement for Excavation & Waste Disposal	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
09 Training, Functional Testing & Readiness Review	$0							$0	$0

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
Review									
(System Defaults)		$0	$0	$0	$0	$0	$0		
10 SNL Professional Labor Management	$2,718,093							$5,014,209	$7,732,302
(System Defaults)		$0	$0	$3,731,942	$516,003	$0	$766,264		
11 Contractor Labor Management	$7,422,787							$13,693,205	$21,115,992
(System Defaults)		$0	$0	$10,191,487	$1,409,142	$0	$2,092,576		
12 Additional Equipment and Operators	$2,528,644							$1,205,947	$3,734,591
(System Defaults)		$0	$0	$586,631	$249,222	$0	$370,095		
13 Administrative and Onsite Lab Equipment	$9,036,986							$2,982,240	$12,019,225
(System Defaults)		$0	$0	$989,061	$802,084	$0	$1,191,094		
Total Phase Cost	$57,375,540	$0	$0	$23,115,030	$6,439,246	$0	$9,562,280	$39,116,555	$96,492,095

Total Phase Cost $96,492,095

	Direct Cost	Markups	Total
Total Phase Cost	$57,375,540	$39,116,555	$96,492,095

Task Documentation:

Task Type: Remedial Action
Task Name: 01 Procurement for Facilities Construction
Description: Procurement for Facilities Construction

Approach: Ex Situ
Start Date: January, 2025
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Professional Labor Management	True	100	0

Total Marked-up Cost: $62,039.00

Technologies:

Technology: Professional Labor Management

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Costs	1.00	LS	41,567.00	0.00	0.00	0.00	$41,567.00	True

Total Element Cost:	$41,567.00
Total 1st Year Tech Cost:	$41,567.00
Total Phase Element Cost	$41,567.00

Task Documentation:

Task Type:	Remedial Action
Task Name:	02 Site Grading & Site Drainage
Description:	Site Grading & Site Drainage
Approach:	In Situ
Start Date:	July, 2025
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Clear and Grub	True	100	0
Cut-Fill / Rough Grading	True	100	0
Storm Sewer	True	100	0
Finish Grading	True	100	0
Access Roads	True	100	0
Parking Lots	True	100	0
Construct Administrative Facility Pads	True	100	0
Construct Laboratory Facility Pad	True	100	0
Construct Replaceable Soils Staging Area	True	100	0
Construct MWL ET Cover Material Staging Area	True	100	0

Total Marked-up Cost: $1,447,434.30

Technologies:

Technology: Clear and Grub

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17010101	Selective clearing, brush, light clearing, with dozer and brush rake, excludes removal offsite	72.00	ACR	0.00	104.13	82.14	0.00	$13,411.64	False
17010501	Grub and stack, 140 H.P. dozer	3,872.00	CY	0.00	3.25	1.81	0.00	$19,607.41	False
17030226	988, 7.0 CY, Wheel Loader	29.00	HR	0.00	72.94	96.71	0.00	$4,920.00	False
17030296	50 Ton, 773, Off-highway Truck	58.00	HR	0.00	63.80	133.55	0.00	$11,446.29	False

Total Element Cost: $49,385.34

Total 1st Year Tech Cost: $49,385.34

Technology: Cut-Fill / Rough Grading

Element: Pile1

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030279	4 CY, Crawler-mounted, Hydraulic Excavator	3,555.56	CY	0.00	0.87	0.76	0.00	$5,816.56	False
17030312	D10 with U-blade & Single-shank Ripper, Bulldozer	130.00	HR	0.00	72.94	262.27	0.00	$43,577.75	False

Technology: Cut-Fill / Rough Grading

17030523	Compaction, 10 ton, steel wheel tandem roller	74,000.00	ECY	0.00	0.30	0.09	0.00	$28,930.39	False
18050203	Rock Cover, Riprap, Medium (10 to 200 Lb Pieces), includes labor & equipment for placement	777.78	CY	33.00	8.77	3.84	0.00	$35,475.24	False
33010118	Mobilize/Demobilize Dozer, Loader, Backhoe or Excavator, 70 H.P. to 150 H.P., up to 50 miles	2.00	LS	0.00	119.39	94.40	0.00	$427.57	False

Total Element Cost: $114,227.51

Element: General Earthwork

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
16019934	Temporary Office 50' X 12'	12.00	MO	412.65	0.00	0.00	0.00	$4,951.80	False
33010102	Sample collection, vehicles, van or pickup rental	360.00	DAY	0.00	0.00	0.00	64.35	$23,166.00	False
33010114	Mobilization Equipment (Soils)	4.00	LS	0.00	1,786.43	1,674.96	0.00	$13,845.58	False
33010115	Demobilize Equipment (Soils)	4.00	LS	0.00	1,786.43	1,674.96	0.00	$13,845.58	False
33010204	Mobilize Crew, 100 Miles, per Person	6.00	EA	0.00	0.00	0.00	120.32	$721.90	False

Total Element Cost: $56,530.86

Total 1st Year Tech Cost: $170,758.36

Technology: Storm Sewer

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030262	Cat 235, 2.5 CY, Soil/Sand, Trenching, Excludes Sheeting, Excludes Dewatering	664.35	BCY	0.00	0.62	0.29	0.00	$605.34	False
17030401	950, 3.25 CY, Backfill with Excavated Material	413.72	CY	0.00	0.78	0.64	0.00	$586.28	False
17030405	950, 3.00 CY, Delivered & Dumped, Backfill with Sand	137.70	CY	80.10	7.55	4.81	0.00	$12,730.63	False
17030511	Compact Soil with Vibrating Plate, 2 Passes	413.72	ECY	0.00	2.29	0.11	0.00	$994.20	False
17030515	Backfill and compact, 6" layers, air rammer/tamper	137.70	ECY	0.00	13.45	1.07	0.00	$1,999.36	False
18020204	27" x 20", 5' Deep Area Drain with Grate	1.00	EA	1,269.00	2,241.81	38.80	0.00	$3,549.60	False
19030108	36" Corrugated Metal Pipe, Bituminous Coated & Paved	504.00	LF	31.95	28.64	3.56	0.00	$32,331.07	False
19039908	36" Corrugated Metal Pipe, Bituminous Coated, End Section, Excludes Excavation, Excludes Backfill	10.00	EA	657.00	245.51	30.48	0.00	$9,329.91	False
20060101	3 - 9 Lb Magnesium Anodes, Cathodic Protection Point	5.00	EA	186.30	1,124.76	31.06	0.00	$6,710.57	False

Total Element Cost: $68,836.96

Total 1st Year Tech Cost: $68,836.96

Technology: Finish Grading

Element: Pile1

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030108	Fine Grading, 130G, 2 Passes	154,880.00	SY	0.00	0.56	0.42	0.00	$151,897.50	False
17030312	D10 with U-blade & Single-shank Ripper, Bulldozer	46.00	HR	0.00	72.94	262.27	0.00	$15,419.82	False
17030523	Compaction, 10 ton, steel wheel tandem roller	13,165.00	ECY	0.00	0.30	0.09	0.00	$5,146.87	False

Total Element Cost: $172,464.19

Total 1st Year Tech Cost: $172,464.19

Technology: Access Roads

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030103	Rough Grading, 14G, 1 Pass	38,611.00	SY	0.00	0.24	0.30	0.00	$21,125.23	False
17030108	Fine Grading, 130G, 2 Passes	17,761.00	SY	0.00	0.56	0.42	0.00	$17,418.98	False
17030202	Ditch Excavation, Normal Soil, Haul Spoil 1 Mile	3,861.11	CY	0.00	4.67	3.02	0.00	$29,683.48	False
17030203	Roadway Soil Excavation, with Scraper, Load & Haul Spoil	2,960.19	CY	0.00	3.95	3.58	0.00	$22,291.27	False
17030501	Compaction, subgrade, 18" wide,	4,290.12	ECY	0.00	2.62	0.13	0.00	$11,782.42	False

Technology: Access Roads

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
	8" lifts, walk behind, vibrating plate								
18010102	Gravel, Delivered & Dumped	2,960.19	CY	27.00	6.54	6.14	0.00	$117,472.21	False
19030402	34' Complete, 24" Corrugated Metal Pipe Culvert with Headwalls	3.00	EA	4,138.65	3,400.49	387.20	0.00	$23,779.03	False

Total Element Cost: $243,552.61

Total 1st Year Tech Cost: $243,552.61

Technology: Parking Lots

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030102	Rough Grading, 12G, 1 Pass	4,675.19	SY	0.00	0.24	0.18	0.00	$1,986.93	False
17030107	Fine Grading, 120G, 2 Passes	4,675.19	SY	0.00	0.43	0.18	0.00	$2,878.65	False
17030203	Roadway Soil Excavation, with Scraper, Load & Haul Spoil	948.19	CY	0.00	3.95	3.58	0.00	$7,140.20	False
17030501	Compaction, subgrade, 18" wide, 8" lifts, walk behind, vibrating plate	1,185.23	ECY	0.00	2.62	0.13	0.00	$3,255.12	False
17030510	Dry Roll Gravel, Steel Roller	4,266.84	SY	0.00	0.90	0.29	0.00	$5,103.48	False
17030602	Cement Stabilization, 6%	1,185.23	BCY	11.14	0.71	1.76	0.00	$16,122.73	False
18010102	Gravel, Delivered & Dumped	948.19	CY	27.00	6.54	6.14	0.00	$37,627.98	False

Total Element Cost:	$74,115.10
Total 1st Year Tech Cost:	$74,115.10

Technology: Construct Administrative Facility Pads

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18010101	Cement-stabilized Base, Aggregate Base Course for Roadways and Large Paved Areas, delivered and placed, 15 mile haul	244.00	CY	44.55	12.54	4.77	0.00	$15,093.59	False

Total Element Cost:	$15,093.59
Total 1st Year Tech Cost:	$15,093.59

Technology: Construct Laboratory Facility Pad

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18010101	Cement-stabilized Base, Aggregate Base Course for Roadways and Large Paved Areas, delivered and placed, 15 mile haul	122.00	CY	44.55	12.54	4.77	0.00	$7,546.80	False

Total Element Cost:	$7,546.80
Total 1st Year Tech Cost:	$7,546.80

Technology: Construct Replaceable Soils Staging Area

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18010101	Cement-stabilized Base, Aggregate Base Course for Roadways and Large Paved Areas, delivered and placed, 15 mile haul	2,416.00	CY	44.55	12.54	4.77	0.00	$149,451.29	False

Total Element Cost:	$149,451.29
Total 1st Year Tech Cost:	$149,451.29

Technology: Construct MWL ET Cover Material Staging Area

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18010101	Cement-stabilized Base, Aggregate Base Course for Roadways and Large Paved Areas, delivered and placed, 15 mile haul	3,222.00	CY	44.55	12.54	4.77	0.00	$199,309.63	False

Total Element Cost:	$199,309.63
Total 1st Year Tech Cost:	$199,309.63
Total Phase Element Cost	$1,150,513.87

Task Documentation:

Task Type:	Remedial Action
Task Name:	03 Utility Installation
Description:	Utility Installation
Approach:	None
Start Date:	August, 2025
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Sanitary Sewer	True	100	0
Water Distribution/Fire Protection	True	100	0
Overhead Electrical Distribution	True	100	0
Communications	True	100	0

Total Marked-up Cost: $626,554.64

Technologies:

Technology: Sanitary Sewer

Element:

	Unit of	Material	Labor Unit	Equipment	Sub Bid	Cost

Technology: Sanitary Sewer

Assembly	Description	Quantity	Measure	Unit Cost	Cost	Unit Cost	Cost	Extended Cost	Override
17030226	988, 7.0 CY, Wheel Loader	40.00	HR	0.00	72.94	96.71	0.00	$6,786.20	False
17030259	Cat 225, 1.5 CY, Soil/Sand, Trenching, Excludes Sheeting, Excludes Dewatering	880.53	BCY	0.00	0.62	0.30	0.00	$803.40	False
17030295	35 Ton, 769, Off-highway Truck	40.00	HR	0.00	63.80	106.84	0.00	$6,825.77	False
17030401	950, 3.25 CY, Backfill with Excavated Material	855.99	CY	0.00	0.78	0.64	0.00	$1,213.02	False
17030511	Compact Soil with Vibrating Plate, 2 Passes	855.99	ECY	0.00	2.29	0.11	0.00	$2,057.00	False
19020127	Reinforced plastic pipe, ABS truss type, 8" diameter	1,500.00	LF	4.50	8.30	1.45	0.00	$21,371.95	False
19020201	Precast, CIP Base, 4' Diameter, 6' Deep, Manhole	5.00	EA	912.20	640.09	87.89	0.00	$8,200.89	False

Total Element Cost: $47,258.23

Total 1st Year Tech Cost: $47,258.23

Technology: Water Distribution/Fire Protection

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030201	Backfill, waste excess excavated materials on site	600.75	LCY	0.00	0.68	0.26	0.00	$561.34	False
17030257	Cat 215, 1.0 CY, Soil, Shallow, Trenching, Excludes Sheeting, Excludes Dewatering	445.00	BCY	0.00	0.85	0.29	0.00	$509.26	False

Technology: Water Distribution/Fire Protection

17030418	Backfill with Crushed Stone	55.56	CY	26.02	1.40	0.76	0.00	$1,565.73	False
17030423	General fill, Off-Site, Includes Delivery, Spreading	532.01	CY	13.72	1.22	0.92	0.00	$8,439.36	False
17030501	Compaction, subgrade, 18" wide, 8" lifts, walk behind, vibrating plate	600.75	ECY	0.00	2.62	0.13	0.00	$1,649.90	False
19010208	Polyvinyl chloride pressure pipe, 6", class 200, SDR 21, includes trenching to 3' deep	3,000.00	LF	4.36	14.89	15.57	0.00	$104,457.18	False
19010278	Buried Gate Valve	8.00	EA	2,084.67	246.02	31.73	0.00	$18,899.38	False
19010401	Fire Hydrant	6.00	EA	4,713.30	1,035.83	143.66	0.00	$35,356.69	False

Total Element Cost: $171,438.84

Total 1st Year Tech Cost: $171,438.84

Technology: Overhead Electrical Distribution

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
11010121	Underground 150 Amp 240 Volt 1 Phase Transformer	1.00	EA	4,725.00	1,599.95	0.00	0.00	$6,324.95	False
11010221	Underground 125 Amp Secondary Cable	2,500.00	EA	1.89	11.11	3.15	0.00	$40,366.85	False
11010405	Dry type transformer, single phase 240/480 V primary 120/240 V secondary, 37.5 kVA	2.00	EA	2,475.00	1,599.95	0.00	0.00	$8,149.90	False
11020136	Equipment Connections For Up	12.00	EA	302.33	934.97	0.00	0.00	$14,847.54	False

Technology: Overhead Electrical Distribution

	To 5 HP								
11020212	Fluorescent Hazardous Industrial Fixture	12.00	EA	3,759.08	561.96	0.00	0.00	$51,852.46	False
20020301	1/0 ACSR Conductor	8,904.00	LF	0.29	1.00	0.07	0.00	$12,103.73	False
20020310	1/C #2 Aluminum, Bare, Wire	3,488.00	LF	0.30	0.96	0.07	0.00	$4,632.41	False
20020403	40' Class 3 Treated Power Pole	13.00	EA	396.00	649.63	36.14	0.00	$14,062.98	False
20020420	Straight-line Structure, 5 KV Pole Top	11.00	EA	131.04	542.11	50.34	0.00	$7,958.39	False
20020430	Terminal Structure, 5 KV Pole Top	2.00	EA	1,461.15	2,053.73	190.70	0.00	$7,411.15	False
20020511	5 KV, 3/0, Shielded Cable, Copper	120.00	LF	0.40	3.76	0.00	0.00	$499.27	False
20020545	5 KV, 1/0 to 4/0 Conductor, Terminations & Splicing	6.00	EA	123.30	169.11	0.00	0.00	$1,754.45	False
20039902	4" Rigid Steel Conduit	40.00	LF	16.33	24.61	0.00	0.00	$1,637.99	False

Total Element Cost: $171,602.07

Total 1st Year Tech Cost: $171,602.07

Technology: Communications

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
20020401	30' Class 3 Treated Power Pole	14.00	EA	262.80	447.15	24.87	0.00	$10,287.51	False
20040101	27 Pair No. 22 AWG Wire, Communication Cable	2,800.00	LF	5.08	1.78	0.00	0.00	$19,213.77	False

Total Element Cost:	$29,501.28
Total 1st Year Tech Cost:	$29,501.28
Total Phase Element Cost	$419,800.42

Task Documentation:

Task Type:	Remedial Action
Task Name:	04 ET Cover Removal & Staging
Description:	ET Cover Removal & Staging
Approach:	In Situ
Start Date:	July, 2026
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Subgrade Soil	True	100	0
Bio-intrusion Layer (Rock)	True	100	0
Overlay Soil	True	100	0
Native Soil Layer	True	100	0
Topsoil Layer	True	100	0

Total Marked-up Cost: $142,155.18

Technologies:

Technology: Subgrade Soil

Element:

Technology: Subgrade Soil

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030226	988, 7.0 CY, Wheel Loader	34.00	HR	0.00	72.94	96.71	0.00	$5,768.27	False
17030296	50 Ton, 773, Off-highway Truck	68.00	HR	0.00	63.80	133.55	0.00	$13,419.79	False

Total Element Cost: $19,188.06

Total 1st Year Tech Cost: $19,188.06

Technology: Bio-intrusion Layer (Rock)

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030226	988, 7.0 CY, Wheel Loader	23.00	HR	0.00	72.94	96.71	0.00	$3,902.07	False
17030296	50 Ton, 773, Off-highway Truck	46.00	HR	0.00	63.80	133.55	0.00	$9,078.09	False

Total Element Cost: $12,980.16

Total 1st Year Tech Cost: $12,980.16

Technology: Overlay Soil

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Overlay Soil

17030226	988, 7.0 CY, Wheel Loader	13.00	HR	0.00	72.94	96.71	0.00	$2,205.52	False
17030295	35 Ton, 769, Off-highway Truck	26.00	HR	0.00	63.80	106.84	0.00	$4,436.75	False

Total Element Cost: $6,642.27

Total 1st Year Tech Cost: $6,642.27

Technology: Native Soil Layer

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030226	988, 7.0 CY, Wheel Loader	76.00	HR	0.00	72.94	96.71	0.00	$12,893.78	False
17030296	50 Ton, 773, Off-highway Truck	152.00	HR	0.00	63.80	133.55	0.00	$29,997.18	False

Total Element Cost: $42,890.96

Total 1st Year Tech Cost: $42,890.96

Technology: Topsoil Layer

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030226	988, 7.0 CY, Wheel Loader	24.00	HR	0.00	72.94	96.71	0.00	$4,071.72	False
17030296	50 Ton, 773, Off-highway Truck	48.00	HR	0.00	63.80	133.55	0.00	$9,472.79	False

Total Element Cost:	$13,544.51
Total 1st Year Tech Cost:	$13,544.51
Total Phase Element Cost	$95,245.97

Task Documentation:

Task Type:	Remedial Action
Task Name:	05 Construction of Excavation & Waste Mgmt. Tents
Description:	Construction of Excavation & Waste Mgmt. Tents
Approach:	Ex Situ
Start Date:	August, 2025
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
200 X 550 Tent Structure - Means	True	100	0
300 X 500 Tent Structures - Means (3)	True	100	0
350 X 550 Tent Structure - Means	True	100	0
400 X 650 Tent Structure - Means	True	100	0
Demolition, Fencing	True	100	0
Fencing	True	100	0

Total Marked-up Cost: $36,942,359.57

Technologies:

Technology: 200 X 550 Tent Structure - Means

Technology: 200 X 550 Tent Structure - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010302	200 X 550 Tension structure, rigid steel/aluminum frame, vinyl coated polyester fabric shell	110,000.00	SF	18.50	0.73	0.23	0.00	$2,140,787.80	False

Total Element Cost: $2,140,787.80

Total 1st Year Tech Cost: $2,140,787.80

Technology: 300 X 500 Tent Structures - Means (3)

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010303	300 X 500 Tension structure, rigid steel/aluminum frame, vinyl coated polyester fabric shell	450,000.00	SF	22.20	0.61	0.21	0.00	$10,358,890.24	False

Total Element Cost: $10,358,890.24

Total 1st Year Tech Cost: $10,358,890.24

Technology: 350 X 550 Tent Structure - Means

Element:

Technology: 350 X 550 Tent Structure - Means

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010304	350 X 550 Tension structure, rigid steel/aluminum frame, vinyl coated polyester fabric shell	192,500.00	SF	24.75	0.51	0.19	0.00	$4,899,547.56	False

Total Element Cost: $4,899,547.56

Total 1st Year Tech Cost: $4,899,547.56

Technology: 400 X 650 Tent Structure - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010305	400 X 650 Tension structure, rigid steel/aluminum frame, vinyl coated polyester fabric shell	260,000.00	SF	26.24	0.43	0.17	0.00	$6,977,575.61	False

Total Element Cost: $6,977,575.61

Total 1st Year Tech Cost: $6,977,575.61

Technology: Demolition, Fencing

Element:

	Unit of	Material	Labor Unit	Equipment	Sub Bid		Cost

Technology: Demolition, Fencing

Assembly	Description	Quantity	Measure	Unit Cost	Cost	Unit Cost	Cost	Extended Cost	Override
17020225	Remove and Reuse Chain Link Fence, Excludes Hauling	2,000.00	LF	0.00	2.95	0.00	0.00	$5,906.63	False
17030220	910, 1.25 CY, Wheel Loader	6.00	HR	0.00	72.94	31.18	0.00	$624.73	False
17030284	12 CY, Dump Truck	18.00	HR	0.00	70.89	50.13	0.00	$2,178.43	False

Total Element Cost: $8,709.79

Total 1st Year Tech Cost: $8,709.79

Technology: Fencing

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18040158	Fence, chain link industrial, aluminized steel, 6 ga. wire, 2-1/2" posts @ 10' OC, 8' high, includes excavation, in concrete, excludes barbed wire	8,239.00	LF	34.20	7.97	1.57	0.00	$360,361.43	False
18040501	Hazardous Waste Signing	42.00	EA	110.70	28.67	4.15	0.00	$6,027.77	False

Total Element Cost: $366,389.19

Total 1st Year Tech Cost: $366,389.19

Total Phase Element Cost	$24,751,900.21

Task Documentation:

Task Type:	Remedial Action
Task Name:	06 Construction of Warehouses
Description:	Construction of Warehouses
Approach:	In Situ
Start Date:	December, 2025
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
200 X 200 High Bay Warehouse	True	100	0
250 X 250 Shipping Center	True	100	0
200 X 200 Container Storage Canopy	True	100	0

Total Marked-up Cost: $12,090,908.11

Technologies:

Technology: 200 X 200 High Bay Warehouse

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: 200 X 200 High Bay Warehouse

01010103	1'0" X 3'0" Strip Footing 3000 PSI	800.00	LF	17.09	23.43	0.52	0.00	$32,829.19	True
01010213	Column Piers 0.81 m X 0.81 m X 1.42 m(2'8" X 2'8" X 4'8") High	40.00	EA	348.13	729.01	1.46	0.00	$43,143.81	False
01030115	Loading Dock Apron	400.00	SF	7.18	4.56	0.18	0.00	$4,762.88	False
01030201	203.2 mm(8") Structural Slab On Grade	40,000.00	SF	9.80	11.23	0.32	0.00	$853,870.02	False
01030204	1.22 m(4'0") Thick Equipment Slab	400.00	SF	17.67	10.48	0.06	0.00	$11,282.88	False
02020136	Structural Steel, Lt Load, Columns	50.00	TON	2,385.00	605.08	77.36	0.00	$153,371.73	False
03010142	152.4 mm(6") Mtl. Stud Non-Load Bearing	59,200.00	SF	0.44	1.19	0.00	0.00	$96,794.16	False
03010151	Metal Siding	59,200.00	SF	2.70	2.98	0.00	0.00	$336,287.76	False
03030204	1830 mm X 2130 mm(6'0" X 7'0") Pair Hollow Metal Doors W/Frame and Panic Handles	12.00	EA	3,448.26	1,067.44	0.00	0.00	$54,188.35	False
03040103	6100 mm X 4270mm(20'0" X 14'0") Metal Overhead Door	8.00	EA	7,343.53	3,689.81	105.35	0.00	$89,109.54	False
95010603	200 X 200 VTR Building Upgrade	1.00	LS	0.00	0.00	0.00	4,168,000.00	$4,168,000.00	False

Total Element Cost:	$5,843,640.33
Total 1st Year Tech Cost:	$5,843,640.33

Technology: 250 X 250 Shipping Center

Element:

Technology: 250 X 250 Shipping Center

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
01010103	1'0" X 3'0" Strip Footing 3000 PSI	1,000.00	LF	17.09	23.43	0.52	0.00	$41,036.50	True
01010213	Column Piers 0.81 m X 0.81 m X 1.42 m(2'8" X 2'8" X 4'8") High	50.00	EA	348.13	729.01	1.46	0.00	$53,929.76	False
01030115	Loading Dock Apron	400.00	SF	7.18	4.56	0.18	0.00	$4,762.88	False
01030201	203.2 mm(8") Structural Slab On Grade	62,500.00	SF	9.80	11.23	0.32	0.00	$1,334,171.90	False
01030204	1.22 m(4'0") Thick Equipment Slab	400.00	SF	17.67	10.48	0.06	0.00	$11,282.88	False
02020136	Structural Steel, Lt Load, Columns	75.00	TON	2,385.00	605.08	77.36	0.00	$230,057.60	False
03010142	152.4 mm(6") Mtl. Stud Non-Load Bearing	86,500.00	SF	0.44	1.19	0.00	0.00	$141,430.66	False
03010151	Metal Siding	86,500.00	SF	2.70	2.98	0.00	0.00	$491,366.40	False
03030204	1830 mm X 2130 mm(6'0" X 7'0") Pair Hollow Metal Doors W/Frame and Panic Handles	16.00	EA	3,448.26	1,067.44	0.00	0.00	$72,251.13	False
03040103	6100 mm X 4270mm(20'0" X 14'0") Metal Overhead Door	12.00	EA	7,343.53	3,689.81	105.35	0.00	$133,664.31	False

Total Element Cost:	$2,513,954.03
Total 1st Year Tech Cost:	$2,513,954.03

Technology: 200 X 200 Container Storage Canopy

Technology: 200 X 200 Container Storage Canopy

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
01010103	1'0" X 3'0" Strip Footing 3000 PSI	800.00	LF	17.09	23.43	0.52	0.00	$32,829.20	True
01010213	Column Piers 0.81 m X 0.81 m X 1.42 m(2'8" X 2'8" X 4'8") High	40.00	EA	348.13	729.01	1.46	0.00	$43,143.81	False
01030204	1.22 m(4'0") Thick Equipment Slab	400.00	SF	17.67	10.48	0.06	0.00	$11,282.88	False
02020136	Structural Steel, Lt Load, Columns	40.00	TON	2,385.00	605.08	77.36	0.00	$122,697.39	False
03010142	152.4 mm(6") Mtl. Stud Non-Load Bearing	40,000.00	SF	0.44	1.19	0.00	0.00	$65,401.46	False
03010151	Metal Siding	40,000.00	SF	2.70	2.98	0.00	0.00	$227,221.46	False
18010101	Cement-stabilized Base, Aggregate Base Course for Roadways and Large Paved Areas, delivered and placed, 15 mile haul	988.00	CY	44.55	12.54	4.77	0.00	$61,116.67	False

Total Element Cost:	$563,692.87
Total 1st Year Tech Cost:	$563,692.87
Total Phase Element Cost	$8,921,287.23

Task Documentation:

Task Type:	Remedial Action
Task Name:	07 Limited Area Gate
Description:	Copy
Approach:	Ex Situ
Start Date:	January, 2026
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Limited Area Gate Design and Construction	True	100	0

Total Marked-up Cost: $578,533.57

Technologies:

Technology: Limited Area Gate Design and Construction

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010601	Design	1.00	LS	0.00	72,926.83	0.00	0.00	$72,926.83	False
95010602	Construction	1.00	LS	0.00	0.00	0.00	391,800.00	$391,800.00	False

Total Element Cost:	$464,726.83
Total 1st Year Tech Cost:	$464,726.83
Total Phase Element Cost	$464,726.83

Task Documentation:

Task Type:	Remedial Action
Task Name:	08 Procurement for Excavation & Waste Disposal
Description:	Procurement for Excavation & Waste Disposal
Approach:	Ex Situ
Start Date:	July, 2026
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Procurement	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Procurement

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Remedial Action
Task Name:	09 Training, Functional Testing & Readiness Review
Description:	Training, Functional Testing & Readiness Review
Approach:	Ex Situ
Start Date:	August, 2027
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
No Cost	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: No Cost

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Remedial Action
Task Name:	10 SNL Professional Labor Management
Description:	Professional Labor Management
Approach:	Ex Situ
Start Date:	January, 2025
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Professional Labor Management	True	100	0

Total Marked-up Cost: $7,732,302.08

Technologies:

Technology: Professional Labor Management

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	2,718,093.18	0.00	0.00	$2,718,093.18	False

Total Element Cost:	$2,718,093.18
Total 1st Year Tech Cost:	$2,718,093.18
Total Phase Element Cost	$2,718,093.18

Task Documentation:

Task Type:	Remedial Action
Task Name:	11 Contractor Labor Management
Description:	Contractor Labor Management
Approach:	Ex Situ
Start Date:	January, 2025
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Professional Labor Management	True	100	0

Total Marked-up Cost: $21,115,991.85

Technologies:

Technology: Professional Labor Management

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager	2,776.00	HR	0.00	99.66	0.00	0.00	$276,652.09	False
33220102	Project Manager	5,552.00	HR	0.00	91.65	0.00	0.00	$508,840.80	True

Technology: Professional Labor Management

33220104	Senior Staff Engineer	11,104.00	HR	0.00	98.77	0.00	0.00	$1,096,736.63	False
33220106	Staff Engineer	8,992.00	HR	0.00	83.34	0.00	0.00	$749,373.52	False
33220110	QA/QC Officer	4,496.00	HR	0.00	65.35	0.00	0.00	$293,808.11	False
33220111	Certified Industrial Hygienist	4,496.00	HR	0.00	86.30	0.00	0.00	$388,010.27	False
33220112	Field Technician	89,920.00	HR	0.00	42.25	0.00	0.00	$3,798,681.27	False
33220119	Health and Safety Officer	4,496.00	HR	0.00	69.10	0.00	0.00	$310,684.56	False

Total Element Cost:	$7,422,787.25
Total 1st Year Tech Cost:	$7,422,787.25
Total Phase Element Cost	$7,422,787.25

Task Documentation:

Task Type: Remedial Action
Task Name: 12 Additional Equipment and Operators
Description: Additional Equipment

Approach: Ex Situ
Start Date: July, 2025
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Additional Equipment and Operators	True	100	0

Total Marked-up Cost: $3,734,591.06

Technologies:

Technology: Additional Equipment and Operators

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
16019913	950, 3.0 CY Wheel Loader	2,160.00	HR	0.00	72.94	55.27	0.00	$276,931.31	False
17030431	580K, 1.0 CY, Backhoe with	4,320.00	HR	0.00	72.94	30.38	0.00	$446,354.37	False

Technology: Additional Equipment and Operators

	Front-end Loader								
17030703	D5 with A-blade Bulldozer	2,160.00	HR	0.00	72.94	61.12	0.00	$289,574.31	False
33010108	Pickup Truck(s), Rental	2,810.00	DAY	0.00	0.00	0.00	47.77	$134,233.70	False
33100118	R60 Rough Terrain Forklift, 6,000 Lb @ 24" LC	4,320.00	HR	0.00	72.94	31.50	0.00	$451,180.80	False
33100545	Crane, 22 Ton Self-contained, Hydraulic, Rough Terrain, 4 WD	2,160.00	HR	0.00	72.94	79.80	0.00	$329,928.37	False
95010201	Motor Grader, 40,000 Lb.	2,160.00	HR	0.00	72.94	54.00	0.00	$274,190.40	False
95010202	825 G Sheepsfoot Vibratory Roller	1,080.00	HR	0.00	0.00	76.50	0.00	$82,620.00	False
95010203	CS583 Smooth Drum Vibratory Roller	1,080.00	HR	0.00	0.00	24.30	0.00	$26,244.00	False
95010204	4000 Gallon Water Truck	2,160.00	HR	0.00	72.94	27.70	0.00	$217,386.72	False

Total Element Cost:	$2,528,643.97
Total 1st Year Tech Cost:	$2,528,643.97
Total Phase Element Cost	$2,528,643.97

Task Documentation:

Task Type: Operations & Maintenance
Task Name: 13 Administrative and Onsite Lab Equipment
Description: Administrative and Onsite Lab Equipment

Approach: Ex Situ
Start Date: June, 2027
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administrative and Onsite Lab Equipment	True	100	0

Total Marked-up Cost: $12,019,225.16

Technologies:

Technology: Administrative and Onsite Lab Equipment

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010502	Administrative Trailer	3.00	MO	0.00	0.00	448.20	0.00	$1,344.60	False
95010503	Co-ed Shower Trailer	3.00	MO	0.00	0.00	448.20	0.00	$1,344.60	False

Technology: Administrative and Onsite Lab Equipment

95010504	Office Trailer (3 Ea.)	9.00	MO	0.00	0.00	448.20	0.00	$4,033.80	False
95010505	10 X 25 Connex Storage Box (10 Ea.)	30.00	MO	0.00	0.00	115.00	0.00	$3,450.00	False
95010506	Breathing Air Refill System	1.00	EA	0.00	0.00	110,000.00	0.00	$110,000.00	False
95010507	Ventilation System Installation	1.00	LS	0.00	0.00	0.00	5,000,000.00	$5,000,000.00	False
95010508	Laboratory Trailer (5 Ea.)	15.00	MO	0.00	0.00	448.20	0.00	$6,723.00	False
95010510	Customized Construction CostsFor 5 Lab Trailers	5.00	EA	0.00	0.00	45,000.00	0.00	$224,999.99	False
95010513	Field Equipment (PPE, respirators, etc.)	1.00	LS	0.00	0.00	521,501.00	0.00	$521,501.00	False
95010514	Data Management System for Soiland Debris tracking	1.00	EA	150,000.00	0.00	0.00	0.00	$150,000.00	False
95010515	Mob./Demob. AdministrativeTrailer	1.00	LS	0.00	0.00	431.00	0.00	$431.00	False
95010516	Mob./Demob. Office Trailer	3.00	LS	0.00	0.00	431.00	0.00	$1,293.00	False
95010517	Mob./Demob. Laboratory Trailer	5.00	LS	0.00	0.00	431.00	0.00	$2,155.00	False
95010518	Mob./Demob. Shower Trailer	1.00	LS	0.00	0.00	431.00	0.00	$431.00	False
95010519	Mob./Demob Connex Storage Boxes	10.00	EA	0.00	0.00	431.00	0.00	$4,310.00	False
95010520	Radiological Monitoring Equipment Per Table J.3.6	1.00	LS	979,868.50	0.00	0.00	0.00	$979,868.50	False
95010521	Laboratory Equipment Per Table J.3.4	1.00	LS	1,164,658.14	0.00	0.00	0.00	$1,164,658.14	False
95010522	Basic Laboratory Supplies Per Table J.3.5	1.00	LS	860,441.92	0.00	0.00	0.00	$860,441.92	False

Total Element Cost: $9,036,985.55

Total 1st Year Tech Cost:	$9,036,985.55
Total Phase Element Cost	$9,036,985.55

Phase 3 Excavation & Waste Management

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Waste Management	$2,835,590							$1,180,336	$4,015,926
(System Defaults)		$0	$0	$514,365	$267,996	$0	$397,975		
02 Onsite & Offsite Laboratories	$1,129,516							$278,520	$1,408,036
(System Defaults)		$0	$0	$45,022	$93,963	$0	$139,535		
03 Unclassified Area (UCA) Excavation	$35,018,088							$15,236,385	$50,254,473
(System Defaults)		$0	$0	$6,902,560	$3,353,652	$0	$4,980,173		
04 UCA Excavation Verification	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
05 Classified Area (CA) Excavation	$95,580,311							$22,567,771	$118,148,082
(System Defaults)		$0	$0	$2,974,980	$7,884,423	$0	$11,708,368		
06 CA Excavation Verification	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
07 Excavation Backfilling	$2,226,856							$1,094,183	$3,321,039
(System Defaults)		$0	$0	$543,447	$221,624	$0	$329,112		
08 D&D MWL Excavation Sprung	$281,180							$138,483	$419,664
(System Defaults)		$0	$0	$68,889	$28,006	$0	$41,588		
09 Excavation ET Cover Construction	$532,094							$260,666	$792,760
(System Defaults)		$0	$0	$129,201	$52,904	$0	$78,562		

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
10 SNL Professional Labor Management	$17,680,263							$32,615,707	$50,295,970
(System Defaults)		$0	$0	$24,275,001	$3,356,421	$0	$4,984,285		
11 Contractor Labor Management	$37,158,297							$68,547,858	$105,706,155
(System Defaults)		$0	$0	$51,018,342	$7,054,131	$0	$10,475,385		
12 Administration Facilities	$278,062							$136,947	$415,009
(System Defaults)		$0	$0	$68,125	$27,695	$0	$41,127		
Total Phase Cost	$192,720,257	$0	$0	$86,539,931	$22,340,815	$0	$33,176,110	$142,056,856	$334,777,113

Total Phase Cost $334,777,113

	Direct Cost	Markups	Total
Total Phase Cost	$192,720,257	$142,056,856	$334,777,113

Task Documentation:

Task Type:	Remedial Action
Task Name:	01 Waste Management
Description:	Waste Management
Approach:	Ex Situ
Start Date:	September, 2027
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Transportation and Disposal, PPE	True	100	0
Transportation and Disposal, Sprung HEPA Filters	True	100	0
Transportation and Disposal, Conveyer System	True	100	0
Transportation & Disposal, Hydraulic Baler/Logger	True	100	0
Sorting, Processing, Staging	True	100	0
Intermodal Purchase	True	100	0

Total Marked-up Cost: $4,015,925.56

Technologies:

Technology: Transportation and Disposal, PPE

Technology: Transportation and Disposal, PPE

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	90.00	EA	26.96	0.00	0.00	0.00	$2,426.76	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	90.00	EA	0.00	101.55	22.43	0.00	$11,158.51	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	74,250.00	MI	0.00	0.00	0.00	3.60	$267,299.99	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	1,620.00	BCY	0.90	1.27	0.39	0.00	$4,143.91	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $285,074.17

Total 1st Year Tech Cost: $285,074.17

Technology: Transportation and Disposal, Sprung HEPA Filters

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Transportation and Disposal, Sprung HEPA Filters

33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	129.00	EA	26.96	0.00	0.00	0.00	$3,478.36	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	129.00	EA	0.00	101.55	22.43	0.00	$15,993.86	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	106,425.00	MI	0.00	0.00	0.00	3.60	$383,129.99	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	2,322.00	BCY	0.90	1.27	0.39	0.00	$5,939.60	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $408,586.81

Total 1st Year Tech Cost: $408,586.81

Technology: Transportation and Disposal, Conveyer System

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False

Technology: Transportation and Disposal, Conveyer System

95010412	Load LLW, Flatbed Load	2.00	EA	0.00	304.88	375.00	0.00	$1,359.76	False
95010413	Transport LLW, Flatbed Load	1,650.00	MI	0.00	0.00	0.00	4.53	$7,474.50	False

Total Element Cost: $8,834.26

Total 1st Year Tech Cost: $8,834.26

Technology: Transportation & Disposal, Hydraulic Baler/Logger

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
95010412	Load LLW, Flatbed Load	2.00	EA	0.00	304.88	375.00	0.00	$1,359.76	False
95010413	Transport LLW, Flatbed Load	1,650.00	MI	0.00	0.00	0.00	4.53	$7,474.50	False

Total Element Cost: $8,834.26

Total 1st Year Tech Cost: $8,834.26

Technology: Sorting, Processing, Staging

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Sorting, Processing, Staging

07030206	Overhead Traveling Bridge Crane - 4535.9 kg(5 Ton)	1.00	EA	46,350.00	5,822.15	400.74	0.00	$52,572.89	False
17030223	950, 3.0 CY, Wheel Loader	2,080.00	HR	0.00	72.94	55.27	0.00	$266,674.59	False
17030284	12 CY, Dump Truck	2,080.00	HR	0.00	63.80	42.46	0.00	$221,023.33	False
17030285	12 CY, Dump Truck	2,080.00	HR	0.00	63.80	42.46	0.00	$221,031.80	False
33010108	Pickup Truck(s), Rental	1,300.00	DAY	0.00	0.00	0.00	47.77	$62,101.00	False
33040644	Truck, Intermodal Transport, On-site - Rental/Lease	260.00	DAY	0.00	0.00	285.55	0.00	$74,243.52	False
33100118	R60 Rough Terrain Forklift, 6,000 Lb @ 24" LC	2,080.00	HR	0.00	72.94	31.50	0.00	$217,235.20	False
33100146	Fork Lift, Yard, 8,000 Lbs	2,080.00	HR	0.00	72.94	22.43	0.00	$198,381.04	False
33190336	Flatbed Trailer (Monthly)	12.00	MO	0.00	0.00	0.00	714.27	$8,571.24	False
33341009	Man-Lift, Straight Boom, 66' Height, 650 Lbs, 51' Reach	12.00	MO	0.00	0.00	4,895.44	0.00	$58,745.26	False
95010204	4000 Gallon Water Truck	2,080.00	HR	0.00	72.94	27.70	0.00	$209,335.35	False

Total Element Cost: $1,589,915.22

Total 1st Year Tech Cost: $1,589,915.22

Technology: Intermodal Purchase

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010415	Bulk Solid Waste Disposal Container, Purchase, 20 CY Intermodal	50.00	EA	5,526.90	0.00	0.00	0.00	$276,344.99	False

Technology: Intermodal Purchase

95010416	Container Cover System, Hinged, 20 CY Intermodal, Purchase	50.00	EA	5,160.00	0.00	0.00	0.00	$258,000.00	False

Total Element Cost:	$534,344.99
Total 1st Year Tech Cost:	$534,344.99
Total Phase Element Cost	$2,835,589.71

Task Documentation:

Task Type:	Remedial Action
Task Name:	02 Onsite & Offsite Laboratories
Description:	Onsite & Offsite Laboratories
Approach:	Ex Situ
Start Date:	September, 2027
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Offsite Laboratory Analysis	True	100	0
Onsite Laboratory Facilities	True	100	0

Total Marked-up Cost: $1,408,036.24

Technologies:

Technology: Offsite Laboratory Analysis

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33020216	Testing, rad analytical, data packaging, alpha spectroscopy	677.00	EA	0.00	0.00	0.00	110.70	$74,943.90	False

Technology: Offsite Laboratory Analysis

33021602	Testing, pH, electrometric (9045)	82.00	EA	0.00	0.00	0.00	16.40	$1,344.80	False
33021603	Testing, dissolved solids	82.00	EA	0.00	0.00	0.00	17.10	$1,402.20	False
33021604	Testing, suspended solids	82.00	EA	0.00	0.00	0.00	17.10	$1,402.20	False
33021613	Testing, oil and grease EPA 413.2	82.00	EA	0.00	0.00	0.00	53.10	$4,354.20	False
33021614	Testing, total petroleum hydrocarbons (TPH)	82.00	EA	0.00	0.00	0.00	71.67	$5,876.94	False
33021631	Testing, chlorinated hydrocarbons (612, 8120)	82.00	EA	0.00	0.00	0.00	135.00	$11,070.00	False
33021653	Testing, chloride	82.00	EA	0.00	0.00	0.00	22.50	$1,845.00	False
33021656	Testing, flouride, no distillation	82.00	EA	0.00	0.00	0.00	19.12	$1,568.25	False
33021670	Metals Screen, 25 Metals Listed In Method EPA 200.7, Water Analysis	82.00	EA	0.00	0.00	0.00	450.00	$36,900.00	False
33021673	Testing, total organic carbons	82.00	EA	0.00	0.00	0.00	47.25	$3,874.50	False
33021712	Testing, mercury EPA 7470	677.00	EA	0.00	0.00	0.00	30.00	$20,307.97	False
33021717	Pesticides/PCBs (SW 3550B/SW 8081/8082), Soil Analysis	677.00	EA	0.00	0.00	0.00	103.50	$70,069.50	False
33021720	Testing, purgeable organics (624, 8260)	677.00	EA	0.00	0.00	0.00	144.00	$97,488.00	False
33021724	Testing, phenols (9066) total recoverable	82.00	EA	0.00	0.00	0.00	37.50	$3,075.00	False
33021739	Testing, semi-volatile organics, pkd. column (8250)	677.00	EA	0.00	0.00	0.00	266.94	$180,718.38	False
33021762	Testing, soil & sediment analysis, chromium hexavalent 7195/7196/7197/7199	677.00	EA	0.00	0.00	0.00	56.70	$38,385.90	False
33021793	Testing, soil & sediment analysis, Total and Extractable Metals in	677.00	EA	0.00	0.00	0.00	292.50	$198,022.50	False

Technology: Offsite Laboratory Analysis

	Soils (EPA 3050)								
33022128	Testing, chromium, hexavalent (SW7195) with prep	82.00	EA	0.00	0.00	0.00	39.60	$3,247.20	False
33022133	Testing, pesticides/PCBs (SW3510/SW8080)	82.00	EA	0.00	0.00	0.00	103.50	$8,487.00	False
33022139	Testing, BTEX/MTBE (mod EPA 602)	82.00	EA	0.00	0.00	0.00	57.96	$4,752.72	False
33022257	Testing, rad analytical liquid, gas flow proportional counting, gross beta-total	82.00	EA	0.00	0.00	0.00	35.67	$2,924.69	False
33022271	Testing, rad analytical liquid, gamma spectroscopy, gamma isotopic (cesium, 137 20 PCI/I)	82.00	EA	0.00	0.00	0.00	76.81	$6,298.09	False
33022284	Testing, rad analytical, liquid scintillation, tritium (direct counting)	82.00	EA	0.00	0.00	0.00	65.09	$5,337.22	False
33022287	Testing, rad analytical liquid, gross alpha, total gas flow prop. counting	82.00	EA	0.00	0.00	0.00	46.55	$3,816.94	False
33022336	Testing, rad analytical vegetation/sediment/soil, gas flow proportional counting, gross beta-total	677.00	EA	0.00	0.00	0.00	48.35	$32,731.60	False
33022342	Testing, rad analytical vegetation/sediment/soil, gamma spectroscopy, gamma isotopic	677.00	EA	0.00	0.00	0.00	87.76	$59,412.84	False
33022351	Testing, rad analytical vegetation/sediment/soil, liquid scintillation, tritium	677.00	EA	0.00	0.00	0.00	56.03	$37,935.02	False
33022352	Testing, rad analytical vegetation/sediment/soil, gross alpha, total gas flow proportional	677.00	EA	0.00	0.00	0.00	41.60	$28,161.85	False

Technology: Offsite Laboratory Analysis

counting

Total Element Cost:	$945,754.38
Total 1st Year Tech Cost:	$945,754.38

Technology: Onsite Laboratory Facilities

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010508	Laboratory Trailer (5 Ea.)	410.00	MO	0.00	0.00	448.20	0.00	$183,762.00	False

Total Element Cost:	$183,762.00
Total 1st Year Tech Cost:	$183,762.00
Total Phase Element Cost	$1,129,516.38

Task Documentation:

Task Type:	Remedial Action
Task Name:	03 Unclassified Area (UCA) Excavation
Description:	Unclassified Area (UCA) Excavation
Approach:	Ex Situ
Start Date:	September, 2027
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation	True	100	0
Sorting, Processing, Staging	True	100	0
Transportation and Disposal Soil - Low Level Waste	True	100	0
Transportation & Disposal Debris - Low Level Waste	True	100	0
Transportation & Disposal Debris - Mixed Waste	True	100	0

Total Marked-up Cost: $50,254,472.90

Technologies:

Technology: Excavation

Element:

Technology: Excavation

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030223	950, 3.0 CY, Wheel Loader	6,016.00	HR	0.00	72.94	55.27	0.00	$771,304.98	False
17030232	Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	6,016.00	HR	0.00	72.09	75.73	0.00	$889,276.52	False
17039901	Screening Plant (125 Tons/Hour)	6,016.00	HR	0.00	0.00	94.77	0.00	$570,136.32	False
33100136	100-Ton Rough Terrain Crane and Operator	1,040.00	HR	0.00	80.10	240.21	0.00	$333,119.86	False
33100145	Hydraulic Excavator 1.75 CY with Rotating Grapple	3,008.00	HR	0.00	72.09	77.55	0.00	$450,096.52	False
33341009	Man-Lift, Straight Boom, 66' Height, 650 Lbs, 51' Reach	38.00	MO	0.00	0.00	4,895.44	0.00	$186,026.65	False
95010204	4000 Gallon Water Truck	6,016.00	HR	0.00	72.94	27.70	0.00	$605,473.71	False

Total Element Cost: $3,805,434.56

Total 1st Year Tech Cost: $3,805,434.56

Technology: Sorting, Processing, Staging

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030223	950, 3.0 CY, Wheel Loader	6,016.00	HR	0.00	72.94	55.27	0.00	$771,304.98	False
17030284	12 CY, Dump Truck	6,016.00	HR	0.00	63.80	42.46	0.00	$639,267.49	False
17030285	12 CY, Dump Truck	6,016.00	HR	0.00	63.80	42.46	0.00	$639,291.96	False
33010108	Pickup Truck(s), Rental	3,760.00	DAY	0.00	0.00	0.00	47.77	$179,615.20	False

Technology: Sorting, Processing, Staging

33040644	Truck, Intermodal Transport, On-site - Rental/Lease	752.00	DAY	0.00	0.00	285.55	0.00	$214,735.10	False
33100118	R60 Rough Terrain Forklift, 6,000 Lb @ 24" LC	6,016.00	HR	0.00	72.94	31.50	0.00	$628,311.02	False
33100146	Fork Lift, Yard, 8,000 Lbs	6,016.00	HR	0.00	72.94	22.43	0.00	$573,779.01	False
33150432	Radial Stacking Conveyor with 2 CY Hopper, 55' Long	1.00	EA	0.00	0.00	70,000.00	0.00	$70,000.00	False
33190336	Flatbed Trailer (Monthly)	35.00	MO	0.00	0.00	0.00	714.27	$24,999.45	False
95010206	Hydraulic Baler/Logger	1.00	EA	0.00	0.00	105,000.00	0.00	$105,000.00	False
95010903	Brokk 60 Remote Handler w/grapple	1.00	EA	0.00	0.00	109,485.00	0.00	$109,485.00	False
95011001	Radiography, Techni-cart Drum Scanner	35.00	MO	0.00	0.00	45,000.00	0.00	$1,575,000.00	False

Total Element Cost: $5,530,789.21

Total 1st Year Tech Cost: $5,530,789.21

Technology: Transportation and Disposal Soil - Low Level Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	1,703.00	EA	26.96	0.00	0.00	0.00	$45,919.69	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	1,703.00	EA	0.00	101.55	22.43	0.00	$211,143.77	False

Technology: Transportation and Disposal Soil - Low Level Waste

33170924	Transport LLW Roll-Off Containers (1 per truck)	1,404,975.00	MI	0.00	0.00	0.00	3.60	$5,057,909.87	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	30,646.00	BCY	0.90	1.27	0.39	0.00	$78,391.52	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $5,393,409.85

Total 1st Year Tech Cost: $5,393,409.85

Technology: Transportation & Disposal Debris - Low Level Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	1,369.00	BCY	0.90	1.27	0.39	0.00	$3,501.86	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Technology: Transportation & Disposal Debris - Low Level Waste

95010401	7-4-4 LLW Shipping Boxes	334.00	EA	1,888.97	0.00	0.00	0.00	$630,915.98	False
95010402	Load LLW 7-4-4s on Truck or directly in disposal pit/landfill	334.00	EA	0.00	39.68	5.61	0.00	$15,127.84	False
95010403	Transport LLW 7-4-4s (9 7-4-4s per truck)	30,525.00	MI	0.00	0.00	0.00	4.07	$124,236.75	False

Total Element Cost: $773,827.43

Total 1st Year Tech Cost: $773,827.43

Technology: Transportation & Disposal Debris - Mixed Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	10,173.00	BCY	0.90	1.27	0.39	0.00	$26,022.22	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False
95010405	Ultra-MacroPack MW Shipping Boxes	2,164.00	EA	8,287.00	0.00	0.00	0.00	$17,933,068.00	False
95010406	Load Macro Boxes on Truck or directly in disposal pit/landfill	2,164.00	EA	0.00	39.68	5.61	0.00	$98,013.89	False

Technology: Transportation & Disposal Debris - Mixed Waste

95010407	Transport MacroPack Boxes (5 Per Truck)	357,225.00	MI	0.00	0.00	0.00	4.08	$1,457,478.00	False

Total Element Cost:	$19,514,627.11
Total 1st Year Tech Cost:	$19,514,627.11
Total Phase Element Cost	$35,018,088.16

Task Documentation:

Task Type: Remedial Action
Task Name: 04 UCA Excavation Verification
Description: UCA Excavation Verification

Approach: Ex Situ
Start Date: July, 2030
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Soil Sampling	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Soil Sampling

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Remedial Action
Task Name:	05 Classified Area (CA) Excavation
Description:	Classified Area (CA) Excavation
Approach:	Ex Situ
Start Date:	July, 2030
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation	True	100	0
Sorting, Processing, Staging	True	100	0
Transportation & Disposal Soil - Low Level Waste	True	100	0
Transportation & Disposal Soil - Mixed Soil Waste	True	100	0
Transportation & Disposal Soil - Concrete MW	True	100	0
Transportation & Disposal Debris - Low Level Waste	True	100	0
Transportation & Disposal Debris - Mixed Waste	True	100	0
Transportation & Disposal Debris - TRU Waste	True	100	0

Total Marked-up Cost: $118,148,081.96

Technologies:

Technology: Excavation

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030223	950, 3.0 CY, Wheel Loader	5,080.00	HR	0.00	72.94	55.27	0.00	$651,301.41	False
17030232	Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	5,080.00	HR	0.00	72.09	75.73	0.00	$750,918.34	False
17039901	Screening Plant (125 Tons/Hour)	5,080.00	HR	0.00	0.00	94.77	0.00	$481,431.60	False
33100136	100-Ton Rough Terrain Crane and Operator	1,080.00	HR	0.00	80.10	240.21	0.00	$345,932.17	False
33100145	Hydraulic Excavator 1.75 CY with Rotating Grapple	5,080.00	HR	0.00	72.09	77.55	0.00	$760,136.41	False
33341009	Man-Lift, Straight Boom, 66' Height, 650 Lbs, 51' Reach	29.00	MO	0.00	0.00	4,895.44	0.00	$141,967.71	False
95010204	4000 Gallon Water Truck	5,080.00	HR	0.00	0.00	27.70	0.00	$140,716.00	False
95010901	Remote Operated Hydraulic Excavator	2,080.00	HR	0.00	72.94	81.45	0.00	$321,139.31	False
95010902	Remote Operated Wheel Loader	2,080.00	HR	0.00	72.94	81.45	0.00	$321,139.31	False

Total Element Cost: $3,914,682.26

Total 1st Year Tech Cost: $3,914,682.26

Technology: Sorting, Processing, Staging

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Sorting, Processing, Staging

17030223	950, 3.0 CY, Wheel Loader	5,080.00	HR	0.00	72.94	55.27	0.00	$651,301.41	False
17030284	12 CY, Dump Truck	5,080.00	HR	0.00	63.80	42.46	0.00	$539,806.99	False
17030285	12 CY, Dump Truck	5,080.00	HR	0.00	63.80	42.46	0.00	$539,827.66	False
33010108	Pickup Truck(s), Rental	3,175.00	DAY	0.00	0.00	0.00	47.77	$151,669.75	False
33040644	Truck, Intermodal Transport, On-site - Rental/Lease	635.00	DAY	0.00	0.00	285.55	0.00	$181,325.52	False
33100118	R60 Rough Terrain Forklift, 6,000 Lb @ 24" LC	5,080.00	HR	0.00	72.94	31.50	0.00	$530,555.19	False
33100146	Fork Lift, Yard, 8,000 Lbs	5,080.00	HR	0.00	72.94	22.43	0.00	$484,507.54	False
33190336	Flatbed Trailer (Monthly)	29.00	MO	0.00	0.00	0.00	714.27	$20,713.83	False
95011001	Radiography, Techni-cart Drum Scanner	29.00	MO	0.00	0.00	45,000.00	0.00	$1,305,000.00	False

Total Element Cost: $4,404,707.88

Total 1st Year Tech Cost: $4,404,707.88

Technology: Transportation & Disposal Soil - Low Level Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	659.00	EA	26.96	0.00	0.00	0.00	$17,769.28	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	659.00	EA	0.00	101.55	22.43	0.00	$81,705.08	False

Technology: Transportation & Disposal Soil - Low Level Waste

33170924	Transport LLW Roll-Off Containers (1 per truck)	543,675.00	MI	0.00	0.00	0.00	3.60	$1,957,229.95	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	11,848.00	BCY	0.90	1.27	0.39	0.00	$30,306.82	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $2,087,056.12

Total 1st Year Tech Cost: $2,087,056.12

Technology: Transportation & Disposal Soil - Mixed Soil Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	1,051.00	EA	26.96	0.00	0.00	0.00	$28,339.16	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	1,051.00	EA	0.00	101.55	22.43	0.00	$130,306.58	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	761,975.00	MI	0.00	0.00	0.00	3.60	$2,743,109.93	False
33171013	Radioactive Waste Stabilization & Disposal, Energy Solutions,	18,905.00	CY	0.00	0.00	0.00	4,050.00	$76,565,250.00	False

Technology: Transportation & Disposal Soil - Mixed Soil Waste

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
	UT, LLMW, MW, Containerized								
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	18,905.00	BCY	0.90	1.27	0.39	0.00	$48,358.40	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $79,515,409.07

Total 1st Year Tech Cost: $79,515,409.07

Technology: Transportation & Disposal Soil - Concrete MW

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	22.00	EA	26.96	0.00	0.00	0.00	$593.21	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	22.00	EA	0.00	101.55	22.43	0.00	$2,727.64	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	15,950.00	MI	0.00	0.00	0.00	3.60	$57,420.00	False
33171013	Radioactive Waste Stabilization & Disposal, Energy Solutions, UT, LLMW, MW, Containerized	395.00	CY	0.00	0.00	0.00	4,050.00	$1,599,750.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	395.00	BCY	0.90	1.27	0.39	0.00	$1,010.40	False

Technology: Transportation & Disposal Soil - Concrete MW

33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $1,661,546.24

Total 1st Year Tech Cost: $1,661,546.24

Technology: Transportation & Disposal Debris - Low Level Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	209.00	BCY	0.90	1.27	0.39	0.00	$534.62	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False
95010401	7-4-4 LLW Shipping Boxes	51.00	EA	1,888.97	0.00	0.00	0.00	$96,337.47	False
95010402	Load LLW 7-4-4s on Truck or directly in disposal pit/landfill	51.00	EA	0.00	39.68	5.61	0.00	$2,309.94	False
95010403	Transport LLW 7-4-4s (9 7-4-4s per truck)	4,950.00	MI	0.00	0.00	0.00	4.07	$20,146.50	False

Total Element Cost: $119,373.52

Total 1st Year Tech Cost: $119,373.52

Technology: Transportation & Disposal Debris - Mixed Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	1,997.00	BCY	0.90	1.27	0.39	0.00	$5,108.26	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False
95010405	Ultra-MacroPack MW Shipping Boxes	425.00	EA	8,287.00	0.00	0.00	0.00	$3,521,975.00	False
95010406	Load Macro Boxes on Truck or directly in disposal pit/landfill	425.00	EA	0.00	39.68	5.61	0.00	$19,249.49	False
95010407	Transport MacroPack Boxes (5 Per Truck)	70,125.00	MI	0.00	0.00	0.00	4.53	$317,666.25	False

Total Element Cost: $3,864,044.01

Total 1st Year Tech Cost: $3,864,044.01

Technology: Transportation & Disposal Debris - TRU Waste

Technology: Transportation & Disposal Debris - TRU Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010408	SWB Standard Waste Box	3.00	EA	3,000.00	0.00	0.00	0.00	$9,000.00	False
95010409	Load SWBs on Truck for disposal	3.00	EA	0.00	39.68	5.61	0.00	$135.88	False
95010410	Transport TRU SWB Containers	310.00	MI	0.00	0.00	0.00	4.07	$1,261.70	False
95010411	Initial Waste Characterization, TRU, Waste Isolation Pilot Plant	7.00	CY	0.00	0.00	0.00	442.00	$3,094.00	False

Total Element Cost:	$13,491.58
Total 1st Year Tech Cost:	$13,491.58
Total Phase Element Cost	$95,580,310.68

Task Documentation:

Task Type:	Remedial Action
Task Name:	06 CA Excavation Verification
Description:	CA Excavation Verification
Approach:	Ex Situ
Start Date:	December, 2032
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Soil Sampling	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Soil Sampling

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Remedial Action
Task Name:	07 Excavation Backfilling
Description:	Excavation Backfilling
Approach:	Ex Situ
Start Date:	April, 2033
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation Backfill and Compaction - Replaceable	True	100	0
Excavation Backfill and Compaction - Supplemental	True	100	0

Total Marked-up Cost: $3,321,038.60

Technologies:

Technology: Excavation Backfill and Compaction - Replaceable

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030282	Hauling, soil, 12 C.Y. truck, 1 mile haul, includes loading	18,330.00	LCY	0.00	0.65	0.48	0.00	$20,645.84	False

Technology: Excavation Backfill and Compaction - Replaceable

17030514	Compaction, of backfill, structural, 6" lifts, self propelled roller	18,330.00	ECY	0.00	0.86	0.61	0.00	$27,061.11	False
17030520	Backfill, bulk, 6" to 12" lifts, dozer backfilling	18,330.00	ECY	0.00	1.20	1.50	0.00	$49,547.06	False
33021103	Soil testing, Atterberg limits, liquid and plastic limits	2.00	EA	0.00	0.00	0.00	63.00	$126.00	False
33021104	Soil testing, Sieve analysis, washed, ASTM D 422	2.00	EA	0.00	0.00	0.00	49.50	$99.00	False
33021107	Soil testing, soil density, nuclear method, ASTM D2922	36.00	EA	0.00	0.00	0.00	39.60	$1,425.60	False
33021114	Soil testing, Proctor compaction, 4" standard mold, ASTM D 698	2.00	EA	0.00	0.00	0.00	110.70	$221.40	False
33220212	Surveying - 2-man Crew	4.00	DAY	0.00	955.04	12.10	0.00	$3,868.55	False
95010204	4000 Gallon Water Truck	160.00	HR	0.00	72.94	27.70	0.00	$16,102.72	False

Total Element Cost: $119,097.29

Total 1st Year Tech Cost: $119,097.29

Technology: Excavation Backfill and Compaction - Supplemental

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030280	Borrow, General & Subgrade Load & Haul 15 Miles, No Spreading	75,549.00	CY	10.12	7.05	4.52	0.00	$1,638,608.01	False

Technology: Excavation Backfill and Compaction - Supplemental

17030514	Compaction, of backfill, structural, 6" lifts, self propelled roller	75,549.00	ECY	0.00	0.86	0.61	0.00	$111,535.20	False
17030520	Backfill, bulk, 6" to 12" lifts, dozer backfilling	75,549.00	ECY	0.00	1.20	1.50	0.00	$204,213.37	False
33021103	Soil testing, Atterberg limits, liquid and plastic limits	4.00	EA	0.00	0.00	0.00	63.00	$252.00	False
33021104	Soil testing, Sieve analysis, washed, ASTM D 422	4.00	EA	0.00	0.00	0.00	49.50	$198.00	False
33021107	Soil testing, soil density, nuclear method, ASTM D2922	150.00	EA	0.00	0.00	0.00	39.60	$5,940.00	False
33021114	Soil testing, Proctor compaction, 4" standard mold, ASTM D 698	4.00	EA	0.00	0.00	0.00	110.70	$442.80	False
33220212	Surveying - 2-man Crew	35.00	DAY	0.00	955.04	12.10	0.00	$33,849.83	False
95010204	4000 Gallon Water Truck	1,120.00	HR	0.00	72.94	27.70	0.00	$112,719.04	False

Total Element Cost:	$2,107,758.25
Total 1st Year Tech Cost:	$2,107,758.25
Total Phase Element Cost	$2,226,855.54

Task Documentation:

Task Type: Remedial Action
Task Name: 08 D&D MWL Excavation Sprung
Description: D&D MWL Excavation Sprung

Approach: In Situ
Start Date: January, 2034
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition - 400 X 650 Tent Structure - Means	True	100	0

Total Marked-up Cost: $419,663.57

Technologies:

Technology: Demolition - 400 X 650 Tent Structure - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010309	Demolition 400 X 650 Tension structure	260,000.00	SF	0.00	0.84	0.24	0.00	$281,180.49	False

Total Element Cost:	$281,180.49
Total 1st Year Tech Cost:	$281,180.49
Total Phase Element Cost	$281,180.49

Task Documentation:

Task Type:	Remedial Action
Task Name:	09 Excavation ET Cover Construction
Description:	Excavation ET Cover Construction
Approach:	Ex Situ
Start Date:	March, 2034
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Capping	True	100	0
Fencing	True	100	0

Total Marked-up Cost: $792,760.31

Technologies:

Technology: Capping

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030422	General & Subgrade fill, 6" Lifts, On-Site, Includes Spreading and	10,010.00	CY	0.00	2.99	2.28	0.00	$52,701.65	True

Technology: Capping

	Compaction								
18050203	Rock Cover, Riprap, Medium (10 to 200 Lb Pieces), includes labor & equipment for placement	6,800.00	CY	0.00	7.89	3.46	0.00	$77,178.64	True
18050302	Topsoil, 6" Lifts, On-Site	7,020.00	CY	0.00	2.74	2.18	0.00	$34,537.73	False
18050711	Sprinkler System, Above Ground Piping and Sprinkler Heads, Manually Operated	5.00	ACR	3,827.63	12,462.36	57.83	0.00	$81,739.11	False
33021103	Soil testing, Atterberg limits, liquid and plastic limits	6.00	EA	0.00	0.00	0.00	63.00	$378.00	False
33021104	Soil testing, Sieve analysis, washed, ASTM D 422	6.00	EA	0.00	0.00	0.00	49.50	$297.00	False
33021107	Soil testing, soil density, nuclear method, ASTM D2922	86.00	EA	0.00	0.00	0.00	39.60	$3,405.60	False
33021114	Soil testing, Proctor compaction, 4" standard mold, ASTM D 698	6.00	EA	0.00	0.00	0.00	110.70	$664.20	False
33080506	Native Soil, 6" Lifts, On-Site	25,870.00	CY	0.00	3.80	2.89	0.00	$173,036.67	True
33111045	Seeding, Seasonal Grass Mixture, Per Acre	4.98	ACR	431.62	422.45	197.83	0.00	$5,238.45	False
33220212	Surveying - 2-man Crew	38.00	DAY	0.00	955.04	12.10	0.00	$36,751.25	False
95010204	4000 Gallon Water Truck	600.00	HR	0.00	72.94	27.70	0.00	$60,387.54	False

Total Element Cost: $526,315.83

Total 1st Year Tech Cost: $526,315.83

Technology: Fencing

Technology: Fencing

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18040111	Galvanized Barbed Wire, 3-Strand	1,970.00	LF	0.24	1.37	0.28	0.00	$3,728.93	False
18040212	Fence, chain link, gates & posts, end posts, chain link fence, galvanized steel, (1/3 post length in ground), 3" OD, 8', set in concrete, includes excavation	6.00	EA	63.45	34.01	4.92	0.00	$614.32	False
18040501	Hazardous Waste Signing	10.00	EA	110.70	28.67	4.15	0.00	$1,435.18	False

Total Element Cost:	$5,778.43
Total 1st Year Tech Cost:	$5,778.43
Total Phase Element Cost	$532,094.27

Task Documentation:

Task Type:	Remedial Action
Task Name:	10 SNL Professional Labor Management
Description:	Professional Labor Management
Approach:	Ex Situ
Start Date:	September, 2027
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Professional Labor Management	True	100	0

Total Marked-up Cost: $50,295,969.74

Technologies:

Technology: Professional Labor Management

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	17,680,262.70	0.00	0.00	$17,680,262.70	False

Total Element Cost:	$17,680,262.70
Total 1st Year Tech Cost:	$17,680,262.70
Total Phase Element Cost	$17,680,262.70

Task Documentation:

Task Type: Remedial Action
Task Name: 11 Contractor Labor Management
Description: Contractor Labor Management

Approach: Ex Situ
Start Date: September, 2027
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Professional Labor Management	True	100	0

Total Marked-up Cost: $105,706,154.86

Technologies:

Technology: Professional Labor Management

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager	7,048.00	HR	0.00	99.66	0.00	0.00	$702,403.68	True
33220102	Project Manager	14,096.	HR	0.00	91.65	0.00	0.00	$1,291,898.40	True

Technology: Professional Labor Management

		00							
33220104	Senior Staff Engineer	28,192.00	HR	0.00	98.77	0.00	0.00	$2,784,510.01	False
33220106	Staff Engineer	28,192.00	HR	0.00	83.34	0.00	0.00	$2,349,459.33	False
33220110	QA/QC Officer	14,096.00	HR	0.00	65.35	0.00	0.00	$921,156.39	False
33220111	Certified Industrial Hygienist	14,096.00	HR	0.00	86.30	0.00	0.00	$1,216,501.96	False
33220112	Field Technician	281,920.00	HR	0.00	42.25	0.00	0.00	$11,909,744.46	False
33220119	Health and Safety Officer	14,096.00	HR	0.00	69.10	0.00	0.00	$974,067.95	False
33220150	Laboratory Manager	14,136.00	HR	0.00	91.65	0.00	0.00	$1,295,564.40	False
33220151	Data/Document Control Manager	14,136.00	HR	0.00	63.30	0.00	0.00	$894,757.08	False
33220152	Laboratory QA/QC	14,136.00	HR	0.00	65.35	0.00	0.00	$923,770.36	False
33220153	QA/QC Technician	13,216.00	HR	0.00	83.34	0.00	0.00	$1,101,392.43	False
33220154	Chemical Analyst	54,704.00	HR	0.00	83.34	0.00	0.00	$4,558,911.28	False
33220155	Radiological Assessment Analyst	27,352.00	HR	0.00	83.34	0.00	0.00	$2,279,515.68	False
33220156	Laboratory Support Personnel	27,352.00	HR	0.00	83.34	0.00	0.00	$2,279,515.68	False
33220157	HazCat Laboratory Technician	39,648.00	HR	0.00	42.25	0.00	0.00	$1,675,128.00	False

Total Element Cost:	$37,158,297.10
Total 1st Year Tech Cost:	$37,158,297.10
Total Phase Element Cost	$37,158,297.10

Task Documentation:

Task Type:	Remedial Action
Task Name:	12 Administration Facilities
Description:	Administrative Facilities
Approach:	Ex Situ
Start Date:	September, 2027
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administration Facilities	True	100	0

Total Marked-up Cost: $415,009.20

Technologies:

Technology: Administration Facilities

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010502	Administrative Trailer	82.00	MO	0.00	0.00	448.20	0.00	$36,752.40	False
95010503	Co-ed Shower Trailer	82.00	MO	0.00	0.00	448.20	0.00	$36,752.40	False

Technology: Administration Facilities

95010504	Office Trailer (3 Ea.)	246.00	MO	0.00	0.00	448.20	0.00	$110,257.20	False
95010505	10 X 25 Connex Storage Box (10 Ea.)	820.00	MO	0.00	0.00	115.00	0.00	$94,300.00	False

Total Element Cost:	$278,062.00
Total 1st Year Tech Cost:	$278,062.00
Total Phase Element Cost	$278,062.00

Phase 4 Closure

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Onsite & Offsite Laboratories	$1,369,477							$286,732	$1,656,210
(System Defaults)		$0	$0	$12,079	$110,525	$0	$164,129		
02 D&D Sprungs & Warehouses	$12,028,573							$3,052,458	$15,081,031
(System Defaults)		$0	$0	$551,533	$1,006,408	$0	$1,494,517		
03 Operational Area - Pre-Scraping Characterization	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
04 Operational Area - Scrape/Load/Disposal	$3,186,062							$892,158	$4,078,221
(System Defaults)		$0	$0	$215,857	$272,154	$0	$404,148		
05 Operational Area - Verification	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
06 Demobilize Administration & Onsite Laboratory Trailers	$248,808							$122,539	$371,347
(System Defaults)		$0	$0	$60,958	$24,781	$0	$36,800		
07 SNL Professional Labor Management	$3,263,579							$6,020,496	$9,284,075
(System Defaults)		$0	$0	$4,480,894	$619,558	$0	$920,043		
08 Contractor Labor Management	$7,163,254							$13,214,430	$20,377,684
(System Defaults)		$0	$0	$9,835,148	$1,359,872	$0	$2,019,410		

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
09 Administration Facilities	$74,602							$36,742	$111,344
(System Defaults)		$0	$0	$18,277	$7,430	$0	$11,034		
Total Phase Cost	$27,334,356	$0	$0	$15,174,746	$3,400,728	$0	$5,050,081	$23,625,555	$50,959,912

Total Phase Cost	$50,959,912

	Direct Cost	Markups	Total
Total Phase Cost	$27,334,356	$23,625,555	$50,959,912

Task Documentation:

Task Type: Site Closeout
Task Name: 01 Onsite & Offsite Laboratories
Description: Onsite & Offsite Laboratories

Approach: Ex Situ
Start Date: June, 2034
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Offsite Laboratory Analysis	True	100	0
Onsite Laboratory Facilities	True	100	0

Total Marked-up Cost: $1,656,209.74

Technologies:

Technology: Offsite Laboratory Analysis

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33020216	Testing, rad analytical, data packaging, alpha spectroscopy	1,043.00	EA	0.00	0.00	0.00	110.70	$115,460.10	False

Technology: Offsite Laboratory Analysis

33021602	Testing, pH, electrometric (9045)	22.00	EA	0.00	0.00	0.00	16.40	$360.80	False
33021603	Testing, dissolved solids	22.00	EA	0.00	0.00	0.00	17.10	$376.20	False
33021604	Testing, suspended solids	22.00	EA	0.00	0.00	0.00	17.10	$376.20	False
33021613	Testing, oil and grease EPA 413.2	22.00	EA	0.00	0.00	0.00	53.10	$1,168.20	False
33021614	Testing, total petroleum hydrocarbons (TPH)	22.00	EA	0.00	0.00	0.00	71.67	$1,576.74	False
33021631	Testing, chlorinated hydrocarbons (612, 8120)	22.00	EA	0.00	0.00	0.00	135.00	$2,970.00	False
33021653	Testing, chloride	22.00	EA	0.00	0.00	0.00	22.50	$495.00	False
33021656	Testing, flouride, no distillation	22.00	EA	0.00	0.00	0.00	19.12	$420.75	False
33021670	Metals Screen, 25 Metals Listed In Method EPA 200.7, Water Analysis	22.00	EA	0.00	0.00	0.00	450.00	$9,900.00	False
33021673	Testing, total organic carbons	22.00	EA	0.00	0.00	0.00	47.25	$1,039.50	False
33021712	Testing, mercury EPA 7470	1,043.00	EA	0.00	0.00	0.00	30.00	$31,286.87	False
33021717	Pesticides/PCBs (SW 3550B/SW 8081/8082), Soil Analysis	1,043.00	EA	0.00	0.00	0.00	103.50	$107,950.50	False
33021720	Testing, purgeable organics (624, 8260)	1,043.00	EA	0.00	0.00	0.00	144.00	$150,192.00	False
33021724	Testing, phenols (9066) total recoverable	22.00	EA	0.00	0.00	0.00	37.50	$825.00	False
33021739	Testing, semi-volatile organics, pkd. column (8250)	1,043.00	EA	0.00	0.00	0.00	266.94	$278,418.41	False
33021762	Testing, soil & sediment analysis, chromium hexavalent 7195/7196/7197/7199	1,043.00	EA	0.00	0.00	0.00	56.70	$59,138.10	False
33021793	Testing, soil & sediment analysis, Total and Extractable Metals in	1,043.00	EA	0.00	0.00	0.00	292.50	$305,077.50	False

Technology: Offsite Laboratory Analysis

	Soils (EPA 3050)								
33022128	Testing, chromium, hexavalent (SW7195) with prep	22.00	EA	0.00	0.00	0.00	39.60	$871.20	False
33022133	Testing, pesticides/PCBs (SW3510/SW8080)	22.00	EA	0.00	0.00	0.00	103.50	$2,277.00	False
33022139	Testing, BTEX/MTBE (mod EPA 602)	22.00	EA	0.00	0.00	0.00	57.96	$1,275.12	False
33022257	Testing, rad analytical liquid, gas flow proportional counting, gross beta-total	22.00	EA	0.00	0.00	0.00	35.67	$784.67	False
33022271	Testing, rad analytical liquid, gamma spectroscopy, gamma isotopic (cesium, 137 20 PCI/I)	22.00	EA	0.00	0.00	0.00	76.81	$1,689.73	False
33022284	Testing, rad analytical, liquid scintillation, tritium (direct counting)	22.00	EA	0.00	0.00	0.00	65.09	$1,431.94	False
33022287	Testing, rad analytical liquid, gross alpha, total gas flow prop. counting	22.00	EA	0.00	0.00	0.00	46.55	$1,024.06	False
33022336	Testing, rad analytical vegetation/sediment/soil, gas flow proportional counting, gross beta-total	1,043.00	EA	0.00	0.00	0.00	48.35	$50,426.96	False
33022342	Testing, rad analytical vegetation/sediment/soil, gamma spectroscopy, gamma isotopic	1,043.00	EA	0.00	0.00	0.00	87.76	$91,532.63	False
33022351	Testing, rad analytical vegetation/sediment/soil, liquid scintillation, tritium	1,043.00	EA	0.00	0.00	0.00	56.03	$58,443.46	False
33022352	Testing, rad analytical vegetation/sediment/soil, gross alpha, total gas flow proportional	1,043.00	EA	0.00	0.00	0.00	41.60	$43,386.71	False

Technology: Offsite Laboratory Analysis

counting

Total Element Cost:	$1,320,175.35
Total 1st Year Tech Cost:	$1,320,175.35

Technology: Onsite Laboratory Facilities

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010508	Laboratory Trailer (5 Ea.)	110.00	MO	0.00	0.00	448.20	0.00	$49,302.00	False

Total Element Cost:	$49,302.00
Total 1st Year Tech Cost:	$49,302.00
Total Phase Element Cost	$1,369,477.35

Task Documentation:

Task Type:	Site Closeout
Task Name:	02 D&D Sprungs & Warehouses
Description:	D&D Sprungs & Warehouses
Approach:	Ex Situ
Start Date:	June, 2034
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition - 300 X 500 Tent Structures (3) - Means	True	100	0
Demolition - 350 X 550 Tent Structure - Means	True	100	0
Demolition - 200 X 550 Tent Structure - Means	True	100	0
Transportation and Disposal Tent Structure Fabric	True	100	0
Demolition 200 X 200 Warehouse	True	100	0
Demolition 200 X 200 Container Storage Canopy	True	100	0
Demolition 250 X 250 Shipping Center	True	100	0
Transportation & Disposal 200 X 200 Warehouse	True	100	0
Transportation & Disposal 200 X 200 Canopy	True	100	0
Transportation & Disposal 250X250 Shipping Center	True	100	0

Total Marked-up Cost: $15,081,031.26

Technologies:

Technology: Demolition - 300 X 500 Tent Structures (3) - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010307	Demolition 300 X 500 Tension structure	450,000.00	SF	0.00	1.09	0.27	0.00	$609,914.63	False

Total Element Cost:	$609,914.63
Total 1st Year Tech Cost:	$609,914.63

Technology: Demolition - 350 X 550 Tent Structure - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010308	Demolition 350 X 550 Tension structure	192,500.00	SF	0.00	0.95	0.25	0.00	$231,234.76	False

Total Element Cost:	$231,234.76
Total 1st Year Tech Cost:	$231,234.76

Technology: Demolition - 200 X 550 Tent Structure - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010306	Demolition 200 X 550 Tension structure	110,000.00	SF	0.00	1.18	0.29	0.00	$162,021.95	False

Total Element Cost:	$162,021.95
Total 1st Year Tech Cost:	$162,021.95

Technology: Transportation and Disposal Tent Structure Fabric

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	41.00	EA	26.96	0.00	0.00	0.00	$1,105.52	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	41.00	EA	0.00	101.55	22.43	0.00	$5,083.32	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	33,825.00	MI	0.00	0.00	0.00	3.60	$121,770.00	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	730.00	BCY	0.90	1.27	0.39	0.00	$1,867.32	False

Technology: Transportation and Disposal Tent Structure Fabric

33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $129,871.16

Total 1st Year Tech Cost: $129,871.16

Technology: Demolition 200 X 200 Warehouse

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17020105	Single-level, Steel, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	960,000.00	CF	0.00	0.13	0.06	0.00	$188,596.44	False
17030226	988, 7.0 CY, Wheel Loader	64.00	HR	0.00	72.94	96.71	0.00	$10,857.92	False
17030295	35 Ton, 769, Off-highway Truck	127.00	HR	0.00	63.80	106.84	0.00	$21,671.83	False

Total Element Cost: $221,126.20

Total 1st Year Tech Cost: $221,126.20

Technology: Demolition 200 X 200 Container Storage Canopy

Element:

Unit of Material Labor Unit Equipment Sub Bid Cost

Technology: Demolition 200 X 200 Container Storage Canopy

Assembly	Description	Quantity	Measure	Unit Cost	Cost	Unit Cost	Cost	Extended Cost	Override
17020105	Single-level, Steel, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	120,000.00	CF	0.00	0.13	0.06	0.00	$23,574.56	False
17030226	988, 7.0 CY, Wheel Loader	16.00	HR	0.00	72.94	96.71	0.00	$2,714.48	False
17030295	35 Ton, 769, Off-highway Truck	40.00	HR	0.00	63.80	106.84	0.00	$6,825.77	False

Total Element Cost: $33,114.81

Total 1st Year Tech Cost: $33,114.81

Technology: Demolition 250 X 250 Shipping Center

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17020105	Single-level, Steel, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	1,500,000.00	CF	0.00	0.13	0.06	0.00	$294,681.94	False
17030226	988, 7.0 CY, Wheel Loader	99.00	HR	0.00	72.94	96.71	0.00	$16,795.85	False
17030295	35 Ton, 769, Off-highway Truck	198.00	HR	0.00	63.80	106.84	0.00	$33,787.58	False

Total Element Cost: $345,265.37

Total 1st Year Tech Cost: $345,265.37

Technology: Transportation & Disposal 200 X 200 Warehouse

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	1,975.00	EA	26.96	0.00	0.00	0.00	$53,253.90	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	1,975.00	EA	0.00	101.55	22.43	0.00	$244,867.27	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	1,629, 375.00	MI	0.00	0.00	0.00	3.60	$5,865,749.84	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	35,556. 00	BCY	0.90	1.27	0.39	0.00	$90,951.14	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $6,254,867.15

Total 1st Year Tech Cost: $6,254,867.15

Technology: Transportation & Disposal 200 X 200 Canopy

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Transportation & Disposal 200 X 200 Canopy

33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	247.00	EA	26.96	0.00	0.00	0.00	$6,660.11	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	247.00	EA	0.00	101.55	22.43	0.00	$30,623.91	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	203,775.00	MI	0.00	0.00	0.00	3.60	$733,589.98	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	4,444.00	BCY	0.90	1.27	0.39	0.00	$11,367.61	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $782,286.61

Total 1st Year Tech Cost: $782,286.61

Technology: Transportation & Disposal 250X250 Shipping Center

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	1,029.00	EA	26.96	0.00	0.00	0.00	$27,745.96	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in	1,029.00	EA	0.00	101.55	22.43	0.00	$127,578.95	False

Technology: Transportation & Disposal 250X250 Shipping Center

	Disposal Pit/Landfill								
33170924	Transport LLW Roll-Off Containers (1 per truck)	848,925.00	MI	0.00	0.00	0.00	3.60	$3,056,129.92	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	18,519.00	BCY	0.90	1.27	0.39	0.00	$47,371.03	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost:	$3,258,870.85
Total 1st Year Tech Cost:	$3,258,870.85
Total Phase Element Cost	$12,028,573.49

Task Documentation:

Task Type:	Site Closeout
Task Name:	03 Operational Area - Pre-Scraping Characterization
Description:	Operational Area - Pre-Scraping Characterization
Approach:	Ex Situ
Start Date:	October, 2034
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Soil Sampling	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Soil Sampling

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Site Closeout
Task Name:	04 Operational Area - Scrape/Load/Disposal
Description:	Operational Area - Scrape/Load/Disposal
Approach:	Ex Situ
Start Date:	January, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation (Scraping & Loading)	True	100	0
Off-site Transportation and Waste Disposal	True	100	0

Total Marked-up Cost: $4,078,220.57

Technologies:

Technology: Excavation (Scraping & Loading)

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030223	950, 3.0 CY, Wheel Loader	1,600.00	HR	0.00	72.94	55.27	0.00	$205,134.30	False

Technology: Excavation (Scraping & Loading)

33010108	Pickup Truck(s), Rental	1,000.00	DAY	0.00	0.00	0.00	47.77	$47,770.00	False
33040644	Truck, Intermodal Transport, On-site - Rental/Lease	200.00	DAY	0.00	0.00	285.55	0.00	$57,110.40	False
95010201	Motor Grader, 40,000 Lb.	1,600.00	HR	0.00	72.94	54.00	0.00	$203,103.99	False
95010204	4000 Gallon Water Truck	1,600.00	HR	0.00	72.94	27.70	0.00	$161,027.20	False

Total Element Cost: $674,145.89

Total 1st Year Tech Cost: $674,145.89

Technology: Off-site Transportation and Waste Disposal

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	760.00	EA	26.96	0.00	0.00	0.00	$20,492.64	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	760.00	EA	0.00	198.27	37.39	0.00	$179,096.93	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	627,000.00	MI	0.00	0.00	0.00	3.60	$2,257,199.94	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	13,679.00	BCY	0.90	2.48	0.65	0.00	$55,082.03	False
33190317	Waste Stream Evaluation Fee,	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Technology: Off-site Transportation and Waste Disposal

Not Including 50% Rebate on 1st Shipment

Total Element Cost:	$2,511,916.54
Total 1st Year Tech Cost:	$2,511,916.54
Total Phase Element Cost	$3,186,062.43

Task Documentation:

Task Type:	Site Closeout
Task Name:	05 Operational Area - Verification
Description:	Operational Area - Verification
Approach:	Ex Situ
Start Date:	October, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Soil Sampling	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Soil Sampling

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Site Closeout
Task Name:	06 Demobilize Administration & Onsite Laboratory Trailers
Description:	Demobilize Administration & Onsite Laboratory Trailers
Approach:	Ex Situ
Start Date:	January, 2036
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administration Facilities	True	100	0
Revegetation	True	100	0

Total Marked-up Cost: $371,346.78

Technologies:

Technology: Administration Facilities

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010515	Mob./Demob. AdministrativeTrailer	1.00	LS	0.00	0.00	431.00	0.00	$431.00	False

Technology: Administration Facilities

95010516	Mob./Demob. Office Trailer	3.00	LS	0.00	0.00	431.00	0.00	$1,293.00	False
95010517	Mob./Demob. Laboratory Trailer	5.00	LS	0.00	0.00	431.00	0.00	$2,155.00	False
95010518	Mob./Demob. Shower Trailer	1.00	LS	0.00	0.00	431.00	0.00	$431.00	False
95010519	Mob./Demob Connex Storage Boxes	10.00	EA	0.00	0.00	431.00	0.00	$4,310.00	False

Total Element Cost: $8,620.00

Total 1st Year Tech Cost: $8,620.00

Technology: Revegetation

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18050402	Seeding, Vegetative Cover	60.00	ACR	3,285.52	498.52	219.08	0.00	$240,187.56	False

Total Element Cost: $240,187.56

Total 1st Year Tech Cost: $240,187.56

Total Phase Element Cost $248,807.56

Task Documentation:

Task Type: Site Closeout
Task Name: 07 SNL Professional Labor Management
Description: Professional Labor Management

Approach: Ex Situ
Start Date: June, 2034
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Site Close-Out Documentation	True	100	0

Total Marked-up Cost: $9,284,075.11

Technologies:

Technology: Site Close-Out Documentation

Element: Documents

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	3,263,579.32	0.00	0.00	$3,263,579.32	False

Total Element Cost:	$3,263,579.32
Total 1st Year Tech Cost:	$3,263,579.32
Total Phase Element Cost	$3,263,579.32

Task Documentation:

Task Type: Site Closeout
Task Name: 08 Contractor Labor Management
Description: Contractor Labor Management

Approach: Ex Situ
Start Date: June, 2034
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Site Close-Out Documentation	True	100	0

Total Marked-up Cost: $20,377,684.25

Technologies:

Technology: Site Close-Out Documentation

Element: Meetings

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager	1,928.00	HR	0.00	99.66	0.00	0.00	$192,141.65	False
33220102	Project Manager	3,856.00	HR	0.00	91.65	0.00	0.00	$353,402.40	True

Technology: Site Close-Out Documentation

33220104	Senior Staff Engineer	7,712.00	HR	0.00	98.77	0.00	0.00	$761,710.46	False
33220106	Staff Engineer	7,712.00	HR	0.00	83.34	0.00	0.00	$642,701.13	False
33220110	QA/QC Officer	3,856.00	HR	0.00	65.35	0.00	0.00	$251,984.89	False
33220111	Certified Industrial Hygienist	3,856.00	HR	0.00	86.30	0.00	0.00	$332,777.49	False
33220112	Field Technician	66,560.00	HR	0.00	42.25	0.00	0.00	$2,811,835.24	False
33220119	Health and Safety Officer	3,856.00	HR	0.00	69.10	0.00	0.00	$266,459.00	False
33220150	Laboratory Manager	2,800.00	HR	0.00	91.65	0.00	0.00	$256,619.99	False
33220151	Data/Document Control Manager	2,800.00	HR	0.00	63.30	0.00	0.00	$177,240.00	False
33220152	Laboratory QA/QC	2,800.00	HR	0.00	65.35	0.00	0.00	$182,980.00	False
33220153	QA/QC Technician	0.00	HR	0.00	83.34	0.00	0.00	$0.00	False
33220154	Chemical Analyst	5,600.00	HR	0.00	83.34	0.00	0.00	$466,703.99	False
33220155	Radiological Assessment Analyst	2,800.00	HR	0.00	83.34	0.00	0.00	$233,351.99	False
33220156	Laboratory Support Personnel	2,800.00	HR	0.00	83.34	0.00	0.00	$233,345.85	False
33220157	HazCat Laboratory Technician	0.00	HR	0.00	42.25	0.00	0.00	$0.00	False

Total Element Cost:	$7,163,254.09
Total 1st Year Tech Cost:	$7,163,254.09
Total Phase Element Cost	$7,163,254.09

Task Documentation:

Task Type: Site Closeout
Task Name: 09 Administration Facilities
Description: Administration Facilities

Approach: Ex Situ
Start Date: June, 2034
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administration Facilities	True	100	0

Total Marked-up Cost: $111,343.93

Technologies:

Technology: Administration Facilities

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010502	Administrative Trailer	22.00	MO	0.00	0.00	448.20	0.00	$9,860.40	False
95010503	Co-ed Shower Trailer	22.00	MO	0.00	0.00	448.20	0.00	$9,860.40	False

Technology: Administration Facilities

95010504	Office Trailer (3 Ea.)	66.00	MO	0.00	0.00	448.20	0.00	$29,581.20	False
95010505	10 X 25 Connex Storage Box (10 Ea.)	220.00	MO	0.00	0.00	115.00	0.00	$25,300.00	False

Total Element Cost:	$74,602.00
Total 1st Year Tech Cost:	$74,602.00
Total Phase Element Cost	$74,602.00

Phase 5 Closure Reporting - TSCA & RCRA

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Compile Data & Prepare Reports	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
02 Regulatory Review & Approval	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
03 SNL Professional Labor Management	$924,044							$1,704,633	$2,628,677
(System Defaults)		$0	$0	$1,268,713	$175,421	$0	$260,500		
04 Contractor Labor Management	$1,232,053							$2,272,833	$3,504,886
(System Defaults)		$0	$0	$1,691,609	$233,893	$0	$347,331		
Total Phase Cost	$2,156,097	$0	$0	$2,960,322	$409,314	$0	$607,831	$3,977,466	$6,133,563

Total Phase Cost $6,133,563

	Direct Cost	Markups	Total
Total Phase Cost	$2,156,097	$3,977,466	$6,133,563

Task Documentation:

Task Type: Site Closeout
Task Name: 01 Compile Data & Prepare Reports
Description: Compile Data & Prepare Reports

Approach: Ex Situ
Start Date: March, 2033
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
No Cost	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: No Cost

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type: Site Closeout
Task Name: 02 Regulatory Review & Approval
Description: Regulatory Review & Approval

Approach: Ex Situ
Start Date: May, 2036
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
No Cost	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: No Cost

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Site Closeout
Task Name:	03 SNL Professional Labor Management
Description:	Professional Labor Management
Approach:	Ex Situ
Start Date:	March, 2033
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Site Close-Out Documentation	True	100	0

Total Marked-up Cost: $2,628,677.46

Technologies:

Technology: Site Close-Out Documentation

Element: Documents

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	924,044.38	0.00	0.00	$924,044.38	False

Total Element Cost:	$924,044.38
Total 1st Year Tech Cost:	$924,044.38
Total Phase Element Cost	$924,044.38

Task Documentation:

Task Type:	Site Closeout
Task Name:	04 Contractor Labor Management
Description:	Professional Labor Management
Approach:	Ex Situ
Start Date:	March, 2033
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Site Close-Out Documentation	True	100	0

Total Marked-up Cost: $3,504,885.63

Technologies:

Technology: Site Close-Out Documentation

Element: Documents

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager	848.00	HR	0.00	99.66	0.00	0.00	$84,510.44	False
33220102	Project Manager	1,696.00	HR	0.00	91.65	0.00	0.00	$155,438.40	True

Technology: Site Close-Out Documentation

33220104	Senior Staff Engineer	3,392.00	HR	0.00	98.77	0.00	0.00	$335,026.18	False
33220106	Staff Engineer	3,392.00	HR	0.00	83.34	0.00	0.00	$282,681.83	False
33220110	QA/QC Officer	1,696.00	HR	0.00	65.35	0.00	0.00	$110,831.53	False
33220111	Certified Industrial Hygienist	1,696.00	HR	0.00	86.30	0.00	0.00	$146,366.86	False
33220112	Field Technician	0.00	HR	0.00	42.25	0.00	0.00	$0.00	False
33220119	Health and Safety Officer	1,696.00	HR	0.00	69.10	0.00	0.00	$117,197.73	False

Total Element Cost:	$1,232,052.97
Total 1st Year Tech Cost:	$1,232,052.97
Total Phase Element Cost	$1,232,052.97

Phase 6 Long-Term Monitoring & Maintenance

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Install Groundwater and Soil-Gas Monitoring Networks	$878,000							$261,782	$1,139,782
(System Defaults)		$0	$0	$72,769	$76,062	$0	$112,951		
02 Monitoring Well Install Report	$33,000							$60,877	$93,877
(System Defaults)		$0	$0	$45,309	$6,265	$0	$9,303		
03 Install Report Regulatory Review & Approval	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
04 Monitoring, Inspection, Maintenance & Reporting	$5,340,000							$7,152,599	$12,492,599
(System Defaults)		$0	$0	$5,080,920	$833,674	$0	$1,238,005		
Total Phase Cost	$6,251,000	$0	$0	$5,198,998	$916,000	$0	$1,360,260	$7,475,257	$13,726,257

Total Phase Cost $13,726,257

	Direct Cost	Markups	Total
Total Phase Cost	$6,251,000	$7,475,257	$13,726,257

Task Documentation:

Task Type: Long Term Monitoring
Task Name: 01 Install Groundwater and Soil-Gas Monitoring Networks
Description: Install Groundwater and Soil-Gas Monitoring Networks

Approach: Ex Situ
Start Date: June, 2034
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Labor/Equipment/Materials	True	100	0

Total Marked-up Cost: $1,139,781.87

Technologies:

Technology: Labor/Equipment/Materials

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	53,000.00	0.00	0.00	$53,000.00	False
95014001	Materials/Equipment	1.00	LS	0.00	0.00	0.00	825,000.00	$825,000.00	False

Total Element Cost:	$878,000.00
Total 1st Year Tech Cost:	$878,000.00
Total Phase Element Cost	$878,000.00

Task Documentation:

Task Type:	Long Term Monitoring
Task Name:	02 Monitoring Well Install Report
Description:	Monitoring Well Install Report
Approach:	Ex Situ
Start Date:	October, 2034
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Labor Costs	True	100	0

Total Marked-up Cost: $93,876.83

Technologies:

Technology: Labor Costs

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	33,000.00	0.00	0.00	$33,000.00	False
95014001	Materials/Equipment	1.00	LS	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$33,000.00
Total 1st Year Tech Cost:	$33,000.00
Total Phase Element Cost	$33,000.00

Task Documentation:

Task Type:	Long Term Monitoring
Task Name:	03 Install Report Regulatory Review & Approval
Description:	Install Report Regulatory Review & Approval
Approach:	Ex Situ
Start Date:	January, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Labor Costs	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Labor Costs

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	0.00	0.00	0.00	$0.00	False
95014001	Materials/Equment	1.00	LS	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Long Term Monitoring
Task Name:	04 Monitoring, Inspection, Maintenance & Reporting
Description:	Monitoring, Inspection, Maintenance & Reporting
Approach:	Ex Situ
Start Date:	June, 2034
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Labor/Equipment/Materials	True	100	0

Total Marked-up Cost: $12,492,598.66

Technologies:

Technology: Labor/Equipment/Materials

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	3,539,999.92	0.00	0.00	$3,539,999.92	False
95014001	Materials/Equipment	1.00	LS	900,000.00	0.00	0.00	900,000.00	$1,800,000.00	False

Total Element Cost:	$5,339,999.92
Total 1st Year Tech Cost:	$5,339,999.92
Total Phase Element Cost	$5,339,999.92

Onsite Disposal Alternative
Cost Reports

This page intentionally left blank.

Onsite Disposal Alternative
Cost Summary Report

Phase	Direct Cost	Markups	Total Cost
1 Planning & Permitting	$10,307,485	$18,922,088	$29,229,573
2 Support Facility Construction	$61,058,728	$41,189,957	$102,248,685
3 Excavation & Waste Management	$123,256,215	$138,924,248	$262,180,464
4 Closure	$27,334,356	$23,625,555	$50,959,912
5 Closure Reporting - TSCA & RCRA	$2,379,843	$4,390,222	$6,770,065
6 Long-Term Monitoring & Maintenance	$7,967,000	$8,616,331	$16,583,331
Total Project Cost	$232,303,628	$235,668,402	$467,972,030
		***Escalation**	$120,283,572
		Escalated Project Cost	$588,255,602

*Collective escalation factor of 1.252 applied to adjust for start dates of each work phase.

Phase 1 Planning & Permitting

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Procurement of Turn Key Contract	$7,890							$3,886	$11,775
(System Defaults)		$0	$0	$1,933	$786	$0	$1,167		
02 Corrective Measures Implementation Plan (CMIP)	$41,568							$20,472	$62,040
(System Defaults)		$0	$0	$10,184	$4,140	$0	$6,148		
03 TSCA & RCRA Permitting Documents	$10,732							$5,285	$16,017
(System Defaults)		$0	$0	$2,629	$1,069	$0	$1,587		
04 Regulatory Review & Approval	$8,341							$4,108	$12,449
(System Defaults)		$0	$0	$2,044	$831	$0	$1,234		
05 SNL Professional Labor Management	$3,902,066							$7,198,346	$11,100,412
(System Defaults)		$0	$0	$5,357,537	$740,768	$0	$1,100,041		
06 Contractor Labor Management	$6,336,889							$11,689,991	$18,026,880
(System Defaults)		$0	$0	$8,700,548	$1,202,995	$0	$1,786,448		
Total Phase Cost	$10,307,485	$0	$0	$14,074,875	$1,950,589	$0	$2,896,624	$18,922,088	$29,229,573

Total Phase Cost $29,229,573

	Direct Cost	Markups	Total
Total Phase Cost	$10,307,485	$18,922,088	$29,229,573

Task Documentation:

Task Type:	Design
Task Name:	01 Procurement of Turn Key Contract
Description:	Procurement of Turn Key Contract
Approach:	Ex Situ
Start Date:	January, 2020
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $11,775.31

Technologies:

Technology: Remedial Design

Element: Project Planning

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Cost	1.00	LS	7,889.63	0.00	0.00	0.00	$7,889.63	True

Total Element Cost:	$7,889.63
Total 1st Year Tech Cost:	$7,889.63
Total Phase Element Cost	$7,889.63

Task Documentation:

Task Type:	Design
Task Name:	02 Corrective Measures Implementation Plan (CMIP)
Description:	Corrective Measures Implementation Plan (CMIP)
Approach:	Ex Situ
Start Date:	July, 2020
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $62,039.86

Technologies:

Technology: Remedial Design

Element: Project Planning

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Costs	1.00	LS	41,567.58	0.00	0.00	0.00	$41,567.58	True

Total Element Cost:	$41,567.58
Total 1st Year Tech Cost:	$41,567.58
Total Phase Element Cost	$41,567.58

Task Documentation:

Task Type:	Design
Task Name:	03 TSCA & RCRA Permitting Documents
Description:	TSCA & RCRA Permitting Documents
Approach:	Ex Situ
Start Date:	July, 2021
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $16,017.22

Technologies:

Technology: Remedial Design

Element: Project Planning

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Costs	1.00	LS	10,731.76	0.00	0.00	0.00	$10,731.76	True

Total Element Cost:	$10,731.76
Total 1st Year Tech Cost:	$10,731.76
Total Phase Element Cost	$10,731.76

Task Documentation:

Task Type:	Design
Task Name:	04 Regulatory Review & Approval
Description:	Regulatory Review & Approval
Approach:	Ex Situ
Start Date:	July, 2022
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $12,448.79

Technologies:

Technology: Remedial Design

Element: Prefinal Design

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Costs	1.00	LS	8,340.87	0.00	0.00	0.00	$8,340.87	True

Total Element Cost:	$8,340.87

Element: Final Design

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Costs	1.00	LS	0.00	0.00	0.00	0.00	$0.00	True

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$8,340.87
Total Phase Element Cost	$8,340.87

Task Documentation:

Task Type:	Design
Task Name:	05 SNL Professional Labor Management
Description:	Professional Labor Management
Approach:	Ex Situ
Start Date:	January, 2020
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $11,100,412.24

Technologies:

Technology: Remedial Design

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	3,902,066.22	0.00	0.00	$3,902,066.22	False

Total Element Cost:	$3,902,066.22
Total 1st Year Tech Cost:	$3,902,066.22
Total Phase Element Cost	$3,902,066.22

Task Documentation:

Task Type:	Design
Task Name:	06 Contractor Labor Management
Description:	Contractor Labor Management
Approach:	Ex Situ
Start Date:	June, 2020
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Remedial Design	True	100	0

Total Marked-up Cost: $18,026,879.57

Technologies:

Technology: Remedial Design

Element: Project Planning

Assembly Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101 Senior Project Manager	1,565.00	HR	0.00	99.66	0.00	0.00	$155,967.90	True
33220102 Project Manager	3,912.00	HR	0.00	91.65	0.00	0.00	$358,534.80	True

Technology: Remedial Design

33220104	Senior Staff Engineer	15,648.00	HR	0.00	98.77	0.00	0.00	$1,545,552.96	True
33220106	Staff Engineer	23,472.00	HR	0.00	83.34	0.00	0.00	$1,956,156.48	True
33220110	QA/QC Officer	7,824.00	HR	0.00	65.35	0.00	0.00	$511,298.40	True
33220111	Certified Industrial Hygienist	7,824.00	HR	0.00	86.30	0.00	0.00	$675,211.20	True
33220158	Secretarial/ Administrative	15,648.00	HR	0.00	39.02	0.00	0.00	$610,584.96	False
33220159	Draftsman/CADD	15,648.00	HR	0.00	33.46	0.00	0.00	$523,582.08	False

Total Element Cost:	$6,336,888.78
Total 1st Year Tech Cost:	$6,336,888.78
Total Phase Element Cost	$6,336,888.78

Phase 2 Support Facility Construction

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Procurement for Facilities Construction	$41,567							$20,472	$62,039
(System Defaults)		$0	$0	$10,184	$4,140	$0	$6,148		
02 Site Grading & Site Drainage	$1,718,657							$722,959	$2,205,123
(System Defaults)		$0	$0	$357,278	$147,155	$0	$218,526		
03 Utility Installation	$419,800							$206,754	$626,555
(System Defaults)		$0	$0	$102,851	$41,812	$0	$62,091		
04 ET Cover Removal & Staging	$95,246							$46,909	$142,155
(System Defaults)		$0	$0	$23,335	$9,486	$0	$14,087		
05 Construction of Excavation & Waste Mgmt. Tents	$24,976,761							$12,301,205	$37,277,966
(System Defaults)		$0	$0	$6,119,306	$2,487,685	$0	$3,694,213		
06 Construction of Onsite Disposal Cell	$2,747,511							$1,337,862	$4,085,373
(System Defaults)		$0	$0	$660,374	$272,631	$0	$404,857		
07 Construction of Warehouses	$8,921,287							$3,169,621	$12,090,908
(System Defaults)		$0	$0	$1,164,555	$806,867	$0	$1,198,198		
08 Limited Area Gate	$464,727							$113,807	$578,534
(System Defaults)		$0	$0	$17,867	$38,608	$0	$57,332		
09 Procurement for Excavation & Waste Disposal	$0							$0	$0
(System Defaults)									

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
(System Defaults)		$0	$0	$0	$0	$0	$0		
10 Training, Functional Testing & Readiness Review	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
11 SNL Professional Labor Management	$2,770,398							$5,110,698	$7,881,095
(System Defaults)		$0	$0	$3,803,756	$525,932	$0	$781,009		
12 Contractor Labor Management	$7,573,637							$13,971,485	$21,545,121
(System Defaults)		$0	$0	$10,398,603	$1,437,779	$0	$2,135,102		
13 Additional Equipment and Operators	$2,528,644							$1,205,947	$3,734,591
(System Defaults)		$0	$0	$586,631	$249,222	$0	$370,095		
14 Administrative and Onsite Lab Equipment	$9,036,986							$2,982,240	$12,019,225
(System Defaults)		$0	$0	$989,061	$802,084	$0	$1,191,094		
Total Phase Cost	$61,058,728	$0	$0	$24,233,802	$6,823,402	$0	$10,132,753	$41,189,957	$102,248,685

Total Phase Cost $102,248,685

	Direct Cost	Markups	Total
Total Phase Cost	$61,058,728	$41,189,957	$102,248,685

Task Documentation:

Task Type:	Remedial Action
Task Name:	01 Procurement for Facilities Construction
Description:	Procurement for Facilities Construction
Approach:	Ex Situ
Start Date:	January, 2026
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Professional Labor Management	True	100	0

Total Marked-up Cost: $62,039.00

Technologies:

Technology: Professional Labor Management

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33240101	Other Direct Costs	1.00	LS	41,567.00	0.00	0.00	0.00	$41,567.00	True

Total Element Cost:	$41,567.00
Total 1st Year Tech Cost:	$41,567.00
Total Phase Element Cost	$41,567.00

Task Documentation:

Task Type:	Remedial Action
Task Name:	02 Site Grading & Site Drainage
Description:	Site Grading & Site Drainage
Approach:	In Situ
Start Date:	July, 2026
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Clear and Grub	True	100	0
Cut-Fill / Rough Grading	True	100	0
Storm Sewer	True	100	0
Finish Grading	True	100	0
Access Roads	True	100	0
Parking Lots	True	100	0
Construct Administrative Facility Pads	True	100	0
Construct Laboratory Facility Pad	True	100	0
Construct Replaceable Soils Staging Area	True	100	0
Construct MWL ET Cover Material Staging Area	True	100	0
Construct Disposal Cell Excavated Soils Area	True	100	0

Total Marked-up Cost: $2,205,123.14

Technologies:

Technology: Clear and Grub

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17010101	Selective clearing, brush, light clearing, with dozer and brush rake, excludes removal offsite	96.00	ACR	0.00	104.13	82.14	0.00	$17,882.19	False
17010501	Grub and stack, 140 H.P. dozer	5,162.67	CY	0.00	3.25	1.81	0.00	$26,143.24	False
17030226	988, 7.0 CY, Wheel Loader	38.00	HR	0.00	72.94	96.71	0.00	$6,446.89	False
17030296	50 Ton, 773, Off-highway Truck	77.00	HR	0.00	63.80	133.55	0.00	$15,195.94	False

Total Element Cost: $65,668.25

Total 1st Year Tech Cost: $65,668.25

Technology: Cut-Fill / Rough Grading

Element: Pile1

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030279	4 CY, Crawler-mounted, Hydraulic Excavator	4,740.74	CY	0.00	0.87	0.76	0.00	$7,755.40	False
17030312	D10 with U-blade & Single-shank Ripper, Bulldozer	230.00	HR	0.00	72.94	262.27	0.00	$77,099.09	False

Technology: Cut-Fill / Rough Grading

17030523	Compaction, 10 ton, steel wheel tandem roller	98,642.00	ECY	0.00	0.30	0.09	0.00	$38,564.21	False
18050203	Rock Cover, Riprap, Medium (10 to 200 Lb Pieces), includes labor & equipment for placement	1,036.78	CY	33.00	8.77	3.84	0.00	$47,288.46	False
33010118	Mobilize/Demobilize Dozer, Loader, Backhoe or Excavator, 70 H.P. to 150 H.P., up to 50 miles	2.00	LS	0.00	119.39	94.40	0.00	$427.57	False

Total Element Cost: $171,134.73

Element: General Earthwork

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
16019934	Temporary Office 50' X 12'	12.00	MO	412.65	0.00	0.00	0.00	$4,951.80	False
33010102	Sample collection, vehicles, van or pickup rental	360.00	DAY	0.00	0.00	0.00	64.35	$23,166.00	False
33010114	Mobilization Equipment (Soils)	4.00	LS	0.00	1,786.43	1,674.96	0.00	$13,845.58	False
33010115	Demobilize Equipment (Soils)	4.00	LS	0.00	1,786.43	1,674.96	0.00	$13,845.58	False
33010204	Mobilize Crew, 100 Miles, per Person	6.00	EA	0.00	0.00	0.00	120.32	$721.90	False

Total Element Cost: $56,530.86

Total 1st Year Tech Cost: $227,665.59

Technology: Storm Sewer

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030262	Cat 235, 2.5 CY, Soil/Sand, Trenching, Excludes Sheeting, Excludes Dewatering	664.35	BCY	0.00	0.62	0.29	0.00	$605.34	False
17030401	950, 3.25 CY, Backfill with Excavated Material	413.72	CY	0.00	0.78	0.64	0.00	$586.28	False
17030405	950, 3.00 CY, Delivered & Dumped, Backfill with Sand	137.70	CY	80.10	7.55	4.81	0.00	$12,730.63	False
17030511	Compact Soil with Vibrating Plate, 2 Passes	413.72	ECY	0.00	2.29	0.11	0.00	$994.20	False
17030515	Backfill and compact, 6" layers, air rammer/tamper	137.70	ECY	0.00	13.45	1.07	0.00	$1,999.36	False
18020204	27" x 20", 5' Deep Area Drain with Grate	1.00	EA	1,269.00	2,241.81	38.80	0.00	$3,549.60	False
19030108	36" Corrugated Metal Pipe, Bituminous Coated & Paved	504.00	LF	31.95	28.64	3.56	0.00	$32,331.07	False
19039908	36" Corrugated Metal Pipe, Bituminous Coated, End Section, Excludes Excavation, Excludes Backfill	10.00	EA	657.00	245.51	30.48	0.00	$9,329.91	False
20060101	3 - 9 Lb Magnesium Anodes, Cathodic Protection Point	5.00	EA	186.30	1,124.76	31.06	0.00	$6,710.57	False

Total Element Cost:	$68,836.96
Total 1st Year Tech Cost:	$68,836.96

Technology: Finish Grading

Element: Pile1

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030108	Fine Grading, 130G, 2 Passes	206,455.00	SY	0.00	0.56	0.42	0.00	$202,479.33	False
17030312	D10 with U-blade & Single-shank Ripper, Bulldozer	81.00	HR	0.00	72.94	262.27	0.00	$27,152.29	False
17030523	Compaction, 10 ton, steel wheel tandem roller	17,549.00	ECY	0.00	0.30	0.09	0.00	$6,860.80	False

Total Element Cost: $236,492.42

Total 1st Year Tech Cost: $236,492.42

Technology: Access Roads

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030103	Rough Grading, 14G, 1 Pass	51,847.11	SY	0.00	0.24	0.30	0.00	$28,367.34	False
17030108	Fine Grading, 130G, 2 Passes	23,493.22	SY	0.00	0.56	0.42	0.00	$23,041.10	False
17030202	Ditch Excavation, Normal Soil, Haul Spoil 1 Mile	4,050.56	CY	0.00	4.67	3.02	0.00	$31,139.94	False
17030203	Roadway Soil Excavation, with Scraper, Load & Haul Spoil	6,525.90	CY	0.00	3.95	3.58	0.00	$49,142.31	False
17030501	Compaction, subgrade, 18" wide,	8,641.19	ECY	0.00	2.62	0.13	0.00	$23,732.22	False

Technology: Access Roads

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
	8" lifts, walk behind, vibrating plate								
18010102	Gravel, Delivered & Dumped	6,525.90	CY	27.00	6.54	6.14	0.00	$258,973.87	False
19030402	34' Complete, 24" Corrugated Metal Pipe Culvert with Headwalls	3.00	EA	4,138.65	3,400.49	387.20	0.00	$23,779.03	False

Total Element Cost: $438,175.83

Total 1st Year Tech Cost: $438,175.83

Technology: Parking Lots

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030102	Rough Grading, 12G, 1 Pass	4,675.19	SY	0.00	0.24	0.18	0.00	$1,986.93	False
17030107	Fine Grading, 120G, 2 Passes	4,675.19	SY	0.00	0.43	0.18	0.00	$2,878.65	False
17030203	Roadway Soil Excavation, with Scraper, Load & Haul Spoil	948.19	CY	0.00	3.95	3.58	0.00	$7,140.20	False
17030501	Compaction, subgrade, 18" wide, 8" lifts, walk behind, vibrating plate	1,185.23	ECY	0.00	2.62	0.13	0.00	$3,255.12	False
17030510	Dry Roll Gravel, Steel Roller	4,266.84	SY	0.00	0.90	0.29	0.00	$5,103.48	False
17030602	Cement Stabilization, 6%	1,185.23	BCY	11.14	0.71	1.76	0.00	$16,122.73	False
18010102	Gravel, Delivered & Dumped	948.19	CY	27.00	6.54	6.14	0.00	$37,627.98	False

Total Element Cost:	$74,115.10
Total 1st Year Tech Cost:	$74,115.10

Technology: Construct Administrative Facility Pads

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18010101	Cement-stabilized Base, Aggregate Base Course for Roadways and Large Paved Areas, delivered and placed, 15 mile haul	244.00	CY	44.55	12.54	4.77	0.00	$15,093.59	False

Total Element Cost:	$15,093.59
Total 1st Year Tech Cost:	$15,093.59

Technology: Construct Laboratory Facility Pad

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18010101	Cement-stabilized Base, Aggregate Base Course for Roadways and Large Paved Areas, delivered and placed, 15 mile haul	122.00	CY	44.55	12.54	4.77	0.00	$7,546.80	False

Total Element Cost:	$7,546.80
Total 1st Year Tech Cost:	$7,546.80

Technology: Construct Replaceable Soils Staging Area

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18010101	Cement-stabilized Base, Aggregate Base Course for Roadways and Large Paved Areas, delivered and placed, 15 mile haul	2,416.00	CY	44.55	12.54	4.77	0.00	$149,451.29	False

Total Element Cost:	$149,451.29
Total 1st Year Tech Cost:	$149,451.29

Technology: Construct MWL ET Cover Material Staging Area

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18010101	Cement-stabilized Base, Aggregate Base Course for Roadways and Large Paved Areas, delivered and placed, 15 mile haul	3,222.00	CY	44.55	12.54	4.77	0.00	$199,309.63	False

Total Element Cost:	$199,309.63
Total 1st Year Tech Cost:	$199,309.63

Technology: Construct Disposal Cell Excavated Soils Area

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18010101	Cement-stabilized Base, Aggregate Base Course for Roadways and Large Paved Areas, delivered and placed, 15 mile haul	3,820.00	CY	44.55	12.54	4.77	0.00	$236,301.30	False

Total Element Cost:	$236,301.30
Total 1st Year Tech Cost:	$236,301.30
Total Phase Element Cost	$1,718,656.75

Task Documentation:

Task Type:	Remedial Action
Task Name:	03 Utility Installation
Description:	Utility Installation
Approach:	None
Start Date:	August, 2026
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Sanitary Sewer	True	100	0
Water Distribution/Fire Protection	True	100	0
Overhead Electrical Distribution	True	100	0
Communications	True	100	0

Total Marked-up Cost: $626,554.64

Technologies:

Technology: Sanitary Sewer

Element:

	Unit of	Material	Labor Unit	Equipment	Sub Bid	Cost

Technology: Sanitary Sewer

Assembly	Description	Quantity	Measure	Unit Cost	Cost	Unit Cost	Cost	Extended Cost	Override
17030226	988, 7.0 CY, Wheel Loader	40.00	HR	0.00	72.94	96.71	0.00	$6,786.20	False
17030259	Cat 225, 1.5 CY, Soil/Sand, Trenching, Excludes Sheeting, Excludes Dewatering	880.53	BCY	0.00	0.62	0.30	0.00	$803.40	False
17030295	35 Ton, 769, Off-highway Truck	40.00	HR	0.00	63.80	106.84	0.00	$6,825.77	False
17030401	950, 3.25 CY, Backfill with Excavated Material	855.99	CY	0.00	0.78	0.64	0.00	$1,213.02	False
17030511	Compact Soil with Vibrating Plate, 2 Passes	855.99	ECY	0.00	2.29	0.11	0.00	$2,057.00	False
19020127	Reinforced plastic pipe, ABS truss type, 8" diameter	1,500.00	LF	4.50	8.30	1.45	0.00	$21,371.95	False
19020201	Precast, CIP Base, 4' Diameter, 6' Deep, Manhole	5.00	EA	912.20	640.09	87.89	0.00	$8,200.89	False

Total Element Cost: $47,258.23

Total 1st Year Tech Cost: $47,258.23

Technology: Water Distribution/Fire Protection

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030201	Backfill, waste excess excavated materials on site	600.75	LCY	0.00	0.68	0.26	0.00	$561.34	False
17030257	Cat 215, 1.0 CY, Soil, Shallow, Trenching, Excludes Sheeting, Excludes Dewatering	445.00	BCY	0.00	0.85	0.29	0.00	$509.26	False

Technology: Water Distribution/Fire Protection

17030418	Backfill with Crushed Stone	55.56	CY	26.02	1.40	0.76	0.00	$1,565.73	False
17030423	General fill, Off-Site, Includes Delivery, Spreading	532.01	CY	13.72	1.22	0.92	0.00	$8,439.36	False
17030501	Compaction, subgrade, 18" wide, 8" lifts, walk behind, vibrating plate	600.75	ECY	0.00	2.62	0.13	0.00	$1,649.90	False
19010208	Polyvinyl chloride pressure pipe, 6", class 200, SDR 21, includes trenching to 3' deep	3,000.00	LF	4.36	14.89	15.57	0.00	$104,457.18	False
19010278	Buried Gate Valve	8.00	EA	2,084.67	246.02	31.73	0.00	$18,899.38	False
19010401	Fire Hydrant	6.00	EA	4,713.30	1,035.83	143.66	0.00	$35,356.69	False

Total Element Cost: $171,438.84

Total 1st Year Tech Cost: $171,438.84

Technology: Overhead Electrical Distribution

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
11010121	Underground 150 Amp 240 Volt 1 Phase Transformer	1.00	EA	4,725.00	1,599.95	0.00	0.00	$6,324.95	False
11010221	Underground 125 Amp Secondary Cable	2,500.00	EA	1.89	11.11	3.15	0.00	$40,366.85	False
11010405	Dry type transformer, single phase 240/480 V primary 120/240 V secondary, 37.5 kVA	2.00	EA	2,475.00	1,599.95	0.00	0.00	$8,149.90	False
11020136	Equipment Connections For Up	12.00	EA	302.33	934.97	0.00	0.00	$14,847.54	False

Technology: Overhead Electrical Distribution

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
	To 5 HP								
11020212	Fluorescent Hazardous Industrial Fixture	12.00	EA	3,759.08	561.96	0.00	0.00	$51,852.46	False
20020301	1/0 ACSR Conductor	8,904.00	LF	0.29	1.00	0.07	0.00	$12,103.73	False
20020310	1/C #2 Aluminum, Bare, Wire	3,488.00	LF	0.30	0.96	0.07	0.00	$4,632.41	False
20020403	40' Class 3 Treated Power Pole	13.00	EA	396.00	649.63	36.14	0.00	$14,062.98	False
20020420	Straight-line Structure, 5 KV Pole Top	11.00	EA	131.04	542.11	50.34	0.00	$7,958.39	False
20020430	Terminal Structure, 5 KV Pole Top	2.00	EA	1,461.15	2,053.73	190.70	0.00	$7,411.15	False
20020511	5 KV, 3/0, Shielded Cable, Copper	120.00	LF	0.40	3.76	0.00	0.00	$499.27	False
20020545	5 KV, 1/0 to 4/0 Conductor, Terminations & Splicing	6.00	EA	123.30	169.11	0.00	0.00	$1,754.45	False
20039902	4" Rigid Steel Conduit	40.00	LF	16.33	24.61	0.00	0.00	$1,637.99	False

Total Element Cost: $171,602.07

Total 1st Year Tech Cost: $171,602.07

Technology: Communications

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
20020401	30' Class 3 Treated Power Pole	14.00	EA	262.80	447.15	24.87	0.00	$10,287.51	False
20040101	27 Pair No. 22 AWG Wire, Communication Cable	2,800.00	LF	5.08	1.78	0.00	0.00	$19,213.77	False

Total Element Cost:	$29,501.28
Total 1st Year Tech Cost:	$29,501.28
Total Phase Element Cost	$419,800.42

Task Documentation:

Task Type:	Remedial Action
Task Name:	04 ET Cover Removal & Staging
Description:	ET Cover Removal & Staging
Approach:	In Situ
Start Date:	July, 2027
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Subgrade Soil	True	100	0
Bio-intrusion Layer (Rock)	True	100	0
Overlay Soil	True	100	0
Native Soil Layer	True	100	0
Topsoil Layer	True	100	0

Total Marked-up Cost: $142,155.18

Technologies:

Technology: Subgrade Soil

Element:

Technology: Subgrade Soil

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030226	988, 7.0 CY, Wheel Loader	34.00	HR	0.00	72.94	96.71	0.00	$5,768.27	False
17030296	50 Ton, 773, Off-highway Truck	68.00	HR	0.00	63.80	133.55	0.00	$13,419.79	False

Total Element Cost: $19,188.06

Total 1st Year Tech Cost: $19,188.06

Technology: Bio-intrusion Layer (Rock)

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030226	988, 7.0 CY, Wheel Loader	23.00	HR	0.00	72.94	96.71	0.00	$3,902.07	False
17030296	50 Ton, 773, Off-highway Truck	46.00	HR	0.00	63.80	133.55	0.00	$9,078.09	False

Total Element Cost: $12,980.16

Total 1st Year Tech Cost: $12,980.16

Technology: Overlay Soil

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Overlay Soil

17030226	988, 7.0 CY, Wheel Loader	13.00	HR	0.00	72.94	96.71	0.00	$2,205.52	False
17030295	35 Ton, 769, Off-highway Truck	26.00	HR	0.00	63.80	106.84	0.00	$4,436.75	False

Total Element Cost: $6,642.27

Total 1st Year Tech Cost: $6,642.27

Technology: Native Soil Layer

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030226	988, 7.0 CY, Wheel Loader	76.00	HR	0.00	72.94	96.71	0.00	$12,893.78	False
17030296	50 Ton, 773, Off-highway Truck	152.00	HR	0.00	63.80	133.55	0.00	$29,997.18	False

Total Element Cost: $42,890.96

Total 1st Year Tech Cost: $42,890.96

Technology: Topsoil Layer

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030226	988, 7.0 CY, Wheel Loader	24.00	HR	0.00	72.94	96.71	0.00	$4,071.72	False
17030296	50 Ton, 773, Off-highway Truck	48.00	HR	0.00	63.80	133.55	0.00	$9,472.79	False

Total Element Cost:	$13,544.51
Total 1st Year Tech Cost:	$13,544.51
Total Phase Element Cost	$95,245.97

Task Documentation:

Task Type:	Remedial Action
Task Name:	05 Construction of Excavation & Waste Mgmt. Tents
Description:	Construction of Excavation & Waste Mgmt. Tents
Approach:	Ex Situ
Start Date:	August, 2026
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
200 X 550 Tent Structure - Means	True	100	0
300 X 500 Tent Structures - Means (3)	True	100	0
350 X 550 Tent Structure - Means	True	100	0
400 X 650 Tent Structure - Means	True	100	0
Demolition, Fencing	True	100	0
Fencing	True	100	0

Total Marked-up Cost: $37,277,965.93

Technologies:

Technology: 200 X 550 Tent Structure - Means

Technology: 200 X 550 Tent Structure - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010302	200 X 550 Tension structure, rigid steel/aluminum frame, vinyl coated polyester fabric shell	110,000.00	SF	18.50	0.73	0.23	0.00	$2,140,787.80	False

Total Element Cost: $2,140,787.80

Total 1st Year Tech Cost: $2,140,787.80

Technology: 300 X 500 Tent Structures - Means (3)

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010303	300 X 500 Tension structure, rigid steel/aluminum frame, vinyl coated polyester fabric shell	450,000.00	SF	22.20	0.61	0.21	0.00	$10,358,890.24	False

Total Element Cost: $10,358,890.24

Total 1st Year Tech Cost: $10,358,890.24

Technology: 350 X 550 Tent Structure - Means

Element:

Technology: 350 X 550 Tent Structure - Means

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010304	350 X 550 Tension structure, rigid steel/aluminum frame, vinyl coated polyester fabric shell	192,500.00	SF	24.75	0.51	0.19	0.00	$4,899,547.56	False

Total Element Cost: $4,899,547.56

Total 1st Year Tech Cost: $4,899,547.56

Technology: 400 X 650 Tent Structure - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010305	400 X 650 Tension structure, rigid steel/aluminum frame, vinyl coated polyester fabric shell	260,000.00	SF	26.24	0.43	0.17	0.00	$6,977,575.61	False

Total Element Cost: $6,977,575.61

Total 1st Year Tech Cost: $6,977,575.61

Technology: Demolition, Fencing

Element:

			Unit of	Material	Labor Unit	Equipment	Sub Bid		Cost

Technology: Demolition, Fencing

Assembly	Description	Quantity	Measure	Unit Cost	Cost	Unit Cost	Cost	Extended Cost	Override
17020225	Remove and Reuse Chain Link Fence, Excludes Hauling	2,000.00	LF	0.00	2.95	0.00	0.00	$5,906.63	False
17030220	910, 1.25 CY, Wheel Loader	6.00	HR	0.00	72.94	31.18	0.00	$624.73	False
17030284	12 CY, Dump Truck	18.00	HR	0.00	70.89	50.13	0.00	$2,178.43	False

Total Element Cost: $8,709.79

Total 1st Year Tech Cost: $8,709.79

Technology: Fencing

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18040158	Fence, chain link industrial, aluminized steel, 6 ga. wire, 2-1/2" posts @ 10' OC, 8' high, includes excavation, in concrete, excludes barbed wire	13,298.00	LF	34.20	7.97	1.57	0.00	$581,634.45	False
18040501	Hazardous Waste Signing	67.00	EA	110.70	28.67	4.15	0.00	$9,615.72	False

Total Element Cost: $591,250.17

Total 1st Year Tech Cost: $591,250.17

Total Phase Element Cost	$24,976,761.19

Task Documentation:

Task Type:	Remedial Action
Task Name:	06 Construction of Onsite Disposal Cell
Description:	Construction of Onsite Disposal Cell
Approach:	Ex Situ
Start Date:	October, 2026
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Fencing	True	100	0
Administrative Facility	True	100	0
Cell Construction	True	100	0

Total Marked-up Cost: $4,085,373.25

Technologies:

Technology: Fencing

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Fencing

18040111	Galvanized Barbed Wire, 3-Strand	3,250.00	LF	0.24	1.37	0.28	0.00	$6,151.79	False
18040212	Fence, chain link, gates & posts, end posts, chain link fence, galvanized steel, (1/3 post length in ground), 3" OD, 8', set in concrete, includes excavation	6.00	EA	63.45	34.01	4.92	0.00	$614.32	False
18040501	Hazardous Waste Signing	17.00	EA	110.70	28.67	4.15	0.00	$2,439.81	False

Total Element Cost: $9,205.92

Total 1st Year Tech Cost: $9,205.92

Technology: Administrative Facility

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33430109	24.0' x 20.0' x 10.0' Administrative Building	1.00	EA	0.00	0.00	0.00	48,427.20	$48,427.20	False

Total Element Cost: $48,427.20

Total 1st Year Tech Cost: $48,427.20

Technology: Cell Construction

Element:

Technology: Cell Construction

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030101	Rough Grading, D6 Dozer	45,000.00	SY	0.00	0.34	0.34	0.00	$30,634.10	False
17030108	Fine Grading, 130G, 2 Passes	22,800.00	SY	0.00	0.56	0.42	0.00	$22,360.94	False
17030114	Fine grading, sand layer, fine grade for large area, 15,000 S.Y. or more	24,889.00	SY	0.00	0.70	0.38	0.00	$26,778.26	False
17030115	Fine grading, slopes, steep, finish grading	22,200.00	SY	0.00	1.38	0.71	0.00	$46,354.68	False
17030515	Backfill and compact, 6" layers, air rammer/tamper	656.00	ECY	0.00	13.45	1.07	0.00	$9,524.90	False
17030545	Compaction, 4 passes, 6" lifts, towed vibrating roller	32,840.00	ECY	0.00	0.62	0.77	0.00	$45,846.98	False
17030616	Geosynthetic soil stabilization, geotextile fabric, woven, 200 lb. tensile strength	43,386.00	SY	1.71	0.31	0.00	0.00	$87,589.98	False
18010111	Aggregate for earthwork, dead or bank sand, delivered and dumped, 15 mile haul	5,005.00	LCY	17.85	7.83	5.02	0.00	$153,649.84	False
19010268	12", Schedule 40 Steel Pipe, Plain End, Tar Coated & Wrapped	80.00	LF	85.18	57.92	0.00	0.00	$11,448.51	False
19020112	6" Extra-strength Vitrified Clay Pipe, Class 200, Premium Joints	2,600.00	LF	4.99	7.44	0.00	0.00	$32,327.67	False
33021103	Soil testing, Atterberg limits, liquid and plastic limits	3.00	EA	0.00	0.00	0.00	63.00	$189.00	False
33021104	Soil testing, Sieve analysis, washed, ASTM D 422	3.00	EA	0.00	0.00	0.00	49.50	$148.50	False

Technology: Cell Construction

33021107	Soil testing, soil density, nuclear method, ASTM D2922	76.00	EA	0.00	0.00	0.00	39.60	$3,009.60	False
33021114	Soil testing, Proctor compaction, 4" standard mold, ASTM D 698	3.00	EA	0.00	0.00	0.00	110.70	$332.10	False
33080513	Drainage Netting, Geotextile Fabric Heat-bonded 2 Sides	224,000.00	SF	0.54	0.10	0.01	0.00	$144,225.62	False
33080520	Bentonite, rolls, with geotextile fabric both sides, 3/8" thick	390,475.00	SF	0.77	0.39	0.03	0.00	$464,445.71	False
33080572	60 Mil Polymeric Liner, High-density Polyethylene	390,475.00	SF	0.52	0.24	0.02	0.00	$305,211.35	False
33230303	6" PVC, Well Plug	8.00	EA	50.61	18.88	16.12	0.00	$684.85	False
33230802	Product Recovery Pump, 1/3 HP, 115V, Controls, Probe (>3" dia.)	1.00	EA	9,858.33	3,396.37	750.00	0.00	$14,004.70	False
33231101	Hollow Stem Auger, 8" Dia Borehole, Depth <= 100 ft	160.00	LF	0.00	16.83	20.18	0.00	$5,922.51	False
33260433	12" PVC, Schedule 80, Connection Piping	660.00	LF	128.00	59.28	0.95	0.00	$124,232.12	False
33260434	15" PVC, Schedule 80, Connection Piping	120.00	LF	146.00	59.28	0.95	0.00	$24,747.15	False
33260902	Plastic, perforated PVC, pipe, 6" diameter, excludes excavation and backfill	560.00	LF	2.95	9.53	0.63	0.00	$7,347.99	False
95010204	4000 Gallon Water Truck	1,120.00	HR	0.00	81.05	30.78	0.00	$125,248.23	False
95011501	Excavation, bulk, scrapers, bank measure, clay, 3,000Ft haul, 21 C.Y. bucket, self propelled scrapers, 1/4 push dozer	51,616.00	BCY	0.00	1.56	5.45	0.00	$361,878.52	False
95011502	Excavating, trench or continuous footing, common earth, 3/8 C.Y. excavator, 1Ft to 4Ft deep, excludes sheeting or dewatering	656.00	ECY	0.00	5.52	1.92	0.00	$4,883.52	False

Technology: Cell Construction

95014002	60 Mil Polymeric Liner, High-density Polyethylene, Upper Liner	400,000.00	SF	0.58	0.29	0.02	0.00	$357,073.17	False
95014003	Geocomposite subsurface drainage filtration, soil drainage mat, 0.44" thick	24,890.00	SY	2.59	2.27	0.16	0.00	$124,905.30	False
95014004	Water supply distribution piping, piping polyvinyl chloride, pressure pipe, 6", AWWA C900, Class 150, SDR 18, excludes excavation or backfill	1,200.00	LF	10.40	4.02	0.90	0.00	$18,389.27	False
95014005	Water supply distribution piping, fitting w/rubber gasket, polyvinyl chloride, 22.5 degree, 6" diameter, class 150, DR 18, excludes excavation or backfill	8.00	EA	455.00	100.00	11.50	0.00	$4,532.00	False
95014006	Water supply distribution piping, fitting w/rubber gasket, polyvinyl chloride, 11 1/4 degree, 6" diameter, class 150, DR 18, excludes excavation or backfill	8.00	EA	470.00	100.00	11.50	0.00	$4,652.00	False
95014009	Water supply distribution piping, fitting, reducer, ductile iron, mechanical joint, AWWA C110, 10" x 6" diameter, class 50 water piping	8.00	EA	545.00	103.05	26.85	0.00	$5,399.19	False
95014010	Storage tank, horizontal, steel, above ground, double wall, 10,000 gallon, incl. cradles, coating, fittings, foundation & concrete containment	1.00	EA	82,740.00	19,012.20	7,580.00	0.00	$109,332.20	False
95014011	Cabinets & enclosures, enclosures fiberglass, quick release latch door, 24" H x 20" W	12.00	EA	785.00	207.32	55.00	0.00	$12,567.80	False

Technology: Cell Construction

x 6" D, NEMA 4X,
Instrumentation

	Total Element Cost:	$2,689,878.26
	Total 1st Year Tech Cost:	$2,689,878.26
	Total Phase Element Cost	$2,747,511.38

Task Documentation:

Task Type:	Remedial Action
Task Name:	07 Construction of Warehouses
Description:	Construction of Warehouses
Approach:	In Situ
Start Date:	December, 2026
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
200 X 200 High Bay Warehouse	True	100	0
250 X 250 Shipping Center	True	100	0
200 X 200 Container Storage Canopy	True	100	0

Total Marked-up Cost: $12,090,908.11

Technologies:

Technology: 200 X 200 High Bay Warehouse

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: 200 X 200 High Bay Warehouse

01010103	1'0" X 3'0" Strip Footing 3000 PSI	800.00	LF	17.09	23.43	0.52	0.00	$32,829.19	True
01010213	Column Piers 0.81 m X 0.81 m X 1.42 m(2'8" X 2'8" X 4'8") High	40.00	EA	348.13	729.01	1.46	0.00	$43,143.81	False
01030115	Loading Dock Apron	400.00	SF	7.18	4.56	0.18	0.00	$4,762.88	False
01030201	203.2 mm(8") Structural Slab On Grade	40,000.00	SF	9.80	11.23	0.32	0.00	$853,870.02	False
01030204	1.22 m(4'0") Thick Equipment Slab	400.00	SF	17.67	10.48	0.06	0.00	$11,282.88	False
02020136	Structural Steel, Lt Load, Columns	50.00	TON	2,385.00	605.08	77.36	0.00	$153,371.73	False
03010142	152.4 mm(6") Mtl. Stud Non-Load Bearing	59,200.00	SF	0.44	1.19	0.00	0.00	$96,794.16	False
03010151	Metal Siding	59,200.00	SF	2.70	2.98	0.00	0.00	$336,287.76	False
03030204	1830 mm X 2130 mm(6'0" X 7'0") Pair Hollow Metal Doors W/Frame and Panic Handles	12.00	EA	3,448.26	1,067.44	0.00	0.00	$54,188.35	False
03040103	6100 mm X 4270mm(20'0" X 14'0") Metal Overhead Door	8.00	EA	7,343.53	3,689.81	105.35	0.00	$89,109.54	False
95010603	200 X 200 VTR Building Upgrade	1.00	LS	0.00	0.00	0.00	4,168,000.00	$4,168,000.00	False

Total Element Cost:	$5,843,640.33
Total 1st Year Tech Cost:	$5,843,640.33

Technology: 250 X 250 Shipping Center

Element:

Technology: 250 X 250 Shipping Center

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
01010103	1'0" X 3'0" Strip Footing 3000 PSI	1,000.00	LF	17.09	23.43	0.52	0.00	$41,036.50	True
01010213	Column Piers 0.81 m X 0.81 m X 1.42 m(2'8" X 2'8" X 4'8") High	50.00	EA	348.13	729.01	1.46	0.00	$53,929.76	False
01030115	Loading Dock Apron	400.00	SF	7.18	4.56	0.18	0.00	$4,762.88	False
01030201	203.2 mm(8") Structural Slab On Grade	62,500.00	SF	9.80	11.23	0.32	0.00	$1,334,171.90	False
01030204	1.22 m(4'0") Thick Equipment Slab	400.00	SF	17.67	10.48	0.06	0.00	$11,282.88	False
02020136	Structural Steel, Lt Load, Columns	75.00	TON	2,385.00	605.08	77.36	0.00	$230,057.60	False
03010142	152.4 mm(6") Mtl. Stud Non-Load Bearing	86,500.00	SF	0.44	1.19	0.00	0.00	$141,430.66	False
03010151	Metal Siding	86,500.00	SF	2.70	2.98	0.00	0.00	$491,366.40	False
03030204	1830 mm X 2130 mm(6'0" X 7'0") Pair Hollow Metal Doors W/Frame and Panic Handles	16.00	EA	3,448.26	1,067.44	0.00	0.00	$72,251.13	False
03040103	6100 mm X 4270mm(20'0" X 14'0") Metal Overhead Door	12.00	EA	7,343.53	3,689.81	105.35	0.00	$133,664.31	False

Total Element Cost:	$2,513,954.03
Total 1st Year Tech Cost:	$2,513,954.03

Technology: 200 X 200 Container Storage Canopy

Technology: 200 X 200 Container Storage Canopy

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
01010103	1'0" X 3'0" Strip Footing 3000 PSI	800.00	LF	17.09	23.43	0.52	0.00	$32,829.20	True
01010213	Column Piers 0.81 m X 0.81 m X 1.42 m(2'8" X 2'8" X 4'8") High	40.00	EA	348.13	729.01	1.46	0.00	$43,143.81	False
01030204	1.22 m(4'0") Thick Equipment Slab	400.00	SF	17.67	10.48	0.06	0.00	$11,282.88	False
02020136	Structural Steel, Lt Load, Columns	40.00	TON	2,385.00	605.08	77.36	0.00	$122,697.39	False
03010142	152.4 mm(6") Mtl. Stud Non-Load Bearing	40,000.00	SF	0.44	1.19	0.00	0.00	$65,401.46	False
03010151	Metal Siding	40,000.00	SF	2.70	2.98	0.00	0.00	$227,221.46	False
18010101	Cement-stabilized Base, Aggregate Base Course for Roadways and Large Paved Areas, delivered and placed, 15 mile haul	988.00	CY	44.55	12.54	4.77	0.00	$61,116.67	False

Total Element Cost:	$563,692.87
Total 1st Year Tech Cost:	$563,692.87
Total Phase Element Cost	$8,921,287.23

Task Documentation:

Task Type:	Remedial Action
Task Name:	08 Limited Area Gate
Description:	Copy
Approach:	Ex Situ
Start Date:	January, 2027
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Limited Area Gate Design and Construction	True	100	0

Total Marked-up Cost: $578,533.57

Technologies:

Technology: Limited Area Gate Design and Construction

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010601	Design	1.00	LS	0.00	72,926.83	0.00	0.00	$72,926.83	False
95010602	Construction	1.00	LS	0.00	0.00	0.00	391,800.00	$391,800.00	False

Total Element Cost:	$464,726.83
Total 1st Year Tech Cost:	$464,726.83
Total Phase Element Cost	$464,726.83

Task Documentation:

Task Type:	Remedial Action
Task Name:	09 Procurement for Excavation & Waste Disposal
Description:	Procurement for Excavation & Waste Disposal
Approach:	Ex Situ
Start Date:	July, 2027
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Procurement	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Procurement

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Remedial Action
Task Name:	10 Training, Functional Testing & Readiness Review
Description:	Training, Functional Testing & Readiness Review
Approach:	Ex Situ
Start Date:	August, 2028
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
No Cost	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: No Cost

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Remedial Action
Task Name:	11 SNL Professional Labor Management
Description:	Professional Labor Management
Approach:	Ex Situ
Start Date:	January, 2026
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Professional Labor Management	True	100	0

Total Marked-up Cost: $7,881,095.15

Technologies:

Technology: Professional Labor Management

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	2,770,397.57	0.00	0.00	$2,770,397.57	False

Total Element Cost:	$2,770,397.57
Total 1st Year Tech Cost:	$2,770,397.57
Total Phase Element Cost	$2,770,397.57

Task Documentation:

Task Type:	Remedial Action
Task Name:	12 Contractor Labor Management
Description:	Contractor Labor Management
Approach:	Ex Situ
Start Date:	January, 2026
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Professional Labor Management	True	100	0

Total Marked-up Cost: $21,545,121.26

Technologies:

Technology: Professional Labor Management

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager	2,824.00	HR	0.00	99.66	0.00	0.00	$281,435.70	False
33220102	Project Manager	5,648.00	HR	0.00	91.65	0.00	0.00	$517,639.20	True

Technology: Professional Labor Management

33220104	Senior Staff Engineer	11,296.00	HR	0.00	98.77	0.00	0.00	$1,115,700.38	False
33220106	Staff Engineer	9,184.00	HR	0.00	83.34	0.00	0.00	$765,374.38	False
33220110	QA/QC Officer	4,592.00	HR	0.00	65.35	0.00	0.00	$300,081.59	False
33220111	Certified Industrial Hygienist	4,592.00	HR	0.00	86.30	0.00	0.00	$396,295.19	False
33220112	Field Technician	91,840.00	HR	0.00	42.25	0.00	0.00	$3,879,791.90	False
33220119	Health and Safety Officer	4,592.00	HR	0.00	69.10	0.00	0.00	$317,318.39	False

Total Element Cost:	$7,573,636.73
Total 1st Year Tech Cost:	$7,573,636.73
Total Phase Element Cost	$7,573,636.73

Task Documentation:

Task Type: Remedial Action
Task Name: 13 Additional Equipment and Operators
Description: Additional Equipment

Approach: Ex Situ
Start Date: July, 2026
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Additional Equipment and Operators	True	100	0

Total Marked-up Cost: $3,734,591.06

Technologies:

Technology: Additional Equipment and Operators

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
16019913	950, 3.0 CY Wheel Loader	2,160.00	HR	0.00	72.94	55.27	0.00	$276,931.31	False
17030431	580K, 1.0 CY, Backhoe with	4,320.00	HR	0.00	72.94	30.38	0.00	$446,354.37	False

Technology: Additional Equipment and Operators

	Front-end Loader								
17030703	D5 with A-blade Bulldozer	2,160.00	HR	0.00	72.94	61.12	0.00	$289,574.31	False
33010108	Pickup Truck(s), Rental	2,810.00	DAY	0.00	0.00	0.00	47.77	$134,233.70	False
33100118	R60 Rough Terrain Forklift, 6,000 Lb @ 24" LC	4,320.00	HR	0.00	72.94	31.50	0.00	$451,180.80	False
33100545	Crane, 22 Ton Self-contained, Hydraulic, Rough Terrain, 4 WD	2,160.00	HR	0.00	72.94	79.80	0.00	$329,928.37	False
95010201	Motor Grader, 40,000 Lb.	2,160.00	HR	0.00	72.94	54.00	0.00	$274,190.40	False
95010202	825 G Sheepsfoot Vibratory Roller	1,080.00	HR	0.00	0.00	76.50	0.00	$82,620.00	False
95010203	CS583 Smooth Drum Vibratory Roller	1,080.00	HR	0.00	0.00	24.30	0.00	$26,244.00	False
95010204	4000 Gallon Water Truck	2,160.00	HR	0.00	72.94	27.70	0.00	$217,386.72	False

Total Element Cost:	$2,528,643.97
Total 1st Year Tech Cost:	$2,528,643.97
Total Phase Element Cost	$2,528,643.97

Task Documentation:

Task Type:	Operations & Maintenance
Task Name:	14 Administrative and Onsite Lab Equipment
Description:	Administrative and Onsite Lab Equipment
Approach:	Ex Situ
Start Date:	June, 2028
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administrative and Onsite Lab Equipment	True	100	0

Total Marked-up Cost: $12,019,225.16

Technologies:

Technology: Administrative and Onsite Lab Equipment

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010502	Administrative Trailer	3.00	MO	0.00	0.00	448.20	0.00	$1,344.60	False
95010503	Co-ed Shower Trailer	3.00	MO	0.00	0.00	448.20	0.00	$1,344.60	False

Technology: Administrative and Onsite Lab Equipment

95010504	Office Trailer (3 Ea.)	9.00	MO	0.00	0.00	448.20	0.00	$4,033.80	False
95010505	10 X 25 Connex Storage Box (10 Ea.)	30.00	MO	0.00	0.00	115.00	0.00	$3,450.00	False
95010506	Breathing Air Refill System	1.00	EA	0.00	0.00	110,000.00	0.00	$110,000.00	False
95010507	Ventilation System Installation	1.00	LS	0.00	0.00	0.00	5,000,000.00	$5,000,000.00	False
95010508	Laboratory Trailer (5 Ea.)	15.00	MO	0.00	0.00	448.20	0.00	$6,723.00	False
95010510	Customized Construction CostsFor 5 Lab Trailers	5.00	EA	0.00	0.00	45,000.00	0.00	$224,999.99	False
95010513	Field Equipment (PPE, respirators, etc.)	1.00	LS	0.00	0.00	521,501.00	0.00	$521,501.00	False
95010514	Data Management System for Soiland Debris tracking	1.00	EA	150,000.00	0.00	0.00	0.00	$150,000.00	False
95010515	Mob./Demob. AdministrativeTrailer	1.00	LS	0.00	0.00	431.00	0.00	$431.00	False
95010516	Mob./Demob. Office Trailer	3.00	LS	0.00	0.00	431.00	0.00	$1,293.00	False
95010517	Mob./Demob. Laboratory Trailer	5.00	LS	0.00	0.00	431.00	0.00	$2,155.00	False
95010518	Mob./Demob. Shower Trailer	1.00	LS	0.00	0.00	431.00	0.00	$431.00	False
95010519	Mob./Demob Connex Storage Boxes	10.00	EA	0.00	0.00	431.00	0.00	$4,310.00	False
95010520	Radiological Monitoring Equipment Per Table J.3.6	1.00	LS	979,868.50	0.00	0.00	0.00	$979,868.50	False
95010521	Laboratory Equipment Per Table J.3.4	1.00	LS	1,164,658.14	0.00	0.00	0.00	$1,164,658.14	False
95010522	Basic Laboratory Supplies Per Table J.3.5	1.00	LS	860,441.92	0.00	0.00	0.00	$860,441.92	False

Total Element Cost: $9,036,985.55

Total 1st Year Tech Cost:	$9,036,985.55
Total Phase Element Cost	$9,036,985.55

Phase 3 Excavation & Waste Management

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Waste Management	$4,710,793							$2,453,471	$7,164,263
(System Defaults)		$0	$0	$1,265,403	$478,096	$0	$709,972		
02 Onsite & Offsite Laboratories	$1,153,471							$286,573	$1,440,044
(System Defaults)		$0	$0	$47,767	$96,099	$0	$142,707		
03 Unclassified Area (UCA) Excavation	$33,498,854							$17,461,954	$50,960,808
(System Defaults)		$0	$0	$9,010,996	$3,400,788	$0	$5,050,170		
04 UCA Excavation Verification	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
05 Classified Area (CA) Excavation	$21,786,044							$10,210,258	$31,996,302
(System Defaults)		$0	$0	$4,904,231	$2,135,222	$0	$3,170,805		
06 CA Excavation Verification	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
07 Excavation Backfilling	$1,707,316							$838,372	$2,545,689
(System Defaults)		$0	$0	$416,214	$169,882	$0	$252,275		
08 D&D MWL Excavation Sprung	$281,180							$138,483	$419,664
(System Defaults)		$0	$0	$68,889	$28,006	$0	$41,588		
09 Excavation ET Cover Construction	$532,094							$260,666	$792,760
(System Defaults)		$0	$0	$129,201	$52,904	$0	$78,562		

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
10 On-site Cell ET Cover Construction	$1,660,181							$813,760	$2,473,942
(System Defaults)		$0	$0	$403,500	$165,095	$0	$245,165		
11 SNL Professional Labor Management	$18,555,161							$34,229,677	$52,784,838
(System Defaults)		$0	$0	$25,476,236	$3,522,512	$0	$5,230,930		
12 Contractor Labor Management	$39,076,104							$72,085,736	$111,161,839
(System Defaults)		$0	$0	$53,651,490	$7,418,207	$0	$11,016,038		
13 Administration Facilities	$295,017							$145,298	$440,315
(System Defaults)		$0	$0	$72,279	$29,384	$0	$43,635		
Total Phase Cost	$123,256,215	$0	$0	$95,446,207	$17,496,194	$0	$25,981,848	$138,924,248	$262,180,464

Total Phase Cost $262,180,464

	Direct Cost	Markups	Total
Total Phase Cost	$123,256,215	$138,924,248	$262,180,464

Task Documentation:

Task Type:	Remedial Action
Task Name:	01 Waste Management
Description:	Waste Management
Approach:	Ex Situ
Start Date:	September, 2028
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Transportation and Disposal, PPE	True	100	0
Transportation and Disposal, Sprung HEPA Filters	True	100	0
Transportation and Disposal, Conveyer System	True	100	0
Transportation & Disposal, Hydraulic Baler/Logger	True	100	0
Sorting, Processing, Staging	True	100	0
Waste Placement On-site Cell	True	100	0
Intermodal Purchase	True	100	0

Total Marked-up Cost: $7,164,263.23

Technologies:

Technology: Transportation and Disposal, PPE

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	95.00	EA	26.96	0.00	0.00	0.00	$2,561.58	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	95.00	EA	0.00	101.55	22.43	0.00	$11,778.43	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	78,375.00	MI	0.00	0.00	0.00	3.60	$282,149.99	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	1,710.00	BCY	0.90	1.27	0.39	0.00	$4,374.13	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $300,909.12

Total 1st Year Tech Cost: $300,909.12

Technology: Transportation and Disposal, Sprung HEPA Filters

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Transportation and Disposal, Sprung HEPA Filters

33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	129.00	EA	26.96	0.00	0.00	0.00	$3,478.36	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	129.00	EA	0.00	101.55	22.43	0.00	$15,993.86	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	106,425.00	MI	0.00	0.00	0.00	3.60	$383,129.99	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	2,322.00	BCY	0.90	1.27	0.39	0.00	$5,939.60	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $408,586.81

Total 1st Year Tech Cost: $408,586.81

Technology: Transportation and Disposal, Conveyer System

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False

Technology: Transportation and Disposal, Conveyer System

95010412	Load LLW, Flatbed Load	2.00	EA	0.00	304.88	375.00	0.00	$1,359.76	False
95010413	Transport LLW, Flatbed Load	1,650.00	MI	0.00	0.00	0.00	4.53	$7,474.50	False

Total Element Cost: $8,834.26

Total 1st Year Tech Cost: $8,834.26

Technology: Transportation & Disposal, Hydraulic Baler/Logger

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
95010412	Load LLW, Flatbed Load	2.00	EA	0.00	304.88	375.00	0.00	$1,359.76	False
95010413	Transport LLW, Flatbed Load	1,650.00	MI	0.00	0.00	0.00	4.53	$7,474.50	False

Total Element Cost: $8,834.26

Total 1st Year Tech Cost: $8,834.26

Technology: Sorting, Processing, Staging

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Sorting, Processing, Staging

07030206	Overhead Traveling Bridge Crane - 4535.9 kg(5 Ton)	1.00	EA	46,350.00	5,822.15	400.74	0.00	$52,572.89	False
17030223	950, 3.0 CY, Wheel Loader	2,080.00	HR	0.00	72.94	55.27	0.00	$266,674.59	False
17030284	12 CY, Dump Truck	2,080.00	HR	0.00	63.80	42.46	0.00	$221,023.33	False
17030285	12 CY, Dump Truck	2,080.00	HR	0.00	63.80	42.46	0.00	$221,031.80	False
33010108	Pickup Truck(s), Rental	1,300.00	DAY	0.00	0.00	0.00	47.77	$62,101.00	False
33040644	Truck, Intermodal Transport, On-site - Rental/Lease	260.00	DAY	0.00	0.00	285.55	0.00	$74,243.52	False
33100118	R60 Rough Terrain Forklift, 6,000 Lb @ 24" LC	2,080.00	HR	0.00	72.94	31.50	0.00	$217,235.20	False
33100146	Fork Lift, Yard, 8,000 Lbs	2,080.00	HR	0.00	72.94	22.43	0.00	$198,381.04	False
33190336	Flatbed Trailer (Monthly)	12.00	MO	0.00	0.00	0.00	714.27	$8,571.24	False
33341009	Man-Lift, Straight Boom, 66' Height, 650 Lbs, 51' Reach	12.00	MO	0.00	0.00	4,895.44	0.00	$58,745.26	False
95010204	4000 Gallon Water Truck	2,080.00	HR	0.00	72.94	27.70	0.00	$209,335.35	False

Total Element Cost: $1,589,915.22

Total 1st Year Tech Cost: $1,589,915.22

Technology: Waste Placement On-site Cell

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030284	12 CY, Dump Truck	2,080.00	HR	0.00	63.80	42.46	0.00	$221,027.49	False
17030285	12 CY, Dump Truck	2,080.00	HR	0.00	63.80	42.46	0.00	$221,031.80	False

Technology: Waste Placement On-site Cell

17030703	D5 with A-blade Bulldozer	2,080.00	HR	0.00	72.94	61.12	0.00	$278,849.33	False
33100118	R60 Rough Terrain Forklift, 6,000 Lb @ 24" LC	2,080.00	HR	0.00	72.94	31.50	0.00	$217,235.19	False
33190336	Flatbed Trailer (Monthly)	12.00	MO	0.00	0.00	0.00	714.27	$8,571.24	False
33220112	Field Technician	6,240.00	HR	0.00	42.25	0.00	0.00	$263,609.55	False
33220212	Surveying - 2-man Crew	65.00	DAY	0.00	955.04	12.10	0.00	$62,863.98	False
95010201	Motor Grader, 40,000 Lb.	520.00	HR	0.00	72.94	54.00	0.00	$66,008.80	False
95010202	825 G Sheepsfoot Vibratory Roller	2,080.00	HR	0.00	72.94	76.50	0.00	$310,835.19	False
95010204	4000 Gallon Water Truck	2,080.00	HR	0.00	72.94	27.70	0.00	$209,335.35	False

Total Element Cost: $1,859,367.93

Total 1st Year Tech Cost: $1,859,367.93

Technology: Intermodal Purchase

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010415	Bulk Solid Waste Disposal Container, Purchase, 20 CY Intermodal	50.00	EA	5,526.90	0.00	0.00	0.00	$276,344.99	False
95010416	Container Cover System, Hinged, 20 CY Intermodal, Purchase	50.00	EA	5,160.00	0.00	0.00	0.00	$258,000.00	False

Total Element Cost:	$534,344.99
Total 1st Year Tech Cost:	$534,344.99
Total Phase Element Cost	$4,710,792.60

Task Documentation:

Task Type: Remedial Action
Task Name: 02 Onsite & Offsite Laboratories
Description: Onsite & Offsite Laboratories

Approach: Ex Situ
Start Date: September, 2028
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Offsite Laboratory Analysis	True	100	0
Onsite Laboratory Facilities	True	100	0

Total Marked-up Cost: $1,440,044.41

Technologies:

Technology: Offsite Laboratory Analysis

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33020216	Testing, rad analytical, data packaging, alpha spectroscopy	682.00	EA	0.00	0.00	0.00	110.70	$75,497.40	False

Technology: Offsite Laboratory Analysis

33021602	Testing, pH, electrometric (9045)	87.00	EA	0.00	0.00	0.00	16.40	$1,426.80	False
33021603	Testing, dissolved solids	87.00	EA	0.00	0.00	0.00	17.10	$1,487.70	False
33021604	Testing, suspended solids	87.00	EA	0.00	0.00	0.00	17.10	$1,487.70	False
33021613	Testing, oil and grease EPA 413.2	87.00	EA	0.00	0.00	0.00	53.10	$4,619.70	False
33021614	Testing, total petroleum hydrocarbons (TPH)	87.00	EA	0.00	0.00	0.00	71.67	$6,235.29	False
33021631	Testing, chlorinated hydrocarbons (612, 8120)	87.00	EA	0.00	0.00	0.00	135.00	$11,745.00	False
33021653	Testing, chloride	87.00	EA	0.00	0.00	0.00	22.50	$1,957.50	False
33021656	Testing, flouride, no distillation	87.00	EA	0.00	0.00	0.00	19.12	$1,663.87	False
33021670	Metals Screen, 25 Metals Listed In Method EPA 200.7, Water Analysis	87.00	EA	0.00	0.00	0.00	450.00	$39,150.00	False
33021673	Testing, total organic carbons	87.00	EA	0.00	0.00	0.00	47.25	$4,110.75	False
33021712	Testing, mercury EPA 7470	682.00	EA	0.00	0.00	0.00	30.00	$20,457.95	False
33021717	Pesticides/PCBs (SW 3550B/SW 8081/8082), Soil Analysis	682.00	EA	0.00	0.00	0.00	103.50	$70,587.00	False
33021720	Testing, purgeable organics (624, 8260)	682.00	EA	0.00	0.00	0.00	144.00	$98,208.00	False
33021724	Testing, phenols (9066) total recoverable	87.00	EA	0.00	0.00	0.00	37.50	$3,262.50	False
33021739	Testing, semi-volatile organics, pkd. column (8250)	682.00	EA	0.00	0.00	0.00	266.94	$182,053.08	False
33021762	Testing, soil & sediment analysis, chromium hexavalent 7195/7196/7197/7199	682.00	EA	0.00	0.00	0.00	56.70	$38,669.40	False
33021793	Testing, soil & sediment analysis, Total and Extractable Metals in	682.00	EA	0.00	0.00	0.00	292.50	$199,485.00	False

Technology: Offsite Laboratory Analysis

	Soils (EPA 3050)								
33022128	Testing, chromium, hexavalent (SW7195) with prep	87.00	EA	0.00	0.00	0.00	39.60	$3,445.20	False
33022133	Testing, pesticides/PCBs (SW3510/SW8080)	87.00	EA	0.00	0.00	0.00	103.50	$9,004.50	False
33022139	Testing, BTEX/MTBE (mod EPA 602)	87.00	EA	0.00	0.00	0.00	57.96	$5,042.52	False
33022257	Testing, rad analytical liquid, gas flow proportional counting, gross beta-total	87.00	EA	0.00	0.00	0.00	35.67	$3,103.03	False
33022271	Testing, rad analytical liquid, gamma spectroscopy, gamma isotopic (cesium, 137 20 PCI/l)	87.00	EA	0.00	0.00	0.00	76.81	$6,682.12	False
33022284	Testing, rad analytical, liquid scintillation, tritium (direct counting)	87.00	EA	0.00	0.00	0.00	65.09	$5,662.66	False
33022287	Testing, rad analytical liquid, gross alpha, total gas flow prop. counting	87.00	EA	0.00	0.00	0.00	46.55	$4,049.68	False
33022336	Testing, rad analytical vegetation/sediment/soil, gas flow proportional counting, gross beta-total	682.00	EA	0.00	0.00	0.00	48.35	$32,973.34	False
33022342	Testing, rad analytical vegetation/sediment/soil, gamma spectroscopy, gamma isotopic	682.00	EA	0.00	0.00	0.00	87.76	$59,851.64	False
33022351	Testing, rad analytical vegetation/sediment/soil, liquid scintillation, tritium	682.00	EA	0.00	0.00	0.00	56.03	$38,215.19	False
33022352	Testing, rad analytical vegetation/sediment/soil, gross alpha, total gas flow proportional	682.00	EA	0.00	0.00	0.00	41.60	$28,369.84	False

Technology: Offsite Laboratory Analysis

counting

Total Element Cost:	$958,504.33
Total 1st Year Tech Cost:	$958,504.33

Technology: Onsite Laboratory Facilities

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010508	Laboratory Trailer (5 Ea.)	435.00	MO	0.00	0.00	448.20	0.00	$194,967.00	False

Total Element Cost:	$194,967.00
Total 1st Year Tech Cost:	$194,967.00
Total Phase Element Cost	$1,153,471.33

Task Documentation:

Task Type:	Remedial Action
Task Name:	03 Unclassified Area (UCA) Excavation
Description:	Unclassified Area (UCA) Excavation
Approach:	Ex Situ
Start Date:	September, 2028
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation	True	100	0
Sorting, Processing, Staging	True	100	0
Load-out Soil - LLW	True	100	0
Containerize/Load-out Debris - LLW	True	100	0
Containerize/Load-out Debris - Mixed Waste	True	100	0
Waste Placement On-site Cell	True	100	0

Total Marked-up Cost: $50,960,807.95

Technologies:

Technology: Excavation

Technology: Excavation

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030223	950, 3.0 CY, Wheel Loader	6,016.00	HR	0.00	72.94	55.27	0.00	$771,304.98	False
17030232	Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	6,016.00	HR	0.00	72.09	75.73	0.00	$889,276.52	False
17039901	Screening Plant (125 Tons/Hour)	6,016.00	HR	0.00	0.00	94.77	0.00	$570,136.32	False
33100136	100-Ton Rough Terrain Crane and Operator	1,040.00	HR	0.00	80.10	240.21	0.00	$333,119.86	False
33100145	Hydraulic Excavator 1.75 CY with Rotating Grapple	3,008.00	HR	0.00	72.09	77.55	0.00	$450,096.52	False
33341009	Man-Lift, Straight Boom, 66' Height, 650 Lbs, 51' Reach	38.00	MO	0.00	0.00	4,895.44	0.00	$186,026.65	False
95010204	4000 Gallon Water Truck	6,016.00	HR	0.00	72.94	27.70	0.00	$605,473.71	False

Total Element Cost: $3,805,434.56

Total 1st Year Tech Cost: $3,805,434.56

Technology: Sorting, Processing, Staging

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030223	950, 3.0 CY, Wheel Loader	6,016.00	HR	0.00	72.94	55.27	0.00	$771,304.98	False
17030284	12 CY, Dump Truck	6,016.00	HR	0.00	63.80	42.46	0.00	$639,267.49	False

Technology: Sorting, Processing, Staging

17030285	12 CY, Dump Truck	6,016.00	HR	0.00	63.80	42.46	0.00	$639,291.96	False
33010108	Pickup Truck(s), Rental	3,760.00	DAY	0.00	0.00	0.00	47.77	$179,615.20	False
33040644	Truck, Intermodal Transport, On-site - Rental/Lease	752.00	DAY	0.00	0.00	285.55	0.00	$214,735.10	False
33100118	R60 Rough Terrain Forklift, 6,000 Lb @ 24" LC	6,016.00	HR	0.00	72.94	31.50	0.00	$628,334.50	False
33100146	Fork Lift, Yard, 8,000 Lbs	6,016.00	HR	0.00	72.94	22.43	0.00	$573,779.01	False
33150432	Radial Stacking Conveyor with 2 CY Hopper, 55' Long	1.00	EA	0.00	0.00	70,000.00	0.00	$70,000.00	False
33190336	Flatbed Trailer (Monthly)	35.00	MO	0.00	0.00	0.00	714.27	$24,999.45	False
95010206	Hydraulic Baler/Logger	1.00	EA	0.00	0.00	105,000.00	0.00	$105,000.00	False
95010903	Brokk 60 Remote Handler w/grapple	1.00	EA	0.00	0.00	109,485.00	0.00	$109,485.00	False
95011001	Radiography, Techni-cart Drum Scanner	35.00	MO	0.00	0.00	45,000.00	0.00	$1,575,000.00	False

Total Element Cost: $5,530,812.69

Total 1st Year Tech Cost: $5,530,812.69

Technology: Load-out Soil - LLW

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	30,646.00	BCY	0.90	1.27	0.39	0.00	$78,391.52	False

Total Element Cost:	$78,391.52
Total 1st Year Tech Cost:	$78,391.52

Technology: Containerize/Load-out Debris - LLW

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	1,369.00	BCY	0.90	1.27	0.39	0.00	$3,501.86	False
95010401	7-4-4 LLW Shipping Boxes	334.00	EA	1,888.97	0.00	0.00	0.00	$630,915.98	False
95010402	Load LLW 7-4-4s on Truck or directly in disposal pit/landfill	334.00	EA	0.00	39.68	5.61	0.00	$15,127.84	False

Total Element Cost:	$649,545.68
Total 1st Year Tech Cost:	$649,545.68

Technology: Containerize/Load-out Debris - Mixed Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	10,173.00	BCY	0.90	1.27	0.39	0.00	$26,022.22	False
95010405	Ultra-MacroPack MW Shipping	2,164.00	EA	8,287.00	0.00	0.00	0.00	$17,933,068.00	False

Technology: Containerize/Load-out Debris - Mixed Waste

	Boxes								
95010406	Load Macro Boxes on Truck or directly in disposal pit/landfill	2,164.00	EA	0.00	39.68	5.61	0.00	$98,013.89	False

Total Element Cost: $18,057,104.11

Total 1st Year Tech Cost: $18,057,104.11

Technology: Waste Placement On-site Cell

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030284	12 CY, Dump Truck	6,016.00	HR	0.00	63.80	42.46	0.00	$639,279.53	False
17030285	12 CY, Dump Truck	6,016.00	HR	0.00	63.80	42.46	0.00	$639,291.96	False
17030703	D5 with A-blade Bulldozer	6,016.00	HR	0.00	72.94	61.12	0.00	$806,518.07	False
33100118	R60 Rough Terrain Forklift, 6,000 Lb @ 24" LC	6,016.00	HR	0.00	72.94	31.50	0.00	$628,311.04	False
33190336	Flatbed Trailer (Monthly)	35.00	MO	0.00	0.00	0.00	714.27	$24,999.45	False
33220112	Field Technician	18,048.00	HR	0.00	42.25	0.00	0.00	$762,439.94	False
33220212	Surveying - 2-man Crew	188.00	DAY	0.00	955.04	12.10	0.00	$181,821.96	False
95010201	Motor Grader, 40,000 Lb.	1,500.00	HR	0.00	72.94	54.00	0.00	$190,410.00	False
95010202	825 G Sheepsfoot Vibratory Roller	6,016.00	HR	0.00	72.94	76.50	0.00	$899,031.04	False
95010204	4000 Gallon Water Truck	6,016.00	HR	0.00	72.94	27.70	0.00	$605,462.27	False

Total Element Cost:	$5,377,565.27
Total 1st Year Tech Cost:	$5,377,565.27
Total Phase Element Cost	$33,498,853.83

Task Documentation:

Task Type: Remedial Action
Task Name: 04 UCA Excavation Verification
Description: UCA Excavation Verification

Approach: Ex Situ
Start Date: August, 2031
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Soil Sampling	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Soil Sampling

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Remedial Action
Task Name:	05 Classified Area (CA) Excavation
Description:	Classified Area (CA) Excavation
Approach:	Ex Situ
Start Date:	August, 2031
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation	True	100	0
Sorting, Processing, Staging	True	100	0
Load-out Soil - LLW	True	100	0
Transport/Place On-site Cell - Mixed Soil Waste	True	100	0
Transport/Place On-site Cell, Concrete MW	True	100	0
Transport/Place On-site Cell, Debris - LLW	True	100	0
Transport/Place On-site Cell, Debris - Mixed Waste	True	100	0
Transportation & Disposal Debris - TRU Waste	True	100	0
Stabilization	True	100	0
Waste Placement On-site Cell	True	100	0

Total Marked-up Cost: $31,996,302.34

Technologies:

Technology: Excavation

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030223	950, 3.0 CY, Wheel Loader	5,080.00	HR	0.00	72.94	55.27	0.00	$651,301.41	False
17030232	Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	5,080.00	HR	0.00	72.09	75.73	0.00	$750,918.34	False
17039901	Screening Plant (125 Tons/Hour)	5,080.00	HR	0.00	0.00	94.77	0.00	$481,431.60	False
33100136	100-Ton Rough Terrain Crane and Operator	1,080.00	HR	0.00	80.10	240.21	0.00	$345,932.17	False
33100145	Hydraulic Excavator 1.75 CY with Rotating Grapple	5,080.00	HR	0.00	72.09	77.55	0.00	$760,136.41	False
33341009	Man-Lift, Straight Boom, 66' Height, 650 Lbs, 51' Reach	29.00	MO	0.00	0.00	4,895.44	0.00	$141,967.71	False
95010204	4000 Gallon Water Truck	5,080.00	HR	0.00	0.00	27.70	0.00	$140,716.00	False
95010901	Remote Operated Hydraulic Excavator	2,080.00	HR	0.00	72.94	81.45	0.00	$321,139.31	False
95010902	Remote Operated Wheel Loader	2,080.00	HR	0.00	72.94	81.45	0.00	$321,139.31	False

Total Element Cost: $3,914,682.26

Total 1st Year Tech Cost: $3,914,682.26

Technology: Sorting, Processing, Staging

Technology: Sorting, Processing, Staging

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030223	950, 3.0 CY, Wheel Loader	5,080.00	HR	0.00	72.94	55.27	0.00	$651,301.41	False
17030284	12 CY, Dump Truck	5,080.00	HR	0.00	63.80	42.46	0.00	$539,806.99	False
17030285	12 CY, Dump Truck	5,080.00	HR	0.00	63.80	42.46	0.00	$539,827.66	False
33010108	Pickup Truck(s), Rental	3,175.00	DAY	0.00	0.00	0.00	47.77	$151,669.75	False
33040644	Truck, Intermodal Transport, On-site - Rental/Lease	635.00	DAY	0.00	0.00	285.55	0.00	$181,325.52	False
33100118	R60 Rough Terrain Forklift, 6,000 Lb @ 24" LC	5,080.00	HR	0.00	72.94	31.50	0.00	$530,555.19	False
33100146	Fork Lift, Yard, 8,000 Lbs	5,080.00	HR	0.00	72.94	22.43	0.00	$484,507.54	False
33190336	Flatbed Trailer (Monthly)	29.00	MO	0.00	0.00	0.00	714.27	$20,713.83	False
95011001	Radiography, Techni-cart Drum Scanner	29.00	MO	0.00	0.00	45,000.00	0.00	$1,305,000.00	False

Total Element Cost: $4,404,707.88

Total 1st Year Tech Cost: $4,404,707.88

Technology: Load-out Soil - LLW

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Load-out Soil - LLW

33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	11,848.00	BCY	0.90	1.27	0.39	0.00	$30,306.82	False

Total Element Cost: $30,306.82

Total 1st Year Tech Cost: $30,306.82

Technology: Transport/Place On-site Cell - Mixed Soil Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	18,905.00	BCY	0.90	1.27	0.39	0.00	$48,358.40	False

Total Element Cost: $48,358.40

Total 1st Year Tech Cost: $48,358.40

Technology: Transport/Place On-site Cell, Concrete MW

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk	395.00	BCY	0.90	1.27	0.39	0.00	$1,010.40	False

Technology: Transport/Place On-site Cell, Concrete MW

Disposal Container

Total Element Cost:	$1,010.40
Total 1st Year Tech Cost:	$1,010.40

Technology: Transport/Place On-site Cell, Debris - LLW

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	209.00	BCY	0.90	1.27	0.39	0.00	$534.62	False
95010401	7-4-4 LLW Shipping Boxes	51.00	EA	1,888.97	0.00	0.00	0.00	$96,337.47	False
95010402	Load LLW 7-4-4s on Truck or directly in disposal pit/landfill	51.00	EA	0.00	39.68	5.61	0.00	$2,309.94	False

Total Element Cost:	$99,182.02
Total 1st Year Tech Cost:	$99,182.02

Technology: Transport/Place On-site Cell, Debris - Mixed Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Transport/Place On-site Cell, Debris - Mixed Waste

33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	1,997.00	BCY	0.90	1.27	0.39	0.00	$5,108.26	False
95010405	Ultra-MacroPack MW Shipping Boxes	425.00	EA	8,287.00	0.00	0.00	0.00	$3,521,975.00	False
95010406	Load Macro Boxes on Truck or directly in disposal pit/landfill	425.00	EA	0.00	39.68	5.61	0.00	$19,249.49	False

Total Element Cost: $3,546,332.76

Total 1st Year Tech Cost: $3,546,332.76

Technology: Transportation & Disposal Debris - TRU Waste

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010408	SWB Standard Waste Box	3.00	EA	3,000.00	0.00	0.00	0.00	$9,000.00	False
95010409	Load SWBs on Truck for disposal	3.00	EA	0.00	39.68	5.61	0.00	$135.88	False
95010410	Transport TRU SWB Containers	310.00	MI	0.00	0.00	0.00	4.07	$1,261.70	False
95010411	Radioactive Waste Disopsal, TRU, Waste Isolation Pilot Plant	7.00	CY	0.00	0.00	0.00	442.00	$3,094.00	False

Total Element Cost: $13,491.58

Total 1st Year Tech Cost: $13,491.58

Technology: Stabilization

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030223	950, 3.0 CY, Wheel Loader	5,080.00	HR	0.00	72.94	55.27	0.00	$651,301.41	False
33197265	Landfill Hazardous Solid Bulk Waste Stabilization	19,300.00	CY	0.00	0.00	0.00	235.00	$4,535,500.00	False

Total Element Cost:	$5,186,801.41
Total 1st Year Tech Cost:	$5,186,801.41

Technology: Waste Placement On-site Cell

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030284	12 CY, Dump Truck	5,080.00	HR	0.00	63.80	42.46	0.00	$539,817.16	False
17030285	12 CY, Dump Truck	5,080.00	HR	0.00	63.80	42.46	0.00	$539,827.66	False
17030703	D5 with A-blade Bulldozer	5,080.00	HR	0.00	72.94	61.12	0.00	$681,035.87	False
33100118	R60 Rough Terrain Forklift, 6,000 Lb @ 24" LC	5,080.00	HR	0.00	72.94	31.50	0.00	$530,555.20	False
33190336	Flatbed Trailer (Monthly)	29.00	MO	0.00	0.00	0.00	714.27	$20,713.83	False
33220112	Field Technician	15,240.00	HR	0.00	42.25	0.00	0.00	$643,815.64	False
33220212	Surveying - 2-man Crew	159.00	DAY	0.00	955.04	12.10	0.00	$153,774.96	False
95010201	Motor Grader, 40,000 Lb.	1,270.00	HR	0.00	72.94	54.00	0.00	$161,213.80	False

Technology: Waste Placement On-site Cell

95010202	825 G Sheepsfoot Vibratory Roller	5,080.00	HR	0.00	72.94	76.50	0.00	$759,155.20	False
95010204	4000 Gallon Water Truck	5,080.00	HR	0.00	72.94	27.70	0.00	$511,261.36	False

Total Element Cost:	$4,541,170.67
Total 1st Year Tech Cost:	$4,541,170.67
Total Phase Element Cost	$21,786,044.20

Task Documentation:

Task Type: Remedial Action
Task Name: 06 CA Excavation Verification
Description: CA Excavation Verification

Approach: Ex Situ
Start Date: January, 2034
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Soil Sampling	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Soil Sampling

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type: Remedial Action
Task Name: 07 Excavation Backfilling
Description: Excavation Backfilling

Approach: Ex Situ
Start Date: April, 2034
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation Backfill and Compaction - Replaceable	True	100	0
Excavation Backfill and Compaction - Supplemental	True	100	0

Total Marked-up Cost: $2,545,688.66

Technologies:

Technology: Excavation Backfill and Compaction - Replaceable

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030282	Hauling, soil, 12 C.Y. truck, 1 mile haul, includes loading	42,739.00	LCY	0.00	0.65	0.48	0.00	$48,138.71	False

Technology: Excavation Backfill and Compaction - Replaceable

17030514	Compaction, of backfill, structural, 6" lifts, self propelled roller	42,739.00	ECY	0.00	0.86	0.61	0.00	$63,096.83	False
17030520	Backfill, bulk, 6" to 12" lifts, dozer backfilling	42,739.00	ECY	0.00	1.20	1.50	0.00	$115,526.02	False
33021103	Soil testing, Atterberg limits, liquid and plastic limits	2.00	EA	0.00	0.00	0.00	63.00	$126.00	False
33021104	Soil testing, Sieve analysis, washed, ASTM D 422	2.00	EA	0.00	0.00	0.00	49.50	$99.00	False
33021107	Soil testing, soil density, nuclear method, ASTM D2922	84.00	EA	0.00	0.00	0.00	39.60	$3,326.40	False
33021114	Soil testing, Proctor compaction, 4" standard mold, ASTM D 698	2.00	EA	0.00	0.00	0.00	110.70	$221.40	False
33220212	Surveying - 2-man Crew	12.00	DAY	0.00	955.04	12.10	0.00	$11,605.66	False
95010204	4000 Gallon Water Truck	376.00	HR	0.00	72.94	27.70	0.00	$37,841.39	False

Total Element Cost: $279,981.41

Total 1st Year Tech Cost: $279,981.41

Technology: Excavation Backfill and Compaction - Supplemental

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030280	Borrow, General & Subgrade Load & Haul 15 Miles, No Spreading	51,140.00	CY	10.13	7.05	4.52	0.00	$1,109,192.92	False

Technology: Excavation Backfill and Compaction - Supplemental

17030514	Compaction, of backfill, structural, 6" lifts, self propelled roller	51,140.00	ECY	0.00	0.86	0.61	0.00	$75,499.48	False
17030520	Backfill, bulk, 6" to 12" lifts, dozer backfilling	51,140.00	ECY	0.00	1.20	1.50	0.00	$138,234.41	False
33021103	Soil testing, Atterberg limits, liquid and plastic limits	3.00	EA	0.00	0.00	0.00	63.00	$189.00	False
33021104	Soil testing, Sieve analysis, washed, ASTM D 422	3.00	EA	0.00	0.00	0.00	49.50	$148.50	False
33021107	Soil testing, soil density, nuclear method, ASTM D2922	102.00	EA	0.00	0.00	0.00	39.60	$4,039.20	False
33021114	Soil testing, Proctor compaction, 4" standard mold, ASTM D 698	3.00	EA	0.00	0.00	0.00	110.70	$332.10	False
33220212	Surveying - 2-man Crew	24.00	DAY	0.00	955.04	12.10	0.00	$23,211.31	False
95010204	4000 Gallon Water Truck	760.00	HR	0.00	72.94	27.70	0.00	$76,487.92	False

Total Element Cost:	$1,427,334.85
Total 1st Year Tech Cost:	$1,427,334.85
Total Phase Element Cost	$1,707,316.26

Task Documentation:

Task Type:	Remedial Action
Task Name:	08 D&D MWL Excavation Sprung
Description:	D&D MWL Excavation Sprung
Approach:	In Situ
Start Date:	January, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition - 400 X 650 Tent Structure - Means	True	100	0

Total Marked-up Cost: $419,663.57

Technologies:

Technology: Demolition - 400 X 650 Tent Structure - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010309	Demolition 400 X 650 Tension structure	260,000.00	SF	0.00	0.84	0.24	0.00	$281,180.49	False

Total Element Cost:	$281,180.49
Total 1st Year Tech Cost:	$281,180.49
Total Phase Element Cost	$281,180.49

Task Documentation:

Task Type:	Remedial Action
Task Name:	09 Excavation ET Cover Construction
Description:	Excavation ET Cover Construction
Approach:	Ex Situ
Start Date:	March, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Capping	True	100	0
Fencing	True	100	0

Total Marked-up Cost: $792,760.32

Technologies:

Technology: Capping

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030422	General & Subgrade fill, 6" Lifts, On-Site, Includes Spreading and	10,010.00	CY	0.00	2.99	2.28	0.00	$52,701.65	True

Technology: Capping

	Compaction								
18050203	Rock Cover, Riprap, Medium (10 to 200 Lb Pieces), includes labor & equipment for placement	6,800.00	CY	0.00	7.89	3.46	0.00	$77,178.65	True
18050302	Topsoil, 6" Lifts, On-Site	7,020.00	CY	0.00	2.74	2.18	0.00	$34,537.73	False
18050711	Sprinkler System, Above Ground Piping and Sprinkler Heads, Manually Operated	5.00	ACR	3,827.63	12,462.36	57.83	0.00	$81,739.11	False
33021103	Soil testing, Atterberg limits, liquid and plastic limits	6.00	EA	0.00	0.00	0.00	63.00	$378.00	False
33021104	Soil testing, Sieve analysis, washed, ASTM D 422	6.00	EA	0.00	0.00	0.00	49.50	$297.00	False
33021107	Soil testing, soil density, nuclear method, ASTM D2922	86.00	EA	0.00	0.00	0.00	39.60	$3,405.60	False
33021114	Soil testing, Proctor compaction, 4" standard mold, ASTM D 698	6.00	EA	0.00	0.00	0.00	110.70	$664.20	False
33080506	Native Soil, 6" Lifts, On-Site	25,870.00	CY	0.00	3.80	2.89	0.00	$173,036.67	True
33111045	Seeding, Seasonal Grass Mixture, Per Acre	4.98	ACR	431.62	422.45	197.83	0.00	$5,238.45	False
33220212	Surveying - 2-man Crew	38.00	DAY	0.00	955.04	12.10	0.00	$36,751.25	False
95010204	4000 Gallon Water Truck	600.00	HR	0.00	72.94	27.70	0.00	$60,387.54	False

Total Element Cost:	$526,315.84
Total 1st Year Tech Cost:	$526,315.84

Technology: Fencing

Technology: Fencing

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18040111	Galvanized Barbed Wire, 3-Strand	1,970.00	LF	0.24	1.37	0.28	0.00	$3,728.93	False
18040212	Fence, chain link, gates & posts, end posts, chain link fence, galvanized steel, (1/3 post length in ground), 3" OD, 8', set in concrete, includes excavation	6.00	EA	63.45	34.01	4.92	0.00	$614.32	False
18040501	Hazardous Waste Signing	10.00	EA	110.70	28.67	4.15	0.00	$1,435.18	False

Total Element Cost:	$5,778.43
Total 1st Year Tech Cost:	$5,778.43
Total Phase Element Cost	$532,094.27

Task Documentation:

Task Type: Remedial Action
Task Name: 10 On-site Cell ET Cover Construction
Description: On-site Cell ET Cover Construction

Approach: Ex Situ
Start Date: February, 2035
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Capping	True	100	0

Total Marked-up Cost: $2,473,941.64

Technologies:

Technology: Capping

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030422	General & Subgrade fill, 6" Lifts, On-Site, Includes Spreading and Compaction	49,513.00	CY	1.22	3.32	2.53	0.00	$350,052.44	False

Technology: Capping

18050203	Rock Cover, Riprap, Medium (10 to 200 Lb Pieces), includes labor & equipment for placement	6,795.00	CY	33.00	8.77	3.84	0.00	$309,926.00	False
18050302	Topsoil, 6" Lifts, On-Site	10,639.00	CY	0.00	2.74	2.18	0.00	$52,342.87	False
18050711	Sprinkler System, Above Ground Piping and Sprinkler Heads, Manually Operated	5.00	ACR	3,827.63	12,462.36	57.83	0.00	$81,739.11	False
33021103	Soil testing, Atterberg limits, liquid and plastic limits	10.00	EA	0.00	0.00	0.00	63.00	$630.00	False
33021104	Soil testing, Sieve analysis, washed, ASTM D 422	10.00	EA	0.00	0.00	0.00	49.50	$495.00	False
33021107	Soil testing, soil density, nuclear method, ASTM D2922	278.00	EA	0.00	0.00	0.00	39.60	$11,008.80	False
33021114	Soil testing, Proctor compaction, 4" standard mold, ASTM D 698	10.00	EA	0.00	0.00	0.00	110.70	$1,107.00	False
33080506	Native Soil, 6" Lifts, On-Site	29,862.00	CY	17.15	3.80	2.89	0.00	$711,871.26	True
33111040	Lysimeter Monitoring System	1.00	EA	3,337.29	1,378.50	169.48	0.00	$4,885.27	False
33111045	Seeding, Seasonal Grass Mixture, Per Acre	9.61	ACR	431.62	422.45	197.83	0.00	$10,108.73	False
33111103	Topsoil placement and grading, gravel mulch, delivered and dumped, includes spreading and grading	432.00	CY	27.50	37.30	2.04	0.00	$28,876.04	False
33220212	Surveying - 2-man Crew	38.00	DAY	0.00	955.04	12.10	0.00	$36,751.25	False
95010204	4000 Gallon Water Truck	600.00	HR	0.00	72.94	27.70	0.00	$60,387.54	False

Total Element Cost: $1,660,181.30

Total 1st Year Tech Cost:	$1,660,181.30
Total Phase Element Cost	$1,660,181.30

Task Documentation:

Task Type: Remedial Action
Task Name: 11 SNL Professional Labor Management
Description: Professional Labor Management
Approach: Ex Situ
Start Date: September, 2028
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Professional Labor Management	True	100	0

Total Marked-up Cost: $52,784,837.64

Technologies:

Technology: Professional Labor Management

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	18,555,160.60	0.00	0.00	$18,555,160.60	False

Total Element Cost:	$18,555,160.60
Total 1st Year Tech Cost:	$18,555,160.60
Total Phase Element Cost	$18,555,160.60

Task Documentation:

Task Type:	Remedial Action
Task Name:	12 Contractor Labor Management
Description:	Contractor Labor Management
Approach:	Ex Situ
Start Date:	September, 2028
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Professional Labor Management	True	100	0

Total Marked-up Cost: $111,161,839.36

Technologies:

Technology: Professional Labor Management

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager	7,492.00	HR	0.00	99.66	0.00	0.00	$746,652.72	True
33220102	Project Manager	14,984.	HR	0.00	91.65	0.00	0.00	$1,373,283.60	True

Technology: Professional Labor Management

		00							
33220104	Senior Staff Engineer	29,968.00	HR	0.00	98.77	0.00	0.00	$2,959,924.66	False
33220106	Staff Engineer	29,968.00	HR	0.00	83.34	0.00	0.00	$2,497,467.27	False
33220110	QA/QC Officer	14,984.00	HR	0.00	65.35	0.00	0.00	$979,186.10	False
33220111	Certified Industrial Hygienist	14,984.00	HR	0.00	86.30	0.00	0.00	$1,293,137.44	False
33220112	Field Technician	299,680.00	HR	0.00	42.25	0.00	0.00	$12,660,017.81	False
33220119	Health and Safety Officer	14,984.00	HR	0.00	69.10	0.00	0.00	$1,035,430.92	False
33220150	Laboratory Manager	15,132.00	HR	0.00	91.65	0.00	0.00	$1,386,847.80	False
33220151	Data/Document Control Manager	15,132.00	HR	0.00	63.30	0.00	0.00	$957,800.24	False
33220152	Laboratory QA/QC	15,132.00	HR	0.00	65.35	0.00	0.00	$988,857.75	False
33220153	QA/QC Technician	13,224.00	HR	0.00	83.34	0.00	0.00	$1,102,059.13	False
33220154	Chemical Analyst	56,512.00	HR	0.00	83.34	0.00	0.00	$4,709,586.03	False
33220155	Radiological Assessment Analyst	28,256.00	HR	0.00	83.34	0.00	0.00	$2,354,855.04	False
33220156	Laboratory Support Personnel	28,256.00	HR	0.00	83.34	0.00	0.00	$2,354,855.04	False
33220157	HazCat Laboratory Technician	39,672.00	HR	0.00	42.25	0.00	0.00	$1,676,142.00	False

Total Element Cost:	$39,076,103.55
Total 1st Year Tech Cost:	$39,076,103.55
Total Phase Element Cost	$39,076,103.55

Task Documentation:

Task Type:	Remedial Action
Task Name:	13 Administration Facilities
Description:	Administrative Facilities
Approach:	Ex Situ
Start Date:	September, 2028
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administration Facilities	True	100	0

Total Marked-up Cost: $440,314.64

Technologies:

Technology: Administration Facilities

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010502	Administrative Trailer	87.00	MO	0.00	0.00	448.20	0.00	$38,993.40	False
95010503	Co-ed Shower Trailer	87.00	MO	0.00	0.00	448.20	0.00	$38,993.40	False

Technology: Administration Facilities

95010504	Office Trailer (3 Ea.)	261.00	MO	0.00	0.00	448.20	0.00	$116,980.20	False
95010505	10 X 25 Connex Storage Box (10 Ea.)	870.00	MO	0.00	0.00	115.00	0.00	$100,050.00	False

Total Element Cost:	$295,017.00
Total 1st Year Tech Cost:	$295,017.00
Total Phase Element Cost	$295,017.00

Phase 4 Closure

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Onsite & Offsite Laboratories	$1,369,477							$286,732	$1,656,210
(System Defaults)		$0	$0	$12,079	$110,525	$0	$164,129		
02 D&D Sprungs & Warehouses	$12,028,573							$3,052,458	$15,081,031
(System Defaults)		$0	$0	$551,533	$1,006,408	$0	$1,494,517		
03 Operational Area - Pre-Scraping Characterization	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
04 Operational Area - Scrape/Load/Disposal	$3,186,062							$892,158	$4,078,221
(System Defaults)		$0	$0	$215,857	$272,154	$0	$404,148		
05 Operational Area - Verification	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
06 Demobilize Administration & Onsite Laboratory Trailers	$248,808							$122,539	$371,347
(System Defaults)		$0	$0	$60,958	$24,781	$0	$36,800		
07 SNL Professional Labor Management	$3,263,579							$6,020,496	$9,284,075
(System Defaults)		$0	$0	$4,480,894	$619,558	$0	$920,043		
08 Contractor Labor Management	$7,163,254							$13,214,430	$20,377,684
(System Defaults)		$0	$0	$9,835,148	$1,359,872	$0	$2,019,410		

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
09 Administration Facilities	$74,602							$36,742	$111,344
(System Defaults)		$0	$0	$18,277	$7,430	$0	$11,034		
Total Phase Cost	$27,334,356	$0	$0	$15,174,746	$3,400,728	$0	$5,050,081	$23,625,555	$50,959,912

Total Phase Cost $50,959,912

	Direct Cost	Markups	Total
Total Phase Cost	$27,334,356	$23,625,555	$50,959,912

Task Documentation:

Task Type:	Site Closeout
Task Name:	01 Onsite & Offsite Laboratories
Description:	Onsite & Offsite Laboratories
Approach:	Ex Situ
Start Date:	June, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Offsite Laboratory Analysis	True	100	0
Onsite Laboratory Facilities	True	100	0

Total Marked-up Cost: $1,656,209.74

Technologies:

Technology: Offsite Laboratory Analysis

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33020216	Testing, rad analytical, data packaging, alpha spectroscopy	1,043.00	EA	0.00	0.00	0.00	110.70	$115,460.10	False

Technology: Offsite Laboratory Analysis

33021602	Testing, pH, electrometric (9045)	22.00	EA	0.00	0.00	0.00	16.40	$360.80	False
33021603	Testing, dissolved solids	22.00	EA	0.00	0.00	0.00	17.10	$376.20	False
33021604	Testing, suspended solids	22.00	EA	0.00	0.00	0.00	17.10	$376.20	False
33021613	Testing, oil and grease EPA 413.2	22.00	EA	0.00	0.00	0.00	53.10	$1,168.20	False
33021614	Testing, total petroleum hydrocarbons (TPH)	22.00	EA	0.00	0.00	0.00	71.67	$1,576.74	False
33021631	Testing, chlorinated hydrocarbons (612, 8120)	22.00	EA	0.00	0.00	0.00	135.00	$2,970.00	False
33021653	Testing, chloride	22.00	EA	0.00	0.00	0.00	22.50	$495.00	False
33021656	Testing, flouride, no distillation	22.00	EA	0.00	0.00	0.00	19.12	$420.75	False
33021670	Metals Screen, 25 Metals Listed In Method EPA 200.7, Water Analysis	22.00	EA	0.00	0.00	0.00	450.00	$9,900.00	False
33021673	Testing, total organic carbons	22.00	EA	0.00	0.00	0.00	47.25	$1,039.50	False
33021712	Testing, mercury EPA 7470	1,043.00	EA	0.00	0.00	0.00	30.00	$31,286.87	False
33021717	Pesticides/PCBs (SW 3550B/SW 8081/8082), Soil Analysis	1,043.00	EA	0.00	0.00	0.00	103.50	$107,950.50	False
33021720	Testing, purgeable organics (624, 8260)	1,043.00	EA	0.00	0.00	0.00	144.00	$150,192.00	False
33021724	Testing, phenols (9066) total recoverable	22.00	EA	0.00	0.00	0.00	37.50	$825.00	False
33021739	Testing, semi-volatile organics, pkd. column (8250)	1,043.00	EA	0.00	0.00	0.00	266.94	$278,418.41	False
33021762	Testing, soil & sediment analysis, chromium hexavalent 7195/7196/7197/7199	1,043.00	EA	0.00	0.00	0.00	56.70	$59,138.10	False
33021793	Testing, soil & sediment analysis, Total and Extractable Metals in	1,043.00	EA	0.00	0.00	0.00	292.50	$305,077.50	False

Technology: Offsite Laboratory Analysis

	Soils (EPA 3050)								
33022128	Testing, chromium, hexavalent (SW7195) with prep	22.00	EA	0.00	0.00	0.00	39.60	$871.20	False
33022133	Testing, pesticides/PCBs (SW3510/SW8080)	22.00	EA	0.00	0.00	0.00	103.50	$2,277.00	False
33022139	Testing, BTEX/MTBE (mod EPA 602)	22.00	EA	0.00	0.00	0.00	57.96	$1,275.12	False
33022257	Testing, rad analytical liquid, gas flow proportional counting, gross beta-total	22.00	EA	0.00	0.00	0.00	35.67	$784.67	False
33022271	Testing, rad analytical liquid, gamma spectroscopy, gamma isotopic (cesium, 137 20 PCI/I)	22.00	EA	0.00	0.00	0.00	76.81	$1,689.73	False
33022284	Testing, rad analytical, liquid scintillation, tritium (direct counting)	22.00	EA	0.00	0.00	0.00	65.09	$1,431.94	False
33022287	Testing, rad analytical liquid, gross alpha, total gas flow prop. counting	22.00	EA	0.00	0.00	0.00	46.55	$1,024.06	False
33022336	Testing, rad analytical vegetation/sediment/soil, gas flow proportional counting, gross beta-total	1,043.00	EA	0.00	0.00	0.00	48.35	$50,426.96	False
33022342	Testing, rad analytical vegetation/sediment/soil, gamma spectroscopy, gamma isotopic	1,043.00	EA	0.00	0.00	0.00	87.76	$91,532.63	False
33022351	Testing, rad analytical vegetation/sediment/soil, liquid scintillation, tritium	1,043.00	EA	0.00	0.00	0.00	56.03	$58,443.46	False
33022352	Testing, rad analytical vegetation/sediment/soil, gross alpha, total gas flow proportional	1,043.00	EA	0.00	0.00	0.00	41.60	$43,386.71	False

Technology: Offsite Laboratory Analysis

counting

Total Element Cost:	$1,320,175.35
Total 1st Year Tech Cost:	$1,320,175.35

Technology: Onsite Laboratory Facilities

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010508	Laboratory Trailer (5 Ea.)	110.00	MO	0.00	0.00	448.20	0.00	$49,302.00	False

Total Element Cost:	$49,302.00
Total 1st Year Tech Cost:	$49,302.00
Total Phase Element Cost	$1,369,477.35

Task Documentation:

Task Type:	Site Closeout
Task Name:	02 D&D Sprungs & Warehouses
Description:	D&D Sprungs & Warehouses
Approach:	Ex Situ
Start Date:	June, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition - 300 X 500 Tent Structures (3) - Means	True	100	0
Demolition - 350 X 550 Tent Structure - Means	True	100	0
Demolition - 200 X 550 Tent Structure - Means	True	100	0
Transportation and Disposal Tent Structure Fabric	True	100	0
Demolition 200 X 200 Warehouse	True	100	0
Demolition 200 X 200 Container Storage Canopy	True	100	0
Demolition 250 X 250 Shipping Center	True	100	0
Transportation & Disposal 200 X 200 Warehouse	True	100	0
Transportation & Disposal 200 X 200 Canopy	True	100	0
Transportation & Disposal 250X250 Shipping Center	True	100	0

Total Marked-up Cost: $15,081,031.26

Technologies:

Technology: Demolition - 300 X 500 Tent Structures (3) - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010307	Demolition 300 X 500 Tension structure	450,000.00	SF	0.00	1.09	0.27	0.00	$609,914.63	False

Total Element Cost:	$609,914.63
Total 1st Year Tech Cost:	$609,914.63

Technology: Demolition - 350 X 550 Tent Structure - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010308	Demolition 350 X 550 Tension structure	192,500.00	SF	0.00	0.95	0.25	0.00	$231,234.76	False

Total Element Cost:	$231,234.76
Total 1st Year Tech Cost:	$231,234.76

Technology: Demolition - 200 X 550 Tent Structure - Means

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010306	Demolition 200 X 550 Tension structure	110,000.00	SF	0.00	1.18	0.29	0.00	$162,021.95	False

Total Element Cost:	$162,021.95
Total 1st Year Tech Cost:	$162,021.95

Technology: Transportation and Disposal Tent Structure Fabric

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	41.00	EA	26.96	0.00	0.00	0.00	$1,105.52	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	41.00	EA	0.00	101.55	22.43	0.00	$5,083.32	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	33,825.00	MI	0.00	0.00	0.00	3.60	$121,770.00	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	730.00	BCY	0.90	1.27	0.39	0.00	$1,867.32	False

Technology: Transportation and Disposal Tent Structure Fabric

33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $129,871.16

Total 1st Year Tech Cost: $129,871.16

Technology: Demolition 200 X 200 Warehouse

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17020105	Single-level, Steel, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	960,000.00	CF	0.00	0.13	0.06	0.00	$188,596.44	False
17030226	988, 7.0 CY, Wheel Loader	64.00	HR	0.00	72.94	96.71	0.00	$10,857.92	False
17030295	35 Ton, 769, Off-highway Truck	127.00	HR	0.00	63.80	106.84	0.00	$21,671.83	False

Total Element Cost: $221,126.20

Total 1st Year Tech Cost: $221,126.20

Technology: Demolition 200 X 200 Container Storage Canopy

Element:

			Unit of	Material	Labor Unit	Equipment	Sub Bid		Cost

Technology: Demolition 200 X 200 Container Storage Canopy

Assembly	Description	Quantity	Measure	Unit Cost	Cost	Unit Cost	Cost	Extended Cost	Override
17020105	Single-level, Steel, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	120,000.00	CF	0.00	0.13	0.06	0.00	$23,574.56	False
17030226	988, 7.0 CY, Wheel Loader	16.00	HR	0.00	72.94	96.71	0.00	$2,714.48	False
17030295	35 Ton, 769, Off-highway Truck	40.00	HR	0.00	63.80	106.84	0.00	$6,825.77	False

Total Element Cost: $33,114.81

Total 1st Year Tech Cost: $33,114.81

Technology: Demolition 250 X 250 Shipping Center

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17020105	Single-level, Steel, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	1,500,000.00	CF	0.00	0.13	0.06	0.00	$294,681.94	False
17030226	988, 7.0 CY, Wheel Loader	99.00	HR	0.00	72.94	96.71	0.00	$16,795.85	False
17030295	35 Ton, 769, Off-highway Truck	198.00	HR	0.00	63.80	106.84	0.00	$33,787.58	False

Total Element Cost: $345,265.37

Total 1st Year Tech Cost: $345,265.37

Technology: Transportation & Disposal 200 X 200 Warehouse

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	1,975.00	EA	26.96	0.00	0.00	0.00	$53,253.90	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	1,975.00	EA	0.00	101.55	22.43	0.00	$244,867.27	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	1,629, 375.00	MI	0.00	0.00	0.00	3.60	$5,865,749.84	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	35,556. 00	BCY	0.90	1.27	0.39	0.00	$90,951.14	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $6,254,867.15

Total 1st Year Tech Cost: $6,254,867.15

Technology: Transportation & Disposal 200 X 200 Canopy

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override

Technology: Transportation & Disposal 200 X 200 Canopy

33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	247.00	EA	26.96	0.00	0.00	0.00	$6,660.11	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	247.00	EA	0.00	101.55	22.43	0.00	$30,623.91	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	203,775.00	MI	0.00	0.00	0.00	3.60	$733,589.98	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	4,444.00	BCY	0.90	1.27	0.39	0.00	$11,367.61	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost: $782,286.61

Total 1st Year Tech Cost: $782,286.61

Technology: Transportation & Disposal 250X250 Shipping Center

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	1,029.00	EA	26.96	0.00	0.00	0.00	$27,745.96	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in	1,029.00	EA	0.00	101.55	22.43	0.00	$127,578.95	False

Technology: Transportation & Disposal 250X250 Shipping Center

	Disposal Pit/Landfill								
33170924	Transport LLW Roll-Off Containers (1 per truck)	848,925.00	MI	0.00	0.00	0.00	3.60	$3,056,129.92	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	18,519.00	BCY	0.90	1.27	0.39	0.00	$47,371.03	False
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Total Element Cost:	$3,258,870.85
Total 1st Year Tech Cost:	$3,258,870.85
Total Phase Element Cost	$12,028,573.49

Task Documentation:

Task Type:	Site Closeout
Task Name:	03 Operational Area - Pre-Scraping Characterization
Description:	Operational Area - Pre-Scraping Characterization
Approach:	Ex Situ
Start Date:	October, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Soil Sampling	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Soil Sampling

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Site Closeout
Task Name:	04 Operational Area - Scrape/Load/Disposal
Description:	Operational Area - Scrape/Load/Disposal
Approach:	Ex Situ
Start Date:	January, 2036
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation (Scraping & Loading)	True	100	0
Off-site Transportation and Waste Disposal	True	100	0

Total Marked-up Cost: $4,078,220.57

Technologies:

Technology: Excavation (Scraping & Loading)

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
17030223	950, 3.0 CY, Wheel Loader	1,600.00	HR	0.00	72.94	55.27	0.00	$205,134.30	False

Technology: Excavation (Scraping & Loading)

33010108	Pickup Truck(s), Rental	1,000.00	DAY	0.00	0.00	0.00	47.77	$47,770.00	False
33040644	Truck, Intermodal Transport, On-site - Rental/Lease	200.00	DAY	0.00	0.00	285.55	0.00	$57,110.40	False
95010201	Motor Grader, 40,000 Lb.	1,600.00	HR	0.00	72.94	54.00	0.00	$203,103.99	False
95010204	4000 Gallon Water Truck	1,600.00	HR	0.00	72.94	27.70	0.00	$161,027.20	False

Total Element Cost: $674,145.89

Total 1st Year Tech Cost: $674,145.89

Technology: Off-site Transportation and Waste Disposal

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33170462	DISPOSABLE INTERMODAL LINER, 30-CY, 6-MIL	760.00	EA	26.96	0.00	0.00	0.00	$20,492.64	False
33170910	Load Intermodal Container on Disposal Vehicle or Directly in Disposal Pit/Landfill	760.00	EA	0.00	198.27	37.39	0.00	$179,096.93	False
33170924	Transport LLW Roll-Off Containers (1 per truck)	627,000.00	MI	0.00	0.00	0.00	3.60	$2,257,199.94	False
33171016	Radioactive Waste Disposal, Nevada Test Site, NV, LLRW, Bulk or Containerized	0.00	CY	0.00	0.00	0.00	401.50	$0.00	False
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	13,679.00	BCY	0.90	2.48	0.65	0.00	$55,082.03	False
33190317	Waste Stream Evaluation Fee,	1.00	EA	0.00	0.00	0.00	45.00	$45.00	False

Technology: Off-site Transportation and Waste Disposal

Not Including 50% Rebate on 1st Shipment

Total Element Cost:	$2,511,916.54
Total 1st Year Tech Cost:	$2,511,916.54
Total Phase Element Cost	$3,186,062.43

Task Documentation:

Task Type:	Site Closeout
Task Name:	05 Operational Area - Verification
Description:	Operational Area - Verification
Approach:	Ex Situ
Start Date:	October, 2036
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Soil Sampling	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Soil Sampling

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type: Site Closeout
Task Name: 06 Demobilize Administration & Onsite Laboratory Trailers
Description: Demobilize Administration & Onsite Laboratory Trailers

Approach: Ex Situ
Start Date: January, 2037
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administration Facilities	True	100	0
Revegetation	True	100	0

Total Marked-up Cost: $371,346.78

Technologies:

Technology: Administration Facilities

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010515	Mob./Demob. AdministrativeTrailer	1.00	LS	0.00	0.00	431.00	0.00	$431.00	False

Technology: Administration Facilities

95010516	Mob./Demob. Office Trailer	3.00	LS	0.00	0.00	431.00	0.00	$1,293.00	False
95010517	Mob./Demob. Laboratory Trailer	5.00	LS	0.00	0.00	431.00	0.00	$2,155.00	False
95010518	Mob./Demob. Shower Trailer	1.00	LS	0.00	0.00	431.00	0.00	$431.00	False
95010519	Mob./Demob Connex Storage Boxes	10.00	EA	0.00	0.00	431.00	0.00	$4,310.00	False

Total Element Cost: $8,620.00

Total 1st Year Tech Cost: $8,620.00

Technology: Revegetation

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
18050402	Seeding, Vegetative Cover	60.00	ACR	3,285.52	498.52	219.08	0.00	$240,187.56	False

Total Element Cost: $240,187.56

Total 1st Year Tech Cost: $240,187.56

Total Phase Element Cost $248,807.56

Task Documentation:

Task Type:	Site Closeout
Task Name:	07 SNL Professional Labor Management
Description:	Professional Labor Management
Approach:	Ex Situ
Start Date:	June, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Site Close-Out Documentation	True	100	0

Total Marked-up Cost: $9,284,075.11

Technologies:

Technology: Site Close-Out Documentation

Element: Documents

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	3,263,579.32	0.00	0.00	$3,263,579.32	False

Total Element Cost:	$3,263,579.32
Total 1st Year Tech Cost:	$3,263,579.32
Total Phase Element Cost	$3,263,579.32

Task Documentation:

Task Type:	Site Closeout
Task Name:	08 Contractor Labor Management
Description:	Contractor Labor Management
Approach:	Ex Situ
Start Date:	June, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Site Close-Out Documentation	True	100	0

Total Marked-up Cost: $20,377,684.25

Technologies:

Technology: Site Close-Out Documentation

Element: Meetings

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager	1,928.00	HR	0.00	99.66	0.00	0.00	$192,141.65	False
33220102	Project Manager	3,856.00	HR	0.00	91.65	0.00	0.00	$353,402.40	True

Technology: Site Close-Out Documentation

33220104	Senior Staff Engineer	7,712.00	HR	0.00	98.77	0.00	0.00	$761,710.46	False
33220106	Staff Engineer	7,712.00	HR	0.00	83.34	0.00	0.00	$642,701.13	False
33220110	QA/QC Officer	3,856.00	HR	0.00	65.35	0.00	0.00	$251,984.89	False
33220111	Certified Industrial Hygienist	3,856.00	HR	0.00	86.30	0.00	0.00	$332,777.49	False
33220112	Field Technician	66,560.00	HR	0.00	42.25	0.00	0.00	$2,811,835.24	False
33220119	Health and Safety Officer	3,856.00	HR	0.00	69.10	0.00	0.00	$266,459.00	False
33220150	Laboratory Manager	2,800.00	HR	0.00	91.65	0.00	0.00	$256,619.99	False
33220151	Data/Document Control Manager	2,800.00	HR	0.00	63.30	0.00	0.00	$177,240.00	False
33220152	Laboratory QA/QC	2,800.00	HR	0.00	65.35	0.00	0.00	$182,980.00	False
33220153	QA/QC Technician	0.00	HR	0.00	83.34	0.00	0.00	$0.00	False
33220154	Chemical Analyst	5,600.00	HR	0.00	83.34	0.00	0.00	$466,703.99	False
33220155	Radiological Assessment Analyst	2,800.00	HR	0.00	83.34	0.00	0.00	$233,351.99	False
33220156	Laboratory Support Personnel	2,800.00	HR	0.00	83.34	0.00	0.00	$233,345.85	False
33220157	HazCat Laboratory Technician	0.00	HR	0.00	42.25	0.00	0.00	$0.00	False

Total Element Cost:	$7,163,254.09
Total 1st Year Tech Cost:	$7,163,254.09
Total Phase Element Cost	$7,163,254.09

Task Documentation:

Task Type:	Site Closeout
Task Name:	09 Administration Facilities
Description:	Administration Facilities
Approach:	Ex Situ
Start Date:	June, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Administration Facilities	True	100	0

Total Marked-up Cost: $111,343.93

Technologies:

Technology: Administration Facilities

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010502	Administrative Trailer	22.00	MO	0.00	0.00	448.20	0.00	$9,860.40	False
95010503	Co-ed Shower Trailer	22.00	MO	0.00	0.00	448.20	0.00	$9,860.40	False

Technology: Administration Facilities

95010504	Office Trailer (3 Ea.)	66.00	MO	0.00	0.00	448.20	0.00	$29,581.20	False
95010505	10 X 25 Connex Storage Box (10 Ea.)	220.00	MO	0.00	0.00	115.00	0.00	$25,300.00	False

Total Element Cost:	$74,602.00
Total 1st Year Tech Cost:	$74,602.00
Total Phase Element Cost	$74,602.00

Phase 5 Closure Reporting - TSCA & RCRA

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Compile Data & Prepare Reports	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
02 Regulatory Review & Approval	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
03 SNL Professional Labor Management	$1,019,936							$1,881,529	$2,901,465
(System Defaults)		$0	$0	$1,400,372	$193,625	$0	$287,533		
04 Contractor Labor Management	$1,359,908							$2,508,693	$3,868,600
(System Defaults)		$0	$0	$1,867,153	$258,165	$0	$383,375		
Total Phase Cost	$2,379,843	$0	$0	$3,267,525	$451,789	$0	$670,907	$4,390,222	$6,770,065

Total Phase Cost $6,770,065

	Direct Cost	Markups	Total
Total Phase Cost	$2,379,843	$4,390,222	$6,770,065

Task Documentation:

Task Type: Site Closeout
Task Name: 01 Compile Data & Prepare Reports
Description: Compile Data & Prepare Reports

Approach: Ex Situ
Start Date: April, 2034
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
No Cost	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: No Cost

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type: Site Closeout
Task Name: 02 Regulatory Review & Approval
Description: Regulatory Review & Approval

Approach: Ex Situ
Start Date: June, 2037
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
No Cost	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: No Cost

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
95010801	No Cost	1.00	EA	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type: Site Closeout
Task Name: 03 SNL Professional Labor Management
Description: Professional Labor Management

Approach: Ex Situ
Start Date: April, 2034
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Site Close-Out Documentation	True	100	0

Total Marked-up Cost: $2,901,464.75

Technologies:

Technology: Site Close-Out Documentation

Element: Documents

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	1,019,935.78	0.00	0.00	$1,019,935.78	False

Total Element Cost:	$1,019,935.78
Total 1st Year Tech Cost:	$1,019,935.78
Total Phase Element Cost	$1,019,935.78

Task Documentation:

Task Type:	Site Closeout
Task Name:	04 Contractor Labor Management
Description:	Professional Labor Management
Approach:	Ex Situ
Start Date:	April, 2034
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Site Close-Out Documentation	True	100	0

Total Marked-up Cost: $3,868,600.18

Technologies:

Technology: Site Close-Out Documentation

Element: Documents

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220101	Senior Project Manager	936.00	HR	0.00	99.66	0.00	0.00	$93,280.39	False
33220102	Project Manager	1,872.00	HR	0.00	91.65	0.00	0.00	$171,568.80	True

Technology: Site Close-Out Documentation

33220104	Senior Staff Engineer	3,744.00	HR	0.00	98.77	0.00	0.00	$369,793.04	False
33220106	Staff Engineer	3,744.00	HR	0.00	83.34	0.00	0.00	$312,016.73	False
33220110	QA/QC Officer	1,872.00	HR	0.00	65.35	0.00	0.00	$122,332.91	False
33220111	Certified Industrial Hygienist	1,872.00	HR	0.00	86.30	0.00	0.00	$161,555.88	False
33220112	Field Technician	0.00	HR	0.00	42.25	0.00	0.00	$0.00	False
33220119	Health and Safety Officer	1,872.00	HR	0.00	69.10	0.00	0.00	$129,359.76	False

Total Element Cost:	$1,359,907.52
Total 1st Year Tech Cost:	$1,359,907.52
Total Phase Element Cost	$1,359,907.52

Phase 6 Long-Term Monitoring & Maintenance

Task (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
01 Install Groundwater and Soil-Gas Monitoring Networks	$878,000							$261,782	$1,139,782
(System Defaults)		$0	$0	$72,769	$76,062	$0	$112,951		
02 Monitoring Well Install Report	$33,000							$60,877	$93,877
(System Defaults)		$0	$0	$45,309	$6,265	$0	$9,303		
03 Install Report Regulatory Review & Approval	$0							$0	$0
(System Defaults)		$0	$0	$0	$0	$0	$0		
04 Monitoring, Inspection, Maintenance & Reporting	$7,056,000							$8,293,672	$15,349,672
(System Defaults)		$0	$0	$5,748,198	$1,024,336	$0	$1,521,139		
Total Phase Cost	$7,967,000	$0	$0	$5,866,276	$1,106,662	$0	$1,643,393	$8,616,331	$16,583,331

Total Phase Cost $16,583,331

	Direct Cost	Markups	Total
Total Phase Cost	$7,967,000	$8,616,331	$16,583,331

Task Documentation:

Task Type: Long Term Monitoring
Task Name: 01 Install Groundwater and Soil-Gas Monitoring Networks
Description: Install Groundwater and Soil-Gas Monitoring Networks

Approach: Ex Situ
Start Date: June, 2035
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Labor/Equipment/Materials	True	100	0

Total Marked-up Cost: $1,139,781.87

Technologies:

Technology: Labor/Equipment/Materials

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	53,000.00	0.00	0.00	$53,000.00	False
95014001	Materials/Equipment	1.00	LS	0.00	0.00	0.00	825,000.00	$825,000.00	False

Total Element Cost:	$878,000.00
Total 1st Year Tech Cost:	$878,000.00
Total Phase Element Cost	$878,000.00

Task Documentation:

Task Type:	Long Term Monitoring
Task Name:	02 Monitoring Well Install Report
Description:	Monitoring Well Install Report
Approach:	Ex Situ
Start Date:	October, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Labor Costs	True	100	0

Total Marked-up Cost: $93,876.83

Technologies:

Technology: Labor Costs

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	33,000.00	0.00	0.00	$33,000.00	False
95014001	Materials/Equipment	1.00	LS	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$33,000.00
Total 1st Year Tech Cost:	$33,000.00
Total Phase Element Cost	$33,000.00

Task Documentation:

Task Type: Long Term Monitoring
Task Name: 03 Install Report Regulatory Review & Approval
Description: Install Report Regulatory Review & Approval

Approach: Ex Situ
Start Date: January, 2036
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Task Markup Template: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Labor Costs	True	100	0

Total Marked-up Cost: $0.00

Technologies:

Technology: Labor Costs

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	0.00	0.00	0.00	$0.00	False
95014001	Materials/Equipment	1.00	LS	0.00	0.00	0.00	0.00	$0.00	False

Total Element Cost:	$0.00
Total 1st Year Tech Cost:	$0.00
Total Phase Element Cost	$0.00

Task Documentation:

Task Type:	Long Term Monitoring
Task Name:	04 Monitoring, Inspection, Maintenance & Reporting
Description:	Monitoring, Inspection, Maintenance & Reporting
Approach:	Ex Situ
Start Date:	June, 2035
Labor Rate Group:	System Labor Rate
Analysis Rate Group:	System Analysis Rate
Task Markup Template:	System Defaults

Technology Markups	Markup	% Prime	% Sub.
Labor/Equipment/Materials	True	100	0

Total Marked-up Cost: $15,349,672.29

Technologies:

Technology: Labor/Equipment/Materials

Element:

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Cost	Extended Cost	Cost Override
33220148	Project Oversight Labor Cost	1.00	LS	0.00	4,025,999.90	0.00	0.00	$4,025,999.90	False
95014001	Materials/Equipment	1.00	LS	900,000.00	0.00	0.00	2,130,000.00	$3,030,000.00	False

Total Element Cost:	$7,055,999.90
Total 1st Year Tech Cost:	$7,055,999.90
Total Phase Element Cost	$7,055,999.90