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Department of Energy
Richland Operations Office
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Mr. Nicholas Ceto, Program Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington 99352

Dear Mr. Ceto:

TRANSMITTAL OF THE ENGINEERING EVALUATION/COST ANALYSIS FOR THE CENTRAL PLATEAU STREAMLINED DECOMMISSIONING PROFILE FACILITIES, WITH APPENDIX A FOR THE 224-B FACILITY, DOE/RL-2000-06, REV. 0

The "Engineering Evaluation/Cost Analysis for the Central Plateau Streamlined Decommissioning Profile Facilities," is being transmitted for your review. The first structure proposed to be decommissioned through the streamlined process is the 224 B Plutonium Concentration Facility. The specific information for this structure is included in appendix A for the 224 B Plutonium Concentration Facility, DOE/RL-2000-06, Rev.0. This document was prepared by the U.S. Department of Energy, Richland Operations Office (RL) in accordance with the joint policy issued in 1995 by RL and the U.S. Environmental Protection Agency (EPA). That policy guides RL to conduct building decommissioning activities as non-time critical removal actions under the Comprehensive Environmental Response, Compensation and Liability Act of 1980. RL is requesting that EPA perform a technical review of the document by August 22, 2003, prior to RL's initiation of the public comment period. EPA's concurrence on the action memorandum, which will be prepared by RL following public comment, will be required to support RL's desire to implement the preferred alternative at the 224-B Plutonium Concentration Facility.

If you have any questions, please contact me, or your staff may contact Ellen Mattlin, Regulatory Compliance and Analysis Division, on (509) 376-2385; or Harry Bell, Waste Management Division, on (509) 376-2347.

Sincerely,

Keith A. Klein
Manager

RCA:EMM

Enclosure

cc: See page 2

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Attachment 1

DOE/RL-2000-06
Rev. 0

Engineering Evaluation/ Cost Analysis for Central Plateau Streamlined Decommissioning Profile Facilities

United States
Department of Energy

For External Review

DOE/RL-2000-06
Rev. 0

Engineering Evaluation/Cost Analysis for Central Plateau Streamlined Decommissioning Profile Facilities

April 2003

United States Department of Energy

P.O. Box 550, Richland, Washington 99352

For External Review

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ACRONYMS

ACM	asbestos-containing material
ARAR	applicable or relevant and appropriate requirement
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CDI	Canyon Disposition Initiative
CFR	*Code of Federal Regulations*
CP	Central Plateau
CWC	Central Waste Complex
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
Ecology	State of Washington Department of Ecology
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	explanation of significant differences
ETF	Effluent Treatment Facility
LLW	low-level waste
NEPA	*National Environmental Policy Act of 1969*
NPL	National Priorities List
OMB	U.S. Office of Management and Budget
PCB	polychlorinated biphenyl
PPE	personal protective equipment
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	*Revised Code of Washington*
ROD	Record of Decision
S&M	surveillance and maintenance
SDP	Streamlined Decommissioning Profile
TBC	To-be-considered
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
TSCA	*Toxic Substances Control Act of 1976*
TSD	treatment, storage, and disposal
WAC	*Washington Administrative Code*
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Packaging

1.0 INTRODUCTION

This document presents the results of a general engineering evaluation/cost analysis (EE/CA) that evaluates options for decommissioning Hanford Site Central Plateau (CP) facilities that fit a predetermined Streamlined Decommissioning Profile (SDP). This EE/CA is based on existing joint Department of Energy (DOE) and Environmental Protection Agency (EPA) policy. It is consistent with a similar Hanford strategy for streamlining remedy selections in the 200 Areas (DOE/RL-98-28, Section 2.5.3).

1.1 SDP APPROACH OVERVIEW

The SDP approach involves comparing a CP facility with a set of predetermined qualifying criteria. If a facility fits these criteria, this EE/CA will apply to that facility. When a CP facility is selected for action pursuant to this EE/CA, facility-specific selection and cost information will be added as a facility-specific appendix. The SDP approach will be implemented as follows: First, DOE will establish a standard removal action by issuing an Action Memorandum (AM) based on the results of this EE/CA. Second, the need for action will be identified for each CP facility considered for decommissioning under the EE/CA. Third, the CP facility will be evaluated to see if it fits the SDP. Fourth, each CP facility determined to meet the SDP will be appended to this EE/CA and incorporated into the AM. The EE/CA and the AM will be maintained as part of the Administrative Record (AR) file for public availability.

1.2 GENERAL FACILITY DESCRIPTION

Past operations at Hanford resulted in contamination at various DOE facilities. The facilities are inactive, surplus buildings awaiting final disposition. The facilities contain *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) hazardous substances, predominantly residual radionuclides, and small quantities of residual hazardous chemicals. Since facility deactivation, the structural integrity and internal systems degradation results in an increased potential for releases of hazardous substances to the environment. The U.S. Department of Energy (DOE) has identified no further facility use. It is DOE's intent that such facilities be decommissioned through the use of the CERCLA non-time critical removal action process. This EE/CA provides the necessary evaluation to allow for the development of documentation to justify decommissioning actions.

1.3 REGULATORY OVERVIEW

1.3.1 Regulatory Framework/Decommissioning Policy

Four areas of the Hanford Site, including the 200 Area, were placed on the U.S. Environmental Protection Agency's (EPA) CERCLA National Priorities List (NPL) in November 1989. The work for cleanup of these NPL sites continues in accordance with the Tri-Party Agreement (TPA) and the National Contingency Plan (NCP) regulations of 40 CFR 300.
In addition to the NPL cleanup work, the Department of Energy (DOE) and the Environmental Protection Agency (EPA) have agreed upon an approach for decommissioning surplus facilities consistent with the requirements of the CERCLA. The approach is documented in the "*Policy on*

Decommissioning Department of Energy Facilities Under CERCLA" (hereinafter referred to as the Policy) issued jointly by DOE and EPA on May 22, 1995. The Policy is based on the provisions of Executive Order 12580, which delegates from the President to the Secretary of Energy certain CERCLA response authorities for facilities under DOE jurisdiction, custody, or control. The Policy establishes that decommissioning activities will be conducted as non-time critical removal actions unless the circumstances at the facility make it inappropriate.

The Policy encourages streamlined decisionmaking, consistent with the DOE/EPA jointly issued *"Guidance on Accelerating CERCLA Environmental Restoration at Federal Facilities"* issued August 22, 1994. Specifically, the Policy builds upon the effort to "develop decisions that appropriately address the reduction of risk to human health and the environment as expeditiously as the law allows." Consistent with these efforts, the DOE, Richland Operations Office has prepared this EE/CA to determine the appropriate removal action for CP facilities that meet the SDP.

1.3.2 SDP Approach Basis

This EE/CA was prepared in accordance with CERCLA, Title 40 *Code of Federal Regulations* (CFR), Section 300.415, and the Policy.

The provisions of 40 CFR 300.415:

- Allow the lead agency to take *any appropriate* removal action to respond to releases or threats of release;
- Require the lead agency to begin taking *actions as soon as possible* to respond to releases or threats of release;
- Do not specify limitations or intent to prevent the lead agency from taking any *actions deemed necessary*;
- Do not create a duty on the lead agency to take action *at any particular time*

The Policy endorses streamlining of removal actions consistent with the flexibility allowed by 40 CFR 300.415 for lead agency actions. This EE/CA purpose is to recommend a removal action from a viable set of alternatives applied to CP facilities that meet the SDP criteria (Section 1.5.2).

1.3.3 EPA Involvement

EPA involvement will be in accordance with the Policy to ensure that decommissioning activities comply with applicable requirements, that protection of human health and the environment is achieved, and that decommissioning is consistent with ongoing or subsequent related remedial actions. Accordingly, EPA concurrence will be sought for the AM resulting from this EE/CA process including all subsequent EE/CA appendix additions, and for any sampling and analysis plans.

1.3.4 Stakeholder Involvement

Actions taken pursuant to the results of this EE/CA will be conducted in compliance with the community relations and public participation requirements established in 40 CFR 300.415(n) and any applicable DOE policies. This EE/CA will be provided to the public consistent with the provisions of 40 CFR 300.415(n)(4). After a reasonable opportunity to comment is provided, a written response to significant comments will be provided in accordance with 40 CFR 300.820(a).

After all public comments have been dispositioned; an AM will document the selected standard removal action. The AM will be placed in an AR that will be established to provide a publicly accessible record. Additionally, the AR will initially include this EE/CA with an appendix or appendices addressing the facility or facilities selected for the removal action. Subsequently, information will be added to the AR for each additional facility selected for the standard removal action. This will be accomplished by providing facility cost and selection information in an EE/CA appendix and by amending the AM as necessary. The AR will be accessible to the public for inspection and copying, consistent with the requirement of 40 CFR 300.415(n)(3)(iii).

The State of Washington Department of Ecology (Ecology) is authorized by EPA to implement and enforce a hazardous waste program in lieu of the federal Resource Conservation and Recovery Act (RCRA). Consistent with the Policy, DOE and EPA will work where necessary with Ecology to coordinate RCRA and CERCLA authorities to the maximum extent practicable in order to prevent unnecessary duplication or delay in any decommissioning projects that are subject to both authorities. Facilities that contain TSD units within their boundaries will be coordinated with Ecology prior to documentation in the AR to ensure compliance with applicable standards and encourage integration where possible to minimize redundancy. In addition, Ecology will have the opportunity to review and comment on this EE/CA along with the public during the public comment period.

1.3.5 NEPA Values

In accordance with the Secretary of Energy's Policy Statement on the *National Environmental Policy Act* (NEPA) (DOE 1994), NEPA values have been incorporated into this EE/CA to the extent practicable.

1.4 REMOVAL ACTION SCOPE

The removal action scope is to mitigate the risks associated with the residual hazardous substance inventory contained within the deteriorating aboveground structures. The scope does not include activities that may be performed in preparation for the removal action, nor does it include full remediation of below-grade contamination. These are the subjects of other actions as discussed in Section 1.6.

1.5 PLUG-IN APPROACH

The alternative approaches available to conduct decommissioning projects typically are clear and very limited. Non-time critical removal action requirements provide the necessary flexibility to develop decommissioning plans appropriate for the circumstances. Furthermore, the Superfund statutory time and dollar limits do not apply to removal actions conducted by DOE. This increases the scope of projects that may be addressed by DOE removal action. Consistent with the Policy's streamlined decommissioning goal, these EE/CA implements a "plug-in" evaluation approach for addressing CP facilities that qualify for decommissioning.

The plug-in approach is a recognized strategy for streamlining the regulatory pathway and documentation requirements. In DOE/RL-98-28, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program*, Section 2.5.3, the plug-in approach is outlined for implementation in 200 Area Record of Decision (ROD) documents.

Because of the large number of generally similar CP facilities that require decommissioning, the traditional cleanup approach would result in many redundant EE/CAs. The plug-in approach allows for alternative analysis for a facility group that have similar characteristics (e.g., physical attributes, contaminants, and contaminated media) using a predetermined facility profile. The AM is issued with a standard removal action selected based on the facility profile. When it is determined that a facility to be decommissioned is sufficiently similar to the profile for which the alternatives have been developed and analyzed, the subject facility is said to "plug-in" to the predetermined analysis for that facility. A plug-in approach allows decommissioning of multiple similar facilities without expending unnecessary resources to issue multiple EE/CAs and AMs.

An effective plug-in approach requires a plug-in EE/CA. A plug-in EE/CA specifies the criteria that a specific facility must meet to "plug-in" to the process so that it can be dispositioned in accordance with the action selected in the AM. The plug-in EE/CA also describes the process for determining whether a particular facility condition is consistent with the profile. CP facilities identified as candidates for decommissioning will be compared to the SDP described in Section 1.5.2. This EE/CA serves as the plug-in EE/CA for CP facilities that meet the SDP.

Three conditions must be considered in applying the plug-in approach. First, a need for action must be established for each selected facility. Second, facilities must share a common profile with facilities addressed by the standard action identified in the existing AM. Finally, the AM removal action selected pursuant to this EE/CA must be applied to facilities that meet the SDP. The SDP analysis is documented in a facility specific appendix attached as a revision to this EE/CA.

1.5.1 Need for Action

Facilities can be considered for the standard action using the plug-in approach if a need for action is established. For CP facilities, the need for action is established by the presence of CERCLA hazardous substances that pose an unacceptable risk to the Hanford Site worker, the public, and/or the environment.

1.5.2 Comparison to the SDP

Facility selection is based on comparison to the SDP described below. The SDP consists of established parameters regarding facility type and location, anticipated future land use, historical significance, the presence of hazardous substances, and physical waste types.

For selection, CP facilities must exhibit characteristics consistent with the SDP as follows.

- The facility must be an aboveground-engineered structure. *It* may be constructed of a variety of materials (e.g., wood, concrete, metal).
- The facility must be located in a previously disturbed area of the CP where future land use is anticipated to be industrial-exclusive.
- The facility must have implemented the process for individual documentation or mitigation as a historic property and been determined acceptable for demolition.
- The facility must be contaminated by radioactive and/or nonradioactive hazardous substances.
- The facility must contain waste consisting primarily of contaminated debris with some miscellaneous liquid and solid waste streams.
- The facility must not be a key facility as defined in the *Hanford Federal Facility Agreement and Consent Order* (HFFACO).
- The facility cannot be a site that served predominantly as a waste disposal unit (e.g., cribs, surface impoundments).
- The facility must qualify for decommissioning in accordance with the Policy.
- The facility must not be subject to specific past practice milestones in the HFFACO.

1.5.3 Standard Removal Action

An alternative evaluation presented in this EE/CA will recommend a standard removal action. The standard removal action will be documented in the AM. This standard removal action will be applied to each facility that meets the SDP.

1.6 RELATED CLEANUP ACTIONS

Other cleanup actions related to the proposed removal action include facility deactivation, remediation of below-grade contamination, and the Canyon Disposition Initiative (CDI). Their relationship to the proposed removal action and potential impacts are described below.

1.6.1 Facility Deactivation

Many CP facilities were deactivated within a few years after operations ended. Deactivation included removing bulk process and waste streams, and stabilizing each facility. Additional deactivation-type activities may be performed prior to initiating any work covered by this removal action scope. If implemented, these activities would focus on removing additional transuranic (TRU) waste to reduce the risk to workers and the environment during D&D. Activities performed prior to the removal action would be performed in accordance with all applicable regulations and permits, including provisions of an existing site-wide categorical exclusion for deactivation prepared in accordance with NEPA requirements and existing *Clean Air Act* related permits. It is assumed for this EE/CA that no large TRU contaminant inventory is removed from facilities before initiation of the removal action. Some inventory maybe removed prior to implementing the removal action to reduce the short-term exposure impacts that might occur during the removal action. This removal would not substantially affect the analysis or the selection of an appropriate removal action.

1.6.2 Below-Grade Contamination

Facilities included in this EE/CA may be associated with below-grade contamination. The majority of the potential below-grade contamination is not included in this removal action scope. Below-grade sources of contamination may include subsurface structures, pipelines, drains, or unplanned releases. Upon completion of this removal action, each site will be stabilized at grade and formally identified as a potential subsurface waste site, as appropriate. It will then be subject to future evaluation and remediation in accordance with the process described in the *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program* (DOE-RL 1999a). The proposed removal action should include facilitating a smooth transition to the subsurface remediation process as one of its goals.

1.6.3 Canyon Disposition Initiative (CDI)

The CDI project was initiated in 1996 and addresses the disposition of the five 200 Area CP canyon facilities. DOE is using U Plant as a pilot to prepare a CDI feasibility study and proposed plan. It is intended that the results of the U Plant evaluation will be applied to the other canyon facilities. The CDI concept is canyon facilities disposition in place instead of demolishing and burying the debris elsewhere. Based on the initial evaluation, in-place disposal with an overlying barrier appears to be feasible. Some facilities available for D&D are adjacent to canyon facilities. Alternatives for facility removal actions will be consistent with CDI remedial action alternatives. Should in-place disposal with a barrier be chosen for the CDI, the barrier likely would extend beyond the canyon building and would include partial or complete coverage of any adjacent facility site. This may negate the need for additional remediation of below-grade contamination at that particular site, but would not affect the need for D&D of the aboveground structure.

2.0 SITE CHARACTERIZATION

2.1 BACKGROUND AND SITE DESCRIPTION

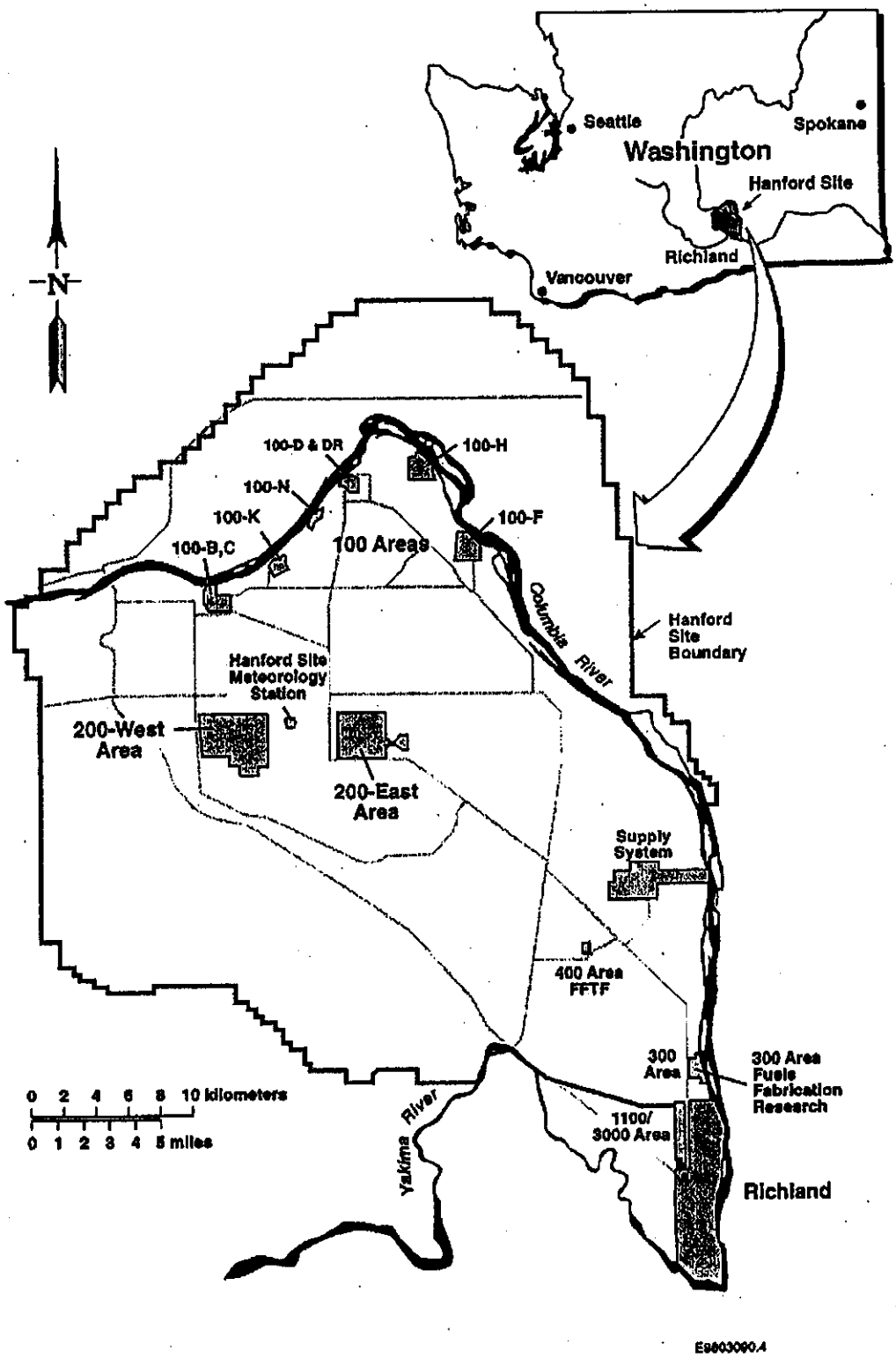
2.1.1 Land-Use Access

Public access to the Hanford Site currently is restricted and controlled at the Wye Barricade on Route 4 and the Yakima and Rattlesnake Barricades on State Highway 240. Present CP land use consists of inactive irradiated-fuel reprocessing facilities and waste management. Proposed alternatives for future land use were described in the *Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP-EIS) (DOE 1999). The Record of Decision (ROD) for that EIS identifies land use in the 200 Areas as industrial-exclusive use for the foreseeable future (64 FR 61615).

2.1.2 Flora and Fauna

The land area around each CP facility is predominantly disturbed from building and parking lot construction activities. What little plant community does exist is primarily composed of semi-arid species common to disturbed areas, such as cheatgrass, rabbitbrush, and other nonnative plant species. There are no known plants or animals on the federal or state list of endangered and threatened wildlife and plants in the vicinity of CP facilities. If new information reveals the presence of such wildlife or plants in the vicinity of CP facilities, appropriate measures will be taken, as necessary. Further information on ecological resources in the 200 Area and threatened, endangered, and candidate species at the Hanford Site is available in Neitzel (2002). There are no perennial or ephemeral streams in the 200 Areas. There are no regulated wetlands within the 200 Areas.

Figure 2-1. The Hanford Site and Washington State.



2.1.3 Cultural Resources

Some CP facilities may have contributed to the Hanford Site Manhattan Project/Cold War Era Historic District. Only CP facilities for which the individual documentation or mitigation process has been implemented (DOE-RL, 1998) will be evaluated through this EE/CA. An assessment team that consists of appropriate DOE and contractor personnel and/or offsite experts performs a walkthrough of each facility. Some items may be tagged for retention as items with interpretive or public education value. These items will be removed and stored, if possible, based on potential radiological contamination issues, prior to demolition of each structure.

No archaeological resources or traditional-use areas are known to exist within the proposed project locations. This information will be verified prior to conducting the removal action, with appropriate response if new information is found.

2.2 FACILITY DESCRIPTION

A brief description of each facility selected for removal action under this EE/CA will be included in the facility-specific appendix generated from Section 1.5.2.

2.3 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

A brief source, nature and extent of contamination description is included for each specific facility under evaluation by this EE/CA. It is included in the attached facility-specific appendix developed from Section 1.5.2.

Generally, the primary hazardous materials of concern are radioactive materials. All known quantities of concentrated hazardous chemicals have been removed from each facility during deactivation and S&M operations. Some residual quantities of hazardous chemicals may remain as hold up or heels in process lines, tanks, and vessels. In addition, each facility is anticipated to contain one or more of the following hazardous materials, including the following:

- Polychlorinated biphenyls (PCB) and non-PCB light ballasts
- Lead paint
- Lead for shielding
- Mercury switches, gauges, thermometers
- Mercury or sodium vapor lights
- Used oil from motors and pumps
- Unspecified chemical containers
- Friable and nonfriable forms of asbestos.

2.4 RISK EVALUATION AND SITE CONDITIONS THAT JUSTIFY A REMOVAL ACTION

Many of CP facilities awaiting dispositioning are contaminated with hazardous substances, primarily a significant inventory of radionuclides. Radionuclides are known carcinogens.

The risks to Hanford Site workers, the public, and the environment associated with routine S&M activities at these facilities have not been quantified. However, the radiological conditions require special precautions for worker entry.

The inhalation and ingestion pathways are also of concern if the material within equipment and piping is disturbed. During aggressive D&D activities in a facility, the potential for radiological doses to workers is considered to be a significant risk. Aggressive activities include dismantling of process cell equipment and cutting process piping. Even though personal protective equipment (PPE) would be worn, external exposure and inhalation of radionuclides may still pose a risk. During initial D&D activities, the potential for a release of radionuclides would increase, but as the inventory is stabilized or disposed of appropriately the source term (hence, the risk) would decrease.

The current radionuclear contamination release threat from each CP facility is relatively low In general, as a facility ages, the risk of an accidental release of radionuclides (e.g., from a structural failure resulting from a heavy load drop, fire, or seismic event) would increase the longer the facility remains in an S&M program awaiting disposition. As a result of interior surface contamination threats, some of the CP facilities were listed as an urgent risk in the multi-year work plan (DOE-RL 1999b). There is a potential for inventory releases from structure degradation through time and the lack of a robust ventilation system. Most S&M facilities have reduced the ventilation system capacity to meet minimum requirements. The external radiation, inhalation, and ingestion risks associated with building contamination under a continued S&M scenario justify a non-time-critical removal action.

3.0 REMOVAL ACTION OBJECTIVES

This EE/CA's primary purpose is to analyze removal action alternatives to address the risks at qualifying CP facilities and to determine the most appropriate removal alternative. Removal actions would be performed in a manner that is protective of human health and the environment. The principal threats to be addressed are radioactive hazardous substances associated with each facility and contaminated surfaces of each facility.

Based on the potential hazards identified in Sections 2.3 and 2.4, the specific removal action objectives are as follows:

- Reduce or eliminate the potential for exposure to hazardous substances above levels that are a danger to the workers, public, and/or environment.
- Reduce or eliminate the potential for a release of hazardous substances.
- Safely manage (treat and/or dispose) waste streams generated by the removal action.
- Facilitate and be consistent with future remediation for the 200 Areas, including remediation of subsurface waste sites and potential CDI-based remedial actions.

4.0 DISCUSSION OF ALTERNATIVES

The removal action alternative for all selected CP facilities must be protective of human health and the environment. Based on these considerations, the following four removal action alternatives were identified:

- Alternative One: No Action
- Alternative Two: Continued S&M
- Alternative Three: D&D (to grade, excluding building foundation and underlying soils/structures)
- Alternative Four: D&D (including building foundation and underlying soils/structures to 1 m below surface).

With the exception of the No Action alternative, each of the alternatives would result in generation of waste. The majority of the contaminated debris would likely be designated as low-level waste (LLW); however, quantities of mixed waste, dangerous waste, and TRU waste may be generated. Waste management applicable or relevant and appropriate requirements (ARARs) are discussed in Section 5.1.2.1.

Removal action Alternatives Two, Three, and Four would result in waste generation. This would require disposal at an appropriate disposal site should they be implemented as final removal actions under CERCLA. Waste management would be a common element among these alternatives. For each alternative, recycling and/or reuse options would be evaluated and possibly implemented to reduce the volume of material disposed. Media that is removed from the removal action work site for recycle/reuse purposes would not be subject to CERCLA authority, including CERCLA offsite acceptability determinations, but instead would have to comply with all applicable provisions of the *Resource Conservation and Recovery Act of 1976* (RCRA) or other laws. Inert uncontaminated and decontaminated rubble and other miscellaneous structural material that could not be recycled could be disposed to an inert/demolition waste landfill.

Contaminated waste for which no reuse, recycle, or decontamination option is identified would be assigned an appropriate waste designation (e.g., solid, asbestos, PCB, radioactive, dangerous, or mixed). Most of the contaminated waste generated during implementation of these alternatives would be disposed at the Environmental Restoration Disposal Facility (ERDF) in the Hanford Site's 200 West Area. ERDF would be the preferred waste disposal option because it is an engineered facility that provides a high degree of protection to human health and the environment and it is more cost effective than disposal at other disposal sites. Construction and operation of ERDF was authorized using a separate CERCLA ROD (EPA et al. 1995) and explanation of significant differences (ESD) (EPA et al. 1996). ERDF is an engineered structure designed to meet RCRA minimum technological requirements for landfills, including standards for a double liner, a leachate collection system, leak detection, and final cover.

The *U.S. Department of Energy Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington, Explanation of Significant Differences* (EPA et al. 1996) modified the ERDF ROD (EPA et al. 1995) to clarify the eligibility of waste generated during cleanup of the Hanford Site. Per the ESD, ERDF is eligible for disposal of any low-level waste, mixed waste, and hazardous/dangerous waste generated as a result of CERCLA or RCRA cleanup actions (e.g., D&D wastes, RCRA past-practice wastes, and investigation-derived wastes), provided that the waste meets ERDF waste acceptance criteria and that appropriate CERCLA decision documents are in place.

The waste generated during the selected CERCLA removal action would fall within the definition of waste eligible for disposal at ERDF established in the ERDF ROD and subsequent ESD. Waste may require treatment to meet ERDF waste acceptance criteria. The type of treatment and the location of treatment will be determined on a case-by-case basis. Solidification, encapsulation, neutralization, and size reduction/compaction may be employed to treat various wastes. For wastes requiring treatment, the techniques will be documented in a treatment plan.

Several mixed waste streams have already been reviewed and approved for treatment and disposal at ERDF. These mixed waste streams are as follows:

- Radioactively contaminated elemental mercury may be amalgamated.
- Radioactively contaminated elemental lead may be macroencapsulated at the ERDF.
- Aqueous solutions may be treated (solidified) in accordance with the approved waste treatment plan and sent to ERDF.

While most waste generated during the removal action would likely meet ERDF waste acceptance criteria, some waste may not meet or may not be able to be treated to meet ERDF acceptance criteria. Specifically, this would include low-level radioactive and nonradioactive liquid wastes and TRU wastes that may be encountered or generated during the removal action.

Liquid waste containing levels of radioactive and/or nonradioactive hazardous substances meeting the Effluent Treatment Facility (ETF) waste acceptance standards would be sent to the Hanford Site's ETF and treated to meet ETF waste discharge standards. Liquids that do not meet ETF waste acceptance standards would be solidified and either disposed at ERDF (if ERDF waste acceptance criteria are met) or stored at the Hanford Site's Central Waste Complex (CWC). Clean water (e.g., nonradioactive and nonhazardous) could be used for dust suppression.

TRU waste would be transported to CWC for interim storage. Packaged at the Hanford Site's Waste Receiving and Packaging (WRAP) Facility and then transported offsite for disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico.

The specific CP facility, ETF, CWC, WRAP Facility, and ERDF are considered to be a single site for management and/or disposal of waste from removal actions proposed in this document[1]. There is no requirement to obtain a permit to manage or dispose of CERCLA wastes at these facilities. However, ETF, CWC, and WRAP facilities already have been permitted for management of non-CERCLA wastes, and any CERCLA wastes handled at those facilities must be managed in accordance with the substantive requirements of the existing permits. It is expected that the great majority of the waste generated during the removal action proposed in this document can be disposed onsite. For waste that must be sent offsite, such as TRU waste, EPA would make a determination in accordance with 40 CFR 300.440 as to the acceptability of the proposed disposal site for receiving this CERCLA removal action waste, if necessary.

4.1 ALTERNATIVE ONE: NO ACTION

Under the No Action alternative, access to the facility would not be restricted. The No Action alternative would not address the hazards posed by the facility. The facility would continue to deteriorate. Initial risks of the No Action alternative would be minimal to the environment. Barring an unusual event, contaminants are assumed to remain confined within the facility. Industrial and radiological hazards would exist under a No Action alternative assumption because controls to prevent access would not be maintained. Risks over time can be expected to increase as the facility's deterioration progresses and the structural integrity of the facility and its systems is compromised. Eventually, the facility's decay would be expected to result in radiological releases to the environment and potential exposure to workers and the public. Physical hazards associated with partial structural collapse would also be anticipated.

4.1.1 Cost Estimates for Alternative One: No Action

The near-term costs for implementing this alternative would be negligible.

4.2 ALTERNATIVE TWO: CONTINUED SURVEILLANCE AND MAINTENANCE

Alternative Two would ensure that the facility is sustained in a safe condition until final disposition. For this alternative, the S&M of each facility is estimated to continue until 2030.

[1] CERCLA Section 104(d)(4) states that, where two or more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat or potential threat to the public health or welfare or the environment, the President may, at his discretion, treat these facilities as one for the purpose of this section. The preamble to the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300) clarifies the stated EPA interpretation that when noncontiguous facilities are reasonably close to one another, and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. Therefore, the ERDF, ETF, WRAP, and CWC are considered to be a single site for response purposes under this removal action. It should be noted that the scope of work covered in this removal action is for those facilities and wastes contaminated with hazardous substances. Materials encountered during implementation of the selected removal action that are not contaminated with hazardous substances will be dispositioned by DOE.

This date was arbitrarily chosen as the halfway point within the long-range plan's range of 2017 and 2043.

Under this alternative, the facility would remain in the S&M program until final facility decommissioning occurs. These S&M measures would include periodic radiological and industrial hazard monitoring (both inside and outside of the facility), cold weather protection, preventive maintenance, annual roof inspections, identification and minor repair of friable asbestos, and general visual inspections. Major maintenance operations, such as roof maintenance, would be performed to ensure the maintenance of safe conditions and the control of the ongoing deterioration process. Additionally, limited decontamination and fixative application would occur to control the spread of radiological contamination.

This alternative's prime goal is to prevent radiological environmental releases and to avoid industrial accidents. Adoption of the S&M Alternative extends the life of the facility for approximately the next 30 years, during which time deterioration progresses and unusual events might occur. Severe weather conditions can create facility conditions amenable to radiological releases, and long-term aging of confinement structures could lead to eventual failure. These conditions, accompanied by minimum surveillance efforts, could result in an unplanned radiological release.

Because minimal surveillance would not readily detect facility decay (e.g., system corrosion or structural breakdown), preventive maintenance may not occur in time, and response actions could be required. This approach could result in the spread of contamination. An ongoing S&M program would have to become increasingly more labor intensive and expensive. Requiring periodic characterization efforts to counter these conditions. Such conditions would ultimately lead to increased worker exposure to radioactive material and contamination.

While the magnitude of a continued S&M program should be controlled to conserve funding and be responsive only to safety issues, the program financial growth should be planned to account for progressive facility deterioration. Data evaluation, inspection/observations, and future facility plans should be factored into the continued S&M planning and implementation.

4.2.1 Cost Estimates for Alternative Two: Continued Surveillance and Maintenance

The Alternative Two detailed cost estimates are shown in the facility-specific appendix, along with a projection of costs over the S&M period for roof replacement and maintenance. Present-worth costs are used for evaluation of alternatives in the CERCLA process. The total nondiscounted costs are presented for information purposes only.

Consistent with guidance established by the U.S. Office of Management and Budget (OMB), present-worth analysis is used as the basis for comparing costs of cleanup alternatives under the CERCLA program (OMB 1992). For purposes of this evaluation, present-worth (discounted) cost values were calculated using a discount rate of 3.2% (Rodovsky 2000, OMB 1992).

Waste generation under this alternative would occur, but is considered to be minimal. The identified costs do not account for increased efforts required if facility deterioration is

accelerated or if an unusual deleterious event occurred that required emergency response and cleanup. These costs also do not include facility disposition.

S&M cleanup actions often incur costs at different times. For example, construction costs (e.g., roof replacement) could be followed by periodic costs in subsequent years or decades to maintain the effectiveness of the remedy. Because of the time-dependent value of money, future expenditures are not considered directly equivalent to current expenditures. The present-worth cost method shows the money amount required at the initial point in time (e.g., in the current year) to fund all cleanup activities occurring over the alternative life. Present-worth analysis assumes that the funding set aside at the initial point in time increases in value as time goes on, similar to how money placed in a savings account gains in value as a result of interest paid on the account. Although the federal government does not typically set aside the money in this manner, the present-worth analysis is specified under CERCLA as the approach for establishing a common baseline to evaluate and compare alternatives that have costs occurring at different times. While the money may not actually be set aside, the present-worth costs are considered directly comparable for the purpose of evaluating alternative costs.

In contrast with the present-worth costs, the total nondiscounted costs do not take into account the value of money over time. The nondiscounted cost method displays the total costs occurring over the entire duration of an alternative, with no adjustment (or "discounting") to reflect current year or "set aside" cost based on an assumed interest rate. Because nondiscounted costs do not reflect the changing value of funds over time, presentation of this information under CERCLA is for information purposes only, not for remedy selection purposes.

The costs for surveillance and maintenance are greater than the "No Action" alternative, but less than the costs for Alternatives 3 and 4.

4.3 ALTERNATIVE THREE: DECONTAMINATION AND DECOMMISSIONING (TO GRADE, EXCLUDING BUILDING FOUNDATION AND UNDERLYING SOILS/STRUCTURES)

This alternative would consist of the following primary elements:

- Remove the nonradiological and radiological hazardous substances from the facility
- Remove equipment and associated piping
- Decontaminate/stabilize contamination
- Demolish structure to grade
- Dispose of waste generated during these operations
- Stabilize the area.

Nonradiological hazardous substances would be removed. These would include asbestos-containing material (ACM), chemical feed tanks and piping, equipment oils, mercury, control panels, and potentially, materials/liquids in the floor drains. Radiological hazardous substances removal would include removal of process hoods and piping. Equipment, vessels, and piping might need to be cut to facilitate removal and/or disposal. Remote handling equipment may be used to facilitate removal of equipment and piping. While concerns for operational methods and technology used would be encountered and resolved during removal actions, no major issues exist that might compromise this alternative.

In general, piping and vessels would be removed from a facility, either prior to or as part of facility demolition. Piping, tunnels, and drains entering or exiting a facility below grade would be plugged or grouted to prevent potential pathways to the environment.

Demolition would use heavy equipment (e.g., excavator with various attachments) to demolish the structure. Other industry standard practices for demolition may also be used (e.g., mechanical saws, cutting torches). The facility would be demolished until only a slab remains. Areas such as a pipe tunnel or pit that may exist below grade would be filled and covered with grout, gravel, or other suitable material to grade level to prevent water accumulation. The entire facility footprint is stabilized to prevent migration of any residual contamination to the environment.

This removal scope action does not include soil, groundwater, or waste site remediation. Over time contaminants could still pose a risk through the groundwater transport exposure pathway. Further soil or waste site remediation would be conducted in coordination with future remedial actions as described in Section 1.6.

The major risk associated with this alternative is worker safety during the process system removal and decontamination and the industrial aspects of facility D&D. These risks are related to the potential release of contamination during operations and the hazards associated with D&D activities. Risks associated with credible natural phenomenon events (e.g., seismic actions and high-velocity wind) would continue to exist until the radioactive material inventory is removed from the facility. These risks would diminish as the facility removal progresses and the radiological inventory is removed.

4.3.1 Cost Estimates For Alternative Three

The detailed cost estimates for Alternative Three are shown in the facility-specific appendix. Costs are presented in terms of total nondiscounted costs and present-worth (discounted) costs. As explained in more detail in Section 4.2.1, present-worth analysis is a standard methodology endorsed by the OMB that allows for a cost comparison of different remedial alternatives where costs are incurred in different time periods, on the basis of a single cost figure for each alternative (OMB 1992). This single figure, or present worth, is the amount needed to be set aside at the start of the removal action to ensure that funds will be available in the future as they are needed. Present-worth (discounted) cost values were calculated using a discount rate of 3.2% (Rodovsky 2000, OMB 1992).

The costs for decontamination and decommissioning excluding the foundation are greater than the costs for surveillance and maintenance, but less than the costs for Alternative 4.

4.4 ALTERNATIVE FOUR: DECONTAMINATION AND DECOMMISSIONING (INCLUDING BUILDING FOUNDATION AND UNDERLYING SOILS/STRUCTURES TO 1 METER BELOW SURFACE)

This alternative consists of the scope of Alternative Three (see Section 4.3) plus the demolition of the building foundation to a depth of 1 m below the surface. In this alternative, potentially contaminated facility foundation, piping, drains and surrounding soil would be removed to 1 m below grade and 1 m out from the building footprint. The resulting void space would be backfilled with clean soil or other acceptable media. The demolition would use heavy equipment (e.g., excavator with various attachments) to demolish the structure. Other industry standard practices for demolition may also be used (e.g., mechanical saws, cutting torches). Facility removal would include the facility's above-grade structure and subsurface systems and structures to a depth of 1 m. Underground piping and trenches extending away from the facility are only included in the scope to a distance of 1 m from the walls of the structure, although additional piping or trenches might be removed and disposed, as necessary, to accommodate the removal action for the structure. Contaminated and uncontaminated soil to a distance of 1 m from the walls and floors of the structure might be moved or removed as necessary to implement the removal of the structures; however, the scope of this removal action does not include any additional soil, groundwater, or waste site remediation. In time, however, any contaminants that might remain at the site could still pose a risk, most likely through the groundwater transport exposure pathway and, therefore, would need to be remediated as part of future remedial actions as described in Section 1.6. While concerns for operational methods and technology utilization would be encountered and resolved during removal actions, no major issues exist that would compromise this alternative.

The major risk associated with this alternative is worker safety during the process system removal and decontamination and the industrial aspects of facility D&D. These risks are related to the potential release of contamination during operations and the hazards associated with D&D activities. Risks associated with credible natural phenomenon events (e.g., seismic actions and high-velocity wind) would continue to exist until the radioactive material inventory is removed from the facility. These risks would diminish as the facility removal progresses and the radioactive inventory is removed.

The facility radioactive material inventory disposal and the immediate removal of the facility and its systems are the most direct resolutions to eliminating impending radiological and physical hazards. Since the structure foundation and underlying and adjacent soils would be removed to the extent described above, this alternative would provide protection to the environment and public that is comparable to Alternative Three.

4.4.1 Cost Estimates For Alternative Four

The detailed cost estimates for Alternative Four are shown in the facility specific appendix. Costs are presented in terms of total nondiscounted costs and present-worth costs. As explained

in more detail in Section 4.2.1, present-worth analysis is a standard methodology endorsed by the OMB that allows for a cost comparison of different remedial alternatives where costs are incurred in different time periods, on the basis of a single cost figure for each alternative (OMB 1992). This single figure, or present worth, is the amount needed to be set aside at the start of the removal action to ensure that funds will be available in the future as they are needed. Present-worth (discounted) cost values were calculated using a discount rate of 3.2% (Rodovsky 2000, OMB 1992).

The costs for decontamination and decommissioning including the foundation to 1 meter below the surface are greater than the costs for Alternatives 2 and 3.

5.0 ANALYSIS OF ALTERNATIVES

CERCLA requires that non-time-critical removal action alternatives be evaluated against three criteria: effectiveness, implementability, and cost. To provide a more comprehensive evaluation, the criterion of effectiveness is divided into subcriteria that are consistent with the requirements for CERCLA actions. The removal action alternatives are evaluated against the following criteria:

- Effectiveness
  - Overall protection of human health and the environment
  - Compliance with applicable federal and state laws and regulations (i.e., ARARs)
  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility, or volume through treatment
  - Short-term effectiveness
- Implementability
- Cost.

State and public acceptance will be evaluated after Ecology and the public have had an opportunity to review and comment on this EE/CA. Each criterion is briefly explained in the following subsections; a detailed analysis of each alternative relative to each criterion follows. Finally, the alternatives are compared against one another relative to each criterion.

The alternatives are reiterated below:

- Alternative One: No Action

- Alternative Two: Continued S&M

- Alternative Three: D&D (to grade, excluding building foundation and underlying soils/structures)

- Alternative Four: D&D (including building foundation and underlying soils/structures to 1 m below surface).

5.1 EFFECTIVENESS

5.1.1 Overall Protection of Human Health and the Environment

This criterion evaluates whether the alternative achieves adequate overall elimination, reduction, or control of risks to human health and the environment posed by the likely exposure pathways. It draws on the assessment of the other evaluation criteria identified above. Reducing the potential threat to acceptable levels is a threshold requirement and is the primary objective of the removal action. The evaluation of this criterion was based on qualitative analysis and assumptions regarding the radionuclides inventory.

Alternative One does not provide overall protection to human health and the environment. As the facility deteriorates over time with no ongoing maintenance, the facility contamination could be released to the environment. The radioactive inventory, including alpha-emitting radionuclides, would expose Hanford Site workers, and potentially the public and environment to an unacceptable radiation dose. Because this alternative does not meet the threshold requirement of meeting overall protection of human health and the environment, especially in the long term, this alternative is not analyzed further. For the remainder of this EE/CA, when "all" the alternatives are mentioned, this represents Alternatives Two, Three, and Four.

Alternatives Two through Four would meet the overall protection criterion. Alternative Two provides adequate overall protection of human health and the environment, although the maintenance effort and funding required to maintain this protection would increase over time. The structure and roof of the facility would require significant modification, repair, and replacement in order to maintain contamination and radioactive inventory confinement within the structure during the period of S&M. Additionally, Alternative Two would not remove the radioactive inventory within the building. Therefore, relative to the other alternatives, it does not perform as well under this criterion.

Alternatives Three and Four would remove existing loose contamination and the majority of the radioactive inventory present at the site. This would reduce or eliminate release pathways to the environment and meet the removal action objectives. The risk associated with residual subsurface contamination that might be present would be minimized through interim surface stabilization. Alternative Four would remove slightly more inventory than Alternative Three because it would remove a small amount of subsurface contamination. However, under Alternative Three, the foundation slab would remain in place effectively isolating any subsurface contamination.

5.1.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This criterion addresses whether a removal action will, to the extent practicable, meet ARARs. In accordance with 40 CFR 300.415(d), removal actions shall, to the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action with respect to the release concerned. ARARs are defined to mean only substantive requirements. ARARs do not include administrative requirements. . Furthermore, onsite actions are exempt from

obtaining federal, state, and local permits (40 CFR 300.400(e)). The ARARs criterion must be met for a removal action to be eligible for consideration. It is anticipated that each alternative would meet ARARs.

To-be-considered (TBC) information is nonpromulgated advisories or guidance issued by federal or state governments that are not legally binding and do not have the status of potential ARARs. In certain situations, TBCs should be referenced with ARARs in determining the removal action necessary for protection of human health and the environment. Because the activities would primarily result in waste generation and potential for air emissions, the key ARARs proposed for the alternatives being considered include waste management standards, standards controlling emissions to the environment, and environment, safety and health standards. Final ARARs, which must be complied with during implementation of the selected removal action, will be documented in the CERCLA AM. The proposed ARARs are discussed generally in the following sections and are documented in detail in Table 5-1.

5.1.2.1 Waste Management Standards. A variety of waste streams would be generated under the proposed removal action alternatives. It is anticipated that most of the waste would be designated as LLW. Small quantities of TRU waste, dangerous or mixed waste, PCB-contaminated waste, and asbestos and ACM may also be generated. The great majority of the waste would be in a solid form. However, some aqueous solutions might be generated.

Radioactive wastes are governed under the authority of the *Atomic Energy Act of 1954*. The U.S. Nuclear Regulatory Commission's performance objectives for land disposal of LLW are provided in 10 CFR 61.40 through 44. Although not applicable to DOE facilities, these standards are proposed as relevant and appropriate to any disposal facility that would accept LLW generated at the CP facilities. Standards for management and storage of TRU wastes are in 40 CFR 191.3.

The identification, storage, treatment, and disposal of hazardous waste and the hazardous component of mixed waste are governed by RCRA. Authority to implement most of the RCRA was delegated to the State of Washington, which implements RCRA requirements under *Washington Administrative Code* (WAC) 173-303. The dangerous waste standards for generation and storage would apply to the management of any dangerous or mixed waste generated at CP facilities. Treatment standards for dangerous or mixed waste subject to RCRA land disposal restrictions are specified in WAC 173-303-140, which incorporates 40 CFR 268 by reference.

The management and disposal of PCB wastes are governed by the *Toxic Substances Control Act of 1976* (TSCA), which is implemented by 40 CFR 761. The TSCA regulations contain specific provisions for PCB waste, including PCB waste that contains a radioactive component. PCBs are also considered underlying hazardous constituents under RCRA and thus may be subject to WAC 173-303 and 40 CFR 268 requirements.

Removal and disposal of asbestos and ACM are regulated under the *Clean Air Act* (40 CFR 61, Subpart M) and Occupational Safety and Health Administration regulations (29 CFR 1910.1101

and WAC 296-62). These regulations provide for special precautions to prevent environmental releases or exposure to workers of airborne emissions of asbestos fibers during removal actions. 40 CFR 61.52 identifies packaging requirements.

It is anticipated that all alternatives would be performed in compliance with all waste management ARARs. All waste streams would be evaluated, designated, and managed in compliance with the appropriate requirements. Prior to disposal, waste would be managed in a protective manner to prevent releases to the environment or unnecessary exposure to workers.

Waste that is designated as LLW would be disposed at ERDF, which is engineered to meet appropriate performance standards under 10 CFR 61. Waste that is designated as either contact-handled or remote-handled TRU waste or TRU mixed waste would be stored at CWC until it can be packaged and certified at Hanford Site's WRAP Facility for eventual disposal at WIPP. WIPP meets 40 CFR 191 requirements for TRU waste disposal and is a RCRA-permitted disposal facility.

Waste designated as dangerous or mixed waste would be treated as appropriate to meet land disposal restrictions, then disposed at ERDF. ERDF is engineered to meet landfill design standards under WAC 173-303-665. All applicable packaging and pre-transportation requirements for dangerous or mixed waste generated at CP facilities would be identified and implemented prior to movement of any wastes.

Some of the aqueous waste that is designated as LLW, dangerous, or mixed waste would be transported to ETF for disposal. ETF is a RCRA-permitted facility that is authorized to treat aqueous waste streams generated at the Hanford Site and dispose of them at a designated state-approved land disposal facility.

Waste designated as PCB remediation waste likely would be disposed at ERDF or WIPP, depending on whether it is a LLW or a TRU waste, respectively. ERDF is authorized to accept solid PCB waste containing PCB concentration up to 500 ppm for disposal. WIPP is not authorized as a chemical landfill under TSCA; however, TSCA allows bulk PCB waste to be disposed at RCRA-permitted facilities. All TRU waste suspected to contain PCBs would be evaluated to determine whether the waste meets ERDF or WIPP waste acceptance criteria. Any PCB waste that does not meet ERDF or WIPP waste acceptance criteria would be retained at an onsite PCB storage area meeting the substantive requirements for TSCA storage. It would be transported for future disposal at an appropriate disposal facility.

Asbestos and ACM would be removed, packaged as appropriate, and disposed of in ERDF.

CERCLA Section 104(d)(4) states that where two of more noncontiguous facilities are reasonably related on the basis of geography, or threat or potential threat, the facilities may be treated as one for purposes of CERCLA response actions. Consistent with this, CP facilities and ERDF, CWC, WRAP, and ETF could be considered to be a single site for purposes of this removal action, and waste could be transferred between them without requiring a permit.

5.1.2.2 Standards Controlling Emissions to the Environment. The proposed removal action has the potential to generate airborne emissions of both radioactive and nonradioactive emissions.

The federal *Clean Air Act* and the "Washington Clean Air Act" *Revised Code of Washington* [RCW] Chapters 70.94 and 43.21) regulate both toxic and radioactive airborne emissions. Under implementing regulations found in 40 CFR 61, Subpart H, and WAC 246-247, radionuclide airborne emissions from all combined operations at the Hanford Site may not exceed 10 mrem/yr effective dose equivalent to the hypothetical offsite maximally exposed individual. WAC 246-247 also requires verification of compliance, typically through periodic confirmatory air sampling. Any potential for a nonzero radioactive emission requires use of best available radionuclide control technology. The potential to emit would be calculated prior to starting the removal action and a monitoring plan would be developed and implemented as appropriate.

Chapter 173-400 and 173-460 WAC establish requirements for emissions of nonradionuclide air pollutants. The primary source of nonradionuclide emissions would be fugitive dust, which would be regulated under WAC 173-400-040(3). Fugitive emissions would be controlled through standard industrial practices such as application of water spray and fixatives and temporary confinement enclosures/glovebag containments. Alternatives Two through Four would be expected to comply with these standards.

5.1.2.3 Safety and Health Standards. The DOE requirements for worker protection from radiation hazards are specified in "Occupational Radiation Protection" (10 CFR 835). This establishes radiation protection standards, limits, and program requirements for protecting workers from ionizing radiation. The rule also requires that measures be taken to maintain radiation exposures as low as reasonably achievable.

Under Alternatives Two through Four, radiological and physical hazards would be identified and analyzed prior to the start of activities. Appropriate mitigation measures would be addressed in a task-specific health and safety plan. All alternatives would be expected to comply with these standards. A combination of PPE, personnel training, and administrative controls (e.g., limiting time in and distance from radiation zones) would be used to ensure that the requirements for worker and visitor protection are met. Individual monitoring would be performed as necessary to verify compliance with the requirements. Because Alternative Two would extend over a longer period of time but would involve a lower potential for incidences to occur in the near term, it is uncertain whether it would perform better or worse than the other alternatives.

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered for CP Facilities that fit the SDP.

Potential ARAR Citation	Potential ARAR or TBC	Requirement	Rationale for Use
5.1.2.1 WASTE MANAGEMENT STANDARDS			
Regulations pursuant to the *Resource Conservation and Recovery Act of 1976*, 42 USC 6901, et seq. – Implemented through the *Hazardous Waste Management Act*, RCW 70.105			
Dangerous Waste Regulations, (WAC 173-303):			
Solid Waste Identification Specific subsections: WAC 173-303-016 WAC 173-303-017	ARAR	These regulations define how to identify when materials are and are not solid waste	These regulations are applicable because they define how to determine which materials are subject to the designation regulations.
Incorporation of EPA Regulations By Reference Specific subsection: WAC 173-303-045	ARAR	This regulation clarifies that reference in WAC 173-303 to 40 CFR Parts 260 through 280 and Part 124 refer to those rules as they existed on July 1, 1999. It also clarifies which portions of the above regulations are not incorporated or adopted by reference because they are provisions that EPA cannot delegate to states.	This regulation clarifies how reference to federal RCRA regulations is implemented
Dangerous/Mixed Waste Designation Specific subsections: WAC 173-303-070 WAC 173-303-071 WAC 173-303-080 WAC 713-303-081 WAC 173-303-082 WAC 173-303-083 WAC 173-303-090 WAC 173-303-100 WAC 173-303-110	ARAR	This regulation defines the procedures to be used to determine if solid waste requires management as dangerous waste. It identifies which waste codes are appropriate for application to the waste.	These regulations are applicable to solid wastes that will be generated during removal action.
Dangerous/Mixed Waste Management Specific subsections: WAC 173-303-073 WAC 173-303-077 WAC 173-303-170(3)	ARAR	These regulations establish the management standards for solid wastes designated as dangerous or mixed wastes. Special wastes are addressed in WAC 173-303-073. Universal wastes are addressed in WAC 173-303-077. Generator standards are addressed in -170 and -200. Requirements, e.g., used oil, batteries, and fluorescent tubes.	These regulations are applicable to the management of materials subject to WAC 173-303. Specifically, the standards for management of special wastes and universal wastes and the standards for management of dangerous/mixed wastes are applicable to the interim management of certain wastes that will be generated during the removal action. WAC 173-303-170(3) includes the provisions of WAC 173-303-200 by reference. WAC 173-303-200 further includes certain standards from WAC 173-303-630 and -640 by reference.
Dangerous/Mixed Waste Disposal	ARAR	This regulation establishes state standards for land disposal of dangerous waste and incorporates by	This regulation is applicable to dangerous/mixed waste generated from the removal action that will be destined for land

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered for CP Facilities that fit the SDP.

Potential ARAR Citation	Potential ARAR or TBC	Requirement	Rationale for Use
Specific subsections: WAC 173-303-140		reference, federal land disposal restrictions of 40 CFR 268, that are applicable to solid waste that designates as dangerous or mixed waste in accordance with WAC 173-303-070.	disposal.
Recycling Requirements Specific subsections: WAC 173-303-120(3) WAC 173-303-120(5)	ARAR	These regulations define the requirements for the recycling of materials that are solid and dangerous wastes. Specifically, WAC 173-303-120(3) provides for management of certain recyclable materials, including spent refrigerants, antifreeze, and lead-acid batteries. WAC 173-303-120(5) provides for the recycling of used oil.	These regulations provide for the management of materials, such as antifreeze and used oil that will be generated during removal action. Such materials can be recycled and/or conditionally excluded from certain dangerous waste requirements.
Final TSD facility Requirements Specific subsection: WAC 173-303-610	ARAR	This regulation establishes requirements applicable to final status TSD units undergoing closure.	This regulation would be applicable to any final status TSD unit undergoing closure activities in conjunction with the removal action. This regulation would be relevant and appropriate to any interim status TSD unit undergoing closure in conjunction with the removal action.
Regulations pursuant to the *Atomic Energy Act of 1954*, 42 USC 2011, et seq			
Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste (40 CFR 191)			
TRU Waste Storage Standards Specific subsection: 40 CFR 191.3	ARAR	This regulation establishes the standard for management of spent nuclear fuel, high level, or TRU waste at any facility operated by the Nuclear Regulatory Commission or by Agreement States and for management at disposal facilities operated by the DOE.	This requirement is potentially relevant and appropriate to TRU waste during onsite storage.
Regulations pursuant to the *Toxic Substances Control Act (TSCA)*, 15 USC 2601 et seq.			
Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Provisions (40 CFR 761)			
PCB Waste Management and Disposal Specific subsections: 40 CFR 761.50(b)(1) 40 CFR 761.50(b)(2) 40 CFR 761.50(b)(3) 40 CFR 761.50(b)(4) 40 CFR 761.50(b)(7) 40 CFR 761.50(c)	ARAR		These regulations are applicable to the storage and disposal of PCB liquids, items, remediation waste, and bulk product waste at >50 ppm. The specific identified subsections from 40 CFR 761.50(b) reference the specific sections for management of each PCB waste type. Radioactive PCB waste can be disposed in accordance with 40 CFR 761.50(b)(7).

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered for CP Facilities that fit the SDP.

Potential ARAR Citation	Potential ARAR or TBC	Requirement	Rationale for Use
Regulations pursuant to the *Solid Waste Management, Recovery and Recycling Act*, RCW 70.95			
"Minimum Functional Standards for Solid Waste Handling," (WAC 173-304)			
Nondangerous, Nonradioactive Solid Waste Management Specific subsections: WAC 173-304-190 WAC 173-304-200 WAC 173-304-350	ARAR	These regulations establish requirements for the management of solid waste that is not dangerous or radioactive waste. Affected solid waste includes garbage, industrial waste, construction waste, and ashes. Requirements for containerized storage, collection, transportation, treatment, and disposal of solid waste are included.	These regulations are applicable to onsite management and disposal of nondangerous, nonradioactive solid waste that may be generated during removal action.

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered for CP Facilities that fit the SDP.

Potential ARAR Citation	Potential ARAR or TBC	Requirement	Rationale for Use
To-Be-Considered pursuant to relevant facility acceptance criteria			
Environmental Restoration Disposal Facility Waste Acceptance Criteria (BHI-00139)	TBC	This document establishes waste acceptance criteria for the Environmental Restoration Disposal Facility.	Wastes destined for management at ERDF must meet acceptance criteria to ensure proper disposal.
Central Waste Complex Waste Acceptance Criteria	TBC	This document establishes waste acceptance criteria for the Central Waste Complex.	Wastes destined for management at ERDF must meet acceptance criteria to ensure proper disposal.
Waste Receiving and Packaging Facility Waste Acceptance Criteria	TBC	This document establishes waste acceptance criteria for the Waste Receiving and Packaging Facility.	Wastes destined for management at ERDF must meet acceptance criteria to ensure proper disposal.
Effluent Treatment Facility Waste Acceptance Criteria	TBC	This document establishes waste acceptance criteria for the Effluent Treatment Facility.	Wastes destined for management at ERDF must meet acceptance criteria to ensure proper disposal.
5.1.2.2 STANDARDS CONTROLLING EMISSIONS TO THE ENVIRONMENT			
Regulations pursuant to the *Clean Air Act of 1977*, 42 USC 7401, et seq.			
"National Emission Standards for Hazardous Air Pollutants (NESHAP)," (40 CFR 61)			
Emissions of Hazardous Air Pollutants Specific subsections: 40 CFR 61.01 40 CFR 61.05 40 CFR 61.12 40 CFR 61.14 40 CFR 61.92	ARAR	These regulations establish emission standards for hazardous air pollutants including radionuclides (except radon) and asbestos. These regulations provide general requirements and listings for regulated emissions at a regulated facility 40 CFR 61.92 sets limits for emissions of radionuclides from the entire facility to ambient air. Radionuclide emissions cannot exceed those amounts that are would cause any member of the public to receive an effective dose equivalent of 10 mrem/yr. The definition of facility includes all buildings, structures, and operations at one contiguous site. The requirements also set standards to ensure that emissions from asbestos are minimized during collection, processing, packaging, and transportation.	These regulations apply to the Hanford Site because there is potential to emit radionuclides to unrestricted areas. Radionuclide emissions from activities associated with the removal action must be controlled and monitored.

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered for CP Facilities that fit the SDP.

Potential ARAR Citation	Potential ARAR or TBC	Requirement	Rationale for Use
40 CFR 61.145(a)(1) 40 CFR 61.145(a)(5) 40 CFR 61.145(c) 40 CFR 61.150(a) 40 CFR 61.150(b) 40 CFR 61.150(c)		These regulations define regulated asbestos-containing materials and establish removal requirements based on quantity present and handling requirements. These regulations also specify handling and disposal requirements for regulated sources having the potential to emit asbestos	
Regulations pursuant to the *Washington Clean Air Act*, RCW 70.94 / *Department of Ecology*, RCW 43.21A			
"Radiation Protection - Air Emissions," (WAC 246-247)			
Radionuclide Emission Standards Specific subsections: WAC 246-247-120 WAC 246-247-130	ARAR	This regulation establishes limits for airborne radionuclide emissions as defined in WAC 173-480 and 40 CFR 61 Subparts H and I. The ambient air standards under WAC 173-480 require that the most stringent standard be enforced. Ambient air standards under 40 CFR 61 Subparts H and I are not to exceed amounts that result in an effective dose equivalent of 10 mrem/yr to any member of the public. These standard specify emission monitoring requirements and the application of best available radionuclide technology requirements.	This regulation is applicable because it sets emission limits and use of BARCT or ALARACT for airborne radionuclides.
"General Regulations for Air Pollution," (WAC 173-400)			
Air Contaminant Emission Standards Specific subsections: WAC 173-400-040 WAC 173-400-075	ARAR	This regulation requires that reasonable precautions be taken to prevent the release of air contaminants associated with fugitive emissions resulting from materials handling, construction, demolition, or other operations. Emission standards are identified for visible, particulate, fugitive, odors, and hazardous air emissions. The regulation requires that source testing and monitoring be performed.	Requirements of this standard are relevant and appropriate to removal actions performed at the site that could result in the emission of hazardous air pollutants (e.g., fugitive dust). Substantive standards established for the control and prevention of air pollution under this regulation might be applicable during the removal action.
"Controls for New Sources of Air Pollution," (WAC 173-460)			
Controls for New Sources of Toxic Air Pollutants Specific subsection: WAC 173-460-040	ARAR	These regulations require that new sources of air emissions provide emission estimates for toxic air contaminants listed in the regulation. The standard requires	These regulations are relevant and appropriate to removal actions performed at the site, if a treatment technology that emits toxic air emissions were necessary during the implementation of the removal action.

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered for CP Facilities that fit the SDP.

Potential ARAR Citation	Potential ARAR or TBC	Requirement	Rationale for Use
		that emissions be quantified and used in risk modeling to evaluate ambient impacts and establish acceptable source impact levels. The standard establishes three major requirements for new sources of air pollutants: use of best available control technology, quantification of toxic emissions, and demonstration that human health is protected.	
"Ambient Air Quality Standards and Emission Limits for Radionuclides," (WAC 173-480)			
Ambient Air Standards for Radionuclides Specific subsections: WAC 173-480-040 WAC 173-480-050 WAC 173-480-060	ARAR	These requirements establish that the most stringent Federal or state ambient air quality standard for radionuclides be enforced. The WAC 173-480 standard defines the maximum allowable level for radionuclides in the ambient air, which shall not cause a maximum accumulated dose equivalent of 25 mrem/yr to the whole body or 75 mrem/yr to any critical organ. However, ambient air standards under 40 CFR 61 Subparts H and I are not to exceed amounts that result in an effective dose equivalent of 10 mrem/yr to any member of the public. Emission standards for new and modified emission units shall utilize best available radionuclide control technology.	Requirements of this standard are relevant and appropriate to removal actions performed at the site that may emit radionuclides to the air.
5.1.2.3 SAFETY AND HEALTH STANDARDS			
Occupational Radiation Protection (10 CFR 835)			
10 CFR 835	ARAR	These regulations establish occupational dose limits for adults	These regulations are applicable to the removal action.

5.1.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion addresses whether the alternative leaves an unacceptable risk after the removal action is completed. It also refers to the removal action ability to maintain long-term reliable protection of human health and the environment after remedial action objectives have been met.

In Alternative Two, S&M would be carried out until the eventual D&D of the facility, which is planned to occur between 2017 and 2043. Therefore, the alternative would be effective at protecting human health during this time frame, although the efforts to maintain that level of

protection would necessarily become increasingly aggressive as the facility ages. Because contamination would be left in place with this alternative, environment release risk would remain. It would be closely monitored. With time, the effectiveness of this alternative would diminish. This alternative would not provide a permanent solution with respect to the facility, because final D&D or inventory removal would need to occur at some time in the future.

Alternatives Three and Four would provide greater protection of human health and the environment compared to Alternative Two. They would provide a permanent remedy for the purposes of meeting the removal action objectives. Both Alternatives Three and Four would remove the majority of contaminated inventory associated with the facility. Further remedial actions would potentially be required for subsurface and surrounding contamination, which is considered a small quantity compared to the inventory within the building itself. Above ground contamination and structures would be removed and disposed, thereby creating an effective and permanent remedy. This would allow improved access to contamination surrounding the specific facility for future remedial action. There would be no unacceptable risk attributable to the surface and near-surface portions of the facility remaining after completion of the removal action under Alternatives Three and Four. Alternative Four would result in removing a fraction of the subsurface contamination, which could potentially provide additional long-term protection. However, Alternatives Three and Four are judged to be comparable in terms of long-term protectiveness because the facility foundation would be left in place under Alternative Three thereby isolating any potential subsurface contamination. By placing the waste in ERDF, WIPP, or an offsite treatment, storage, and disposal (TSD) facility, long–term protection to human health and the environment from contaminants in the facility would be achieved.

5.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion refers to an evaluation of the anticipated performance of the treatment technologies that may be employed in a removal action. It assesses whether the alternative permanently and significantly reduces the hazard posed through application of a treatment technology. This could be accomplished by destroying the contaminants, reducing the quantity of contaminants, or irreversibly reducing the mobility of contaminants. Reduction of toxicity, mobility, and/or volume contributes toward overall protectiveness.

It is anticipated that a maximum of 10% of the waste generated under Alternatives Two through Four would require treatment to meet ERDF, WIPP, or offsite TSD facility waste acceptance criteria. Treatment would not be a significant component of the removal action. However, because Alternatives Three and Four would generate substantially more waste than Alternative Two, they may be considered more effective at meeting this criterion. Most of the treatment methods anticipated (e.g., macroencapsulation) would act to reduce the mobility of contaminants. Some treatment methods (e.g., elementary neutralization) would reduce the toxicity of contaminants. Each alternative would evaluate recycling to reduce the volume of material disposed.

5.1.5 Short-Term Effectiveness

The short-term effectiveness criterion refers to any potential adverse effects on human health (e.g., workers or surrounding public) and the environment during the removal action implementation phases. The criterion also refers to an evaluation of the speed with which the remedy achieves protection.

Under Alternative Two, there would be a potential for exposure to workers during the S&M period because they would be required to enter the contaminated facility to perform work. This potential for exposure would become greater as the facility deteriorates. Limiting workers' time in contaminated areas and providing the necessary protective clothing and equipment appropriate to the tasks would mitigate this risk. The speed with which full protection is achieved, however, would be lengthy since the final removal of contaminant inventory would not be planned to occur until 2017-2043.

With regard to short-term risks to workers during implementation, Alternatives Three and Four would increase potential exposure for workers in relation to Alternative Two because workers would be entering the contaminated facility and would be handling more contaminated materials. Limiting workers' time in contaminated areas and providing the necessary protective clothing and equipment appropriate to the tasks would mitigate this risk. Also, the handling of contaminated materials would increase the potential for a release to the environment, especially to the air, in the near term. Strict adherence to all appropriate environmental regulations would help ensure that the potential for releases would be minimized. Alternative Two would present a lesser hazard but for a longer period of time.

5.2 IMPLEMENTABILITY

Implementability refers to the technical and administrative feasibility of a removal action, including the availability of materials and services needed to implement the selected solution.

From a technical standpoint, Alternative Two could be easily implemented, as demonstrated by success of the S&M program currently ongoing at the facility. S&M techniques are widely used throughout the Hanford Site, and no specialized materials or services would be required except when major repairs would be needed on a contaminated facility. As time goes by, the primary implementation deterrent would be subjecting S&M workers to increasing potential contamination exposure as facility deterioration increases. However, normal precautions for dealing with contamination would be applied.

Alternatives Three and Four also could be implemented with relative ease. The specialized skills that would be required to work in a highly alpha radiation contaminated facility are available within the existing workforce at the Hanford Site. ERDF is already authorized via a ROD (EPA et al. 1995) to receive CERCLA waste meeting its acceptance criteria generated on the Hanford Site. WIPP is currently operational, and TRU waste can be stored at CWC until the WIPP schedule can accommodate Hanford-generated waste.

Although any of the alternatives would be implementable, Alternative Two may be easier to implement in the near term because it would not require the engineering, planning, and demolition activities necessary to implement Alternatives Three and Four. However, in the long term, implementation of Alternative Two may become less feasible, because S&M activities would need to become more costly, aggressive, and frequent.

Both Alternatives Three and Four would perform substantially better than Alternative Two with respect to meeting the removal action objective of facilitation and consistency with future remedial actions at or near a major CP facility. If a surface barrier is selected as part of the remedy for a canyon building, demolition of nearby surface structures would be required, and this would occur under Alternatives Three and Four. However, removal of additional subsurface structures and soil to 1 m under Alternative Four would likely provide no additional benefit to final remediation of the area under a canyon barrier alternative. Alternatives Three and Four would also perform better than Alternative Two at facilitating the evaluation and remediation of any potential subsurface contamination. In Alternative Two the continued presence of the aboveground structure would limit access to subsurface contamination. Although some subsurface structures and contamination would be removed under Alternative Four, this would not necessarily facilitate subsurface remediation. If in-place disposal with a barrier were to be selected as a remedy for subsurface contamination, removal of any subsurface contamination as contemplated in Alternative Four would be unnecessary. If a removal action were to be selected for subsurface contamination, the 1-m remediation depth included in Alternative Four would be insufficient, and clean fill placed at the site would need to be re-excavated. For these reasons, Alternative Three would perform best for facilitating and achieving consistency with future subsurface remedial actions.

None of the alternatives discussed in this report would be expected to interfere with other nearby facility operations.

5.3 COST

Total costs for each alternative as described in Sections 4.2 through 4.4 are presented in each facility-specific appendix.

5.4 OTHER CONSIDERATIONS

In accordance with DOE NEPA policy, DOE CERCLA documents are required to incorporate NEPA values (e.g., analysis of cumulative, offsite, ecological, and socioeconomic impacts) to the extent practicable.

Cumulative impacts may occur in both the short term and long term due to the interrelationships between removal action at qualifying CP facilities and other 200 Area activities, such as waste sites and groundwater remediation, deactivation and D&D of surrounding facilities, and operation of waste treatment facilities. For this action, short-term cumulative impacts were considered in terms of both air quality and resource allocation. With appropriate work controls, airborne releases from any removal action will be expected to be minor. The contribution to

cumulative impacts on local and regional air quality would be minimal. With respect to resource allocation, Alternatives Two through Four as well as other CP activities would require resources in terms of budget, materials, and disposal space. The contribution to cumulative impacts would be less for Alternative Two and greater for Alternatives Three and Four, which would require substantially greater budget resources.

In the longer term, the overall cumulative effect of removal action at CP facilities and other activities in the 200 Areas would be to enhance the protection of workers, the public, and the environment. This is consistent with the values expressed by the regulators, stakeholders, affected tribes, and the public. Alternatives Two through Four would contribute to this enhanced protection. Alternatives Three and Four create the greatest and most long-term positive effect. None of the alternatives would be expected to adversely affect existing ecological or cultural resources, or to have any socioeconomic impacts, including disproportionately high and adverse impacts to minority or low-income populations. Alternatives Two through Four would require an irreversible and irretrievable commitment of resources in the form of land area at ERDF for waste disposal. The total quantity of waste generated and the associated land area required would be relatively small compared to the CP area. Alternative Four would also require a commitment of resources in the form of clean fill material to backfill the 1-m deep excavation at the site.

6.0 RECOMMENDED ALTERNATIVE

The recommended removal action alternative for CP facilities that fit the SDP is Alternative Three – D&D (to grade, excluding building foundation and underlying soils/structures). This alternative would provide the best balance of protecting human health and the environment associated with the hazardous substance inventory within the building, meeting the removal action objectives, and providing a cost-effective option. Alternative Four – D&D (including building foundation and underlying soils/structures to 1 m below surface) would provide comparable protection to Alternative Three with higher costs with little added benefit. In addition, Alternative Three would provide an end-state that does not preclude future actions beneath the facility. This allows for possible coordination with future remedial activities that may be in close proximity to the facility.

After an alternative is selected, each CP facility determined to fit the SDP will be 'plugged-in' to the selected alternative. Decommissioning will then be performed in accordance with the SDP AM. As facilities are identified for action under the SDP AM, the selection will be appended to this EE/CA. The facility appendix will include the specific cost information. The AM will be modified, as appropriate and public participation will be as appropriate to accommodate application of the facility removal action.

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A.1.0 INTRODUCTION

Appendix A presents the 224-B Plutonium Concentration Facility (224-B Facility) Streamlined Decommissioning Profile (SDP) (Section 1.5.2) engineering evaluation/cost analysis (EE/CA).

The 224-B Facility, located in the Hanford Site 200 East Area, was once used to facilitate plutonium recovery following spent nuclear fuel reprocessing. Plutonium concentration operations were performed in conjunction with B Plant separations activities from approximately 1944 to 1952. The facility's process components were deactivated shortly thereafter. These past operations resulted in contamination throughout the process cell area. The facility is currently an inactive surplus facility and is administered under a surveillance and maintenance (S&M) program while awaiting final disposition. The U.S. Department of Energy (DOE) has identified no further use for the facility making it a decontamination and decommissioning (D&D) candidate.

A.1.5 PLUG-IN APPROACH FOR 224-B FACILITY

A.1.5.1 Need for Action

The 224-B Facility contains CERCLA hazardous substances that pose an unacceptable risk to the Hanford Site worker, the public, and the environment.

The 224-B Facility is contaminated with hazardous substances, primarily a significant inventory of radionuclides (Table A1-1). Radionuclides are known carcinogens.

The risks to Hanford Site workers, the public, and the environment associated with routine S&M activities at the 224-B Facility have not been quantified. However, cell radiological conditions require special precautions for worker entry.

The *224-B Facility Documented Safety Analysis (*BHI 2001) Beyond Design Basis accident scenario indicates that a seismic event would result in destruction of the 224-B Facility. The bounding accident scenario calculated dose consequences are:

- The calculated dose at 100 m is 12.7 rem.
- The calculated dose at the Columbia River (11.3 km away) is less than 0.009 rem.

The inhalation and ingestion pathways are also of concern if the material within the cell processing equipment and piping is disturbed. During facility canyon cell area D&D activities, the potential for radiological doses to workers is considered to be a significant risk. D&D activities include process cell equipment dismantling (cutting process piping). Even though personal protective equipment would be worn, external radionuclides exposure and inhalation would still pose a risk. During initial D&D activities, the potential for a radionuclide release would increase. As the inventory is stabilized and disposed of appropriately, the source term (hence, the risk) would decrease.

The current 224-B Facility contaminant release threat is relatively low. In general, an accidental radionuclides (e.g., from a structural failure resulting from a heavy load drop, fire, or seismic event) release increases the longer the facility remains in the S&M Program awaiting disposition. The 224-B Facility is listed as an urgent risk in the multi-year work plan (DOE-RL 1999b) due

to the potential for inventory releases from structure degradation through time and the lack of a robust ventilation system. The external radiation, inhalation, and ingestion risks associated with the building contamination under a continued S&M scenario justify a non-time-critical removal action.

A.1.5.2 Comparison to the SDP

The 224-B Facility profile is compared against the SDP on characteristics defined by facility type, location, anticipated land use, historical significance, hazardous substances, and waste types. In summary, the main facility characteristics and the description of how the 224-B Facility meets the characteristics are as follows:

The facility must be an aboveground, engineered structure that may be constructed of a variety of materials (e.g., wood, concrete, metal).

The 224-B Facility is located within the B Plant Complex in the 200 East Area of the Hanford Site (Figure A1-1). Highway 240 is to the southwest of the B Plant Complex and the Columbia River is north-northwest. The 224-B Facility is a deactivated plutonium concentration facility that was formerly associated with the B Plant Complex (Figure A1-2).

The 224-B Facility consists of a single canyon-type building. The building is constructed of reinforced concrete and concrete block (Figure A1-2). The first and second floors have approximate outside dimensions of 60 m by 18 m. The third floor is 44.3 m by 18 m. The building is divided into two main sections along its length by a 0.3-m-thick concrete wall. Offices and galleries are on the north side of the dividing wall, and six processing cells, identified by letters "A" through "F," are on the south side.

Figures A1-3 through A1-5 depict a plan of the three floors in the 224-B Facility.

Figure A1-1. B Plant Region of 200 East Area.

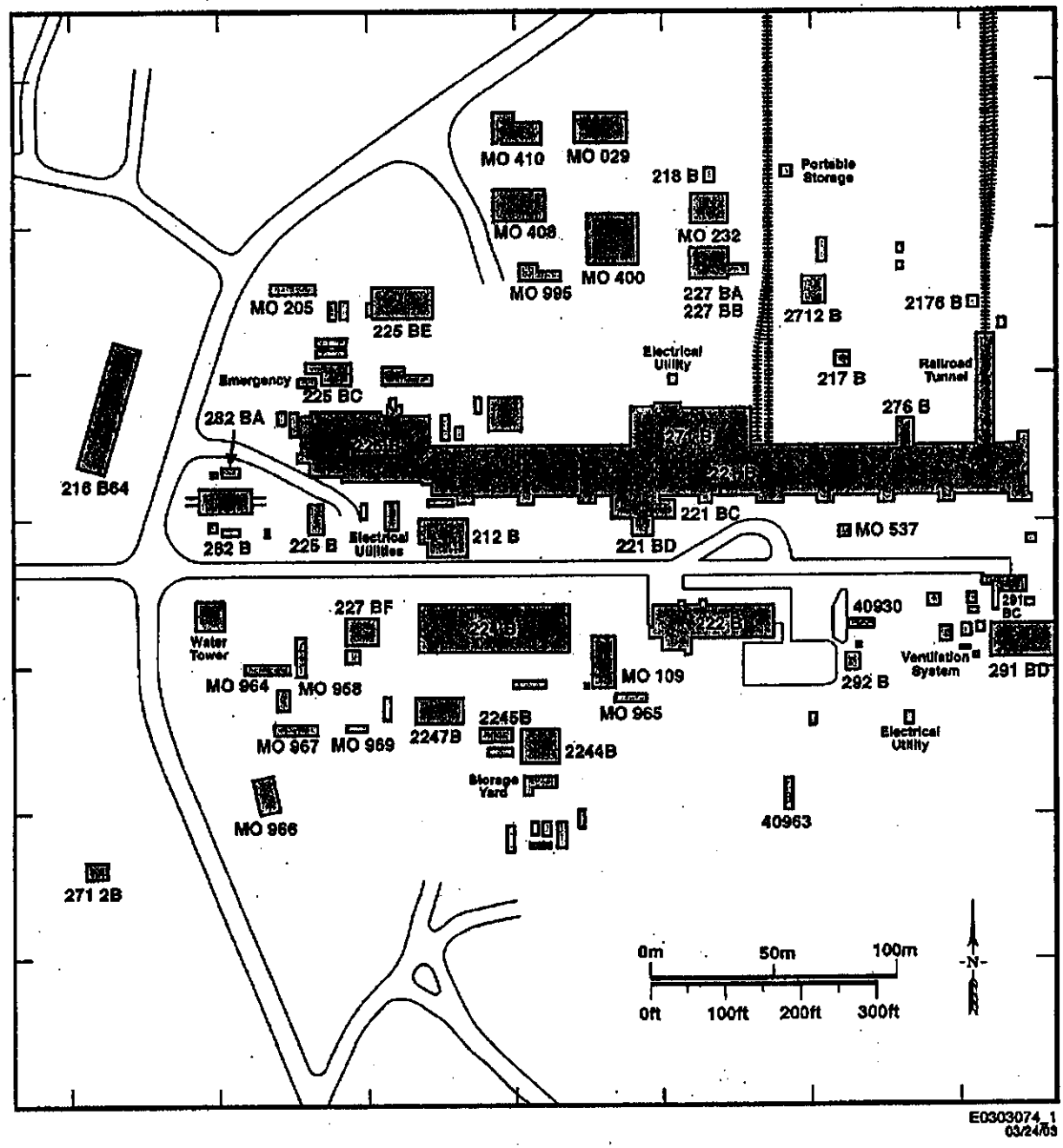
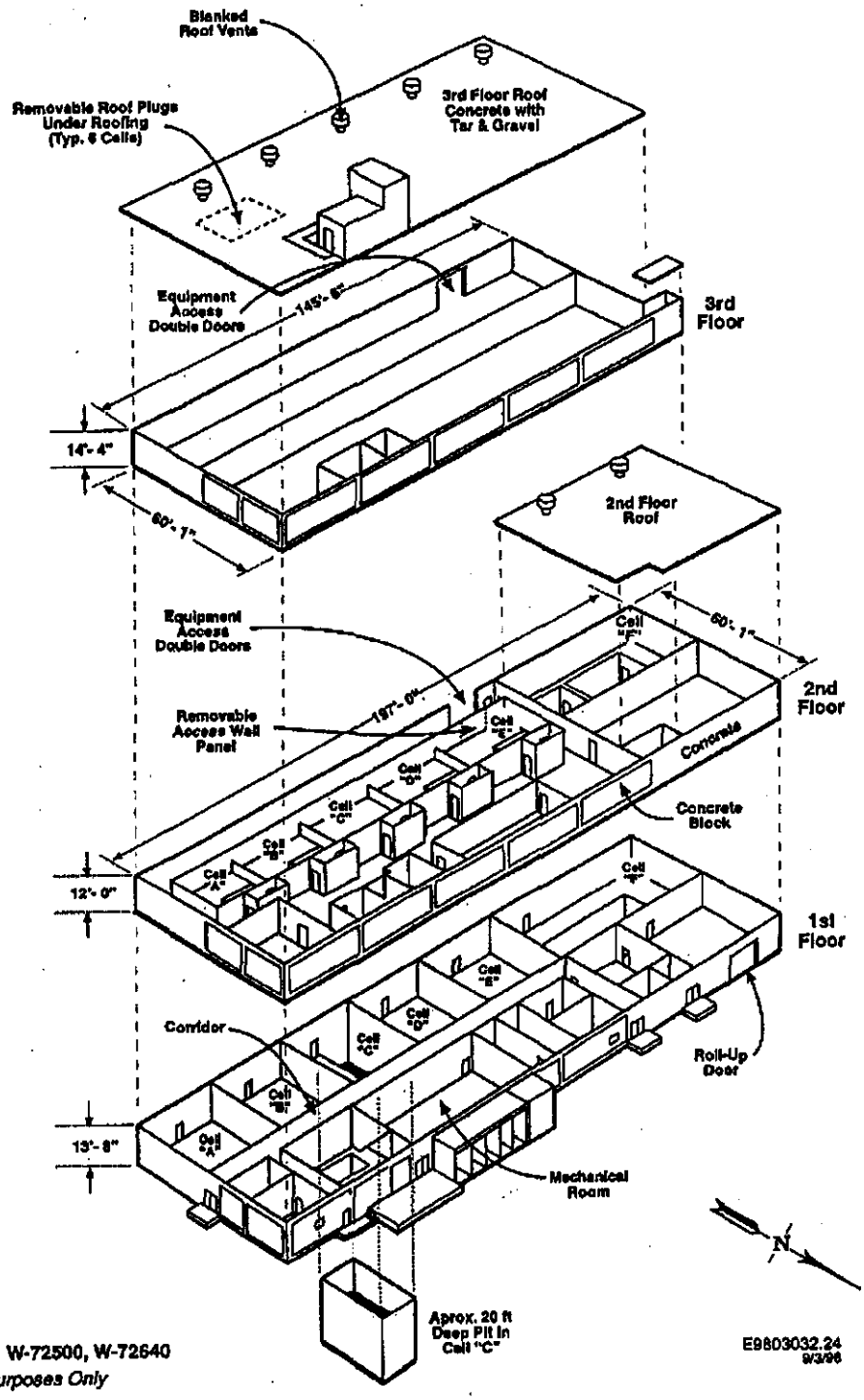


Figure A1-2. 224-B Facility.



Ref. Drawings: W-72500, W-72640
For Illustative Purposes Only

Figure A1-3. First Floor of the 224-B Facility.

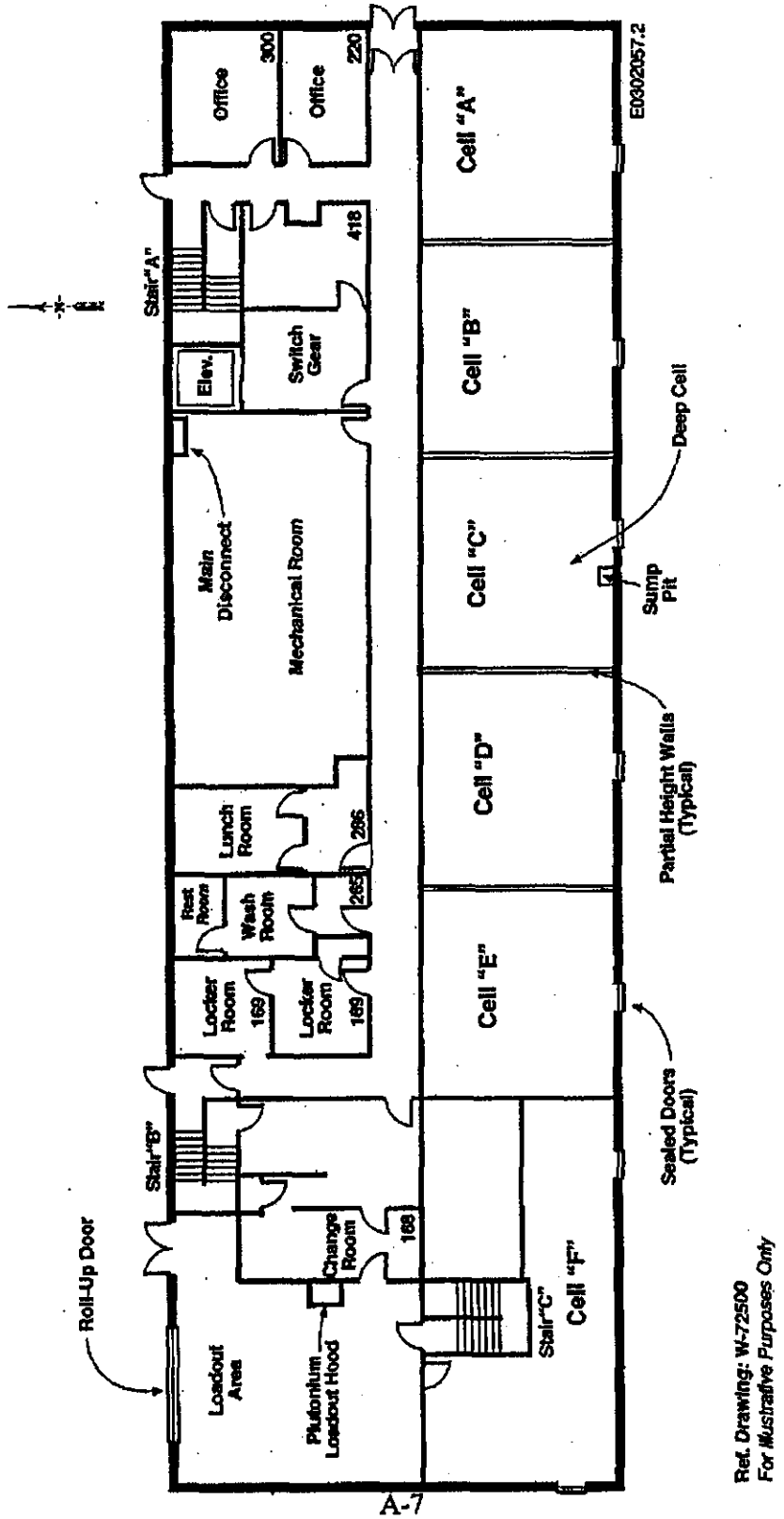


Figure A1-4. Second Floor of the 224-B Facility.

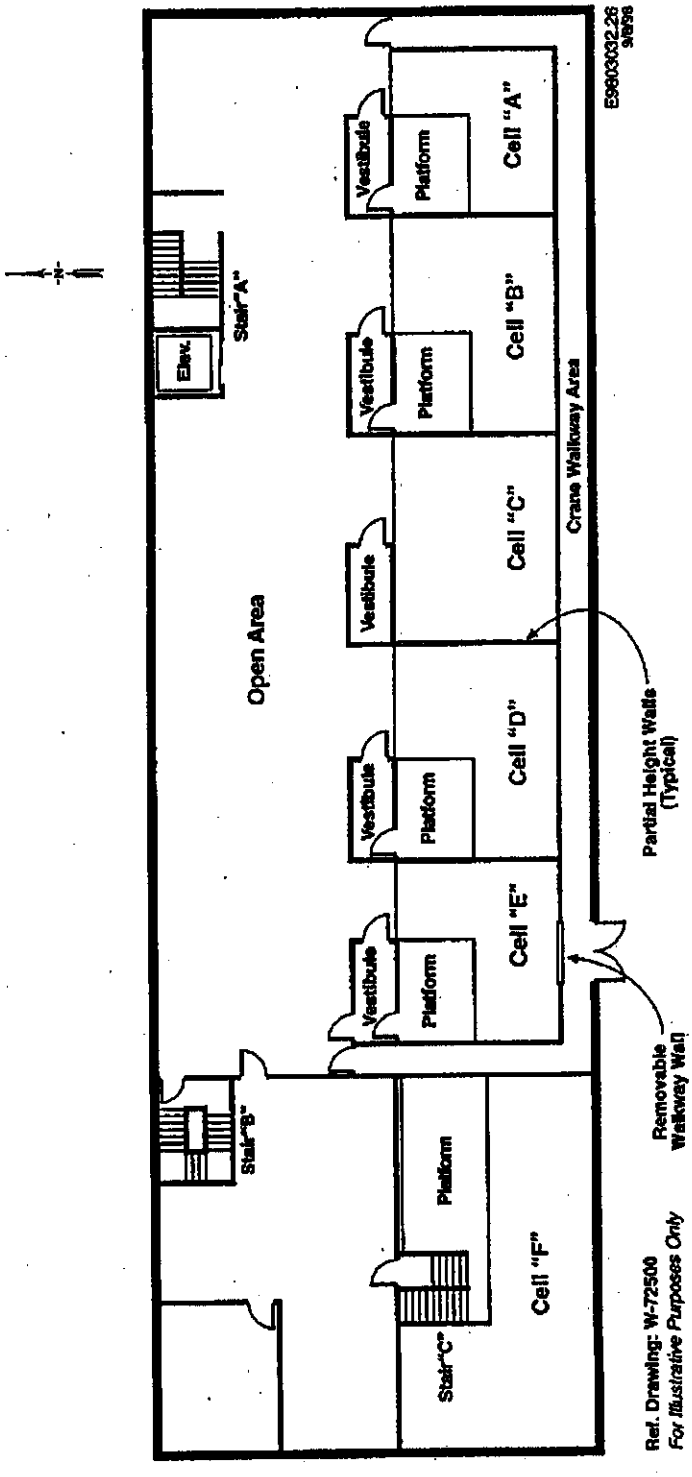
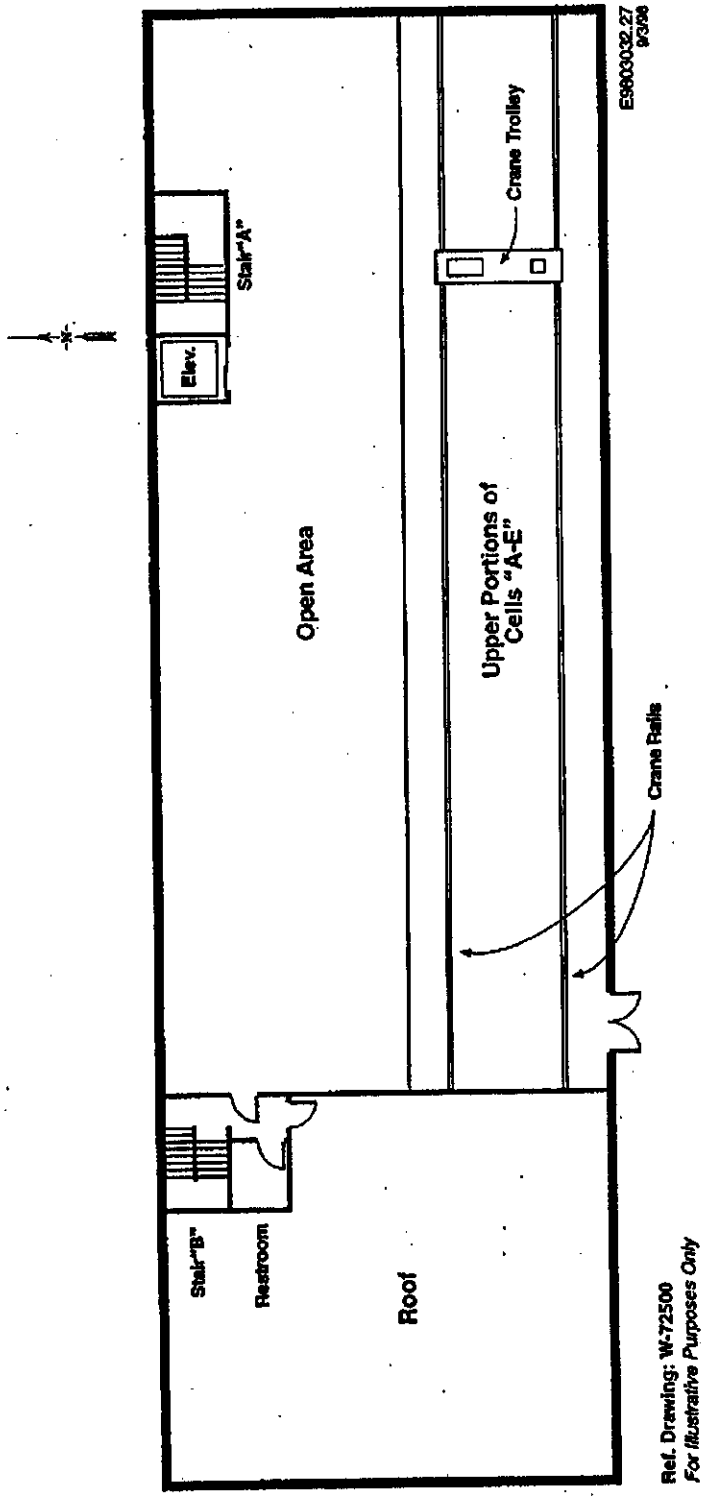


Figure A1-5. Third Floor of the 224-B Facility.



The facility's first floor contained offices, a restroom, change room, lunchroom, and mechanical room. The room at the west end of the building was originally used as a plutonium load-out room. This area was converted to a workshop with a large rollup door following 224-B deactivation.

The second floor gallery side was a pipe gallery for A through E cells and an operating gallery for F cell. The second floor was modified after deactivation for use as an office area and lunchrooms. The third-floor gallery was the operating gallery for A through E cells and contains deactivated aqueous makeup tanks, scales, pumps, and control panels for the five cells.

Chemical processing was performed in A, B, D, and E cells. C cell received dilute plutonium solutions from the 221-B and wastes that were generated within the 224-B Facility. The F cell was the final concentration and plutonium nitrate load-out area. Cells A to E are three stories high (12 m) and are separated from each other by 4.5-m-high, 0.2-m-thick concrete walls. Cells A, B, D, and E, are similar in equipment and configuration. C cell is different, as approximately half of the cell is a deep cell (pit) with a floor 5.7 m below the other cells and has a pipe tunnel extending 10 m from the deep cell beneath the first-floor offices to a pipe encasement going to B Plant. The 15.3 m by 7.6 m by 7.3 m F cell is separated from the other cells by a concrete wall; only process and waste piping interconnect F cell with the other cells. Doors enter F cell from the load out area, the outside, and from the second-floor operating gallery.

Three sewer systems were used in the 224-B Facility: cooling water, chemical sewer, and sanitary systems. An internal cell drainage system collected drainage in a waste receiver tank in the deep portion of C cell. The three sewer systems are not currently in use; however, rubber plugs have been used to seal some portions of the septic drain system.

The facility must be located in a previously disturbed area of the 200 Area where future land use is anticipated to be industrial-exclusive.

Public access to the Hanford Site currently is restricted and controlled at the Wye Barricade on Route 4 and the Yakima and Rattlesnake Barricades on State Highway 240. Present land use in the Central Plateau, which includes 224-B Facility in the 200 East Area consists of inactive irradiated-fuel reprocessing facilities and waste management. Proposed alternatives for future land use were described in the *Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP-EIS) (DOE 1999). The Record of Decision (ROD) for that EIS identifies land use in the 200 East Area as industrial-exclusive use for the foreseeable future (64 FR 61615).

The land area around the 224-B Facility is predominantly disturbed from the construction of buildings and parking lots. What little plant community does exist is primarily composed of semi-arid species common to disturbed areas, such as cheat-grass, rabbit-brush, and other nonnative plant species. No protected plants or animals listed on the federal or state lists of endangered and threatened wildlife and plants are found in the

224-B Facility vicinity. Further information on ecological resources in the 200 Area and threatened, endangered, and candidate species at the Hanford Site is available in Neitzel (2002). There are no perennial or ephemeral streams in the 200 Areas, and there are no regulated wetlands within the 200 East Area.

The facility must have completed the process for individual documentation or mitigation as a historic property and been determined acceptable for demolition.

The 224-B Facility was determined to be a contributing property to the Hanford Site Manhattan Project/Cold War Era Historic District. However, it was not selected for individual documentation or mitigation (DOE-RL 1998), and is acceptable for demolition.

A walkthrough of the facility was performed on June 16, 1999, by an assessment team that consisted of personnel from DOE and contractor personnel. The following items were tagged for retention as items with interpretive or public education value:

CP0014	F Cell Load out Process Control Board (2nd floor-west)
CP0015	Fire Blanket Box with Fire Blanket (2nd floor-central)
CP0016	Main Process Control Board (3rd floor)
CP0017	Spray Pump for Centrifuges D and E (3rd floor).

These items will be removed and stored, if possible based on potential radiological contamination issues, prior to demolition of the structure.

No archaeological resources or traditional-use areas are known to exist within the proposed project location. This information will be verified prior to conducting the removal action, with appropriate response if new information is found.

The facility must be contaminated by radioactive and/or nonradioactive hazardous substances.

The 224-B Facility is contaminated with hazardous substances used or generated during plutonium concentration operations. To help identify facility hazardous substances, several sources of information were used, including characterization data, historical operations, process knowledge, and knowledge of the construction materials. Key radionuclide contaminants are TRUs, including plutonium-239 and americium-241 and mixed fission products such as strontium-90 and cesium-137. The majority of contaminants are found in the form of adherent films and residues encrusted in deactivated process vessels, piping, and ventilation system ductwork. In 1985, a TRU characterization was performed at the 224-B Facility in support of D&D activities. The results of this effort (RHO 1985a) are summarized in Table A1-1.

Table A1-1. Plutonium/Americium Inventory Distribution in the 224-B Facility.

Cell	Americium-241 (Ci)	Plutonium-239 (Ci)[a]	Plutonium-239 (g)
A	0.059	0.78	12.5
B	0.088	0.78	18.6
C	0.20	2.63	42.3
D	3.5	8.57	138.0
E	0.067	0.88	14.2
F	1.3	17.1	275.0
Total	5.21	31.1	500.0

[a]Plutonium-239 based on facility average plutonium-239/americium-241 mass ratio of 13.14:1.

The inventory contained in the table above is consistent with the current *224-B Facility Documented Safety Analysis* (BHI 2001). The inventory report indicates a large uncertainty exists in the inventory. Based on this uncertainty, the actual inventory may be up to one and a half time larger than provided in Table A1-1. Also, the potential doses listed in Section A.1.5.1 may be larger by the same factor as well. The Department of Energy has accepted this uncertainty, however, it is anticipated that the source term and doses in the current documented safety analysis for 224-B Facility may be updated to larger values in the future to better address the uncertainty present in the inventory.

The primary hazardous materials of concern are radioactive materials. All known quantities of concentrated hazardous chemicals have been removed from the facility during deactivation and S&M operations. Some residual quantities of hazardous chemicals may remain as hold up or heels in process lines, tanks, and vessels. In addition, the 224-B Facility is anticipated to contain one or more of the following hazardous materials found in most Hanford Site facilities, including the following:

- Polychlorinated biphenyls (PCB) and non-PCB light ballasts
- Lead paint
- Lead for shielding
- Mercury switches, gauges, thermometers
- Mercury or sodium vapor lights
- Used oil from motors and pumps
- Unspecified chemical containers
- Friable and nonfriable forms of asbestos.

Specific chemicals that were used during or as part of the plutonium concentration process are listed in Table A1-2.

Table A1-2. Suspected Nonradiological Contaminants in the 224-B Facility (Source: RHO 1985b).

Input Chemicals	
$BiPO_4$	Bismuth phosphate
$NaBiO_3$	Sodium metabismuthate
$Na_2Cr_2O_7 \bullet 2H_2O$	Sodium chromate
H_3PO_4	Phosphoric acid
HNO_3	Nitric acid
$La(NO_3)_5 \bullet 2NH_4NO_3 \bullet 4H_2O$	Lanthanum ammonium nitrate
$H_2C_2O_4 2H_2O$	Oxalic acid
HF	Hydrogen fluoride
KOH	Potassium hydroxide
$KMnO_4$	Potassium permanganate
Waste Solutions	
$BiPO_4$	Bismuth phosphate
HNO_3	Nitric acid
LaF_3	Lanthanum fluoride
KOH	Potassium hydroxide
H_3PO_4	Phosphoric acid
$NaNO_3$	Sodium nitrate
KNO_3	Potassium nitrate
$Cr(NO_3)_3$	Chromium nitrate
HF	Hydrogen fluoride
$H_2C_2O_4 \bullet 2H_2O$	Oxalic acid
$Mn(NO_3)_2$	Manganese nitrate
NH_4NO_3	Ammonium nitrate
KF	Potassium fluoride

The facility contains waste consisting primarily of contaminated debris with some miscellaneous liquid and solid waste streams.

With the exception of the No Action alternative, each of the alternatives in the streamlined EE/CA would result in generation of 224-B Facility waste under the removal action. The majority of the contaminated debris would likely be designated as low-level waste (LLW); however, some mixed waste, dangerous waste, and TRU waste may be generated. Waste management applicable or relevant and appropriate requirements (ARARs) are discussed in the streamlined EE/CA.

Recycling and/or reuse options would be evaluated and possibly implemented to reduce the volume of material disposed. Media that is removed from the removal action work site for recycle/reuse purposes would not be subject to CERCLA authority, including

CERCLA offsite acceptability determinations. Instead it must comply with all applicable provisions of the *Resource Conservation and Recovery Act of 1976* (RCRA) or other laws. Inert uncontaminated and decontaminated rubble and other miscellaneous structural material that could not be recycled may be disposed to an inert/demolition waste landfill.

Contaminated waste for which no reuse, recycle, or decontamination option is identified would be assigned an appropriate waste designation (e.g., solid, asbestos, PCB, radioactive, dangerous, or mixed). Most contaminated waste generated would be disposed at the Environmental Restoration Disposal Facility (ERDF) in the Hanford Site's 200 West Area. ERDF would be the preferred waste disposal option because it is an engineered facility that provides a high degree of protection to human health and the environment. It is more cost effective than disposal at other disposal sites. ERDF construction and operation was authorized using a separate CERCLA ROD (EPA et al. 1995) and explanation of significant differences (ESD) (EPA et al. 1996). ERDF is an engineered structure designed to meet RCRA minimum technological requirements for landfills, including standards for a double liner, a leachate collection system, leak detection, and final cover.

Waste may require treatment to meet ERDF waste acceptance criteria. The type of treatment and the location of treatment will be determined on a case-by-case basis. Solidification, encapsulation, neutralization, and size reduction/compaction may be employed to treat various wastes. For wastes requiring treatment, the techniques will be documented in a treatment plan.

Several mixed waste streams have already been reviewed and approved for treatment and disposal at ERDF. These mixed waste streams are as follows:

- Radioactively contaminated elemental mercury may be amalgamated.
- Radioactively contaminated elemental lead may be macroencapsulated at ERDF.
- Aqueous solutions may be treated (solidified) in accordance with the approved waste treatment plan and sent to ERDF.

While most of the waste generated during the removal action would likely meet ERDF waste acceptance criteria, some waste may not meet or may not be able to be treated to meet ERDF acceptance criteria. Specifically, this would include low-level radioactive and nonradioactive liquid wastes and TRU wastes that may be encountered or generated during the removal action.

Liquid waste containing levels of radioactive and/or nonradioactive hazardous substances meeting the Hanford Central Plateau Effluent Treatment Facility (ETF) waste acceptance standards would be sent to ETF. There it would be treated to meet ETF waste discharge standards. Liquids that do not meet ETF waste acceptance standards would be solidified

and either disposed at ERDF (providing ERDF waste acceptance criteria is met) or stored at the Hanford Site's Central Waste Complex (CWC). Clean water (e.g., nonradioactive and nonhazardous) may be used for dust suppression.

TRU waste would be transported to CWC for interim storage, then packaged at the Hanford Site's Waste Receiving and Packaging (WRAP) Facility before being transported offsite for disposal at the New Mexico Waste Isolation Pilot Plant (WIPP).The 224-B Facility, ETF, CWC, WRAP Facility, and ERDF are considered to be a single site for management and/or disposal of waste from removal actions proposed in this document[1]. There is no requirement to obtain a permit to manage or dispose of CERCLA wastes at these facilities. ETF, CWC, and WRAP facilities have been permitted for management of non-CERCLA wastes. All CERCLA wastes handled at those facilities must be managed in accordance with the substantive requirements of the existing permits. It is expected that the great majority of the waste generated during the removal action proposed in this document can be dispositioned onsite. For waste that must be sent offsite, such as TRU waste, EPA would make a determination in accordance with 40 CFR 300.440 as to the acceptability of the proposed disposal site for receiving CERCLA removal action waste, if necessary.

The facility must not be a key facility as defined in the Hanford Federal Facility Agreement and Consent Order (HFFACO) (Ecology et al. 1994).

224-B Plutonium Concentration Facility is not a key facility as defined in the HFFACO. Therefore, it is not subject to specific provisions in the HFFACO, and it can be included in this streamlined EE/CA.

The facility cannot be a site that served predominantly as a waste disposal unit (e.g., cribs, surface impoundments).

The 224-B Plutonium Concentration Facility did not serve as a waste disposal unit.

[1] CERCLA Section 104(d)(4) states that, where two or more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat or potential threat to the public health or welfare or the environment, the President may, at his discretion, treat these facilities as one for the purpose of this section. The preamble to the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300) clarifies the stated EPA interpretation that when noncontiguous facilities are reasonably close to one another, and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. Therefore, ERDF, ETF, WRAP and CWC are considered to be a single site for response purposes under this removal action. It should be noted that the scope of work covered in this removal action is for those facilities and wastes contaminated with hazardous substances. Materials encountered during implementation of the selected removal action that are not contaminated with hazardous substances will be dispositioned by DOE.

The facility must qualify for decommissioning in accordance with the Policy on Decommissioning Department of Energy Facilities under CERCLA (Policy).

The 224-B Plutonium Concentration Facility qualifies for decommissioning in accordance with the Policy.

The facility must not be subject to specific past-practice milestones in the HFFACO.

The 224-B Plutonium Concentration Facility is not subject to any past-practice milestones under the HFFACO.

A.1.5.3 Standard Removal Action

Based on the results of profiling against the SDP criteria, the preferred alternative for the 224-B Facility is Alternative 3, Decontamination and Decommissioning To Grade, Excluding Building Foundation and Underlying Soils/Structures. The standard removal action (i.e., preferred alternative) will be documented in the 224-B Facility Action Memorandum.

Cell C will require a waterproof barrier so that the pit does not fill up with water and drain any remaining contaminates to the environment.

A.4.0 SPECIFIC COST ANALYSES FOR 224-B FACILITY ALTERNATIVES

A.4.1.1 Cost Estimates for Alternative One: No Action

The near-term costs for implementing this alternative would be negligible.

A.4.2.1 Cost Estimates for Alternative Two: Continued Surveillance and Maintenance

The detailed cost estimates for Alternative Two are shown in Table A4-1, along with a projection of costs over the S&M period for roof replacement and maintenance. The present-worth (discounted) cost for Alternative Two is approximately $960,000. The total nondiscounted cost for Alternative Two is approximately $1,450,000. Present-worth costs are used for evaluation of alternatives in the CERCLA process. The total nondiscounted costs are presented here for information purposes.

In contrast with the present-worth costs, the total nondiscounted costs do not take into account the value of money over time. The nondiscounted cost method displays the total costs occurring over the entire duration of an alternative, with no adjustment (or "discounting") to reflect current year or "set aside" cost based on an assumed interest rate. Because nondiscounted costs do not reflect the changing value of funds over time, presentation of this information under CERCLA is for information purposes only, not for remedy selection purposes.

Table A4-1. Cost Estimate for Alternative Two: Continued Surveillance and Maintenance.

Item	Estimated Cost ($1,000)
S&M	1,100
Roof replacement	140
Roof maintenance	210
Nondiscounted Grand Total	1,450
Present-Worth (Discounted)	960

Note: Details on the removal alternative estimates are discussed in Rodovsky (2000).

A.4.3.1 Cost Estimates For Alternative Three: Decontamination and Decommissioning (To Grade, Excluding Building Foundation and Underlying Soils/Structures)

Costs are presented in Table A4-2 in terms of total nondiscounted costs and present-worth (discounted) costs. The present-worth (discounted) cost for Alternative Three is approximately $61,140,000. The total nondiscounted cost (approximately $71,930,000) is a summation of the D&D costs for the duration of the project and reflects potential long-term costs that have not been discounted to reflect cost in 2002 dollars (present worth).

Table A4-2. Cost Estimate for Alternative Three: Decontamination and Decommissioning (To Grade, Excluding Building Foundation and Underlying Soils/Structures).

Item	Estimated Cost ($1,000)
Site mobilization and facility upgrades	1,100
Facility/waste characterization	860
Nonradiological hazardous substance removal	4,600
Process cell equipment and piping dismantlement/disposal preparation/stabilization	42,000
Above-grade demolition	17,000
Site stabilization	150
Waste disposal	
Low-level waste	890
TRU waste	4,300
Mixed waste	860
Solid[a]	Negligible
Project closeout/demobilization	170
Nondiscounted Grand Total	**71,930**
Present-Worth (Discounted)	**61,140**

Note: Details on the removal alternative estimates are discussed in Rodovsky (2000).
[a]No cost is associated with disposal of inert (nonhazardous) solid waste.

A.4.4.1 Cost Estimates For Alternative Four: Decontamination and Decommissioning (Including Building Foundation and Underlying Soils/Structures To One Meter Below Surface)

Costs are presented in Table A4-3 in terms of total nondiscounted costs and present-worth costs. The present-worth (discounted) cost for Alternative Four is approximately $69,530,000. The total nondiscounted cost (approximately $81,850,000) is a summation of the D&D costs for the duration of the project and reflects potential long-term costs that have not been discounted to reflect cost in 2002 dollars (present worth).

Table A4-3. Cost Estimate for Alternative Four: Decontamination and Decommissioning (Including Building Foundation and Underlying Soils/Structures to 1 m Below Surface).

Item	Estimated Cost ($1,000)
Site mobilization and facility upgrades	1,100
Facility/waste characterization	860
Nonradiological hazardous substance removal	4,600
Process cell equipment and piping dismantlement/disposal preparation/stabilization	45,000
Demolition (above and below grade) backfill/site restoration	24,000
Waste disposal	
Low-level waste	960
TRU waste	4,300
Mixed waste	860
Solid waste[a]	Negligible
Project closeout/demobilization	170
Nondiscounted Grand Total	**81,850**
Present-Worth (Discounted)	**69,530**

Note: Details on the removal alternative estimates are discussed in Rodovsky (2000).
[a]No cost is associated with disposal of inert (nonhazardous) solid waste.

A.6.0 RECOMMENDED ALTERNATIVE

Comparison against the SDP criteria determined that the 224-B Facility meets the required dispositioning elements in accordance with the SDP EE/CA. Therefore, the recommended 224-B Facility removal action alternative is Alternative Three – D&D (to grade, excluding building foundation and underlying soils/structures). This alternative provides the best balance of protecting human health and the environment associated with the hazardous substance inventory within the building, meets the removal action objectives, and provides a cost-effective option. In addition, Alternative Three provides a 224-B Facility end-state that does not preclude future actions beneath the 224-B Facility, and allows for possible coordination with future remedial activities in the 224-B Facility vicinity (e.g., Operable Unit 200-BP-6).

A.7.0 REFERENCES

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