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Revision 1

212-N, -P and -R Facilities Engineering Evaluation/Cost Analysis

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

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EXECUTIVE SUMMARY

This document is a *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* non-time critical removal action engineering evaluation/cost analysis that was conducted to evaluate removal action alternatives for the 212-N, -P and –R facilities structures. The 212-N, -P and –R structures located north of the 200 East and 200 West Areas are former storage facilities built to provide lag storage of irradiated fuel before processing.

The 212-N, -P and -R facilities are contaminated with hazardous substances, primarily radionuclides and lead.

Based on these potential hazards for the 212-N, -P and –R facilities the specific objectives of the removal action alternatives are:

- Reduce/eliminate the inventory of hazardous/radioactive substances within the facilities
- Reduce or eliminate the potential for a release to the environment
- Safely manage (treat and/or dispose) of waste streams generated through the removal action unless the No Action alternative is selected
- Be consistent with future remediation plans for the 200 North Area
- Prevent adverse impacts to cultural and natural resources
- Reduce or eliminate the need for future surveillance and maintenance activities.

The selected removal action alternative for the 212-N, -P and -R facilities must be protective of human health and the environment, and otherwise meet the removal action objectives. Based on these considerations, the following four removal action alternatives were identified for assessment:

- Alternative One: No Action
- Alternative Two: Continued Surveillance & Maintenance
- Alternative Three: Decontamination and Decommissioning (Building Structures Down to Basin, Not Including Basin or Underlying Soils/Structures)
- Alternative Four: Expanded Decontamination and Decommissioning (Building Structures, Including Building Basin and Underlying Soils Up to 1 Meter Below Each Basin).

The alternatives were evaluated against three criteria:

- Effectiveness
  - Overall protection of human health and the environment
  - Compliance with applicable federal and state laws and regulations (i.e., applicable or relevant and appropriate requirements)
  - Long-term effectiveness and permanence

  - Reduction of toxicity, mobility, or volume through treatment
  - Short-term effectiveness.

- Implementability

- Cost.

The recommended removal action alternative for the 212-N, -P and -R facilities is Alternative Four – Expanded Decontamination and Decommissioning (Including Building Basins, and Underlying Soils Up to 1 Meter Below Each Basin). This alternative would provide the best balance of protecting human health and the environment associated with the hazardous substance inventory within each facility, meeting the removal action objectives, and providing a cost-effective option.

Alternative Four also supports the geographical area closure approach for the 200 North Area. Following the removal action the resulting excavated area will be evaluated for remedial action using the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (EPA 1999).

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TERMS

ARAR	applicable or relevant and appropriate requirement
CERCLA	*Comprehensive Environmental Response, Compensation and Liability Act of 1980*
CFR	Code of Federal Regulations
CWC	Central Waste Complex
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
Ecology	Washington State Department of Ecology
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	explanation of significant differences
ETF	200 Areas Effluent Treatment Facility
FR	Federal Register
Joint Policy	*Policy on Decommissioning Department of Energy Facilities Under CERCLA*
LLW	low-level waste
MEI	maximally exposed individual
NCP	National Contingency Plan
NEPA	*National Environmental Policy Act of 1969*
NPL	National Priorities List
OMB	U.S. Office of Management and Budget
PCB	polychlorinated biphenyl
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	Revised Code of Washington
Remaining Sites ROD	*Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington*
ROD	record of decision
S&M	surveillance and maintenance
TBC	to-be-considered
TEDE	total effective dose equivalent
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSCA	*Toxic Substances Control Act of 1976*
TSD	treatment, storage, and/or disposal
USC	United States Code
WAC	Washington Administrative Code
WIDS	waste information database system
WIPP	Waste Isolation Pilot Plant

212-N, -P AND -R FACILITIES ENGINEERING EVALUATION/ COST ANALYSIS

1.0 INTRODUCTION

1.1 PURPOSE

This is a *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) non-time critical removal action engineering evaluation/cost analysis (EE/CA) that was conducted to evaluate removal action alternatives for the 212-N, -P and –R facilities' structures. The 212-N, -P and –R structures located north of the 200 East and 200 West Areas are former storage facilities built to provide lag storage of irradiated fuel before processing. The storage pools and basin sediments were pumped out after fuel storage operations ended in 1952 although some items (e.g., old fuel canister reach rods) remain in the basins. Each building is a steel-framed structure with concrete block walls consisting of a high transfer bay formerly serviced by the Hanford railroad, a storage basin (now dry and covered by wood), and a heater/ventilation fan room.

The 212-N, -P and R facilities are inactive surplus facilities and are administered under a surveillance and maintenance (S&M) program while awaiting disposition. The U.S. Department of Energy (DOE) has identified no further use for the inactive facilities, making them candidates for decontamination and decommissioning (D&D).

This report is organized in the following manner:

- Chapter 1.0 provides an introduction, a regulatory overview, and the scope of this EE/CA.
- Chapter 2.0 provides relevant background and site information, and a description of the known hazardous substances associated with the 212-N, -P and –R structures.
- Chapter 3.0 establishes the removal action objectives for the alternatives that will be evaluated.
- Chapter 4.0 identifies the removal action alternatives evaluated to eliminate or reduce the risks associated with the 212-N, -P and –R structures.
- Chapter 5.0 analyzes and compares each alternative relative to the criteria of effectiveness, implementability, and estimated cost.
- Chapter 6.0 presents the recommended alternative.

1.2 REGULATORY OVERVIEW

1.2.1 Regulatory Framework/Decommissioning Policy

Portions of the Hanford Site are on the U.S. Environmental Protection Agency's (EPA) CERCLA *of 1980* National Priorities List (NPL). The work for cleanup of these NPL sites is in accordance with the National Contingency Plan (NCP) regulations of Title 40 *Code of Federal Regulations* (CFR) Part 300 (40 CFR 300) and, where applicable, the *Hanford Federal Facility Agreement and Consent Order*, also referred to as the Tri-Party Agreement, among DOE, EPA, and the Washington State Department of Ecology (Ecology) (Ecology et al. 1989, as amended).

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

The 212-N, -P and –R facilities addressed within this EE/CA are considered non-key facilities as defined in the Tri-Party Agreement Action Plan Section 8, *Facility Decommissioning Process.* Action Plan Section 8.3, *Decommissioning Process Planning,* provides for decommissioning of non-key facilities per DOE guidelines and applicable regulations. These facilities contain CERCLA hazardous substances. The integrity of the inactive structures and internal systems has degraded resulting in an increased potential for release of hazardous substances to the environment. As a result, DOE has determined that a non-time-critical removal action, pursuant to authority delegated under EO 12580 and in accordance with Section 8.3 of the Tri-Party Agreement, is warranted to mitigate the threat of release. The proposed removal action is consistent with the provisions of the NCP and the Joint Policy.

The Action Memorandum for this removal action will serve as the decision point to proceed with the disposition phase. Following implementation of the selected alternative for the facilities in this removal action, follow-on activities in the underlying soils necessary to protect human health and the environment may be conducted under the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* [hereinafter referred to as the Remaining Sites Record of Decision (ROD)] (EPA 1999).

1.2.2 Regulatory Involvement

The EPA is the designated lead regulatory agency for the 200-CW-3 Operable Unit waste sites with the 212-N, -P and -R facilities located in the same geographical area. In accordance with the Joint Policy and the Tri-Party Agreement, as appropriate, EPA ensures that the removal action activities comply with applicable or relevant and appropriate requirements, that protection of human health and the environment is achieved, and that the removal action is consistent with ongoing or subsequent related remedial actions. Accordingly, EPA review with concurrence will be sought for the Action Memorandum from this EE/CA process. Specific implementing documents and appropriate approvals will be established in the Action Memorandum.

1.2.3 Public Involvement

Actions taken pursuant to the results of the 212-N, -P and –R facilities 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) and will undergo a 30-day public comment period. Following the public comment period, a written response to significant comments will be provided in accordance with 40 CFR 300.820(a).

After all public comments have been considered, an Action Memorandum will document the selected removal action. The Action Memorandum and the EE/CA for the 212-N, -P and –R facilities will be placed in the Administrative Record that is established to provide a publicly accessible record for inspection and copying, consistent with the requirements of 40 CFR 300.415(n)(3)(iii).

1.2.4 National Environmental Policy Act (NEPA) of 1969 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.

1.3 SCOPE OF REMOVAL ACTION

The scope of this EE/CA is to identify a recommended removal action alternative to eliminate or reduce the potential hazards associated with the 212-N, -P and –R facilities that could adversely impact human health and the environment. The main focus of this removal action is to mitigate the risks associated with the residual hazardous substance inventory contained within the deteriorating structures.

If, during this removal action, waste sites are discovered, they will undergo the waste information database system (WIDS) classification process described in the Tri-Party Agreement Action Plan, and designated as waste sites, if appropriate.

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2.0 SITE CHARACTERIZATION

This chapter describes the relevant background and site descriptions for 212-N, -P and –R facilities and their source, nature, and extent of contamination, and provides the justification for a non-time critical removal action.

2.1 BACKGROUND AND SITE DESCRIPTION

The 212-N, -P and –R facilities are located in the 200 North Area of the Hanford Site (Figure 2-1). Highway 240 is located to the southwest of the 200 North Area, and the Columbia River is north-northwest. Locations of the 212-N, -P and –R facilities and the waste sites located within this geographical area are identified in Figure 2-2.

2.1.1 Land-Use Access and Designation

Public access to the Hanford Site is currently restricted and controlled at the Wye Barricade on Route 4 and the Yakima and Rattlesnake Barricades on State Highway 240 (Figure 2-1). In addition, access from the Columbia River is prohibited. All persons entering the Hanford Site are required to have badges issued by the DOE in their possession at all times when on the Hanford Site.

The 200 North Area lies outside the exclusive-use boundary identified in the *Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS) (DOE/EIS-0222-F). Based on the HCP EIS the 200 North Area is designated as a conservation (mining) land-use area.

2.1.2 Flora and Fauna

Construction activities for the buildings, parking lot and rail line have disturbed the land area around the 212-N, -P and –R facilities. 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. Current fauna in this area includes, but is not limited to, rabbits, mice and coyotes. In the vicinity of the 212-N, -P and –R facilities there are no known plants or animals listed as endangered or threatened by the federal or state governments. If new information reveals the presence of such wildlife or plants in the vicinity of these facilities, appropriate measures will be taken. Further information on ecological resources in the 200 North Area and threatened, endangered, and candidate species at the Hanford Site is available in *Hanford Site NEPA Characterization* (PNNL-6415). There are no perennial or ephemeral streams in the 200 North Area. There are no regulated wetlands within the designated 200 North Area (Figure 2-1).

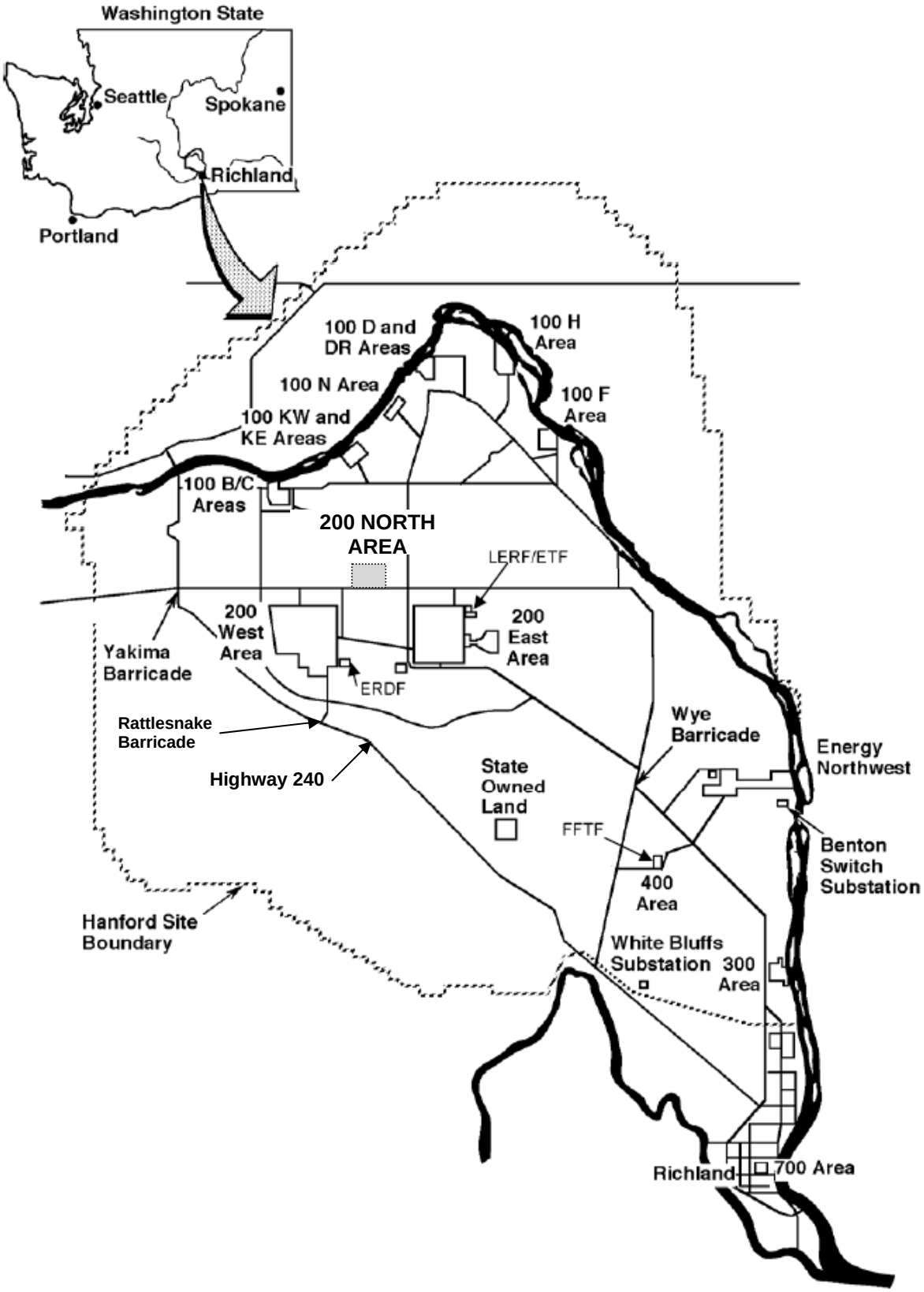


Figure 2-1. Hanford Site and 200 North Area.

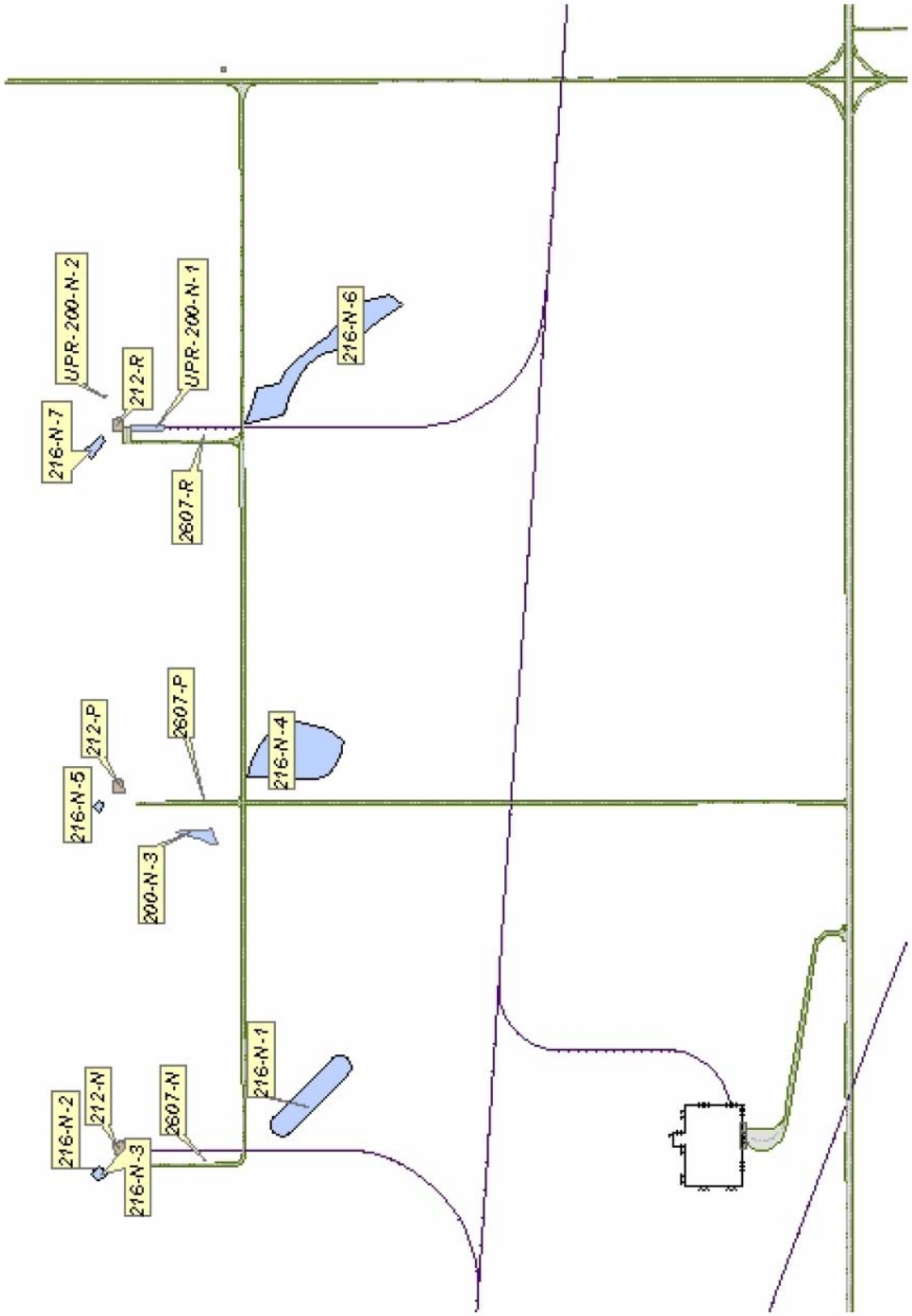


Figure 2-2. 200 North Buildings and Waste Site Locations.

2.1.3 Cultural Resources

Prior to implementation of the selected alternative, all mitigation will be completed per the *Programmatic Agreement Among the U.S. Department of Energy, Richland Operations Office, The Advisory Council on Historic Preservation, and the Washington State Historic Preservation Office for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment on the Hanford Site, Washington* (DOE/RL-96-77).

During removal action activities, personnel will be directed to watch for archaeological resources. If any are encountered, work in the vicinity of the discovery must stop until the find has been evaluated as required in DOE/RL-97-77, which requires assessment of the significance of the find, and if necessary, arrangements are made for the mitigation of impacts to the find.

2.2 FACILITY DESCRIPTIONS

The 212-N, -P and -R facilities are essentially one-story, steel-frame structures with 20.3-cm (8-in.) concrete block walls and pre-cast concrete roofs. The buildings were designed in three parts: the transfer area, the storage basin, and the heater room. The layout of the 212-N, -P and –R facilities is shown in Figure 2-3. Most of the information in this section was taken from *Emergency Preparedness Hazard Assessment for the 212 Storage Buildings* (CP-12759). Facility construction images and a more recent image are provided in Photographs 2-1, 2-2, and 2-3.

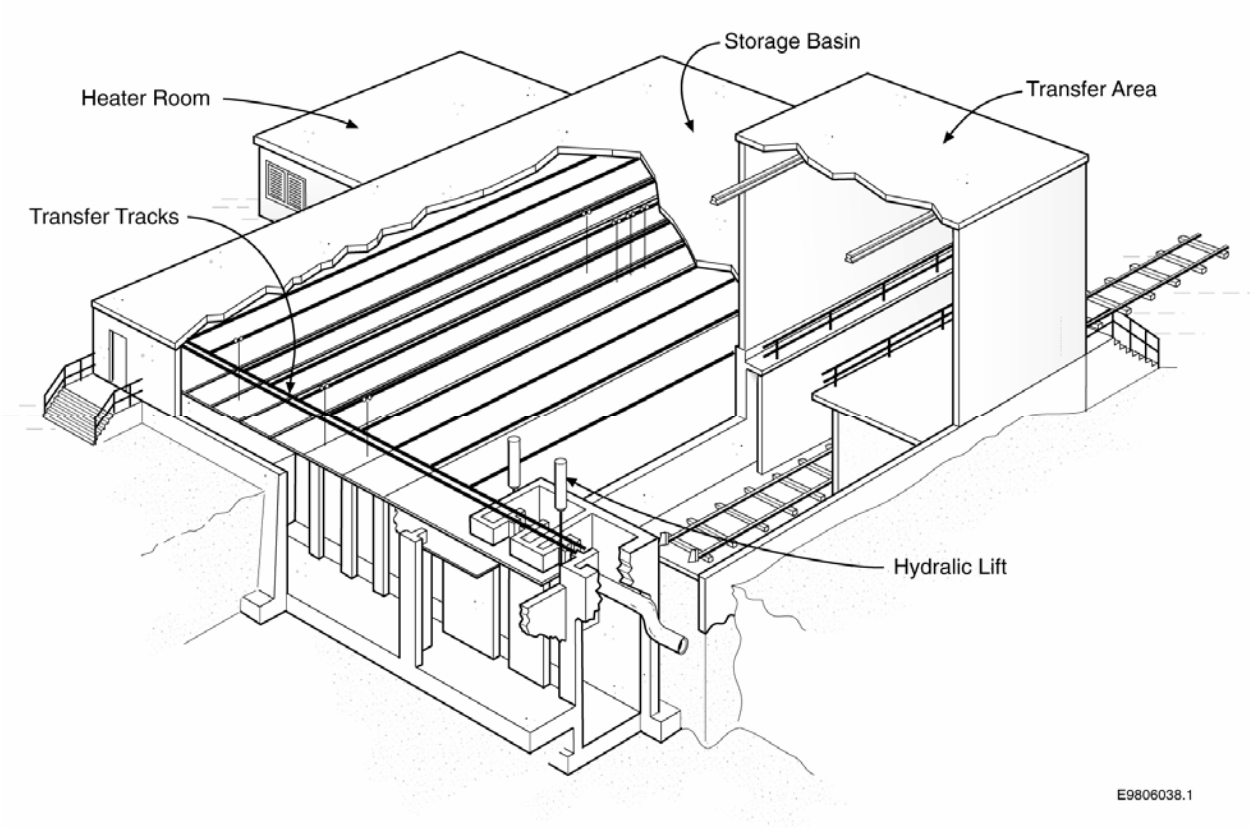
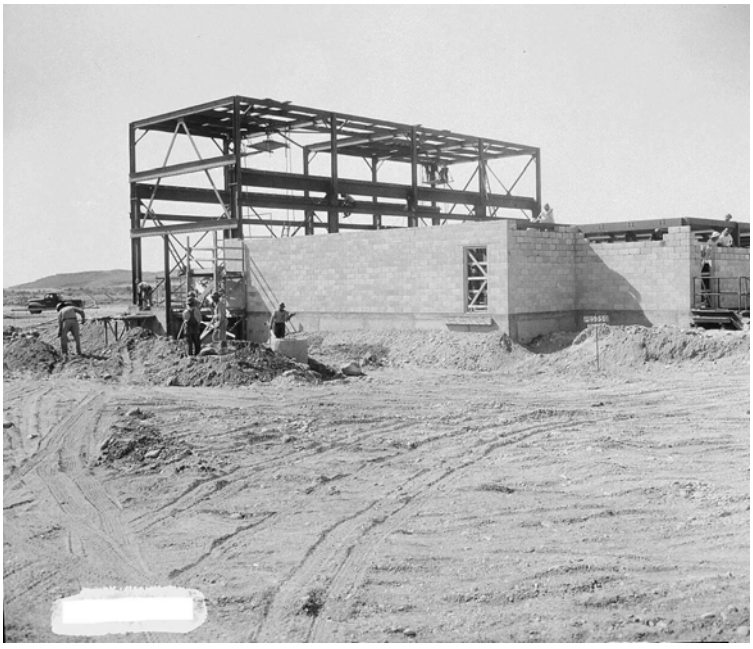


Figure 2-3. Typical Facility Layout.

Photograph 2-1. 212 Building Under Construction.



Photograph 2-2. 212 Building Under Construction.

2.2.1 Transfer Area

The transfer area is a highbay area at the western end of the building. The exterior dimensions are 22.6 m by 8.2 m by 8.9 m high (74.2 ft by 26.9 ft by 29.2 ft high). Two transfer pits are located at the north end of the transfer room. The transfer pits were originally coated with a fixative material to minimize surface contamination and aid in decontaminating the surfaces. Transfer pits were equipped with hydraulic systems that were designed to handle storage buckets containing fuel canisters. The hydraulic fluids have been removed.

Accommodations for one cask and rail transfer car were provided. The top of the rail track is approximately 2.1 m (6.9 ft) below the floor of the transfer area. A crane was used to unload the fresh fuel casks into the fuel transfer pit. The cranes are deactivated in place with no further usage is planned. For cooling, fuel casks were moved underwater and placed in the fuel storage basin within the storage room. Once cooled, the fuel casks were moved from the fuel storage basin to the transfer area, where they were loaded into a transport cask to be moved to the 200 East and West Areas for subsequent processing. A unit heater was located in the transfer room. For the 212-N facility, doors and other penetrations were closed with 0.3-cm (0.12-in.) steel plates. The 212-P and the 212-R facilities are closed with typical wooden doors that do not contain additional steel plates.

2.2.2 Storage Basin

The eastern portion of each facility houses a subgrade, reinforced-concrete fuel storage basin. A 5.1-cm (2-in.)-thick wooden deck that covers the fuel basin is level with the walkways. Supported by concrete piers and steel members, the floor is approximately 6.1 m (20 ft) above the floor of the storage basin and 2.4 m (7.9 ft) from the bottom of the concrete-paneled ceiling.

2.2.3 Heater Room

The heater room is attached to the east wall of the storage room and contains a fan room. Access to the fan room is from an exterior door in the southeast corner of the fan room. Preheated air was filtered and directed into the storage room through louvered openings.

Photograph 2-3. 212-P Building.

2.3 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

The 212-N, -P and -R facilities provided lag storage for irradiated fuel rods. As cited in *Resource Book: Decommissioning of Contaminated Facilities at Hanford* (PNL-7008), fuel operations in the 200 North Area were terminated in 1952. In the 1960s, the facilities were used as temporary storage for various contaminated wastes.

No documentation was found that describes the extent of fuel storage operations or the deactivation of the 212-N, -P and -R facilities. Some fuel storage was performed within these facilities. These operations were most likely limited to the storage of fuel (in canisters) for relatively short periods of time.

After the fuel was removed from each basin, contaminated water and sediments from each basin were pumped by above-ground piping to soil column disposal units (i.e., ponds or trenches) located near each facility. This was done prior to each facility's deactivation. Four of the waste sites that received basin cooling water were sampled in the spring of 2007. Two of the waste sites contained radiological contaminants in the soil, which were remediated in the summer of 2007.

Later missions of the buildings included storage of contaminated components. Records indicate that in the late 1960s, 25 crates of radiologically contaminated equipment removed from service in the Hanford Site 300 Area were shipped to the 212-N and 212-R facilities. In 1972, a project consolidated these waste containers resulting in 15 waste crates stored in the transfer area of the 212-N facility. The majority of crates from 212-R were removed and disposed as industrial waste. Insulating overfill was placed over and around the crates in 212-N to mitigate the potential for hazards and the transfer area doors and openings were secured with steel plates. The 212-N waste crates remained in storage until 2007 when all were removed and disposed as radiological waste (CP-12759).

The 212-P facility was used by electrical utilities for storage to store liquid polychlorinated biphenyl (PCB) waste in a tank inside the facility and electrical transformer outside the facility (Photograph 2-5). The PCB liquid waste and transformers have been removed.

Photograph 2-4. 212-P Facility with Outdoor Transformer Storage.

2.3.1 Characterization Data

The 212-N, -P and -R facilities are contaminated with CERCLA hazardous substances including radiological contaminants, lead, PCBs, and asbestos used or generated during the previously described period of lag storage operations, PCB storage activities in the case of 212-P facility, and waste management activities.

2.3.1.1 Radiological Hazards

The primary hazardous substances of concern are radioactive materials. Key radionuclide contaminants are uranium-234, uranium-235, uranium-238, plutonium-239/240, americium-241, and mixed fission products such as strontium-90, cesium-137, cobalt-60, europium-152, europium-154, and europium-155 (refer to CP-12759). Tritium may also be found as a sealed source within building exit signs. The majority of contaminants are found in the form of adherent films and residues encrusted in the deactivated basins, piping, and ventilation system ductwork.

2.3.1.2 Chemical Hazards

The facilities may also contain some friable and/or nonfriable asbestos in the form of insulation and ductwork, which will be confirmed through sampling and analysis. In addition, the facilities are anticipated to contain one or more of the following materials found in most Hanford Site facilities that contain hazardous substances, which will be confirmed prior to demolition:

- PCB light ballasts and possible structural contamination in the case of 212-P facility
- Lead paint
- Mercury switches, gauges, thermometers
- Mercury or sodium vapor lights
- Used oil from motors and pumps
- Unspecified chemical or waste containers
- Lead batteries.

Additional characterization will be conducted as part of the removal action activities in accordance with an approved sampling and analysis plan. The additional sampling and characterization will be used to support waste designation and determine if the removal action objectives have been met.

2.4 STREAMLINED RISK EVALUATION AND SITE CONDITIONS THAT JUSTIFY A REMOVAL ACTION

The 212-N, -P and -R facilities are contaminated with CERCLA hazardous substances including radiological contaminants, lead, PCBs, and asbestos with the majority of the risk being from radionuclides and lead.

The risks to the environment associated with routine S&M activities at the 212-N, -P and -R facilities have not been quantified. However, radiological conditions require special precautions for entry. In addition, visual inspection of the facilities performed in 1998 and 2000 found that some blocks were cracked and structural deterioration is becoming evident. Since 1986, wooden features (e.g., doors and trim) have been in relatively poor condition and, in some cases beyond repair. There is also significant deterioration of roofing (CP-12759).

For the 212-N, -P and –R facilities, the inhalation and ingestion pathways for contamination are also of concern if the material within the basin, ducting and/or piping is disturbed. D&D activities include equipment dismantling (cutting process piping, ducting and other activities such as crane removal), as well as other hazardous substance removal. During initial D&D activities, the potential for an airborne radionuclide release will increase. As the inventory is stabilized and disposed appropriately, the source term (hence, the risk) will decrease.

In general, the risk of an accidental radiological release (e.g., from a structural failure resulting from weather, fire, or a seismic event) increases the longer the facilities remain in the S&M Program awaiting disposition. The risk from the 212-N, -P and -R facilities will increase with time because of the potential for inventory releases from structure degradation. Under a continued S&M scenario, the residual contamination presents sufficient threat of release to the environment to justify a non-time-critical removal action.

A removal action at the 212-N, -P and -R facilities supports overall Hanford cleanup priorities and the geographical area closure approach.

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3.0 REMOVAL ACTION OBJECTIVES

The primary purpose of this EE/CA is to analyze removal action alternatives to address the risks at the 212-N, -P and -R facilities and determine the most appropriate removal action. The removal action that is selected will be performed in a manner that is protective of human health and the environment. The principal threats to be addressed are CERCLA hazardous substances including radiological contaminants, lead, PCBs, and asbestos associated with the 212-N, -P and -R facilities.

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

- Reduce/eliminate the inventory of hazardous/radioactive substances within the facilities
- Reduce or eliminate the potential for a release to the environment
- Safely manage (treat and/or dispose) of waste streams generated through the removal action
- Be consistent with future remediation plans for the 200 North Area
- Prevent adverse impacts to cultural and natural resources
- Reduce or eliminate the need for future S&M activities.

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4.0 DISCUSSION OF ALTERNATIVES

The removal action alternative for the 212-N, -P and -R facilities must be protective of human health and the environment, and otherwise meet the removal action objectives. Based on these considerations, the following four removal action alternatives were identified for assessment:

- Alternative One: No Action
- Alternative Two: Continued Surveillance & Maintenance (S&M)
- Alternative Three: D&D (Building Structures Down to Basin, Not Including Basin or Underlying Soils/Structures)
- Alternative Four: Expanded D&D (Building Structures, Including Building Basin and Underlying Soils up to 1 Meter Below Each Basin).

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 [*Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (OMB 2006)].

For purposes of this evaluation, present-worth (discounted) cost values were calculated using a discount rate of 3.0% (OMB 2006). Because of the time-dependent value of money, future expenditures were not considered directly equivalent to current expenditures. The present-worth cost method shows the amount required at the initial point in time (e.g., in the current year) to fund activities occurring over the life of the alternative. 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 typically does not set aside funds 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, though actual costs could vary. While the funds actually might not be set aside, the present-worth costs were considered directly comparable for the purpose of evaluating costs of the alternative.

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 response action alternative selection purposes.

Details on the removal alternative cost estimates are discussed in *212-N, -P and –R Facilities Engineering Evaluation/Cost Analysis Cost Backup Report* (CHPRC-00023).

4.1 COMMON ELEMENTS AMONG ALTERNATIVES

With the exception of the No Action alternative, each of the alternatives would result in generating of waste (S&M to a lesser extent). The majority of the contaminated debris likely would be designated as low-level waste (LLW); however, quantities of mixed waste, dangerous waste, and solid waste that is not contaminated with hazardous substances may be generated. Applicable or relevant and appropriate requirements (ARARs) for waste management are discussed in Section 5.1.2.1.

Waste generated under removal action Alternatives Two, Three, and Four would be disposed at an appropriate disposal site. Waste management would be a common element among these alternatives. For each alternative, recycling and/or reuse options would be evaluated and implemented where possible to reduce the volume of material disposed.

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) and disposed of at an approved disposal location. For the purposes of the cost analysis performed in this document, most of the contaminated waste generated during implementation of these alternatives is assumed to be disposed onsite at the Environmental Restoration Disposal Facility (ERDF) in the 200 West Area. Alternate disposal locations may be considered when the removal action is performed if suitable and cost effective locations are identified. Alternate disposal locations will be evaluated using appropriate performance standards to assure that they are adequately protective of human health and the environment, and contribute to efficient performance of possible remedial actions.

ERDF is an engineered facility that provides a high degree of protection to human health and the environment and meets RCRA minimum technical requirements for landfills, including standards for a double liner, a leachate collection system, leak detection, monitoring, and final cover. Construction and operation of ERDF was authorized in a CERCLA ROD (EPA et al. 1995). The *U.S. Department of Energy Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington, Explanation of Significant Differences* (ESD) (EPA et al. 1996) modified the ERDF ROD (EPA et al. 1995 and 2002) to clarify the eligibility of waste generated during cleanup of the Hanford Site. Per the ESD, ERDF is eligible for disposal of any LLW, mixed waste, and hazardous/dangerous waste generated as a result of cleanup actions (e.g., D&D waste and investigation-derived waste), provided that the waste meets ERDF waste acceptance criteria and that appropriate CERCLA decision documents are in place.

If other suitable locations for disposal of wastes are identified before selected alternative is completely implemented (e.g., rubble from the demolished structures used for fill as part of nearby remedial actions), the alternate waste disposal location would be evaluated in accordance with the Removal Action Objectives and the selected ARARs, and the waste management plan would be modified as appropriate.

Most waste that would be generated during the proposed removal action alternatives likely would meet ERDF waste acceptance criteria. However, some waste might not meet, or might not be able to be treated to meet ERDF acceptance criteria. Specifically, this would include low-level radioactive and nonradioactive liquid waste that might be encountered or generated.

Liquid waste containing levels of radioactive and/or nonradioactive hazardous substances meeting the 200 Areas Effluent Treatment Facility (ETF) waste acceptance criteria would be transferred to ETF and treated to meet ETF waste discharge criteria with an approved offsite determination. Liquids that do not meet ETF waste acceptance criteria would be solidified and either disposed at ERDF (if ERDF waste acceptance criteria are met) or stored at the Central Waste Complex (CWC) subject to final disposition under CERCLA. The type and location of treatment would be documented in treatment plans developed as needed for each waste stream requiring treatment. Solidification, encapsulation, neutralization, and size-reduction/compaction could be employed to treat various waste types. Clean water (e.g., nonradioactive and nonhazardous) could be used for dust suppression.

ERDF is considered to be onsite 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 waste at the ERDF. It is expected that the great majority of the waste generated during the removal action proposed in this document can be disposed onsite at ERDF. In accordance with the ERDF ROD (EPA et al. 1996), authorization to dispose at ERDF of waste generated during this removal action will be granted with the execution of the Action Memorandum resulting from this EE/CA and through EPA approval of the sampling and analysis plan. For waste that must be sent offsite, 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.

4.2 ALTERNATIVE ONE: NO ACTION

Under the No Action alternative, access to the 212-N, -P and -R facilities is assumed to be unrestricted. Industrial and radiological hazards continue to exist because controls to prevent access are not maintained. Initial risks of the No Action alternative are minimal to the environment provided there is no significant seismic, weather, or fire events. Risks over time are expected to increase as deterioration of the 212-N, -P and -R facilities progresses and structural integrity is compromised. The No Action alternative does not mitigate address the hazards posed by the 212-N, -P and -R facilities as they continue to deteriorate. Eventually, deterioration is expected to result in releases of radiological or other hazardous substances to the environment and potential exposure to personnel and the public. Physical hazards associated with partial structural collapses also would be anticipated. Biologic intrusions with subsequent uptake and spread of contaminants would be expected.

Cost Estimates for Alternative One: No Action

The near-term costs for implementing this alternative would be negligible as no cost would be expended on security, radiological surveys, maintenance activities, etc.

4.3 ALTERNATIVE TWO: CONTINUED SURVEILLANCE & MAINTENANCE (S&M)

Alternative Two would ensure that the 212-N, -P and -R facilities are sustained in a safe condition until final disposition. If continued S&M is selected as the removal action alternative for the 212-N, -P and -R facilities, it is assumed that D&D may not occur for an undetermined number of years. For the purposes of calculating costs for this alternative, it is assumed that S&M of the 212-N, -P and -R facilities would continue until 2035.

The primary elements of Alternative Two are as follows:

- Limited decontamination and fixative application

[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 is considered to be onsite for response purposes under this removal action. It should be noted that the scope of work covered in this removal action is for a facility and waste 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.

- Leave structures in place with safety and environmental systems operating
- Dispose of the various waste forms generated in these operations
- Conduct periodic S&M.

The prime goal of this alternative is to prevent radiological environmental releases and to avoid industrial accidents.

Under this alternative, the 212-N, -P and -R facilities would remain in the S&M program until decommissioning occurs. The 212-N, -P and -R facilities would be maintained in a quiescent state for a considerable duration while ongoing preventive measures are implemented. These measures would include periodic monitoring for radiological and industrial hazards (both inside and outside the facilities), cold weather protection, preventive maintenance, annual roof inspections and identification and minor repair of friable asbestos for the facilities only, and general visual inspections. Major maintenance operations, such as roof maintenance, would be performed to ensure the structures remain in a safe condition and that the ongoing deterioration process is minimized to control the potential for accidental release of radioactive materials and hazardous substances. Additionally, limited decontamination and application of fixatives would occur to control the spread of radiological contamination for the facilities and the railcars.

The primary goals of this alternative are to prevent releases of radioactive materials or other hazardous substances to the environment and to avoid industrial accidents. Adoption of the S&M alternative extends the life of the 212-N, -P and -R facilities until at least 2035, during which time deterioration progresses and unusual events (e.g., seismic) might occur. Severe weather conditions could create conditions amenable to releases, and long-term aging of facility structures, which could lead to eventual failure. These conditions, accompanied by the minimum surveillance efforts conducted under S&M, could result in an unplanned release to the environment.

Because minimal surveillance would not readily detect structure decay (e.g., systems corrosion or structural breakdowns), preventive maintenance might not occur in time, and response actions could be required. This approach could result in the spread of contamination.

For the alternative of a continued S&M program the majority of the funding would be limited to responding to safety issues. However, data evaluation, inspection/observations, and future plans were factored into planning and implementing the continued S&M.

For purposes of this EE/CA, the 200 North Area activities are evaluated through 2035. This date may be affected by potential delays in other Hanford Site activities. However, the relative comparison of the alternatives is not expected to be impacted substantially.

Cost Estimates for Alternative Two: Continued Surveillance & Maintenance (S&M)

The summarized cost estimates for Alternative Two are shown in Table 4-1, along with a projection of costs over the S&M period (i.e., up to 2035) for roof replacement and maintenance activities. The present-worth (discounted) cost for Alternative Two is approximately $1,680,000. The total nondiscounted cost for Alternative Two is approximately $2,329,000. Present-worth costs are used for evaluation of alternatives in the CERCLA process. Actual costs could vary. The total nondiscounted costs are presented for information and comparison purposes only.

Table 4-1. Cost Estimate for Alternative Two: Continued S&M.

Item	Estimated cost ($)
S&M	1,364,000
Roof Replacement for Facilities	386,000
Roof Maintenance for Facilities	579,000
Total	**2,329,000**
Present-Worth Discounted	**1,680,000**

Note: Details on the removal alternative cost estimates are discussed in CHPRC-00023.

4.4 ALTERNATIVE THREE: D&D (BUILDING STRUCTURES DOWN TO BASIN, NOT INCLUDING BASIN OR UNDERLYING SOILS/STRUCTURES)

This alternative consists of removing the nonradiological and radiological hazardous substances from the 212-N, -P and -R facilities by removing equipment and associated piping, decontaminating the structures and/or stabilizing the contamination, demolishing the structures to the top of each basin, disposing of the waste generated, and stabilizing the basins and surrounding area.

Alternative Three would ensure the structures are dispositioned in a safe condition. This alternative would consist of the following primary elements:

- Remove the nonradiological and radiological hazardous substances from within the structures over the basins
- Decontaminate, fix contamination, and isolate systems as needed
- Remove equipment
- Demolish each structure, excluding each basin
- Cut off equipment penetrating each structure's basin as needed, and seal penetrations to prevent intrusion or leakage
- Dispose of the various waste forms generated during these operations
- Stabilize the area
- Install a cover as needed
- Conduct periodic S&M.

Hazardous substances would be removed to the extent possible, including any asbestos-containing material, piping and equipment as needed prior to demolition, lead, PCB-contaminated items and any materials/liquids in containers or floor drains. Removing radiological hazardous substances would include removing contaminated piping and equipment. Because most of the radioactive inventory exists within vessels, equipment and piping, these would be removed completely and disposed as appropriate, either before or as part of demolition. Equipment, vessels, and piping might need to be cut to facilitate removal and/or disposal. Piping and drains entering or exiting each facility below grade would be plugged or grouted to prevent potential pathways to the environment.

The majority of the demolition would require the use of heavy equipment (e.g., excavator with various attachments) to demolish the structures. Other standard industry practices for demolition also might be used (e.g., mechanical saws, cutting torches). The structures would be demolished to the top of each basin, with only the basin remaining. Below grade areas (i.e., each basin) would be filled with grout, gravel, or other suitable material and the entire footprint of the structures would be stabilized to prevent migration of any residual contamination to the environment.

The scope of this removal action alternative does not include soil, groundwater, or waste site remediation. Further soil or waste site remediation will be conducted in coordination with future remedial actions as part of the 200-CW-3 Operable Unit.

The major risk associated with this alternative is the safety of D&D personnel. They may be exposed to radioactive material or other hazardous substances during removal of equipment/piping, decontamination and the industrial aspects of structural demolition/dismantlement. These risks are related to the potential release of contamination and the hazards associated with construction 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. These risks would diminish as the 212-N, -P and -R facilities removal activities progress and the radiological inventory is removed from the area.

The disposal of the radioactive material inventory from the 212-N, -P and -R facilities and the immediate removal of the facilities and systems are a direct resolution of impending radiological and physical hazards. By backfilling over each facility's basin, the mobility of residual contaminants to the environment in and under each basin floor would be significantly reduced. In time, however, contaminants could still pose a risk through groundwater transport exposure pathways or by inadvertent intrusion. Therefore, further action, including a possible remedial action could be required. 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.

Cost Estimates for Alternative Three: D&D (Building Structures Down to Basins, Not Including Basin or Underlying Soils/Structures)

Costs are presented in terms of total nondiscounted costs and present-worth (discounted) costs. The present-worth (discounted) cost for Alternative Three is approximately $3,410,000. The total nondiscounted cost (approximately $4,179,000) 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 2008 dollars (present worth). Actual costs could vary.

Table 4-2. Cost Estimate for Alternative Three: D&D (Building Structures Down to Basin, Not Including Basin or Underlying Soils/Structures).

	Item	Estimated Cost ($)
1	Project Management/ Support	972,000
2	Characterization & Investigation	681,000
3	Demolition Preparation	594,000
4	Demolition	1,740,000
5	Post Demolition S&M	192,000
	Total	**4,179,000**
	Present-Worth Discounted	**3,410,000**

Note: Details on the removal alternative cost estimates are discussed in CHPRC-00023.

4.5 ALTERNATIVE FOUR: EXPANDED D&D (BUILDING STRUCTURES, INCLUDING BUILDING BASIN, AND UNDERLYING SOILS UP TO 1 METER BELOW EACH BASIN)

This alternative consists of D&D as described in Alternative Three (Section 4.4) plus the removal of the building basin. For cost estimation purposes, this alternative is based on removal of the facility basin, piping, drains, soil beneath and beside the building footprint to a depth of 1 meter (3.3 ft). The depth of soil removal during actual field work will vary slightly depending on as-found field conditions and equipment maneuverability. Following the removal activities, the resulting excavated area will then be evaluated through a remedial action to determine if the underlying soil requires remediation to meet final cleanup standards based on the Remaining Sites ROD (EPA 1999).

Alternative Four would ensure the structures and soil are dispositioned in a safe condition. This alternative would consist of the following primary elements:

- Remove the nonradiological and radiological hazardous substances from within the structures and the basins
- Decontaminate, fix contamination, and isolate systems as needed
- Remove equipment
- Demolish each structure, including each basin
- Dispose of the various waste forms generated during these operations
- Stabilize the area
- Install a cover as needed
- Conduct periodic S&M.

The demolition would use heavy equipment (e.g., excavator with various attachments) to demolish the structures. Other standard industry practices for demolition could also be used (e.g., mechanical saws). Removal would include the 212-N, -P and -R facilities aboveground structures and subsurface structures and systems.

Underground piping and trenches extending away from the 212-N, -P and -R facilities are only included in the scope to an approximate distance of 1 m (3.3 ft) from the walls of the structures. Piping, trenches, and contaminated and/or uncontaminated soil located a distance of more than 1 m (3.3 ft) from the walls and floors of each structure may 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 beyond that described previously.

As in Alternative Three, the major risk associated with this alternative is the safety of D&D personnel. Again, they may be exposed to radioactive material or other hazardous substances during equipment/piping removals, decontamination, excavation, and the industrial aspects of structural demolition/dismantlement and packaging and shipping of building rubble. These risks are related to the potential release of contamination and the hazards associated with construction 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. These risks would diminish as the 212-N, -P and -R facilities removal activities progress and the radiological inventory is removed from the

area. Unlike Alternative Three, in this alternative, the greatest amount of contaminants will be removed because the basins would be removed.

The disposal of the radioactive material inventory in the 212-N, -P and -R facilities and the immediate removal of the facilities and systems are the most direct resolution of impending radiological and physical hazards. Because the basin of the structures, as well as underlying and adjacent soils, would be removed to the extent described, this alternative would potentially result in the removal of the greatest amount of contamination of the four removal action alternatives. In time, however, potential contaminants remaining in the soil could still pose a risk through the groundwater transport exposure pathway or by inadvertent intrusion, and may need to be remediated as part of a future remedial action. While concerns for operational methods and technology utilization would be encountered and resolved during removal actions, no major issues exist that might compromise this alternative.

Cost Estimates for Alternative Four: Expanded D&D (Building Structures, Including Building Basin, and Underlying Soils Up to 1 Meter Below Each Basin)

Costs are presented in terms of total nondiscounted costs and present-worth (discounted) costs. The present-worth cost for Alternative Four is approximately $6,160,000. The total nondiscounted cost (approximately $7,375,000) 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 2008 dollars (present worth). Actual costs could vary.

Table 4-3. Cost Estimate for Alternative Four: Expanded D&D (Including Building Basins, and Underlying Soils Up to 1 Meter Below Each Basin).

	Item	Estimated Cost ($)
1	Project Management/Support	1,499,000
2	Characterization & Investigation	681,000
3	Demolition Preparation	594,000
4	Demolition	4,601,000
	Total	**7,375,000**
	Present-Worth Discounted	**6,160,000**

Note: Details on the removal alternative cost estimates are discussed in CHPRC-00023.

5.0 ANALYSIS OF ALTERNATIVES

Non-time-critical removal action alternatives are 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 individuals have an opportunity to review and comment on this EE/CA. Each criterion is explained briefly 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 as follows:

- Alternative One: No Action
- Alternative Two: Continued S&M
- Alternative Three: D&D (Building Structures Down to Basin, Not Including Basin or Underlying Soils/Structures)
- Alternative Four: Expanded D&D (Including Building Basin, and Underlying Soils Up to 1 Meter Below Each Basin).

5.1 EFFECTIVENESS

The effectiveness criterion refers to the ability to meet the removal action objectives (as outlined in Chapter 3.0) within the scope of the removal action and in terms of overall protection of human health and the environment.

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. This criterion draws on the assessment of the other evaluation criteria identified previously. 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 radioactive inventory.

Alternative One does not provide overall protection to human health and the environment. As the 212-N, -P and -R facilities deteriorate over time with no ongoing maintenance, contamination would be released

to the environment. The radioactive inventory potentially would expose the public and environment to an unacceptable radiation dose.

Because Alternative One does not meet the threshold requirement of providing overall protection of human health and the environment, especially in the long term, this alternative was not analyzed further.

Alternative Two provides adequate overall protection of human health and the environment, although the maintenance effort and funding required for maintaining this protection would increase over time. The structures and roofs of the 212-N, -P and -R facilities would require significant modification, repair, and/or replacement to maintain contamination and radioactive inventory confinement within the structures during the period of S&M. Additionally, Alternative Two would not remove any radioactive inventory or other hazardous substances. Future response actions for the 212-N, -P and –R facilities would eventually be required to provide overall protection of human health and the environment. Therefore, relative to the other alternatives, Alternative Two does not perform as well under this criterion.

Alternatives Three and Four would remove existing dispersible contamination and more of the radioactive inventory present at the 212-N, -P and -R facilities than Alternative Two. This would reduce or eliminate the associated 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, though not eliminated, through interim surface stabilization for each facility under Alternative Three. Alternative Four is expected to remove more inventory than Alternative Three because it is assumed that there is contamination present in the basin of each building and surrounding soil, and Alternative Four would remove the entire basin and up to 1 meter of soil below each basin, as well as the railroad track. Under Alternative Three, the basins would remain in place and be stabilized using cement, gravel and/or other fill material, effectively isolating any subsurface contamination while awaiting possible future remediation as part of the 200-CW-3 Operable Unit.

Both Alternatives Three and Four provide overall protection of human health and the environment.

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

For the removal action being considered in this document, implementation of any selected alternative will be designed to comply with the ARARs cited in this section to the extent practicable. ARARs are selected from promulgated environmental regulations that have been evaluated to determine whether they may be pertinent to the removal action. The purpose of this section is to identify the key ARARs for the proposed alternatives addressed in this EE/CA. ARARs, which will be complied with during implementation of the selected removal action, will be documented in the CERCLA Action Memorandum. The proposed ARARs are discussed generally in the following sections and are documented in detail in Tables 5-1 and 5-2. In addition, To-Be-Considered information consists of nonpromulgated advisories or guidance issued by federal or state governments that are not binding legally and do not have the status of potential ARARs. As appropriate, To-Be-Considered should be considered while determining the removal action necessary for protection of human health and the environment.

Response actions are required to comply with the substantive aspects of ARARs, not with corresponding administrative requirements. That is, permit applications and other administrative procedures, such as administrative reviews, and reporting and recordkeeping requirements, are considered administrative for actions conducted entirely onsite [40 CFR 300.400(e)] and therefore not required.

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 will designate as LLW. However, quantities of dangerous or mixed

waste, PCB-contaminated waste, and asbestos and asbestos-containing material also could be generated. The great majority of the waste will be in a solid form.

The identification, storage, treatment, and disposal of hazardous waste and the hazardous component of mixed waste are governed by RCRA. The State of Washington, which implements RCRA requirements under Washington Administrative Code (WAC) 173-303, has been authorized to implement elements of the RCRA program. The dangerous waste standards for generation and storage would apply to the management of any dangerous or mixed waste generated at the 212-N, -P and -R 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* (TSCA) *of 1976*, and regulations at 40 CFR 761. The TSCA regulations contain specific provisions for PCB waste, including PCB waste that contains a radioactive component. PCBs also are considered underlying hazardous constituents under RCRA and thus could be subject to WAC 173-303 and 40 CFR 268 requirements.

Removal and disposal of asbestos and asbestos-containing material are regulated under the *Clean Air Act* (40 CFR 61, Subpart M). These regulations provide for special precautions to prevent environmental releases or exposure to personnel of airborne emissions of asbestos fibers during removal actions.

Waste that is designated as LLW that meets ERDF acceptance criteria will be disposed at ERDF, which is engineered to meet appropriate performance standards. Alternate potential disposal locations may be considered when the removal action occurs if a suitable and cost effective location is identified. Any potential alternate disposal location will be evaluated for appropriate performance standards to assure that it is adequately protective of human health and the environment.

Waste designated as dangerous or mixed waste would be treated as appropriate to meet land disposal restrictions and ERDF acceptance criteria, and disposed at ERDF. ERDF is engineered to meet technical requirements for landfills under WAC 173-303-665. Applicable packaging and pre-transportation requirements for dangerous or mixed waste generated at the 212-N, -P and -R facilities would be identified and implemented before movement of any waste.

Some of the aqueous waste designated as LLW, dangerous, or mixed waste would be transported to ETF for treatment and disposal with an approved offsite determination. ETF is a RCRA-permitted facility authorized to treat aqueous waste streams generated on the Hanford Site and dispose of these streams at a designated state-approved land disposal facility in accordance with applicable requirements.

Waste designated as PCB remediation waste likely would be disposed at ERDF, depending on whether it meets the waste acceptance criteria. PCB waste that does not meet ERDF waste acceptance criteria would be retained at a PCB storage area meeting the requirements for TSCA storage and would be transported for future disposal at an appropriate disposal facility.

Asbestos and asbestos-containing material would be removed, packaged as appropriate, and disposed in ERDF.

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 facilities can be treated as one for purposes of CERCLA response actions. Consistent with this, the 212-N, -P and -R facilities and ERDF would be considered to be onsite for purposes of Section 104 of CERCLA, and waste may be transferred between the facilities without requiring a permit.

All alternatives can be performed in compliance with the waste management ARARs. Waste streams will be evaluated, designated, and managed in compliance with the ARAR requirements. Before disposal, waste will be managed in a protective manner to prevent releases to the environment or unnecessary exposure to personnel.

5.1.2.2 Standards Controlling Emissions to the Environment

The proposed removal action alternatives have the potential to generate both radioactive and toxic/criteria airborne emissions.

5.1.2.2.1 Radiological Air Emissions

The Revised Code of Washington (RCW) 70.94, "Washington Clean Air Act," requires regulation of radioactive air pollutants. The state implementing regulation WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides," sets standards that are as stringent or more so than the federal *Clean Air Act of 1990* and Amendments (42 United States Code 7401 et seq.), and under the federal implementing regulation, 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." EPA's partial delegation of the 40 CFR 61 authority to the State of Washington includes all substantive emissions monitoring, abatement, and reporting aspects of the federal regulation. The state standards protect the public by conservatively establishing exposure standards applicable to the maximally exposed public individual. Under the Washington Administrative Code [WAC 246-247-030(15)], the "maximally exposed individual" (MEI) is any member of the public (real or hypothetical) who abides or resides in an unrestricted area, and may receive the highest total effective dose equivalent (TEDE) from the emission unit(s) under consideration, taking into account all exposure pathways affected by the radioactive air emissions. All combined radionuclide airborne emissions from the DOE Hanford Site "facility" are not to exceed amounts that would cause an exposure to any member of the public of greater than 10 mrem/yr effective dose equivalent. The state implementing regulation WAC 246-247, "Radiation Protection – Air Emissions," which adopts the WAC 173-480 standards, and the 40 CFR 61 Subpart H standard, require verification of compliance with the 10 mrem/yr standard, and would potentially be applicable to the removal action.

The WAC 246-247 further addresses sources emitting radioactive airborne emissions by requiring monitoring of such sources. Such monitoring requires physical measurement (i.e., sampling) of the effluent or ambient air. The substantive provisions of WAC 246-247 that require monitoring of radioactive airborne emissions would potentially be applicable to the removal action.

The above state implementing regulations further address control of radioactive airborne emissions where economically and technologically feasible [WAC 246-247-040(3) and -040(4), "Radiation Protection - Air Emissions," "General Standards," and associated definitions]. To address the substantive aspect of these potential requirements, best or reasonably achieved control technology could be addressed by ensuring that applicable emission control technologies (those successfully operated in similar applications) would be used when economically and technologically feasible (i.e., based on cost/benefit). If it is determined that there are substantive aspects of the requirement for control of radioactive airborne emissions once ARARs are finalized, then controls will be administered as appropriate using the best methods from among those that are reasonable and effective.

5.1.2.2.2 Criteria/Toxic Air Emissions

Under WAC 173-400, "General Regulations for Air Pollution Sources," and WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," requirements are established for the regulation of emissions of criteria/toxic air pollutants. The primary nonradioactive emissions resulting from this removal action will be fugitive particulate matter. In accordance with WAC 173-400-040, "General Standards for Maximum

Emissions," reasonable precautions must be taken to (1) prevent the release of air contaminants associated with fugitive emissions resulting from excavation, materials handling, or other operations; and (2) prevent fugitive dust from becoming airborne from fugitive sources of emissions. The use of treatment technologies that would result in emissions of toxic air pollutants that would be subject to the substantive applicable requirements of WAC 173-460 are not anticipated to be a part of this removal action. Treatment of some waste encountered during the removal action may be required to meet ERDF waste acceptance criteria. In most cases, the type of treatment anticipated would consist of solidification/stabilization techniques such as macroencapsulation or grouting, and WAC 173-460 would not be considered an ARAR. If more aggressive treatment is required that would result in the emission of regulated air pollutants, the substantive requirements of WAC 173-400-113(2) and WAC 173-460-060 would be evaluated to determine applicability.

Emissions to the air will be minimized during implementation of the removal action through use of standard industry practices such as the application of water sprays and fixatives. These techniques are considered to be reasonable precautions to control fugitive emissions as required by the regulatory standards.

Alternatives Two, Three and Four are expected to comply with the ARARs in Table 5-1 and Table 5-2.

Table 5-1. Identification of Potential Federal Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

	ARAR or TBC	Requirement	Rationale for Use
National Archaeological and Historic Preservation Act of 1976 16 USC 469aa-mm	ARAR	Requires that removal actions at the 200 North Area do not cause the loss of any archaeological or historic data. This act mandates preservation of the data and does not require protection of the actual site.	Archeological and historic sites have been identified within the 100 and 200 Areas, therefore the substantive requirements of this act are potentially applicable to actions that might disturb these sites. This requirement is location-specific.
National Historic Preservation Act of 1966 16 USC 470, Section 106	ARAR	Requires federal agencies to consider the impacts of their undertaking on cultural properties through identification, evaluation and mitigation processes, and consultation with interested parties.	Cultural and historic sites have been identified within the 100 and 200 Areas, and therefore the substantive requirements of this act are potentially applicable to actions that might disturb these types of sites. This requirement is location-specific.
Native American Graves Protection and Repatriation Act, 25 USC 3001, et seq.	ARAR	Establishes federal agency responsibility for discovery of human remains, associated and unassociated funerary objects, sacred objects and items of cultural patrimony.	Substantive requirements of this act are potentially applicable if remains and sacred objects are found during removal action and will require Native American Tribal consultation in the event of discovery. This requirement is location-specific.
Endangered Species Act of 1973 16 USC 1531 et seq, subsection 16 USC 1536(c)	ARAR	Prohibits actions by federal agencies that are likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification or critical habitat. If the removal action is within critical habitat or buffer zones surrounding threatened or endangered species, mitigation measures must be taken to protect the resource.	Substantive requirements of this act are potentially applicable if threatened or endangered species are identified in areas where removal actions will occur. This requirement is location-specific.

Table 5-1. Identification of Potential Federal Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

	ARAR or TBC	Requirement	Rationale for Use
Protection of Stratospheric Ozone, 40 CFR 82			
40 CFR 82.156 "Required practices" 40 CFR 82.158 "Standards for recycling and recovery equipment" 40 CFR 82.161 "Technician certification"	ARAR	Specifies the procedures and processes that will be followed for recycling and recovery of ozone depleting substances (ODS). Establishes the required performance standards for ODS recycling and recovery equipment; and requires appropriate certification for workers who recover or recycle ODS.	Selected alternative may include the recycling or recovery of ozone depleting substances (ODS) that must be conducted in accordance with the applicable requirements and work practices. These requirements are action-specific.

40 CFR 82, "Protection of Stratospheric Ozone."
40 CFR 141, "National Primary Drinking Water Standards."
ARAR = applicable or relevant and appropriate requirement.
CFR = *Code of Federal Regulations.*
MCL = maximum contaminant level.
OU = operable unit.
TBC = to-be-considered.

Table 5-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
Regulations pursuant to the *Resource Conservation and Recovery Act of 1976* and implemented through WAC 173-303, "Dangerous Waste Regulations".			
"Identifying Solid Waste," WAC 173-303-016	ARAR	Identifies those materials that are and are not solid waste.	Substantive requirements of these regulations are potentially applicable because they define how to determine which materials are subject to the designation regulations. Specifically, materials that are generated for removal from the CERCLA site during the removal action potentially would be subject to the procedures for identifying solid waste to ensure proper management. This requirement is action-specific.
"Designation of Dangerous Waste," WAC 173-303-070(3)	ARAR	Establishes the method for determining whether a solid waste is or is not a dangerous waste or an extremely hazardous waste.	Substantive requirements of these regulations are potentially applicable to materials encountered during the removal action. Specifically, solid waste generated for removal from the CERCLA site during this removal action potentially would be subject to the dangerous waste designation procedures to ensure proper management. This requirement is action-specific.
"Excluded Categories of Waste," WAC 173-303-071	ARAR	Describes those waste categories that are excluded from the requirements of WAC 173-303 (excluding WAC 173-303-050).	The conditions of this requirement are potentially applicable to removal actions identified in WAC 173-303-071 be encountered. This requirement is action-specific.
"Conditional Exclusion of Special Wastes," WAC 173-303-073	ARAR	Establishes the conditional exclusion and the management requirements of special waste, as defined in WAC 173-303-040.	Substantive requirements of these regulations are potentially applicable to materials encountered during the removal action. Specifically, the substantive standards for management of special waste are potentially applicable to the interim management of certain waste that will be generated during the removal action. This requirement is action-specific.

Table 5-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
"Requirements for Universal Waste," WAC 173-303-077	ARAR	Identifies waste exempted from regulation under WAC 173-303-140 and WAC 173-303-170 through 173-303-9907 (excluding WAC 173-303-960). This waste is subject to regulation under WAC 173-303-573.	Substantive requirements of these regulations are potentially applicable to materials encountered during the removal action. Specifically, the substantive standards for management of universal waste are potentially applicable to the interim management of certain waste that will be generated during the removal action. This requirement is action-specific.
"Land Disposal Restrictions," WAC 173-303-140(4)	ARAR	This regulation establishes state standards for land disposal of dangerous waste and incorporates by reference the Federal land disposal restrictions of 40 CFR 268 that are applicable to solid waste designated as dangerous or mixed waste in accordance with WAC 173-303-070(3).	The substantive requirements of this regulation are potentially applicable to materials encountered during the removal action. Specifically, dangerous and/or mixed waste generated and removed from the CERCLA site during the removal action for offsite (as defined by CERCLA) land disposal potentially would be subject to the identification of applicable land-disposal restrictions at the point of waste generation. The actual offsite treatment of such waste would not be ARAR to this removal action, but potentially would be subject to all applicable laws and regulations. This requirement is action-specific.
"Requirements for Generators of Dangerous Waste," WAC 173-303-170	ARAR	Establishes the requirements for dangerous waste generators.	Substantive requirements of these regulations are potentially applicable to materials encountered during the removal action. Specifically, the substantive standards for management of dangerous and/or mixed waste are potentially applicable to the interim management of certain waste that will be generated during the removal action. For purposes of this removal action, WAC 173-303-170(3) includes the substantive provisions of WAC 173-303-200 by reference. WAC 173-303-200 further includes certain substantive standards from WAC 173-303-630 and -640 by reference. This requirement is action-specific.
General Regulations for Air Pollution Sources, WAC 173-400 and WAC 173-460			
Washington Clean Air Act of 1967, Ch. 70.94 and Ch. 43.21A RCW General Regulations for Air Pollution, WAC 173-400 Specific subsection: WAC 173-400-040	ARAR	Requires all sources of air contaminants to meet standards for visible emissions, fallout, fugitive emissions, odors, emissions detrimental to persons or property, sulfur dioxide, concealment and masking, and fugitive dust. Requires use of reasonably available control technology (RACT).	Substantive requirements of the general standards for control of fugitive emissions are potentially applicable to removal actions at the site due to the generation of fugitive dust that occurs during excavation or other types of construction activities. These requirements are action-specific.

Table 5-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
Specific subsections: WAC 173-400-050 "Emission standards for combustion and incineration units" WAC 173-400-060 "Emission standards for general process units" WAC 173-400-070 "Emission standards for certain source categories" WAC 173-400-075 "Emission standards for sources emitting hazardous air pollutants"	ARAR	Requires specifically identified types of emission sources to meet additional standards beyond the general emission standards imposed by WAC 173-400-040. Incorporates the applicable federal requirements from 40 CFR Parts 60 and 63. Requires use of either reasonably available control technology (RACT), best available control technology (BACT) or maximum achievable control technology (MACT), depending on the specific type of emission source.	Selected alternative may include or result in one or more defined types of emission sources that would need to be controlled in accordance with these requirements. These requirements are action-specific.
Specific subsection: WAC 173-400-113	ARAR	Incorporates by reference the applicable federal requirements from 40 CFR Parts 60 (NSPS), 61 (NESHAP) and 63 (MACT). Requires controls to minimize the release of air contaminants resulting from new or modified sources of regulated criteria and toxic air emissions. Emissions are to be minimized through application of best available control technology (BACT).	Substantive requirements of this regulation potentially would be applicable to removal actions performed at the site if a treatment technology that emits regulated air emissions were necessary during the implementation of the removal action. This requirement is action-specific.
Controls for New Sources of Toxic Air Pollutants, WAC 173-460 Specific subsections: WAC 173-460-030 WAC 173-460-060 WAC 173-460-070 WAC 173-460-080 WAC 173-460-150 WAC 173-460-160	ARAR	Requires best available control technology for regulated emissions of toxic air pollutants (T-BACT) and demonstration that emissions of toxic air pollutants (TAP) will not endanger human health or safety.	Substantive requirements of these regulations potentially would be applicable 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. These requirements are action-specific.
"Asbestos" Benton Clean Air Agency (BCAA), Regulation 1, Article 8			
Section 8.02 "CFR Adoption by Reference"; Section 8.03 "General Requirements"	ARAR	Incorporates the federal requirements of 40 CFR 61 Subpart M and 40 CFR 763 Subpart E by reference. Requires established controls and work practices for managing and disposing regulated asbestos-containing material (RACM).	Selected alternative may include the removal or disturbance of regulated asbestos containing material (RACM) that must be conducted in accordance with the applicable requirements and work practices.

Table 5-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
Radiation Protection -- Air Emissions, WAC 246-247			
"Radiation Protection -- Air Emissions," WAC 246-247-035(1)(a)(ii)	ARAR	This regulation establishes requirements equivalent to 40 CFR 61, Subpart H, by reference. Radionuclide airborne emissions from the waste site shall be controlled so as not to exceed amounts that would cause an exposure to any member of the public of greater than 10 millirem per year effective dose equivalent.	Substantive requirements of this standard are potentially applicable because this removal action may include activities such as excavation, demolition, decontamination and stabilization of contaminated areas and equipment, each of which may provide airborne emissions of radioactive particulates to unrestricted areas. As a result, requirements limiting emissions potentially apply. This is a risk-based standard for the purposes of protecting human health and the environment. This requirement is action-specific.
"Radiation Protection -- Air Emissions," "Standards," WAC 246-247-040(3) WAC 246-247-040(4)	ARAR	Emissions shall be controlled to ensure that emission standards are not exceeded. Actions creating new sources or significantly modified sources shall apply best available controls. All other actions shall apply reasonably achievable controls.	Substantive requirements of this standard are potentially applicable because fugitive, diffuse and point source emissions of radionuclides to the ambient air may result from activities, such as demolition and excavation of contaminated soils and operation of exhausters and vacuums, performed during the removal action. This standard exists to ensure compliance with emission standards. These requirements are action-specific.
"Monitoring, testing, and quality assurance, "WAC 246-247-075(1) and –(2) and –(4)	ARAR	Establishes the monitoring, testing, and quality assurance requirements for radioactive air emissions from major sources. Effluent flow rate measurements shall be made and the effluent stream shall be directly monitored continuously with an in-line detector or representative samples of the effluent stream shall be withdrawn continuously from the sampling site following the specified guidance. The requirements for continuous sampling are applicable to batch processes when the unit is in operation. Periodic sampling (grab samples) may be used only with lead agency prior approval. Such approval may be granted in cases where continuous sampling is not practical and radionuclide emission rates are relatively constant. In such cases, grab samples shall be collected with sufficient frequency so as to provide a representative sample of the emissions. When it is impractical to measure the effluent flow rate at a source in accordance with the requirements or to monitor or sample an effluent stream at a source in accordance with the site selection and sample extraction requirements, the waste site owner or operator may use alternative effluent flow rate measurement procedures or site selection and sample extraction procedures as approved by the lead agency. Emissions from nonpoint and fugitive sources of airborne radioactive material shall be measured. Measurement techniques may include, but are	Substantive requirements of this standard are potentially applicable because fugitive and nonpoint source emissions of radionuclides to the ambient air may result from activities, such as demolition and excavation of contaminated soils and operation of exhausters and vacuums, performed during the removal action. This standard exists to ensure compliance with emission standards. These requirements are action-specific.

Table 5-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
		not limited to sampling, calculation, smears, or other reasonable method for identifying emissions as determined by the lead agency.	
"Monitoring, testing, and quality assurance," WAC 246-247-075(3)	ARAR	Methods to implement periodic confirmatory monitoring for minor sources may include estimating the emissions or other methods as approved by the lead agency.	Fugitive and diffuse emissions from the demolition and excavation and related activities potentially will require periodic confirmatory measurements to verify low emissions. This requirement is action-specific and potentially applicable.
"Monitoring, testing, and quality assurance," WAC 246-247-075(8)	ARAR	Site emissions resulting from non-point and fugitive sources of airborne radioactive material shall be measured. Measurement techniques may include ambient air measurements, or in-line radiation detector or withdrawal of representative samples from the effluent stream, or other methods as determined by the lead agency.	Fugitive and diffuse emissions of airborne radioactive material due to demolition and excavation and related activities potentially will require measurement. This requirement is action-specific and potentially applicable.
"General Standards," WAC 246-247-040(4) and "General Standards for Maximum Permissible Emissions," WAC 173-480-050(1)	ARAR	At a minimum all emission units shall make every reasonable effort to maintain radioactive materials in effluents to unrestricted areas, as low as reasonably achievable (ALARA). Control equipment of sites operating under ALARA shall be defined as reasonably available control technology and as low as reasonably achievable control technology.	The potential for fugitive and diffuse emissions due to demolition and excavation and related activities potentially will require efforts to minimize those emissions. This requirement is action-specific and potentially applicable.
"Emission Monitoring and Compliance Procedures," WAC 173-480-070-(2)	ARAR	Determine compliance with the public dose standard by calculating exposure at the point of maximum annual air concentration in an unrestricted area where any member of the public may be.	Fugitive and diffuse emissions resulting from demolition and excavation and related activities potentially will require assessment and reporting. This requirement is action-specific and potentially applicable.
To-Be-Considered pursuant to relevant waste acceptance criteria			
Environmental Restoration Disposal Facility Waste Acceptance Criteria (WCH-191)	TBC	This document establishes waste acceptance criteria for the Environmental Restoration Disposal Facility.	Waste destined for management at Environmental Restoration Disposal Facility must meet acceptance criteria to ensure proper disposal.

40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities."
40 CFR 268, "Land Disposal Restrictions."
WAC 173-303, "Dangerous Waste Regulations."
WAC 173-340, "Model Toxics Control Act -- Cleanup."
WAC 173-400, "General Regulations for Air Pollution Sources."
WAC 173-460, "Controls for New Sources of Toxic Air Pollutants."
WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides."
WAC 246-247, "Radiation Protection -- Air Emissions."

ARAR = applicable or relevant and appropriate requirement.
CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*.
CFR = *Code of Federal Regulations.*
TBC = to be considered.
WAC = Washington Administrative Code.

5.1.3 Long-Term Effectiveness and Permanence

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

In Alternative Two, S&M would be carried out until the eventual D&D of the 212-N, -P and -R facilities. Therefore, the alternative would be effective at protecting human health during this time frame, although the efforts to maintain that level of protection necessarily would become increasingly aggressive as the facilities age.

Because contamination would be left in place with this alternative, risk of release to the environment would remain. The structures would be monitored closely. With time, the effectiveness of this alternative would diminish. This alternative would not provide a permanent solution with respect to the 212-N, -P and -R facilities, because D&D or inventory removal would need to occur at some future time.

Alternatives Three and Four would provide greater protection of human health and the environment compared to Alternative Two. These alternatives would provide a more permanent solution for the purposes of meeting the removal action objectives. Both Alternatives Three and Four would remove the majority of contaminated inventory associated with the 212-N, -P and -R facilities and in the case of Alternative Four, the basins as well. Further remedial actions potentially would be required for subsurface and surrounding contamination. Aboveground contamination and structures would be removed and disposed, thereby creating an effective and permanent remedy for the structures. This would allow improved access to possible contamination surrounding the structures for future remedial action. There would be no unacceptable risk attributable to the surface portions of the 212-N, -P and -R facilities after completion of the removal action under Alternatives Three and Four.

Alternative Four would result in removing the subsurface basins and up to 1 meter of underlying soil. This would provide additional long-term protection if significant radiological inventory is actually located in the basins or directly beneath the basins in the soil. However, Alternatives Three and Four are judged to be comparable in terms of long-term protectiveness because the basins would be left in place under Alternative Three, thereby isolating any potential subsurface contamination and limiting the potential for migration of or intrusion into the contaminants. Removal of the aboveground structures and their inventory of radioactive materials and other hazardous substances substantially reduces the potential exposure threat and contributes to the long-term protection of human health and the environment. Alternative Three does not support the geographical area closure approach, which would support the cleanup of the waste sites underneath each building, but Alternative Four does.

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 might be employed in the removal action. This criterion 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.

Based on process knowledge of past facility activities, it is anticipated that a maximum of 10% of the waste generated under Alternative Two would require treatment to meet ERDF or offsite treatment, storage, and/or disposal (TSD) facility waste acceptance criteria. Treatment would not be a significant component of the removal action for Alternative Two. However, because Alternatives Three and Four would generate substantially more waste than Alternative Two, these alternatives could 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., personnel 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 removal action achieves protection.

Under Alternative Two, there would be a potential for exposure to personnel and the environment during the S&M period because personnel would be required to enter each contaminated facility to perform work. This potential for exposure would become greater as each facility deteriorates and eventually could include potential exposure to the public as well as the environment. The speed with which full protection is achieved, however, would be lengthy since the final removal of contaminant inventory might not occur for an undetermined number of years.

With regard to short-term risks to personnel and the environment during implementation, Alternatives Three and Four would increase potential exposure in relation to Alternative Two because personnel would be entering each contaminated facility and would be handling more contaminated materials within each facility. Demolition of the structures would inherently increase the potential for a release to the environment, especially to the air, in the near term. Strict adherence to appropriate environmental regulations and use of appropriate control technologies would mitigate the potential for releases. Alternative Two would present a hazard of lesser magnitude but the hazards would continue for a longer period of time and increase as the facilities deteriorate.

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 can be implemented easily, as demonstrated by success of the S&M program currently ongoing at the 212-N, -P and -R facilities. S&M techniques are widely used throughout the Hanford Site, and no specialized materials or services would be required except when major repairs are needed. As time goes by, the primary implementation deterrent would be subjecting S&M personnel and the environment to increasing potential contamination exposure as facility deterioration increases. However, normal precautions for dealing with contamination would be applied.

Alternatives Three and Four also can be implemented with relative ease. The specialized skills that would be required to work in a radiation contaminated facility and with contaminated materials and equipment would be available within the existing workforce on the Hanford Site. ERDF already is authorized to dispose of CERCLA wastes generated on the Hanford Site (EPA et al. 1995 and 2002) that meet ERDF acceptance criteria (WCH-191).

Although any of the alternatives would be implementable, Alternative Two is easier to implement in the near term because this alternative 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 could become less feasible, because S&M activities would become more costly, aggressive, and frequent. Removal of the structures as described in Alternatives Three and Four would eventually become necessary. In addition, Alternatives Three and Four are sufficiently flexible to allow implementation in specific areas as site conditions change.

None of the alternatives discussed in this report are expected to interfere with other nearby operations. Alternatives Three and Four will also support the implementation of potential remedial action alternatives being considered for nearby waste sites.

5.3 COST

Total estimated costs for each alternative as described in Sections 4.3 through 4.5 are presented in Table 5-3.

Table 5-3. Total Estimated Costs for the 212-N, -P and -R Facilities Removal Action Alternatives.

Alternative	Total Cost	
	Present worth	**Nondiscounted**
Two – Continued S&M	1,680,000	2,329,000
Three – D&D (Building Structures Down to Basin, Not Including Basin or Underlying Soils/Structures)	3,870,000	4,678,000
Four – Expanded D&D (Including Building Basin, and Underlying Soils Up to 1 Meter Below Each Basin)	6,620,000	7,874,000

5.4 NEPA

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 might occur in both the short term and long term because of the interrelationships between the 212-N, -P and -R facilities removal action and other 200 Areas activities, such as remediation of waste sites and groundwater, deactivation and D&D of other facilities, and operation of waste treatment or disposal facilities.

Short-term cumulative impacts were considered in terms of both air quality and resource allocation. With appropriate work controls, airborne releases from the 212-N, -P and -R facilities were expected to be minor under all of the removal action alternatives, so 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 200 North Area activities would require resources in terms of budget, materials, and disposal space. The contribution to cumulative impacts would be less for Alternative Two in the short term and greater for Alternatives Three and Four, which would require additional budget resources. In the long-term, Alternative Two is expected to cost more because the long-term S&M costs are incurred while the threat of release still remains and further action, such as demolition, will eventually be required.

In the long term, the overall cumulative effect of the 212-N, -P and -R facilities removal action and other activities in the 200 North Areas would be to enhance the protection of personnel, the public, and the environment, which is consistent with the values expressed by the regulators, stakeholders, affected tribes, and the public. Alternatives Two through Four would contribute to this expanded protection, with Alternatives Three and Four creating 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 for waste disposal.

In addition, none of the alternatives would adversely affect groundwater, surface water, or water quality resources. Alternatives Three and Four also would require a commitment of resources required to stabilize the basins with cement, gravel or other backfill material (Alternative Three) and for excavation and the clean fill material to backfill and/or contour the sites (Alternative Four).

Lastly, none of the alternatives would result in any transportation impacts or cause any unavoidable adverse impacts.

6.0 CONCLUSIONS AND RECOMMENDED ALTERNATIVE

This EE/CA evaluated four removal action alternatives for the 212-N, -P and –R facilities. These alternatives were:

- Alternative One: No Action
- Alternative Two: Continued S&M
- Alternative Three: D&D (Building Structures Down to Basin, Not Including Basin or Underlying Soils/Structures)
- Alternative Four: Expanded D&D (Including Building Basins, and Underlying Soils Up to 1 Meter Below Each Basin).

Chapter 4.0 provided a description of the four alternatives, and Chapter 5.0 provided an analysis of the four alternatives with regards to the three CERCLA evaluation criteria for non-time critical removal actions: effectiveness, implementability, and cost.

The recommended removal action alternative for the 212-N, -P and -R facilities is Alternative Four – Expanded D&D (Including Building Basins, and Underlying Soils Up to 1 Meter Below Each Basin). This alternative would provide the best balance of protecting human health and the environment associated with the hazardous substance inventory within each facility, meeting the removal action objectives, and providing a cost-effective option.

Alternative One does not provide overall protection to human health and the environment. Alternative Two provides adequate overall protection of human health and the environment, but at an increasing cost over time. Additionally, Alternative Two would not remove the radioactive or other hazardous substance inventory within each facility. The risk to human health and the environment from exposure resulting from facility deterioration increases with time requiring eventual demolition and disposition of the structures. Furthermore, these alternatives are not consistent with remedial actions currently being evaluated for the 200 North Area. Therefore, neither of these alternatives was selected.

Alternative Four provides long-term protectiveness. Removal of the aboveground structures and their inventory of radioactive materials and other hazardous substances substantially reduces the potential exposure threat to human health and the environment. Alternative Four provides protection from potential exposure to radioactive or other hazardous substances that may be present in the building basins or underlying soils and removes the material to a separate approved waste disposal location.

Alternatives Three and Four are both consistent with future remedial actions being considered in the area. However, Alternative Four also supports the geographical area closure approach for the 200 North Area.

Alternative Three has somewhat lower costs, reduces exposure of the workers to industrial hazards, and requires a lesser commitment of additional backfill materials because the basin remains in place.

Alternative Four, which removes the basins, also accomplishes the following objectives:

- Eliminates infiltration into an underlying waste site during the period between demolition and potential future remedial action because the contamination source has been removed

- Minimizes/reduces potential exposure to hazardous substances from the immediate underlying contaminated soil (if present).

Table 6-1 provides a summary of the conclusions from this analysis, based on the information provided in Chapter 5.0.

Table 6-1. Comparative Analysis of the Removal Action Alternatives for the 212-N, -P and -R Facilities.

EE/CA Alternative	Non-Time Critical Removal Action Evaluation Criteria							
	Effectiveness					Implementability	Cost	Supports Geographic Area Closure
	Protection of Human Health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction of toxicity, mobility or volume through treatment	Short-Term Effectiveness			
Alternative 1: No Action	Does not protect human health and the environment	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	Does not support
Alternative 2: S&M	√[2]	√	Does not provide long term effectiveness	Does not reduce mobility	√	√	√	Does not support
Alternative 3: Demolish to Basin	√	√	√	√	√	√	Cost is higher than Alternative 2	Does not support
Alternative 4: Demolish to Soil	√[3]	√	√	√	√	√	Cost is higher than Alternatives 2 and 3	√

[1]This alternative was not protective of human health and the environment; therefore, it was not evaluated further
[2]This alternative is protective in the short-term, but not as protective as Alternative 3 in the long-term
[3]This alternative provides the greatest long term protection and reduction of contaminants, but has the highest costs.

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