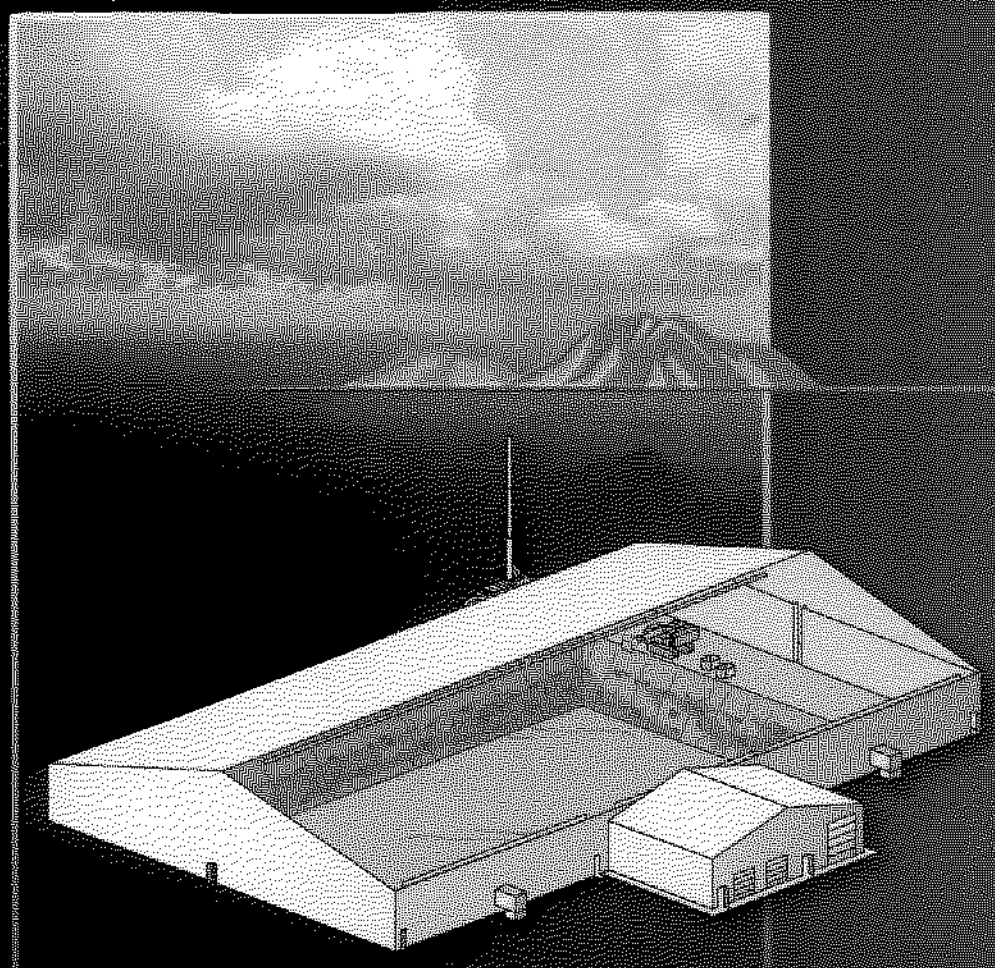
ICP/EXT-03-00121

Conceptual Design Report for the Accelerated Retrieval Project at Area G of Pit 4 within the Radioactive Waste Management Complex

January 2004



Idaho Completion Project

ICP/EXT-03-00121
Project No. 23927

Conceptual Design Report for the Accelerated Retrieval Project at Area G of Pit 4 within the Radioactive Waste Management Complex

January 2004

Idaho Completion Project
Idaho Falls, Idaho 83415

Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE/NE Idaho Operations Office
Contract DE-AC07-99ID13727

Conceptual Design Report for the Accelerated Retrieval Project at Area G of Pit 4 within the Radioactive Waste Management Complex

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Approved by

Stephanie L. Austad, Project Engineer — Date: 1/27/04

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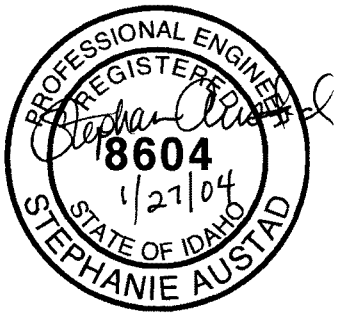
CONCEPTUAL DESIGN REPORT FOR THE ACCELERATED RETRIEVAL PROJECT AT AREA G OF PIT 4 WITHIN THE RADIOACTIVE WASTE MANAGEMENT COMPLEX

The following report was prepared under the direction of the Professional Engineers indicated by the seals and signatures provided on this page.



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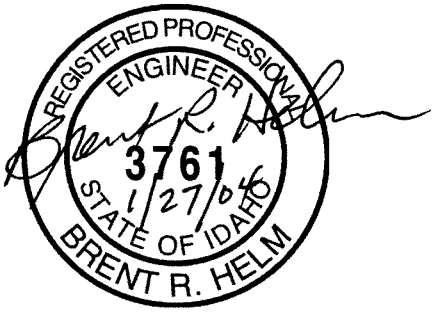

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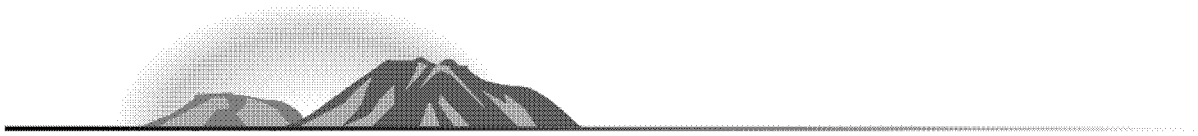


ABSTRACT

The Accelerated Retrieval Project described in this Conceptual Design Report provides a low-cost method for performing a Comprehensive Environmental Response, Compensation and Liability Act non-time critical removal action to retrieve and manage the transuranic waste material buried in Area G of Pit 4 within the Radioactive Waste Management Complex at the Idaho National Engineering and Environmental Laboratory. Value engineering and tradeoff studies were used to develop the conceptual design for the Accelerated Retrieval Project, which will maintain protection of the workers, public health, and the environment. The retrieval process will consist of removing the clean overburden; excavating a layer of potentially contaminated soil above the waste zone material; excavating the waste zone material and about 2 ft of underburden; assaying and segregating the material into TRU (greater than 100 nCi/g) and non-TRU (less than or equal to 100 nCi/g) waste streams; packaging and returning the non-TRU material to the retrieval site; treating (as needed) and packaging the TRU material for shipment to the Waste Isolation Pilot Plant in Carlsbad, New Mexico; and shipping the packaged TRU material to the Waste Isolation Pilot Plant. This work will take place inside a large fabric enclosure constructed over the retrieval area to minimize the spread of contamination and provide protection from the weather. Various characterization, sampling, and packaging systems will be used to prepare the waste material for final disposition. Project execution strategies have been developed for safety, procurement, quality, environmental protection, radiation protection, industrial health and safety, configuration management, security, and construction. A conceptual cost estimate and project schedule are also developed.

SUMMARY

U.S. Department of Energy commitments to the state of Idaho and the U.S. Environmental Protection Agency contain enforceable deadlines that require analyzing the need to remediate transuranic (TRU) waste material buried in the Subsurface Disposal Area at the Radioactive Waste Management Complex at the Idaho National Engineering and Environmental Laboratory. The Subsurface Disposal Area is a radioactive waste landfill that contains hazardous chemicals, remote-handled fission and activation products, and transuranic radionuclides.

Waste materials buried in the Subsurface Disposal Area pose a potential risk to the Snake River Plain Aquifer due to subsurface vapor phase and aqueous transport of contaminants. For this reason, the U.S. Department of Energy Idaho Operations Office has elected to retrieve waste material from selected areas containing comparatively high amounts of buried TRU waste under the Comprehensive Environmental Response, Compensation, and Liability Act (42 USC § 9601 et seq., 1980) National Contingency Plan (40 CFR 300) non-time-critical removal action process. One such area is Pit 4, Area G.

The Accelerated Retrieval Project described in this Conceptual Design Report provides a low-cost method for retrieving and managing the waste material buried in Area G, while maintaining protection of the workers, public health, and the environment. Extensive value engineering and tradeoff studies were used to develop this conceptual design.

Retrieval activities are currently scheduled to begin October 2004 per the approved final design.

The retrieval process (see Figure E-1) consists of removing the soil that covers the waste material; excavating the waste zone material and about 2 ft of soil under the waste zone; assaying and segregating the material into TRU (greater than 100 nCi/g) and non-TRU (less than or equal to 100 nCi/g) waste streams; packaging the TRU material for shipment to the Waste Isolation Pilot Plant in Carlsbad, New Mexico; packaging and returning the non-TRU material to the retrieval site; and shipping the packaged TRU material to the Waste Isolation Pilot Plant.

The concept for the Accelerated Retrieval Project is to have an operator in personal protective equipment excavate the waste material from Area G using a Gradall XL 5200 excavator with a sealed, pressurized cab. This work will take place inside a large fabric enclosure constructed over the retrieval area to minimize the spread of contamination and provide protection from the weather.

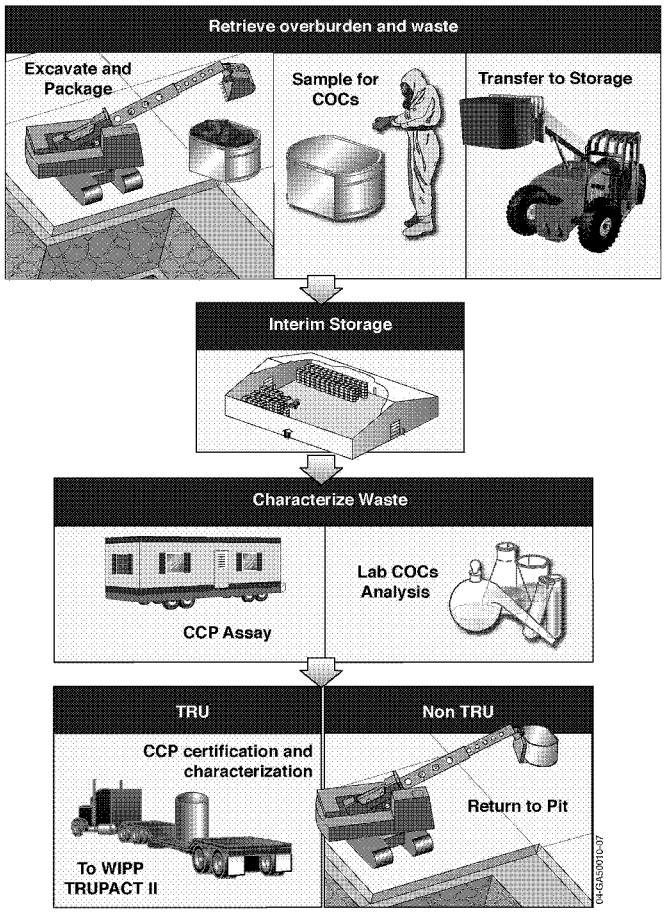
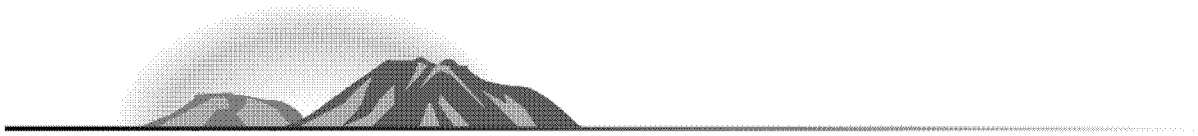


Figure E-1. Process for retrieving, characterizing, and disposing of waste from Pit 4, Area G.

Various characterization, sampling, and packaging systems will be used to prepare the waste material for final disposition. The packages will be stored and maintained in an interim storage enclosure(s) until transported for final disposition. The enclosures, equipment, and systems will use, to the greatest extent practical, standard commercial products and fabrication techniques. Preliminary requirements and equipment for the standard waste box transportation and fogging system, the remote-handled TRU packaging system, dust suppression systems, and the video monitoring system—all preventative systems to minimize contamination risk within the enclosure—are identified and described in this report. Project execution strategies have been developed for safety, procurement, quality, environmental protection, radiation protection, industrial health and safety, configuration management, security, and construction. A conceptual cost estimate and project schedule are also developed.

When the Accelerated Retrieval Project is completed, the retrieved TRU waste material will have been shipped to the Waste Isolation Pilot Plant and the retrieved non-TRU waste material will be reburied in Area G.



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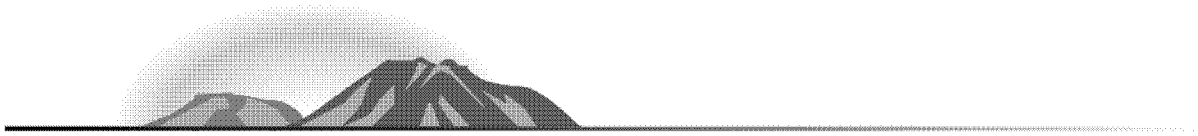


ACRONYMS

ADEC	Advanced Diesel Emission Control
AE	Architectural Engineering (standards)
AHJ	authority having jurisdiction
ALARA	as low as reasonably achievable
AMTLD	area monitoring thermoluminescent dosimeters
AR	Accelerated Retrieval (Project)
ARAR	applicable or relevant and appropriate requirement
BBWI	Bechtel BWXT Idaho, LLC
CAM	constant air monitor
CCP	Central Characterization Project
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CO	carbon monoxide
DAC	derived air concentration
DOE	U.S. Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
ES&H	Environment, Safety, and Health
EPA	Environmental Protection Agency
FY	fiscal year
GAC	granulated activated carbon
GFE	government furnished equipment
GGT	gas generation testing
HC	hydrocarbons
HEPA	high-efficiency particulate air
ICP	Idaho Completion Project
IDEQ	Idaho Department of Environmental Quality
INEEL	Idaho National Engineering and Environmental Laboratory
LTTD	low temperature thermal desorption
NCP	National Oil and Hazardous Substances Contingency Plan
NDA	nondestructive assay
NDE	nondestructive examination
NE	DOE Office of Nuclear Energy, Science, and Technology

NE-ID	U.S. Department of Energy Idaho Operations Office
NFPA	National Fire Protection Association
NOx	oxides of nitrogen
NTCRA	non-time-critical removal action
OCVZ	Organic Contamination in the Vadose Zone (project)
PCB	polychlorinated biphenyl
PSAR	preliminary safety analysis report
PPE	personal protective equipment
QA	Quality Assurance
RAM	radiation area monitors
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technicians
RTR	real time radiography
RWMC	Radioactive Waste Management Complex
SDA	Subsurface Disposal Area
SSC	structures, systems, and components
SWB	standard waste box
T&FR	technical and functional requirement
TLD	thermoluminescent dosimeters
TRU	transuranic
VE	visual examination
VOC	volatile organic compound
WAC	waste acceptance criteria
WIPP	Waste Isolation Pilot Plant

Conceptual Design Report for the Accelerated Retrieval Project at Area G of Pit 4 within the Radioactive Waste Management Complex

1. PROJECT OVERVIEW

U.S. Department of Energy (DOE) commitments to the state of Idaho and the U.S. Environmental Protection Agency (EPA) contain enforceable deadlines that require analyzing the need to remediate buried transuranic (TRU) waste at the Idaho National Engineering and Environmental Laboratory (INEEL). The TRU waste is a result of INEEL support for the nuclear energy mission of the United States, both as a research laboratory and a waste management facility. The Radioactive Waste Management Complex (RWMC) is located in the southwestern portion of the INEEL (see Figure 1-1), and encompasses the Subsurface Disposal Area (SDA). The SDA consists of 20 pits, 58 trenches, 21 soil vaults, Pad A, and the Acid Pit, where waste disposal activities occurred.

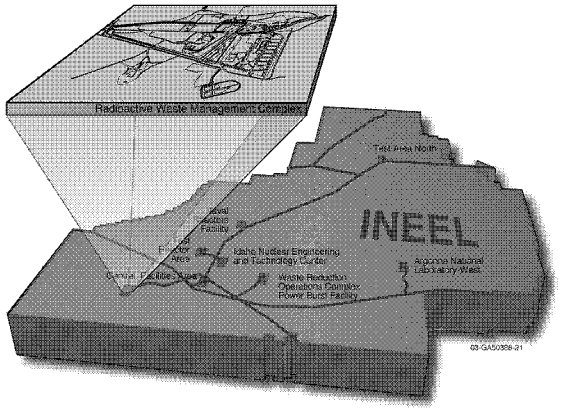


Figure 1-1. The Radioactive Waste Management Complex is located in the southwestern portion of the Idaho National Engineering and Environmental Laboratory.

Accelerated Retrieval (AR) Project Objectives

- Reduce potential threat to the Snake River Plain Aquifer
- Remove all transuranic waste from Pit 4, Area G
- Maintain protection of workers, public health, and the environment.

AR Project End State

- Transuranic waste is shipped to the Waste Isolation Pilot Plant
- Area G is topped with clean soil.
- Other contaminants to be addressed as part of the overall SDA remediation (OU 13/14)

Waste buried at the SDA presents a potential risk to the Snake River Plain Aquifer through subsurface vapor phase and aqueous transport of contaminants. For this reason, the U.S. Department of Energy Idaho Operations Office (NE-ID)[a] has elected to retrieve waste from selected areas containing comparatively high amounts of buried TRU waste under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq.) National Contingency Plan (40 CFR 300) non-time-critical removal action (NTCRA) process. One such area is Pit 4, Area G.

The Accelerated Retrieval (AR) Project described in this conceptual design report provides a low-cost method for retrieving and managing the waste buried in Area G, while maintaining protection of the workers, public health, and the environment. This waste retrieval effort also supports the overarching DOE environmental management goal of accelerated closure described in the DOE-ID *Environmental*

a. NE-ID signifies that the DOE Idaho Operations Office reports to the DOE Office of Nuclear Energy, Science, and Technology (NE).

Management Performance Management Plan for the Accelerated Cleanup of the Idaho National Engineering and Environmental Laboratory (DOE-ID 2002a) to accelerate cleanup of the INEEL. This plan lists remediation of buried waste as an element of Strategic Initiative 4.8, "Remediate Buried Waste at the Radioactive Waste Management Complex."

The selection of Area G as the specific retrieval area for this project was based on an evaluation of shipping and burial records of containerized radioactive materials and sludge from the DOE Rocky Flats Plant and low level radioactive waste generated at the INEEL. From these records, several 1/2-acre areas within the SDA that contain relatively large amounts of TRU or other contaminated waste were targeted. Pit 4, Area G (see Figure 1-2) was selected from these target areas by NE-ID, with agreement from the EPA and the Idaho Department of Environmental Quality.

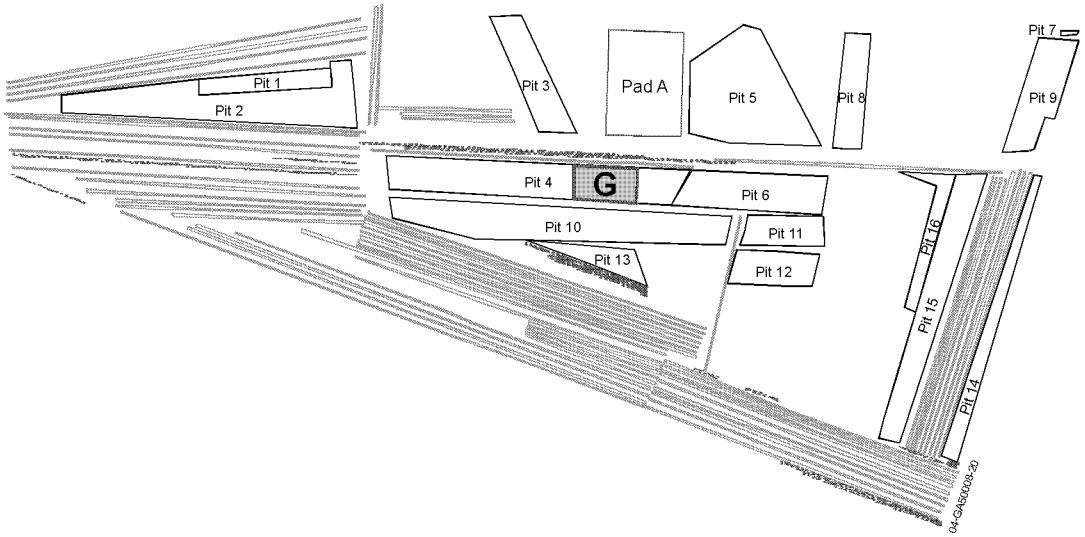


Figure 1-2. Map of the SDA showing the location of Pit 4, Area G.

Waste retrieval and site remediation of Area G will consist of removing the soil that covers the waste material; excavating the waste zone material and about 2 ft of soil under the waste zone; sampling the retrieved waste material; assaying and segregating the retrieved waste material into TRU (greater than 100 nCi/g) and non-TRU (less than or equal to 100 nCi/g) waste streams; treating, if necessary, and packaging the TRU material for shipment to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico; returning the non-TRU material to the excavated site; and shipping the packaged TRU material to WIPP.

When the AR Project is completed, the retrieved TRU waste material will have been shipped to WIPP and the retrieved non-TRU waste material reburied in Area G.

The AR Project provides a low-cost method for safely retrieving, characterizing, treating, and disposing of the waste material buried in Area G, while maintaining protection of the workers, public health, and the environment. This conceptual design for the AR Project includes:

- Assumptions, which are used as the basis for the NTCRA under CERCLA

- Conceptual-level design details addressing the technical and functional requirements
- A basis for the preliminary documented safety analysis
- A basis for preliminary operational planning
- Project execution strategies for safety, procurement, quality, environmental protection, radiation protection, industrial health and safety, configuration management, security, and construction
- A project schedule
- A conceptual budgetary cost estimate for the project.

Retrieval activities are scheduled to begin in October 2004 per the approved final design. The TRU characterization and certification effort is expected to begin in late FY 2005 at the earliest. The TRU volatile organic compound (VOC) treatment system design is not required until the characterization effort starts, and could be delayed until FY 2006.

The concept for the AR Project (see Figure 1-3) is to have an operator in personal protective equipment (PPE) excavate the waste material from Area G using a Gradall XL 5200 excavator with a sealed, pressurized cab. This work will take place inside a large fabric enclosure constructed over the retrieval area to minimize the spread of contamination and provide protection from the weather. Various characterization, sampling, and packaging systems will be used to prepare the waste material for final disposition. The packages will be stored and maintained in an interim storage facility until transported for final disposition. The retrieval/airlock enclosure, equipment, and systems will use, to the greatest extent practical, standard commercial products and fabrication techniques. Preliminary requirements and equipment for the standard waste box transportation and fogging system, the remote-handled (RH) TRU packaging system, dust suppression systems, and the video monitoring system—all preventative systems to minimize contamination risk within the enclosure—are identified and described in this report.

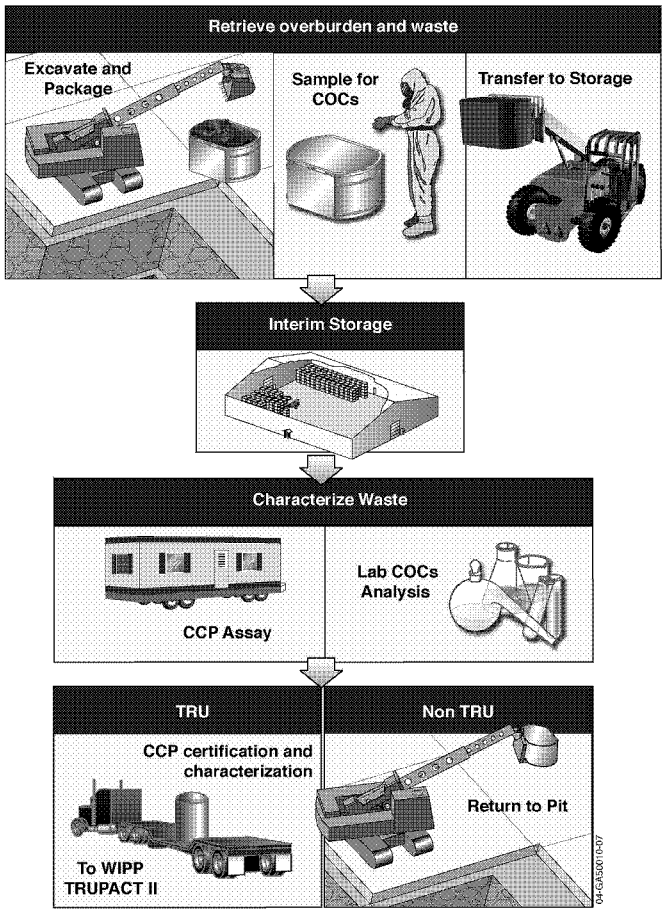


Figure 1-3. Process for retrieving, characterizing, and disposing of waste from Pit 4, Area G.

To the extent practical, uncontaminated soil will be retrieved separately to minimize cross contamination, thereby limiting the amount of material that will be TRU waste (greater than 100 nCi/g).

The material containers—currently assumed to be standard waste boxes (SWBs)—will be sampled to support characterization efforts, decontaminated, bar-code labeled, sealed, and transferred to interim storage. The containers will remain in the CERCLA (MCP-3475) interim storage enclosure or the existing WMF-628 storage facility until additional characterization systems are on-line. The WMF-628 facility will be used for compliant storage of containers of material (if any) with polychlorinated biphenyl (PCB) contamination above thresholds. Central Characterization Project (CCP) personnel and equipment from the National TRU Program, using an existing program adapted to the INEEL, will assist with the characterization and certification of TRU waste. The CCP box assay system will be used to distinguish between TRU (greater than 100 nCi/g) and non-TRU (less than or equal to 100 nCi/g) material. TRU and non-TRU will follow different treatment and disposition paths. TRU material will be characterized, certified, treated for VOCs if necessary, and loaded for transportation to WIPP for final disposal (see Figure 1-4). Non-TRU, non-PCB material will be returned to the pit.

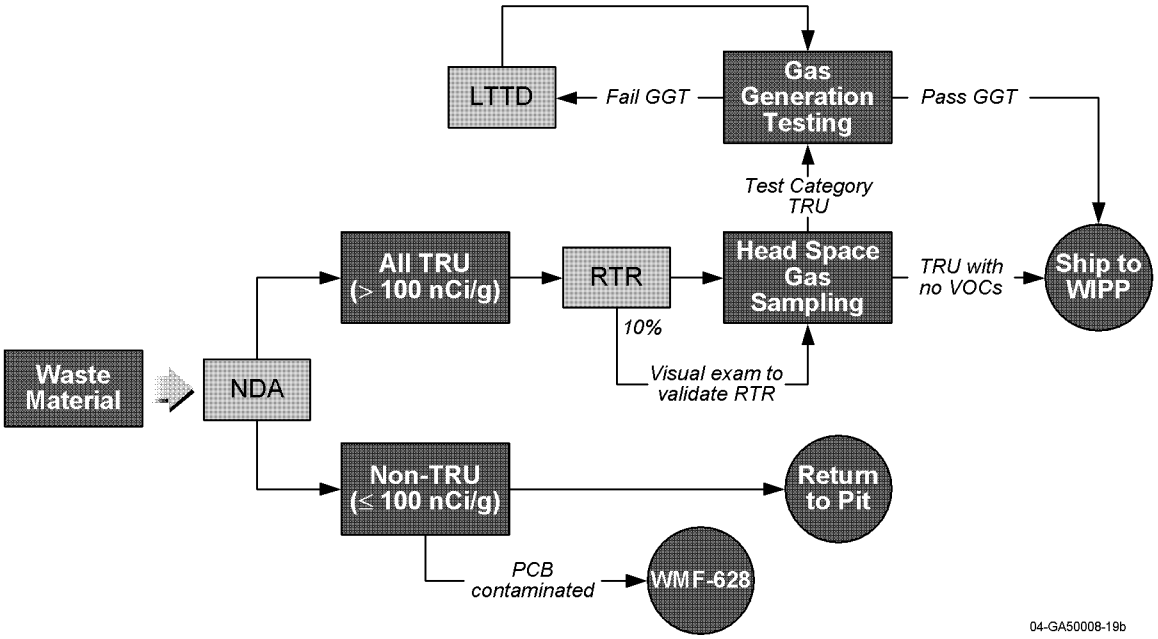
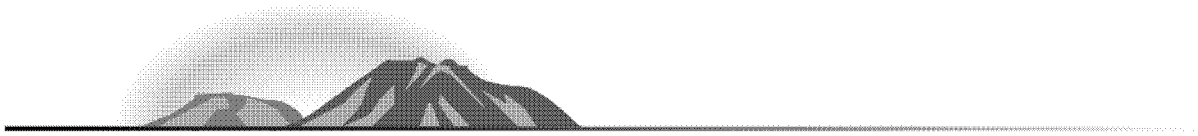


Figure 1-4. TRU sampling, characterization, certification, and disposition path.



2. OVERALL PROJECT ACQUISITION STRATEGY

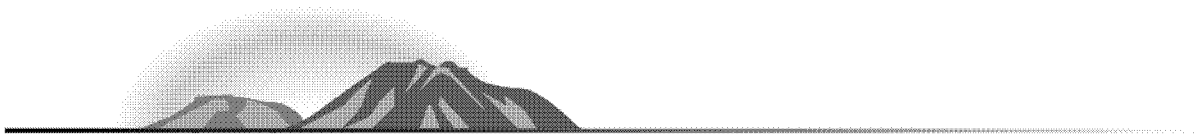
The acquisition strategy for the AR Project addresses design, procurement, and construction. Final design, including deliverables such as performance specifications, drawings, and construction packages, will be performed by in-house engineering resources. Due to the short schedule duration for procurement and construction, most equipment will be procured directly by the Idaho Completion Project (ICP) and installed by force account personnel. Systems anticipated for purchase by direct procurement are:

- Retrieval and storage enclosures
- Excavator and end-effectors
- Forklift
- High-efficiency particulate air (HEPA) filtration system
- Stack monitoring system
- Fissile material assay system
- Closed circuit television system
- Digface radiation monitoring system
- Dust suppression system
- Fissile material assay system monitor/trailer
- Constant air monitors (CAMs) and radiation area monitors (RAMs).

In FY 2004, the following construction packages will be prepared and executed by force account personnel to provide the necessary systems and services to start the retrieval activities in FY 2005:

- **Site Development and Utilities:** Includes establishing roads, enclosure pads, and power and telephone access.
- **Retrieval and Airlock Enclosures and Equipment Installation:** Includes constructing retrieval and airlock enclosures, installing associated government furnished equipment (GFE), and connecting to power and telephone.
- **Interim Storage Enclosure Installation:** Includes constructing the storage enclosure, and connecting to power and telephone.

Additional systems and services such as WIPP characterization and certification, return-to-pit box grouting system, TRU VOC treatment system, and additional storage will be provided in FY 2005 or later. The treatment systems will be fabricated off site and installed by force account personnel. The WIPP characterization and certification system will be provided by the CCP. Additional storage needed to support retrieval, treatment, and CCP operations and a box grouting system will be procured by Bectel BWXT Idaho, LLC (BBWI) and installed by force account personnel. Retrieval, interim storage, treatment, and return-to-pit operations will be performed by BBWI personnel. The WIPP characterization and certification operations will be provided by the CCP.



3. PROJECT TECHNICAL BASIS

The technical basis for the AR Project, which includes objectives and assumptions, technical and functional requirements, codes and standards, and key technical risks is addressed in this section.

3.1 Objectives and Assumptions

PLN-1524, "Project Plan for the Accelerated Retrieval Project at Area G for Pit 4 within the Radioactive Waste Management Complex (Draft)," addresses the activities necessary to retrieve, store, treat, and dispose waste and soil from Area G of Pit 4. This report established the following objectives to accomplish these activities:

- Complete a retrieval of Area G (1/2-acre of Pit 4) within the SDA TRU pits as part of a NTCRA approach using simplified concepts and off-the-shelf commercial-grade enclosures, and equipment.
- Design, construct, and commence retrieval operations within Area G by October 1, 2004.
- To the extent practical, obtain retrieval equipment and enclosures that are relocatable and reusable for follow-on removal actions in adjacent areas of Pit 4 such as Area H, or other targeted TRU retrieval sites within the SDA.
- Characterize waste zone material and removed soils for safe and compliant storage, including fissile assay, to ensure the SWBs do not exceed the limits for criticality safety (after removal from the retrieval/airlock enclosure).
- Package and store waste zone material and removed soils onsite (within the area-of-contamination) awaiting final disposition.
- Provide for final TRU waste disposition at WIPP to ensure long-term storage and legacy TRU waste issues are avoided.

Project Objectives

- Use a non-time-critical removal action to complete Area G retrieval
- Design, construct, and commence retrieval operations by October 2004
- Use commercial off-the-shelf retrieval enclosures and equipment that can be relocated and reused
- Characterize retrieved material to meet safe, compliant storage and SWB limits
- Package and store waste to avoid long-term storage and legacy waste issues
- VOC levels in TRU waste will meet WIPP criterion
- Human health and the environment will be protected per relevant laws and regulations
- All TRU waste will be removed from Area G
- Waste and soil will be segregated
- One-fourth of Area G will be retrieved in the first 6-month operating campaign

- Limited treatment of retrieved wastes to reduce VOCs to acceptable levels will be provided for TRU waste to be shipped to WIPP (FY 2005 and after).
- The process used to retrieve buried TRU waste will be protective of human health and the environment, complying with all federal and state laws and regulations. Applicable or relevant and

appropriate requirements (ARARs) shall be applied consistent with the *National Contingency Plan* (NCP) (40 CFR 300).

- To the extent practical, all TRU waste (including soils that are contaminated to TRU-waste levels) will be removed from the retrieval area.
- At a minimum, the process used to excavate the contents of Area G will achieve gross segregation of material that is clearly only soil from the waste and soil mix.
- The AR Project should achieve removal of approximately one-fourth of Area G in the first 6-month operating campaign.

Appendix A summarizes the constraints and assumptions used in developing the project scope, work plan, cost estimate, and schedule. The project work plan, cost estimate, and schedule may not be achievable if these constraints and assumptions are not valid.

3.2 High-Level Technical and Functional Requirements

TFR-265, "Technical and Functional Requirement for the Accelerated Retrieval Project at Area G of Pit 4 within the Radioactive Waste Management Complex," establishes the technical baseline for the AR Project and defines the requirements for the project to the extent that the requirements are known at the beginning of conceptual design. It is not intended to define analysis or evaluation tasks that may be part of the design activity, but it does capture overall project requirements for retrieving, packaging, temporarily storing, treating, and disposing of the Area G waste material.

3.2.1 Codes and Standards

Unlike typical projects for permanent INEEL facilities the AR Project is not a permanent, fully occupied facility and, as a result, the design basis is being closely evaluated. The existing INEEL AE Standards implement the national design codes and standards for the INEEL in all disciplines of facility engineering, however, many of the AE Standards sections are intended for permanent, fully occupied INEEL facilities. While not directly applicable to non-permanent, fully occupied facilities, the existing INEEL AE Standards can be used as a check list to identify design elements and provides the frame work for mitigating the risk associated with various design aspects and to allow those risks to be identified and managed by the project through administrative and operational measures and engineering controls.

The AR Project design process will result in a graded approach based on the hazards identified in the fire hazards analysis and safety analysis. Major design elements are addressed in Section 6.6, Design, and the applicable codes and standards for the project design are listed in TFR-265.

If there are any perceived deviations from the AE Standards requirements, waivers will be sought from the NE-ID.

3.3 Key Technical Risks

Risk is the degree of exposure to an event that might cause detriment or benefit to a program, project, or activity. Risk management is the process that is structured to eliminate or mitigate potential adverse impacts to a project, as well as to enhance potential positive outcomes.

PLN-1520, "Risk Management Plan for the Accelerated Retrieval Project at Area G of Pit 4 within the Radioactive Waste Management Complex," focuses on areas of concern and helps AR Project personnel make better-informed decisions. The Risk Management Plan uses the six key risk-management process elements described in risk assessment guidance from DOE program and project management practices and GDE-70, Section N, "Project Risk Management," to define the process the project will use to address risk items determined to be significant.

Risk assessments are performed in accordance with instructions included in Section 3, "Risk Management Process Execution," of PLN-1520. The process is an iterative cycle, designed to remain current with project events and details. The project manager schedules a risk management team meeting on an as-needed basis to review new risks, changes to existing risks, and closure of past risks.

The agreed-on risk-handling strategies, response plans, and residual-risk quantifications are entered into the project risk-management database. The risk-response actions are entered into the project action tracking system. This system provides a way to assign action owners and action due dates and provide on-going risk item status to the risk management team. The highest risks to the project, which may result in changed scope, schedule, or cost, are approval of SAR-215, "Preliminary Safety Analysis Report (PSAR) for the Accelerated Retrieval Project at Area G of Pit 4 within the Radioactive Waste Management Complex," identifying and resolving TRU disposition issues, and environmental and personnel protection. Table 3-1 describes the major risk concerns for the AR Project and the proposed mitigation strategy.

Table 3-1. Major risk concerns for the AR Project.

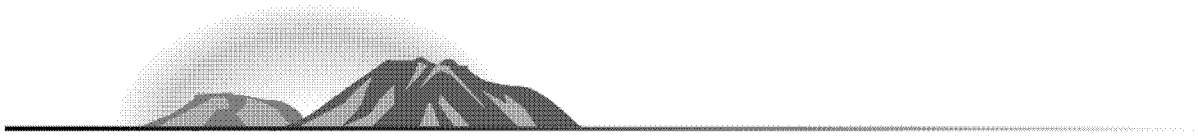
Risk	Description	Mitigation
Nuclear facility safety authorization basis is not approved	Accident analysis anticipated to indicate exposure to immediate area worker is greater than the 25 rem guideline in ID O 420.D. Accident analysis may indicate release at 100 m greater than ID O 420.D guidelines.	Complete a PSAR during the conceptual design process for review and acceptance by NE-ID.
Consensus codes and standards for construction, including maximum possible fire loss requirements for fire protection, are required to be applied	Retrieval/airlock enclosure will be considered a permanent facility and subject to consensus codes and standards.	Early interpretation and waiver process will be utilized for code deviations.
Environmental releases of radiological contamination exceed limits	Preliminary calculations indicate that hazardous contamination in the exhaust from the enclosure will be within acceptable limits. If the assumptions made in performing these calculations are wrong, hazardous contamination will be released from the retrieval enclosure.	Trailer-mounted HEPA ventilation system, portable exhaust stack with grab sampling capability for radiological release estimation. Airflow within enclosure is verified through smoke testing, but enclosure negative pressure is not guaranteed. Radiological control technicians (RCTs) perform periodic radiological surveys to identify contamination outside of the retrieval enclosure.

Table 3-1. (continued).

Risk	Description	Mitigation
Environmental releases of hazardous contamination exceed limits	Hazardous contamination will be released from the retrieval enclosure.	Data from the Glovebox Excavator Method will be used to provide a better estimate of the hazardous contaminant emissions so additional equipment can be provided if needed.
Personnel exposures to radiological and hazardous contamination (airborne and surface) exceed limits	Immediate area workers within the retrieval enclosure are exposed to radiological and hazardous contamination (airborne and surface) above acceptable limits.	The AR Project is operated with personnel within the retrieval area (no confinement), in the presence of airborne and hazardous material contamination. Dust suppression system and ventilation airflow is designed to reduce derived air concentration (DAC) levels and airborne contaminants as the primary defense to protect workers. PPE (e.g., PAPRs, SCBA, supplied air respirators) are used to protect workers against the remaining radioactive and hazardous contaminants in the containment.
DAC levels are excessive	DAC levels within the retrieval enclosure are too high to conduct routine operations.	Engineered systems such as fogging systems and fixants will be provided to reduce airborne contamination levels. Effectiveness of Glovebox Excavator Method contamination control systems will be verified by measuring actual DAC levels during Glovebox Excavator Method operations.
Return-to-pit levels of TRU contamination are disputed	The EPA and Idaho Department of Environmental Quality (IDEQ) will not agree that returning TRU with less than or equal to 100 nCi/g to excavated portions of the TRU pits is acceptable based on residual risk.	Finalize the AR Project risk assessment and obtain concurrence from EPA and IDEQ.
Personnel exposures to penetrating (gamma, neutron) radiation	Immediate area workers within the retrieval enclosure are exposed to penetrating (gamma, neutron) radiation.	RAMs will be located near the digface. Additionally, RCTs will have instruments to periodically measure gamma/neutron fields.
Accidental criticality	A criticality event will occur during the retrieval or storage process.	A criticality safety evaluation will be developed during the conceptual design period. A fissile material assay system trailer to perform nondestructive assay (NDA) will be provided to identify containers suspected of containing high fissile material after they are removed from the retrieval/airlock enclosure.

Table 3-1. (continued).

Risk	Description	Mitigation
Long lead items are procured to a lesser Quality Level and cannot be used in the intended application	Project long-lead items procured prior to approval of PSAR may not be procured to the required Quality Level.	Selected equipment such as the enclosure structure will be procured to a higher Quality Level.
Applicability of land disposal restrictions to waste staged pending return to pit	Land disposal restrictions could be triggered by extended storage in CERCLA storage facility.	None
Physical Security screening of waste cannot confirm no classified objects are present in the waste	Current real-time radiography (RTR) systems may not be adequate to support security review of packaged waste.	A test program will be initiated following the conceptual design to verify operability of commercially available RTR systems and identify a satisfactory technology.
Retrieved TRU material cannot be characterized and certified for WIPP without substantial unpackaging, characterization, and repackaging	The retrieved soil and waste stream is unlike any of the waste streams that have previously been certified for WIPP. A new characterization and certification strategy will have to be developed with the DOE and New Mexico Environmental Division. Furthermore, existing non-destructive examination (NDE) and NDA systems have not been demonstrated in this waste and soil stream and substantial development efforts may be needed.	Efforts in developing the acceptable knowledge base for this retrieval area and the WIPP characterization and certification strategy are being vigorously pursued at present. Demonstration testing of NDE and NDA systems will be performed in FY 2004 to determine the capability of existing systems and, if possible, identify alternative technologies.



4. PROJECT ENGINEERING AND TECHNICAL PLANNING

This section discusses the technology development, systems and value engineering, and alternatives and tradeoffs that pertain to the AR Project.

4.1 Technology Development

The DOE complex, and in particular the RWMC, has extensive experience managing stored TRU waste and certifying it for WIPP. However, there is currently little DOE complex experience in retrieving TRU waste that has been buried for more than 40 years. The material retrieved from Pit 4, Area G will present a number of technical challenges to prior regulatory, operational, and technical bases. These technical challenges will be present from the time the waste is retrieved until it is certified for disposal at WIPP or returned to the pit. These challenges include characterization of the TRU waste and treatment of TRU materials that do not meet transportation or WIPP criteria.

As part of this conceptual design, areas that require additional development effort have been identified and plans have been developed to support those efforts. This section provides this information.

4.1.1 WIPP Characterization

There are regulatory and technical challenges associated with characterization and certification of the retrieved waste for WIPP. The regulatory challenges focus on characterization requirements, which are oriented specifically toward stored wastes that were generated by individual process lines and are fairly well characterized. The wastes retrieved from Area G will be a heterogeneous mixture of waste and soil, a mix of many process streams, and even a mix of waste generators. These characterization and regulatory constraints present technical challenges related to:

- Examination of the waste for physical form
- Examination of the waste for prohibited items such as free liquid, sealed containers, etc.
- Assignment of waste properties, such as the mass of cellulose, paper, and rubber
- Assay of the waste to determine TRU and other nuclide content.

The first three bullets above relate to visual examination or real-time radiography (RTR) requirements for the waste, as required by the WIPP waste acceptance criteria (WAC; DOE-ID 2002b) and Resource Conservation and Recovery Act (RCRA) permit. Segregation and visual examination of all of the waste at the digface has been deemed too expensive and not consistent with as low as reasonably achievable (ALARA) principles. Therefore, characterization will depend on RTR, with a more limited visual examination to verify the RTR results. Current plans include visual examination following RTR for 10% of the SWBs. The retrieved waste and soil will be much more dense than most debris waste matrices of such a heterogeneous nature. Existing technology may not be able to fully reveal contents in the center of an SWB of mixed soil and waste. Also, the soil, drum remnants, etc., may compact the organic waste components so that mass estimates for cellulose, paper, and rubber cannot be made from RTR examinations. The use of RTR on a waste matrix such as the retrieved material has not been demonstrated, but plans have been made to determine if existing systems are capable of meeting the characterization requirements. The capability of existing RTR systems will be evaluated by assembling SWBs of simulated waste and examining them using existing equipment. The results of these

examinations will be used to determine the feasibility of this characterization strategy and, if necessary, identify new requirements for RTR systems.

These retrieved waste matrices may also present problems for the existing nondestructive assay systems. It is expected that the fissile material assay system (see Section 5.9) is within the capability of existing technology and systems, but the extension to 100 nCi/g detection limits and the other WIPP requirements for nondestructive assay are more problematic. Various assay systems have been demonstrated on large containers, and at least two such systems have been certified in accordance with the WIPP criteria on a variety of waste matrices. However, none of those matrices are as dense as those expected from the Area G retrieval, and the presence of significant moisture in the soil may exacerbate the problems. Again, SWBs will be assembled with simulated waste and sealed sources to evaluate the technology using existing systems such as the SuperHENC or the MultiPurpose Crate Counter.

4.2 Systems and Value Engineering

Several concepts were evaluated for the AR Project, and project development went through several phases. The concepts changed as project assumptions and scope conditions changed. The initial concept phase evaluated the following basic assumptions, which resulted in the seven options presented in Appendix B:

- The retrieval area enclosure is a 90 × 110-ft fabric structure obtained from the Rocky Flats site.
- The area to be retrieved contains approximately 5 to 7 ft of clayey, silt overburden soil, 6 to 10 ft of waste zone material, consisting of waste materials and interstitial soil, and approximately 2 ft of possibly contaminated soil beneath the waste zone.

The seven options presented in Appendix B generated the concepts for the trade-off study.

In the final phase of the trade-off studies (see Appendix B), examination of these seven options eliminated the Rocky Flats fabric structure as the enclosure structure due to the cost of obtaining them and the schedule risks. It was also determined that it was more cost-effective to obtain a larger enclosure than to move a smaller enclosure several times in order to retrieve an area the size of Area G. A large, single enclosure has the following advantages:

- Increased staging area for operations
- More flexibility for handling large objects and unexpected items
- More flexibility for matching retrieval operations to waste treatment operations
- Fewer enclosure moves, resulting in lower costs, less downtime for operations, and decreased schedule; the costs for a single move were equivalent to the increased cost for a larger enclosure.

Drawings of two of the later concepts considered for the retrieval process are shown in Appendix B. Both concepts employ fabric enclosures and, to one extent or another, use sheet pile to minimize the amount of excavation, compared to a 1:1 slope. Both concepts use similar equipment (Gradall excavator), and both concepts package and manage the retrieved material similarly. They differ in the enclosure size and the amount of sheet pile used. Advantages of sheet piling are that:

- A smaller amount of waste material is exposed, resulting in easier contamination control, lower VOC releases, and lower derived air concentration (DAC) levels
- Returning materials to the excavation is easier
- Providing air exchanges is easier.

The option selected for the retrieval process was similar to the concepts illustrated in Appendix B, except it eliminates the sheet piling and requires a slightly larger enclosure to accommodate the assumed slope of the excavation boundary. The enclosure concept is illustrated in Figure 4-1, and additional details are presented in the drawings in Appendix C. Cost was the primary factor in eliminating the sheet piling, but other contributing factors were:

- The need for bracing both at the top and bottom of the sheets (the bottom bracing was necessary due to the close proximity of bedrock to the waste seam)
- Less flexibility in dealing with large objects
- The possibility that the sheet piling could not be driven to full depth in some locations
- The sheet piling would be contaminated, contributing additional waste material that must either remain in place or be removed after retrieval operations are complete
- Safety concerns related to driving in the sheet piling.

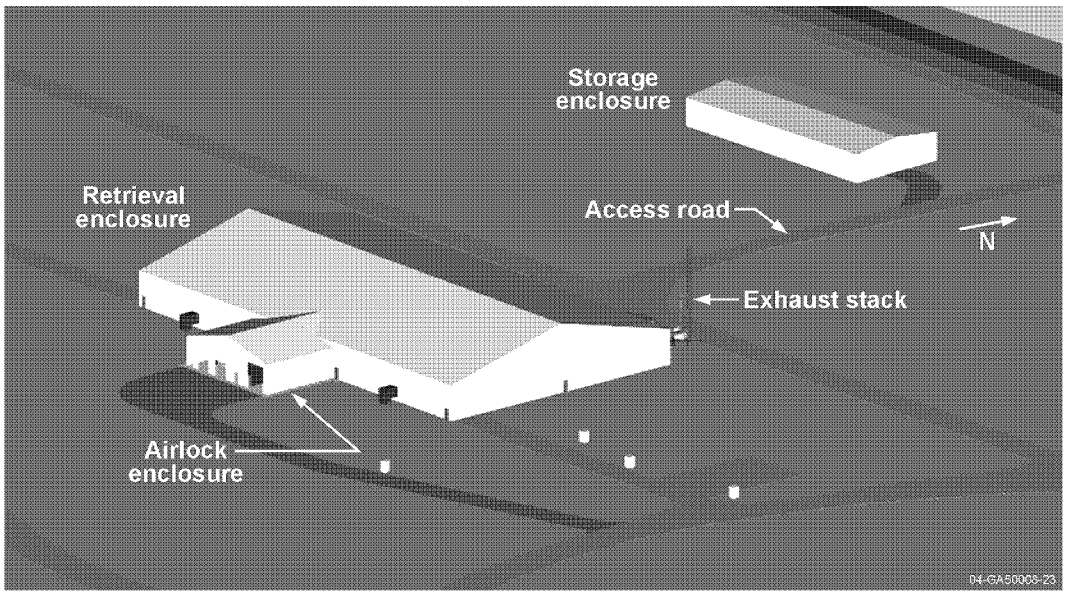


Figure 4-1. Enclosure concept for Area G.