DOE/EA-1707D
REVISED
PREDECISIONAL DRAFT

Environmental Assessment

Closure of Nonradioactive Dangerous Waste Landfill (NRDWL) and Solid Waste Landfill (SWL), Hanford Site, Richland, Washington

U.S. Department of Energy
Richland Operations Office
Richland, Washington 99352

AUGUST 2011

DOE/EA-1707D
REVISED
PREDECISIONAL DRAFT

AUGUST 2011

Contents

Appendices

Figures

Tables

Executive Summary

Introduction. This Environmental Assessment (EA) provides information and analyses of proposed U.S. Department of Energy (DOE) activities associated with the closure of the DOE Hanford Site's Nonradioactive Dangerous Waste Landfill (NRDWL) and the Solid Waste Landfill (SWL).

The DOE needs to close the non-operating NRDWL; this facility has not received waste since 1988 (i.e., a non-operating facility). NRDWL would be closed according to *Resource Conservation and Recovery Act of 1976* (RCRA) requirements as implemented through the *Hazardous Waste Management Act* and *Washington State Dangerous Waste Regulations* (WAC 173-303). To achieve maximum efficiency, the adjacent SWL also would be closed concurrently; the SWL has been inoperative since 1996.

The purpose of the proposed action is to provide enhanced protection of human health and the environment through the closure of non-operating landfills on the Hanford Site. Impacts from past and future potential releases of contaminants to the groundwater would be mitigated.

The NRDWL and SWL are included in DOE/EIS-0391, *Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* (TC&WM EIS) as part of the cumulative impacts analysis. As such, the proposed action is an 'interim action.' DOE prepared the initial interim action EA to take advantage of the unique potential funding opportunity provided by the *American Recovery and Reinvestment Act of 2009* (ARRA). However due to extensive delays, ARRA funds no longer are available. In light of this, the project will take advantage of any near-term funding opportunities as they become available (e.g., carryover or other project efficiencies). DOE is preparing and planning to complete this interim action EA to support cleanup activities at the Hanford Site.

This is a revised draft EA. The initial draft EA was issued in May 2010, for a 30-day public comment period (the comment period was then extended for an additional 30 days based on public requests). Comments were received from the public; Oregon Department of Energy; Washington Fish and Wildlife Office of the USFWS; Nez Perce; Confederated Tribes of the Umatilla Indian Reservation, State of Washington Department of Ecology (Ecology); and EPA, Region 10. This draft EA has been revised after

consideration of comments The six recurring themes identified in the comments addressed are waste inventory, groundwater contamination, closure alternatives, barrier effectiveness, barrier design, and the use of Borrow Area C. Ecology is a cooperating agency on this revised EA.

Proposed Action. DOE proposes to close the non-operating NRDWL and SWL. Historically, proposed closure activities were addressed in DOE/RL-90-17 (Revision 1), *Nonradioactive Dangerous Waste Landfill Closure/Postclosure Plan*, and DOE/RL-2008-54 (Draft A), *Hanford Site Solid Waste Landfill Closure Plan*. Currently, the proposed closure activities are addressed under a single plan for both facilities in DOE/RL-90-17 (Revision 2), *Nonradioactive Dangerous Waste Landfill/Solid Waste Landfill Closure/Postclosure Plan*.

The aforementioned closure plans have been submitted to Ecology in their capacity as the regulatory agency overseeing WAC 173-303, "Dangerous Waste Regulations," and WAC 173-350, "Solid Waste Handling Standards." Ecology is presently reviewing DOE/RL-90-17 (Revision 2).

The proposed closure activities would focus on final barrier installation including oversight of the unit during barrier installation and appropriate certifications. A uniform design for a single evapotranspiration (ET) barrier over both NRDWL and SWL would be used. The ET barrier would consist of a fine-grained, low permeability soil and a top layer of the same fine-grained soil modified with an erosion resistant top soil that would sustain native vegetation.

For this revised EA, the analysis of borrow material for barrier construction considers the use of the Hanford Site's Borrow Area C, consistent with the land use designation [i.e., conservation (Mining)] established in the in the Record of Decision (ROD) for the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS). However after consideration of Tribal concerns voiced during several 2011 consultations on this EA, DOE intends to conduct a separate future NEPA review to analyze impacts of using Borrow Area C and other borrow sources located on the Hanford Site. This future NEPA document will be completed before using any fine-grained borrow source material for engineered barrier construction at NRDWL/SWL.

A Memorandum-of-Agreement (MOA-1) between DOE and the Washington State Department of Archaeology and Historic Preservation and the Advisory Council on Historic Preservation was previously executed for Borrow Area C (April 6, 2009). DOE invited the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes and Bands of the Yakama Nation, the Nez Perce Tribe, and the Wanapum to sign MOA-1 as concurring parties; however, the Tribes declined to sign the MOA-1. The MOA was amended (MOA-2) to address the specific needs associated with closure of NRDWL and SWL; a proposed MOA-2 was exchanged with the Tribes. Materials for cobble and fill material required for the barrier would not be obtained from Borrow Area C, but instead could come from on-site or commercial sources. The proposed action would include road improvements to Army Loop Road to provide improved access to NRDWL and SWL.

Postclosure activities for NRDWL/SWL would begin after installation of the final barrier and Ecology acceptance of closure. Postclosure activities would include long-term groundwater monitoring activities (including installation of 6 additional wells [2 new upgradient, 4 new downgradient, and one replacement), periodic inspections, and maintenance activities to ensure the long-term integrity of the closed landfill. Groundwater monitoring would continue during the postclosure period consistent with a compliant, State-approved groundwater monitoring program. Additional activities would be identified in the approved RCRA closure plan. For additional information, the reader is directed to the NRDWL/SWL Closure Plan (DOE/RL-90-17) and Groundwater Monitoring Plan (DOE/RL-2010-28).

Alternatives. Alternatives to the proposed action that are analyzed in this EA include partial removal, haul and disposal (removal of all waste material from both landfills and impacted soils up to 10 feet below the waste material); complete removal, haul and disposal (removal of all waste material from the landfills and all potential impacted vadose zone soils to groundwater); and the No Action Alternative. Alternatives considered but not analyzed in detail involved selective removal of types of waste (e.g., selective removal of asbestos or drummed dangerous waste).

Affected Environment. The Hanford Site lies within the arid Pasco Basin of the Columbia Plateau in south-central Washington State. The Site, spanning approximately 50 km (30 mi) north to south and 40 km (24 mi) east to west, occupies an area of about

1,517 km^2 (586 mi^2) north of the confluence of the Yakima River with the Columbia River. The Hanford Site has restricted public access, providing a buffer for areas currently used for storage of nuclear materials, waste treatment, and waste storage and/or disposal.

The Columbia River flows through the northern part of the Hanford Site, before turning south to form part of the Site's eastern boundary. The Yakima River, which joins the Columbia River at the city of Richland, runs near the southern boundary of the Hanford Site. Rattlesnake Mountain, Yakima Ridge, and Umtanum Ridge form the southwestern and western boundaries, and Saddle Mountain forms the northern boundary. Two small east-west ridges, Gable Butte and Gable Mountain, rise above the plateau of the central part of the Hanford Site. Adjoining lands to the west, north, and east are principally range and agricultural land. The cities of Kennewick, Pasco, and Richland (the Tri-Cities), West Richland, and Benton City constitute the nearest population centers and are located south-southeast and southwest of the Hanford Site.

The U.S. Army Corps of Engineers began construction of the Hanford Site in 1943 to produce plutonium for national defense; it was the first nuclear production facility in the world. The region was selected because of its remoteness and because it had abundant electrical power from Grand Coulee Dam, a functional railroad, clean water from the Columbia River, and available sand and gravel for construction.

During recent ecological surveys, no federal- or state-threatened or endangered species, species proposed for listing, or critical habitats were observed in any of the areas potentially affected by the proposed action (NRDWL/SWL, Borrow Source C, Old Military Road, and Pit # 6)

Cultural and historical resource issues have been identified within some portions of the four areas affected by the proposed action, and appropriate measures for their management have been established.

An estimated 160,600 people lived in Benton County and 64,200 lived in Franklin County during 2006, totaling 224,800; this represents an increase of over 17 percent from the Census 2000 figure. During 2006, Benton and Franklin counties accounted for 3.5 percent of Washington's population (PNNL-6415). U.S. Census Bureau data indicate the 2010 population estimate for Benton County is approximately 175,200, and Franklin

County is approximately 78, 200.The region contains some concentrations of minority and low-income populations. No prime farmland, scarce geological resources, or floodplains are within the proposed area of potential effect.

Environmental Impacts of Proposed Action. Environmental impacts associated with proposed closure activities are expected to be minimal. Resources required for closure consist of available materials and fuels, and the labor required represents a small fraction of the local market.

Worker and offsite radiological dose consequences are expected to be minimal, due to the absence of radionuclides in the wastes disposed of at NRDWL and SWL. Worker and offsite exposure to hazardous chemicals from closure activities are expected to be small due to the non-invasive nature of the proposed action. However, this would not be the case if the waste forms were exhumed in any alternative analyzed or discussed.

The proposed landfill closure activities would slightly expand the current footprint of the areas associated with NRDWL and SWL, which are largely sites that were previously disturbed during construction and operation of the landfills. Activities in these areas, therefore, only present an opportunity for disruption of ecological resources that have become established since operations ceased. The four proposed sites currently are not known to contain sensitive ecological resources or critical habitats that would be affected by the proposed activities; however the proposed support area (e.g., equipment storage and laydown) beyond the NRDWL/SWL perimeter fence comprises part of the Washington State Natural Heritage program element occurrence of the bitterbrush/Indian ricegrass sand dune complex on the Hanford Site. A mitigation action plan would be prepared. Reclamation of previously disturbed areas may have a beneficial effect on ecological resources and habitats. Mitigation and reclamation would adhere to revegetation plan(s) developed consistent with BRMaP and a future reclamation plan specific for this activity.

The potential for discovery of cultural and historic sites that were previously unrecognized is small. Management of known cultural and historic resources, as well as any discovered during closure activities, would be in accordance with regulatory requirements and agreements among DOE and other responsible agencies or parties.

Health and safety risks to workers and members of the public from landfill closure activities are projected to be minimal, and no different than those normally present at other Hanford cleanup sites. The proposed activities might have short-term impacts on local traffic and noise levels. Temporary impacts on air quality also could occur due to dust generation; however, dust abatement actions such as soil wetting with water and/or soil tackifiers would be implemented. Because of the remoteness of these activities from occupied areas, they would be unlikely to exceed regulatory standards for noise levels or air concentrations of criteria pollutants and particulates. Effluents and wastes generated during closure activities would be minimized to the extent practicable and would be managed using existing Hanford Site facilities.

Postclosure impacts are expected to be minimal, consisting of occasional site access for monitoring. There would be little, if any, incremental impact on community infrastructure, socioeconomic, or transportation resources. Because the impacts from operations are projected to be minimal, and potential effects would be addressed through appropriate mitigation measures, the opportunity for both high and disproportionate adverse impacts to minority or low-income populations likewise would be expected to be minimal.

Health and safety impacts associated with the alternatives considered (i.e., partial removal, haul, and disposal; complete removal, haul, and disposal) would be somewhat greater to workers and members of the public during excavation and handling of large volumes of waste materials compared to the proposed action. Attendant transportation impacts also would slightly be greater, including higher accident incidents and higher greenhouse emissions.

Mitigation of Environmental Impacts. Mitigation of environmental impacts associated with closure activities would take place as required by existing regulations, agreements, and policies, including the aforementioned amended MOA-2 for Borrow Area C and mitigation action plan for the NRDWL/SWL support area. Reclamation and restoration of disturbed areas would return them to a more natural state (consistent with BRMaP), and cultural and historic resources would be managed in consultation with regulatory agencies and Tribal Nations. Health and safety risks would be managed under existing Hanford Site policies and procedures with implementation of special measures, as necessary, to reduce worker risks.

Further, it is noted that the HCP EIS identified Borrow Area C as the preferred site for borrow material. The ROD for the HCP EIS (64 FR 61615) adopted a Comprehensive Land-Use Plan (CLUP) for the Hanford Site, which includes planning and implementing policies and procedures that govern the review and approval of future land uses. Consistent with the HCP EIS ROD, this revised EA analyzes the impacts of removing material, primarily silt/loam soils from approximately 45 acres of Borrow Area C. During consultations, the Tribes were opposed to using Borrow Area C due to impacts to a traditional cultural property, and encouraged DOE to consider other sources of such material. In recognition of Tribal concerns, DOE intends to analyze impacts of extracting borrow material from Borrow Area C and other borrow sources located on the Hanford Site in a separate NEPA review.

Finally, as discussed earlier, this revised EA is an interim action to the aforementioned TC&WM EIS. In January 2004, DOE issued the *Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement* (HSW EIS), which addressed ongoing solid waste management operations, including the use of Borrow Area C. In June 2004, DOE issued a ROD (69 FR 39449). The adequacy of the HSW EIS analyses of offsite waste importation and groundwater was challenged; subsequently, DOE and the Washington State Department of Ecology signed a Settlement Agreement on January 6, 2006. The agreement stipulates that, pending finalization of the TC&WM EIS, the HSW EIS will remain in effect to support ongoing waste management activities at Hanford, in combination with other applicable Hanford Site NEPA and CERCLA documents, permits and approvals; provided, that pending finalization of the TC&WM EIS, DOE will not rely on the groundwater analysis in the HSW EIS for decision making. When completed, the TC & WM EIS will supersede the HSW EIS. For the purposes of this EA, the HSW EIS analyses associated with removal of materials from Borrow Area C remain valid, and are included along with updated information on Borrow Area C as provided in the TC&WM EIS.

This page intentionally left blank.

Acronyms and Abbreviations

AAA	anti-aircraft artillery
ACHP	Advisory Council on Historic Preservation
ALE	Fitzner/Eberhardt Arid Lands Ecology
APE	Area of Potential Effect
ARRA	*American Recovery and Reinvestment Act of 2009*
bls	below landfill surface
BLM	Bureau of Land Management
CCP EIS	*Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement*
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
CLUP	Comprehensive Land-Use Plan
COC	contaminant of concern
COPC	contaminant of potential concern
CRR	cultural resource review
DART	Days Away (from work), Restricted, or Transferred
dBA	decibels
DHUD	U.S. Department of Housing and Urban Development
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
EA	Environmental Assessment
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESA	*Endangered Species Act*
ET	evapotranspiration
FONSI	Finding of No Significant Impact
FR	Federal Register
GTCC EIS	*Environmental Impact Statement for the Disposal of Greater-Than-Class C Low-Level Radioactive Waste*
HCP EIS	*Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*
HCRMP	*Hanford Cultural Resources Management Plan*

HSW EIS	*Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement*
HWMA	*Hazardous Waste Management Act of 1985*
LLBG	Low-Level Burial Ground
MCL	maximum contaminant level
MOA	Memorandum of Agreement
NEPA	*National Environmental Policy Act of 1969*
NHPA	*National Historic Preservation Act of 1966*
NRDWL	Nonradioactive Dangerous Waste Landfill
OM&M	ongoing operation, maintenance and groundwater monitoring
OSHA	U.S. Occupational Safety and Health Administration
OU	operable unit
PNNL	Pacific Northwest National Laboratory
PUREX	Plutonium Uranium Extraction (Plant)
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	Revised Code of Washington
ROD	Record of Decision
RHD	Removal, Haul, and Disposal
SEPA	State Environmental Policy Act of 1971
SHPO	State Historic Preservation Office(r)
SMCL	secondary maximum contaminant levels
SNL	Sandia National Laboratories
SWL	Solid Waste Landfill
TC&WM EIS	*Draft Tank Closure and Waste Management Environmental Impact Statement*
Tri-Party Agreement or TPA	*Hanford Federal Facility Agreement and Consent Order*
TRC	Total Recordable Case(s)
Tri-Cities	Kennewick, Pasco, and Richland
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound
VRM	Visual Resource Management
WAC	Washington Administrative Code

Glossary

Dangerous waste. Solid waste designated in WAC 173-303-070 through 173-303-100 as dangerous, or extremely hazardous or mixed waste.

Detection level. The lowest quantity of a substance that can be distinguished from the absence of that substance within a stated confidence limit.

Drinking Water Standards. The U.S. Environmental Protection Agency (EPA) has established National Primary Drinking Water Regulations that set mandatory water quality standards for drinking water contaminants. These are enforceable standards called "maximum contaminant levels" or "MCLs", which are established to protect the public against consumption of drinking water contaminants that present a risk to human health. An MCL is the maximum allowable amount of a contaminant in drinking water which is delivered to the consumer. In addition, EPA has established National Secondary Drinking Water Regulations that set non-mandatory water quality standards for 15 contaminants. EPA does not enforce these "secondary maximum contaminant levels" or "SMCLs." They are established only as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color and odor. These contaminants are not considered to present a risk to human health at the SMCL.

Hazardous chemical. Any chemical that is a physical or health hazard.

Hazardous waste. Waste that contains chemically hazardous constituents regulated under Subtitle C of the *Resource Conservation and Recovery Act* (RCRA), as amended (40 CFR 261) and regulated as a hazardous waste and/or mixed waste by the U.S. Environmental Protection Agency (EPA).

Health hazard. Any material for which there is statistically significant evidence that acute or chronic health effects may occur in exposed individuals. Such materials include:

- carcinogens
- mutagens
- teratogens
- toxic or acutely toxic agents
- reproductive or developmental toxins
- irritants
- corrosives
- sensitizers
- liver, kidney, and nervous system toxins
- agents that act on the blood-forming systems
- agents that damage the lungs, skin, eyes, or mucous membranes.

Infiltration. The process of the water entering the soil via pores, fractures, root channels, etc.

Low-level (radioactive) waste. Radioactive waste that is not high-level waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in Section 11e[2] of the *Atomic Energy Act of 1954*, as amended), or naturally occurring radioactive material.

Pan Lysimeter. An impermeable area (e.g., layer of high-density polyethylene) in the subsoil that collects, and a data logger that records, the percolation of water through soil.

Mixed low-level waste. Low-level waste determined to contain both source, special nuclear, or byproduct material subject to the *Atomic Energy Act of 1954*, as amended, and a hazardous component subject to the RCRA, as amended, or provisions of the Hazardous Waste Management Act, Chapter 70.105, Revised Code of Washington (RCW), and the regulations promulgated thereunder in Chapter 173-303 Washington Administrative Code (WAC).

Percolation. Atmospheric water that has entered the surface soil profile (infiltrated) and has the potential to transport contaminants to the underlying aquifer.

Physical hazard. Any chemical for which there is scientifically valid evidence that it is a:

- flammable or combustible liquid
- compressed gas
- explosive
- flammable solid
- oxidizer
- peroxide
- pyrophoric
- unstable (reactive) or water-reactive substance.

Pollution Prevention. The use of materials, processes, and practices that reduce or eliminate the generation and release of pollutants, contaminants, hazardous substances, and waste into land, water, and air. For the Department of Energy, this includes recycling activities.

1 Introduction and Purpose and Need

This Environmental Assessment (EA) provides information and analysis of proposed U.S. Department of Energy (DOE) activities to close the DOE Hanford Site's Nonradioactive Dangerous Waste Landfill (NRDWL) and the Solid Waste Landfill (SWL). Information contained in this EA will be used by DOE to determine if the proposed action is a major federal action significantly affecting the quality of the human environment. If the proposed action is determined to be a major action with potentially significant environmental impacts, an Environmental Impact Statement (EIS) would be required. If the proposed action is not determined to be a major action that could result in significant environmental impacts, a Finding of No Significant Impact (FONSI) would be issued, and the action may proceed. This EA is prepared in compliance with the *National Environmental Policy Act of 1969* (NEPA); the *Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA*; and the DOE *National Environmental Policy Act Implementing Procedures*.

1.1 Introduction

This is a revised draft EA. The initial draft EA was issued in May 2010, for a 30-day public comment period (the comment period was extended for an additional 30 days). Comments were received from the public; Oregon Department of Energy; Washington Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS); Nez Perce; Confederated Tribes of the Umatilla Indian Reservation, State of Washington Department of Ecology (Ecology); and EPA, Region 10. This draft EA has been revised after consideration of comments; Section 1.5 provides additional details regarding the basis for revision. In addition, Ecology is a cooperating agency (40 CFR 1501.6 and 1508.5) on this revised EA (Letter, J. Hedges, Ecology, to R. Holten, DOE, September 23, 2010 [Ecology 2010a]).

Further, this revised EA considers Borrow Area C as the source location for borrow material. The DOE/EIS-0222F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS, refer to Section 1.4.4) identified Borrow Area C as the preferred site for borrow material. The Record of Decision (ROD) for the HCP EIS (64 FR 61615) adopted a Comprehensive Land Use Plan (CLUP) for the Hanford Site, which includes planning and implementing policies and procedures that govern the review and approval of future land uses. Consistent with the HCP EIS ROD, this EA analyzes the impacts of removing material, primarily silt/loam soils from approximately 45 acres of Borrow Area C. During consultations, the Tribes were opposed to using Borrow Area C due to impacts to a traditional cultural property, and encouraged DOE to consider other sources of such material. In recognition of Tribal concerns, DOE intends to analyze impacts of extracting borrow material from Borrow Area C and other borrow sources located on the Hanford Site in a separate NEPA review.

Finally, as discussed earlier, this revised EA is an interim action to the aforementioned TC&WM EIS. In January 2004, DOE issued the *Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement* (HSW EIS), which addressed ongoing solid waste management operations, including the use of Borrow Area C. In June 2004, DOE issued a ROD (69 FR 39449). The adequacy of the HSW EIS analyses of offsite waste importation and groundwater was challenged; subsequently, DOE and the Washington State Department of Ecology signed a Settlement Agreement on January 6, 2006. The agreement stipulates that, pending finalization of the TC&WM EIS, the HSW EIS will remain in effect to support ongoing waste management activities at Hanford, in combination with other applicable Hanford Site NEPA and CERCLA documents, permits and approvals; provided, that pending finalization of the TC&WM EIS, DOE will not rely on the groundwater analysis in the HSW EIS for decision making. When completed, the TC & WM EIS will supersede the HSW EIS. For the purposes of this EA, the HSW EIS analyses associated with removal of materials from Borrow Area C remain

valid, and are included along with updated information on Borrow Area C as provided in the TC&WM EIS.

1.2 Purpose and Need

DOE needs to close the non-operating NRDWL and SWL. NRDWL has not received waste since 1988 (i.e., NRDWL is a non-operating facility), and would be closed according to *Resource Conservation and Recovery Act of 1976* (RCRA) requirements as implemented through the Washington State Hazardous Waste Management Act, Chapter 70.105, Revised Code of Washington (RCW), and the regulations promulgated thereunder in Chapter 173-303 Washington Administrative Code (WAC). To achieve maximum efficiency, the adjacent SWL would be closed at the same time as NRDWL; the SWL has been inoperative since 1996 and would have been closed independently as implemented through the *Washington State Solid Waste Reduction and Recycling Act* (RCW 70.93) and Solid Waste Handling Standards Regulations (WAC 173-350). However, DOE decided to close out SWL simultaneously with NRDWL under the more stringent WAC 173-303 regulations to realize cost efficiencies and enhance protection of human health and the environment.

The purpose of the proposed action is to provide enhanced protection of human health and the environment from closure of non-operating landfills on the Hanford Site. Impacts from past and future potential releases of contaminants to the groundwater would be mitigated.

1.3 Background

The proposed activities described in this EA would take place on the Hanford Site, as shown in Figures 1-1, 1-2, 1-3, 1-4, and 1-5 and described in Section 3. The Hanford Site was established as part of the Manhattan Project during World War II. Hanford occupies approximately 586 square miles in the southeastern Washington State along the Columbia River. From the 1940s to 1989, Hanford's mission encompassed defense-related nuclear research, development, and weapons-production activities. DOE Hanford's current mission is environmental cleanup and research.

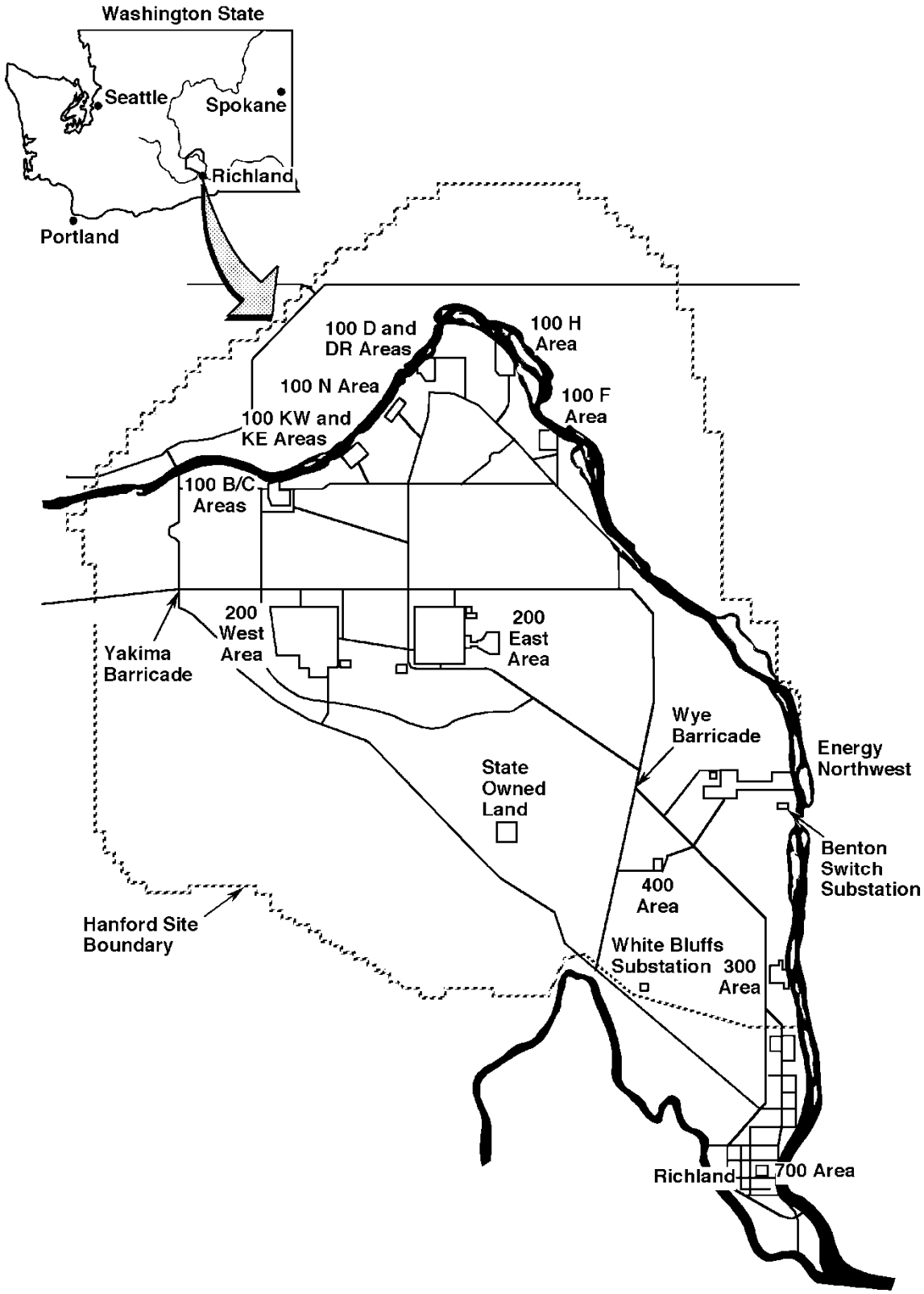


Figure 1-1. Hanford Site

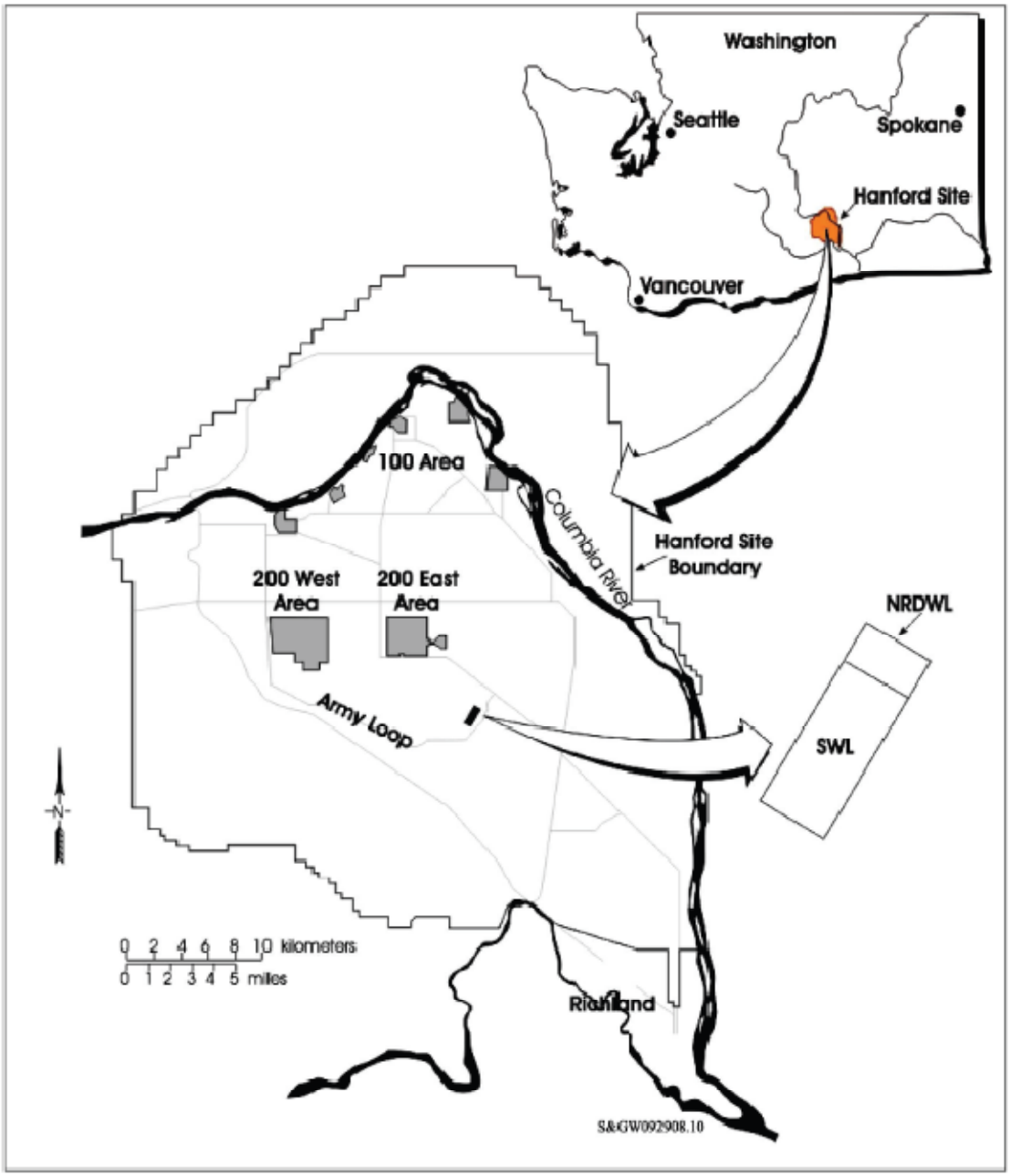


Figure 1-2. Location of NRDWL and SWL

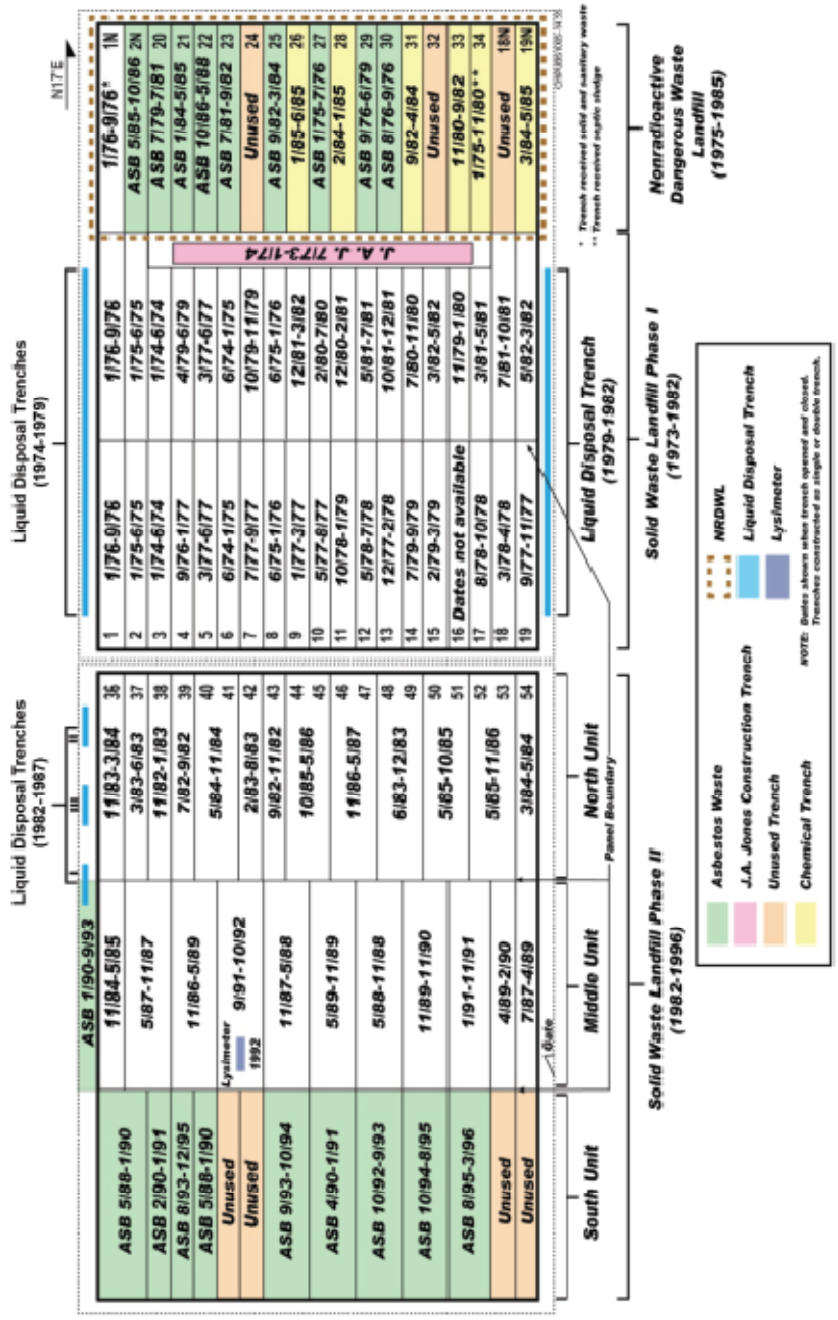


Figure 1-3. NRDWL/SWL Site Schematic (from DOE/RL-90-17, Revision 2)

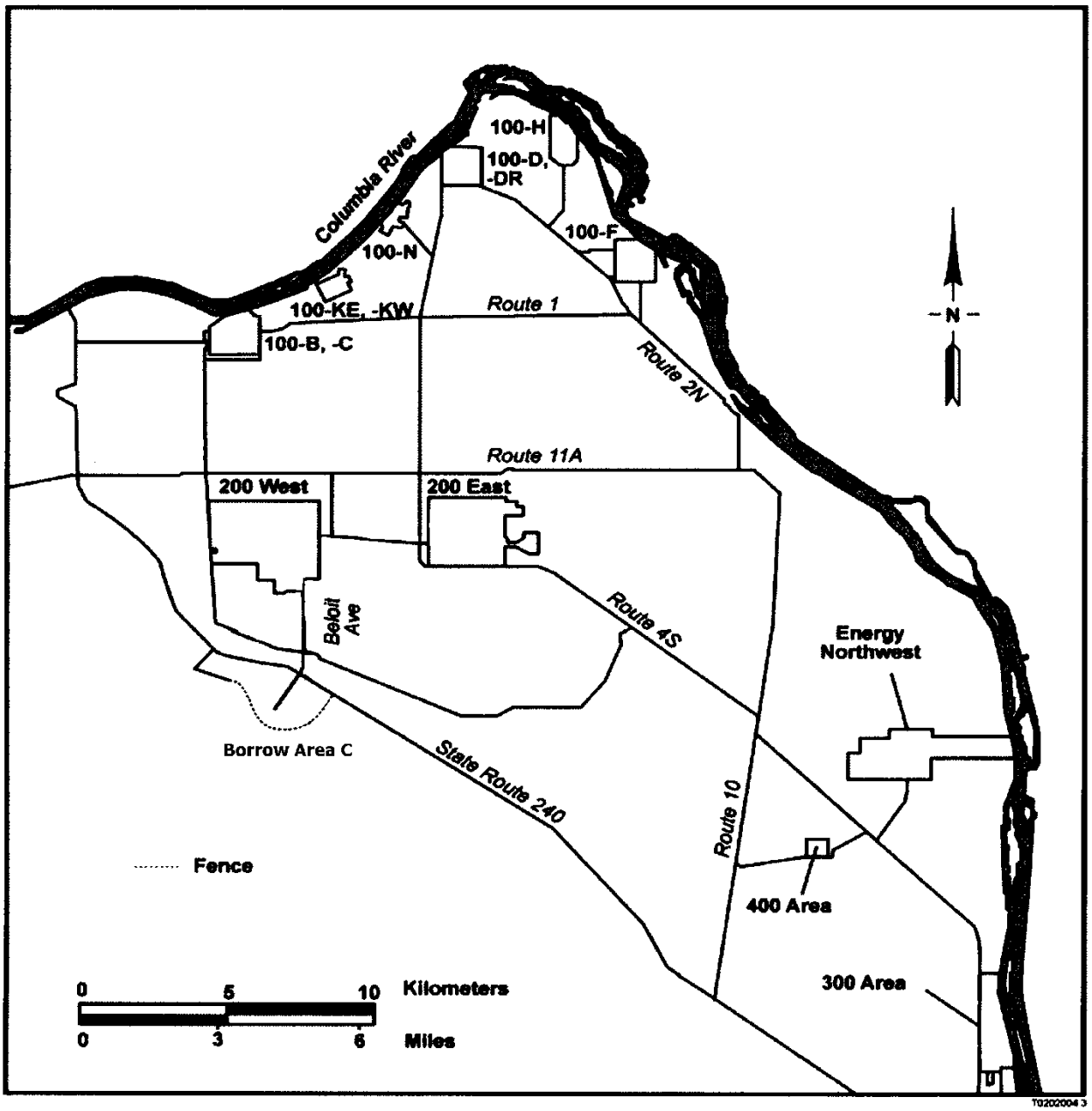


Figure 1-4. Location of Borrow Area C

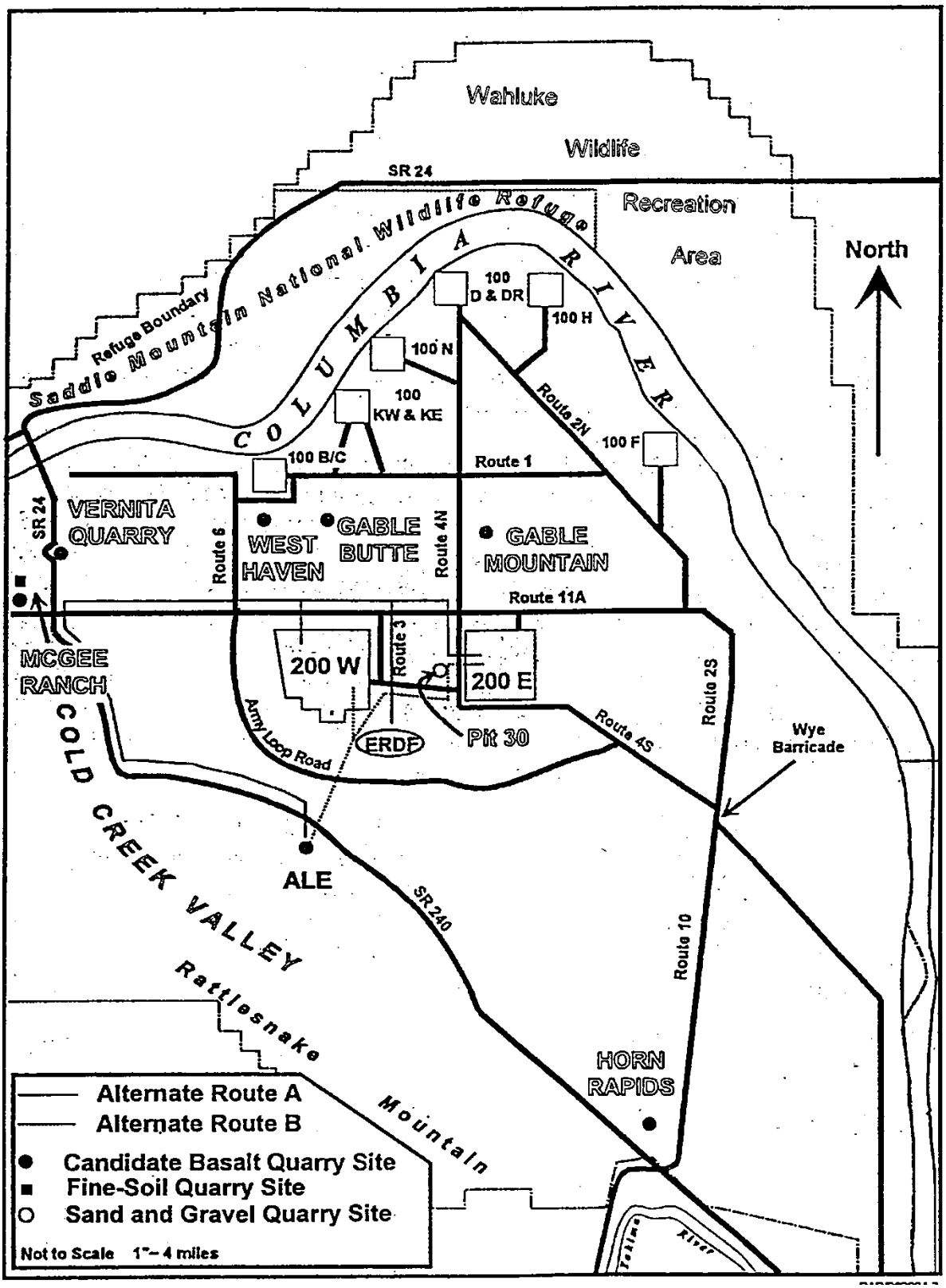


Figure 1-5. Potential Sources of Materials for Barriers

1.3.1 Landfills

The NRDWL and SWL (Figures 1-2 and 1-3) were operated as a single landfill that was originally known as the Central Landfill. Because of the presence of dangerous waste in the chemical trenches, the 19 northernmost trenches were designated as the NRDWL under the Hanford Facility RCRA Permit. The southern two-thirds of the area were later designated as the 600 Central Landfill (or SWL) which is a solid waste landfill that will be closed jointly with NRDWL. Closure standards for the SWL will be those under the more stringent WAC 173-303, rather than WAC 173-350, "Solid Waste Handling Standards."

Both landfills currently do not have an engineered permanent cover; the operational covers are a non-vegetated, very coarse-textured, loamy sand/sand cover with a very low water-holding capacity. Groundwater historically has been impacted from leachate migrating out of the waste material through the vadose zone and into groundwater. However, current NRDWL/SWL trends in groundwater quality indicate contaminants of concern (COCs) at or below detection levels (DOE/RL-2010-28). Four main waste types (sanitary solid waste, asbestos, liquid waste, and drummed dangerous waste) were disposed at NRDWL and SWL.

1.3.1.1 Nonradioactive Dangerous Waste Landfill (NRDWL)

NRDWL is an inactive non-operating landfill centrally located within the 600 Area of the Hanford Site. The landfill provided a site for disposal of dangerous waste generated from process operations, research and development laboratory maintenance activities, and transportation functions throughout Hanford. The NRDWL is located about 5.6 km (2.5 mi) southeast of the 200-East Area on Army Loop Road, southwest of the Route 4 intersection and southeast of the 200-East Area. It began operation in 1975 and occupies an area of approximately 4.5 ha (10 ac). It consists of 19 parallel trenches, each about 122 m (400 ft) long, 4.9 m (18 ft) wide at the base, and 4.6 m (15 ft) deep. A triangular column of undisturbed soil with approximately 1:1 side slopes separated the trenches as they were constructed. The final profile of the trench varied depending on the type of waste received. The trenches typically were backfilled and covered with 2 to 3 m (6 to 10 ft) of soil at the end of each operating day.

The NRDWL received nonradioactive dangerous waste from 1975 through 1985. In addition to dangerous waste, the NRDWL also received a small amount of sanitary solid waste and a substantial amount of both friable and non-friable asbestos-containing waste material (over 50 percent by volume) through 1988 when it ceased operations. Beginning in 1975, drummed chemical waste was disposed of in six trenches, asbestos in nine trenches, and nonhazardous solid waste in one trench; three trenches were unused. Dangerous waste was disposed of in six dedicated trenches (26, 28, 31, 33, 24 and 19N; refer to Figure 1-3) in NRDWL. Based on available information, including detailed disposal records and operator knowledge, all dangerous waste was containerized in drums prior to being placed in a trench. The normal handling procedure that waste generators followed for containers holding liquid dangerous waste was to absorb all free liquid with absorbent materials before shipment to NRDWL. Typically, small containers of chemicals were placed in drums, which were then filled with absorbent material to absorb the contained liquid and to minimize outer-container void space. Absorbent materials consisted of vermiculite or an equivalent (e.g., diatomaceous earth) material. The use of absorbents and waste containerization reduces the potential for groundwater impact by reducing contact between the parent waste material and leachate. Based upon waste container corrosion rates observed from other on-site waste containers (e.g., retrieved as part of the TRU Retrieval Project on Hanford's Central Plateau) and the age of the containers at NRDWL, it is unlikely that these containers have leaked substantial quantities of any contaminant outside the confines of the burial trenches.

Asbestos waste was disposed in nine dedicated trenches in NRDWL. Asbestos waste generally was not containerized prior to disposal; however, it was disposed of and covered in accordance with regulatory requirements in place at the time (e.g., 40 CFR 61, Subpart M, "National Emission Standard for Asbestos"). Nine trenches at NRDWL (2N, 20, 21, 22, 23, 25, 27, 29, and 30; refer to Figure 1-3) were used for the disposal of asbestos waste and represented about 50% of the total waste mass disposed of at NRDWL.

The last receipt of dangerous waste was in May 1985; the last receipt of asbestos occurred in May 1988 (*200-SW-1 Nonradioactive Landfills and Dumps Group Operable Unit and 200-SW-2 Radioactive Landfills and Dumps Group Operable Unit Remedial Investigation/Feasibility Study Work Plan*, DOE/RL-2004-60).

Under the proposed action, NRDWL would be closed according to Washington State *Hazardous Waste Management Act of 1985* (HWMA) requirements as implemented through WAC 173-303. A RCRA Part B permit application was submitted to EPA in November 1985; an initial RCRA Part A permit application for NRDWL was submitted to EPA in November 1980 (including other treatment, storage, and disposal units at Hanford) with the most recent Part A revision (Revision 7) submitted to the Washington State Department of Ecology (Ecology) in October 2008. A NRDWL site closure plan originally was written in 1990 (DOE/RL-90-17, *Nonradioactive Dangerous Waste Landfill Closure/Postclosure Plan*, Rev. 0).

Since it ceased operations, the landfill has continued to be monitored for groundwater contamination (there are over 20 years of groundwater monitoring data), and two detailed soil gas monitoring studies involving over 100 soil gas probes (*Evaluation of the Soil-Gas Survey at the Nonradioactive Dangerous Waste Landfill*, BHI-01115; *Nonradioactive Dangerous Waste Landfill Soil Gas Survey: Final Data Report*, WHC-SD-EN-TI-199) were completed at the NRDWL during the 1990s.

Groundwater monitoring has been used to assess subsurface groundwater conditions at NRDWL since 1986. In 1986, under a consent agreement and compliance order from Ecology, a groundwater monitoring program was initiated. Seven monitoring wells were installed in 1987, which comprised the initial monitoring network. This network was sampled quarterly between 1987 and 1988 and has been sampled semiannually from early 1989 until the present. Two additional wells were installed in 1992, which have also been sampled semiannually (699-25-34D and 699-26-34B).

Groundwater monitoring at NRDWL is performed in accordance with a unit-specific monitoring plan and is coordinated with the overall Hanford Site groundwater-monitoring project under the groundwater operable unit (OU) 200-PO-1. In 1987, releases of volatile organic carbon (VOCs, including Carbon Tetrachloride, PCE, TCE, and 1,1,1 TCA) to the uppermost aquifer were attributed to NRDWL and detected in downgradient monitoring wells for several years thereafter. It is suspected that the sources of VOCs was from bulk liquid discharges that provided the driving force behind the contaminant transport. However, at the present time, COC contamination levels in the groundwater related to NRDWL are generally at or below detection levels.

A closure plan (DOE/RL-90-17, Rev. 2) and groundwater monitoring plan (DOE/RL-2010-28, Rev. 1) have been prepared to address closure requirements for NRDWL and submitted to Ecology for approval (letter R. Holten, RL, to J. Hedges, Ecology [DOE 2010]).

Table 1-1 of this revised EA is representative of the known inventory of chemical[1] contaminants of potential concern (COPCs) disposed of in NRDWL. This inventory was used to evaluate cumulative impacts associated with NRDWL in the *Draft Tank Closure and Waste Management Environmental Impact Statement (EIS) for the Hanford Site, Richland, Washington* (TC&WM EIS) (DOE/EIS-0391).

Table 1-1. Chemical Contaminants of Potential Concern (COPC) Inventory in NRDWL

Chemical	Inventory (kilograms)
1,2-Dichloroethane	3.00
1,4-Dioxane	79.5
1-Butanol	13.5
2,4,6-Trichlorophenol	-
Acetonitrile	4.50
Arsenic	0.27
Benzene	356
Boron and Compound	651
Cadmium	448
Carbon tetrachloride	94
Chromium	26.4
Dichloromethane	21
Fluoride	76.2
Hydrazine/Hydrazine Sulfate	315
Lead	10.4
Manganese	6.1
Mercury	136
Molybdenum	1.9
Nickel	2,240
Nitrate	10,600
Polychlorinated Biphenyls	-
Silver	0.13
Strontium (stable)	0.04
Trichloroethylene	631
Total Uranium	-
Vinyl Chloride	-

Note: Dash (-) means no data found or inventory is estimated to be 0 or below detectable levels.

The derivation of the data presented in Table 1-1 is as follows:

- In 1990 waste manifests from NRDWL operations were used to create the Waste Designation Database. This database first appeared as Appendix 4B of the 1990 NRDWL Closure/Postclosure Plan (DOE/RL-90-17, Rev. 0).
- In 2009 the aforementioned Appendix 4B database was used to generate chemical inventory Tables S-84a and S-84b found in Appendix S of the TC&WM EIS.
- TC&WM EIS Tables S-84-a and S-84b were combined to form Table 1-1 of this revised EA.
- These data also are in the current NRDWL/SWL closure/postclosure plan (DOE/RL-90-17, Rev. 2).

[1] No radionuclides were disposed of in NRDWL or SWL.

For NRDWL chemical inventory, it is important to note that the Appendix 4B chemical database was screened to identify chemicals with a health risk from ingestion and to focus attention on constituents that could contribute to adverse impacts; its primary focus was to consider groundwater release scenarios for cumulative impacts analysis. This allowed for cumulative impacts to be added to the alternative impacts in the TC&WM EIS. To screen for hazardous chemicals, reported chemical inventories for cumulative impact sites were compared with health-based limits. Chemicals with inventories above health-based limits were selected for detailed analysis. This led to a final set of 26 chemical constituents, as shown in Table 1-1 (and Tables S-84a and S-84b found in Appendix S of the TC&WM EIS).

1.3.1.2 Solid Waste Landfill (SWL)

SWL (also known historically as the 600 Central Landfill) is a solid waste landfill adjacent to NRDWL on the south side. It is a much larger facility (27 ha [67 ac]) that received nondangerous and nonradioactive solid waste (i.e., principally solid waste, including paper, construction debris, asbestos, and lunchroom waste, refer to Table 1-2) from 1973 through March 1996.

The majority of the waste disposed at SWL consisted of sanitary solid waste composed mostly of office and lunchroom waste and construction and demolition debris. The waste generally was not containerized prior to disposal. The sanitary solid waste mass has no known specific source areas but originated from throughout Hanford Site operations. It is located in all of the trenches in Phase I and in most of the north and middle units of Phase II of the SWL. [NOTE: there was one trench in NRDWL (1N, refer to Figure 1-3) dedicated for sanitary solid waste]. The estimated total volume of sanitary solid waste is approximately 400,000 m^3 (refer to Table 1-2).

SWL also received limited liquid wastes, approximately 4,600,000 L (1,200,000 gal) of sewage and 1100 Area catch tank liquid, and approximately 380,000 L (100,000 gal) of garage wash water. The liquid waste was discharged to east-west oriented trenches at the perimeter of the main solid-waste area, along the northeast and northwest boundaries of the SWL (refer to Figure 1-3). Based on available analytical data, the liquid waste (likely the garage wash water) contained residual amounts of carbon tetrachloride, 1,1,1 TCA, TCE and PCE. Because of high hydraulic loading (compared to natural recharge rates) these contaminants were prone to migrate more quickly to groundwater than simple leachate generated from NRDWL/SWL via natural recharge. Because of the materials disposed, these trenches are considered one of the leading contributors to groundwater impacts from NRDWL/SWL releases. However, it is likely that most of the mobile contaminants have migrated from the trenches. Based on annual groundwater quality monitoring data trends observed, concentrations increased, peaked, and ebbed to low concentrations [groundwater monitoring plan, DOE/RL-2010-28]). Thus, based upon quantities disposed and groundwater quality monitoring trends, it is expected that little actual mobile source material remains in the trenches.

Table 1-2. SWL Inventory

Date	Solid Waste[a] (m^3)	Asbestos Waste[b] (m^3)	Liquid Waste[c] (L)
1973-1981	4,200	--	1,325,000[d]
1982	650	--	189,300
1983	1,070	--	707,900
1984	31,300	--	636,000
1985	32,900	--	836,600
1986	42,800	--	575,400
1987	44,300	--	371,000
1988	42,800	323	--
1989	44,300	2,982	--
1990	36,307	614	--
1991	21,073	1,161	--
1992	22,220	1,017	--
1993	25,800	1,508	--
1994	28,791	2,062	--
1995	21,755	1,252	--
1996	190	80	--
Total	**400,456**	**10,999**	**4,641,200**

a. Volumetric data are taken from annual letter reports for the SWL operation. Solid waste volume estimates through 1990 are based on the capacity of a typical trench and should be considered maximum values. In 1991, management modified the technique used for reporting volumes based on the daily log volumes of waste. The volumes from the daily logs do not include the amount of backfill (cover) material in the total volume, and thus provide a more accurate estimate of waste disposed.

b. Asbestos waste volumes are summarized from asbestos disposal request forms. Asbestos waste was disposed in the NRDWL trenches until May 1988 and the SWL trenches starting in May 1988. Asbestos volume for 1988 estimated for SWL is based on 776 m^3 of asbestos disposed into both the NRDWL and SWL calendar year 1988.

c. Liquid waste volumes, including sewage and 1100 Area catch tank liquid, are based on estimated numbers and capacities of transport vehicles (tanker trucks). Free liquid was prohibited from disposal at the SWL as of May 1987.

d. no disposal of free liquids occurred in 1973 or 1974.

-- = no waste received/disposed

L = liters

m^3 = cubic meters

Asbestos was also disposed of at SWL, including in nine out of 13 trenches in the south unit and one out of 12, trenches in the middle unit of Phase II (refer to Figure 1-3).

The SWL is a non-operating landfill that was planned to be closed according to the requirements of WAC 173-350**,** "Solid Waste Handling Standards." Ecology has determined (Ecology 2010b) that the same closure/final cover, post-closure care, groundwater monitoring, and other applicable requirements developed for NRDWL will apply to SWL as a corrective action pursuant to WAC 173-303-64620. The requirements of WAC 173-350 will be satisfied through the deferral option in WAC 173-350-710(8). Ecology will waive the solid waste permitting requirement by deferring to the Hanford Facility Dangerous Waste Permit that would include corrective action requirements pursuant to WAC 173-303-64620.

In 1996, when operations ceased at SWL, the waste trenches were covered with an operational cover consisting of coarse-textured (i.e., loamy sand) soil. Since it ceased operations, the landfill has continued to be monitored for groundwater contamination and soil gas characteristics. In addition a large-scale basin lysimeter with collection area of approximately 88 m^2 (21 m [69 ft] long, 4.6 m [15 ft] wide) has been used to measure percolation rates of the coarse-textured operational cover/buried waste and evaluate the resultant percolate water quality.

Groundwater monitoring at the SWL has been performed for over twenty years in accordance with a site-specific monitoring plan and is coordinated with the overall Hanford Site groundwater-monitoring project (200-PO-1 OU). The monitoring network consists of two upgradient wells on the west side of the SWL (Well 699-26-35A is shared with the NRDWL) and seven downgradient wells along the east and south of the SWL. Several new monitoring wells are planned for post-closure period that include 2 new upgradient monitoring wells.

In 1987, releases of VOCs (such as carbon tetrachloride, PCE, TCE, 1,1, Dichloroethane and 1,1,1 TCA) to the uppermost aquifer were attributed to SWL and detected in downgradient monitoring wells for several years thereafter. It is suspected that the source of these VOCs was from the bulk liquid waste disposal and the presence of VOCs in some of the liquid wastes (e.g., liquid garage wash water). The hydraulic head created by this liquid disposal moved the contaminants much quicker to groundwater than under ambient groundwater recharge conditions. However, at the present time COC contamination levels in the groundwater related to SWL are generally at or below detection levels[2]. Also, results of past and recent soil gas monitoring indicate that soil gas releases from the SWL have declined to non-detect levels for COC's. Concentrations of methane and other key volatile organic compounds of concern in the soil gases are at or below detection limits, and are well below the lower flammability limit. The closure plan prepared to address SWL closure (along with NRDWL) and groundwater monitoring plan have been submitted to Ecology for approval (DOE 2010). It includes provisions for continued soil gas and groundwater monitoring during postclosure. The close proximity of SWL to NRDWL allows for closure of both facilities simultaneously, taking advantage of cost efficiency. The chemical inventory in SWL did

[2]. There is a trend of increasing calcium and magnesium concentration in the groundwater. However, the concentrations are being monitored and neither of these constituents are primary or secondary drinking water standards. The U.S. Environmental Protection Agency (EPA) has established National Primary Drinking Water Regulations that set mandatory water quality standards for drinking water contaminants. These are enforceable standards called "maximum contaminant levels" or "MCLs", which are established to protect the public against consumption of drinking water contaminants that present a risk to human health. An MCL is the maximum allowable amount of a contaminant in drinking water which is delivered to the consumer.

In addition, EPA has established National Secondary Drinking Water Regulations that set non-mandatory water quality standards for 15 contaminants. EPA does not enforce these "secondary maximum contaminant levels" or "SMCLs." They are established only as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color and odor. These contaminants are not considered to present a risk to human health or the environment at the SMCL.

not meet the threshold criteria in the TC&WM EIS for "sites having inventories with a potential to contribute significantly to cumulative impacts" (refer to Appendix S of the TC&WM EIS). Therefore, SWL was not considered to be a contributor to potential cumulative impacts (refer to Section 4.10 of this EA for a discussion of potential cumulative impacts).

1.3.2 Borrow Area C

Borrow Area C is on the southwest side adjacent to State Route 240 and is accessed via a paved road on the west side of Highway 240 opposite the Rattlesnake Gate and Beloit Avenue. Borrow Area C is a large (2,287-ac) polygonal area located adjacent to the south side of State Route 240 and is centered approximately at the intersection of Beloit Avenue and State Route 240 (Figure 1-4). The area is bounded by State Route 240 and the Fitzner/Eberhardt Arid Lands Ecology (ALE) Reserve. Borrow Area C is not part of the Hanford Reach National Monument. Borrow Area C is located within the National Register of Historic Places-eligible traditional cultural property of Rattlesnake Mountain (*Laliik*) (DOE 2007). A small portion of the northern portion of Borrow Area C has previously been used as a borrow pit (*Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement* (HSW EIS) (DOE/EIS-0286F).

DOE selected Borrow Area C as the source location for borrow material as documented in the Record of Decision (ROD) (64 FR 61615 and 73 FR 55824) for DOE/EIS-0222F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (1999). Historically, prior to April 1999, McGee Ranch (in the northwest corner of Hanford north of Route 24 and south of the Columbia River) was identified as the primary suitable source of silt, loam, and basalt rock borrow material. Appendix D of the HCP EIS identified potential sources of cap materials. Those sources included McGee Ranch, Pit 30, Vernita Quarry, Horn Rapids, Gable Mountain, Gable Butte, West Haven, Section 9 Quarry, DeAtley Quarry, Mahaffey Quarry, as well as Borrow Area C (refer to Figure 1-5). However, based on public, other agency, and tribal input received by DOE during the HCP EIS process and as documented in the ROD, DOE decided Borrow Area C would be the primary source of geological materials available for Hanford Site remediation activities. Although the area is contiguous with the Fitzner-Eberhardt Arid Lands Ecology Reserve, it is in an area designated for Conservation (Mining) in DOE/EIS-0222F. Such areas are typically reserved for management and protection of cultural, ecological, and natural resources; however, they may also be used for managed mining activities. Borrow Area C is largely undeveloped consistent with its land use classification; however, a paved road was built in 2006 to access a portion of the site that would be used to generate borrow material for environmental remediation activities.

A comprehensive soil sampling and testing program of Borrow Area C was performed in 2005 and is documented in D&D-25575 (*Silt Borrow Source Field Investigation Report*). A subsequent report (*Geotechnical, Hydrogeologic and Vegetation Study Data Package for 200-UW-1 Waste Site Engineered Surface Barrier Design*, PNNL-17134) identified recommended values for Borrow Area C silt loam properties for use in evaluating evapotranspiration (ET) barrier performance. Modeling and comparative analysis from the Hanford prototype barrier and the Field Lysimeter Test Facility (FLTF) has indicated that a barrier consisting of 1.0 m of Borrow Area C soil is adequate to meet design requirements. Boring results also indicate that there are distinct near-surface beds of varying thickness of silt-loam material within Area C. Since the materials are near the surface, excavation likely would be limited to a depth of less than approximately 10 m (30 ft).

Impacts associated with the use of Borrow Area C (approximately 2,287 acres) have been analyzed previously (HSW EIS), and more recently in the TC&WM EIS. [3] A crosswalk of resource areas of concern and associated impacts is provided in Appendix E and also are included in Section 5 of this EA. Resource areas include:

- Land use determination
- Land use
- Air quality
- Water quality
- Geologic resources
- Ecological resources
- Socioeconomics
- Traffic and transportation
- Noise
- Cultural resources
- Resource commitments
- Human health and safety impacts
- Aesthetic and scenic resources
- Environmental justice
- Cumulative impacts
- Mitigation measures

The potential impacts associated with the proposed use of 45 acres of Borrow Area C for the NRDWL/SWL barrier are addressed in Section 4 of this EA (impacts would be expected to be bounded by those presented in the HSW EIS (which analyzed the use of approximately 2,287 acres of Borrow Area C), and the TC&WM EIS (which analyzed the use of approximately 1,410 acres of Borrow Area C). The impact analysis would be the same for a Traditional Cultural Property (TCP) or a non-TCP. Information from the HSW EIS and the TC&WM EIS for cultural and ecological resources is summarized in the following discussion.

Previously, cultural resources associated with the entire Borrow Area C were addressed in the HSW EIS. As noted therein, a cultural resources review was conducted that included Borrow Area C [HCRC #2002-600-012 (February 11, 2002) – 2289 acres for caps over waste sites]. The principal potential for impacts on cultural resources in the alternatives is associated with obtaining materials for the Modified RCRA Subtitle C Barrier to be placed over the disposal sites. This material, which includes basalt, sand, gravel, and silt/loam, would be obtained from a borrow pit in Area C. The borrow pit is within an area of about 926 ha (2287 ac). A cultural resources review also was conducted supporting the TC&WM EIS (Brockman 2007) Brockman, D.A., 2007, U.S. Department of Energy, Richland Operations Office, Richland, Washington, personal communication (letter) to A. Brooks, Department of Archaeology and Historic Preservation, Washington Department of Community, Trade and Economic Development, Olympia, Washington, “Determination of Adverse Effect and Transmittal of Cultural Resource Review for *Tank Closure and Waste Management Environmental Impact Statement* Project (*TC & WM EIS*) (#2007-600-018),” July 30.

[3] As noted previously (Section 1. 1), the HSW EIS analyses remain valid until the TC&WM EIS is finalized, at which time the TC&WM EIS will supersede the HSW EIS.

Also previously, ecological resource impacts to Borrow Area C were analyzed in the HSW EIS. Therein, an ecological resources review was conducted that addressed Borrow Area C [ECR #2002-600-012b (February 2002) – 2289 acres for caps over waste sites]. The bounding analysis was identified as HSW EIS Alternative Group A. Basalt, gravel, and silt/loam for use in capping the HSW disposal facilities would be obtained from borrow pits in Borrow Area C, an area of about 926 ha (2288 ac). [Note: only 18 ha (45 acres) of silt-loam material would be needed from Borrow Source C for the preferred alternative in this EA; gravel would be extracted from Pit # 6]. This area also was burned in the 24 Command Fire; however, some of the pre-fire shrub and understory vegetation survived, so the underlying soil surface has not been as severely affected by wind erosion. Future impacts to habitats and species from borrow source-related activities would depend largely on the locations of borrow pits within Borrow Area C. The locations of these areas of disturbance have not yet been determined. Depending on the location of the borrow pits, three habitats of concern within Borrow Area C may be affected by the excavation of borrow materials. These three habitats are designated element occurrences of plant community types by the State of Washington Natural Heritage Program (NHP). An element occurrence of a plant community type is one that meets the minimum standards set by NHP for ecological condition, size, and the surrounding landscape. Element occurrences are generally considered to be of substantial conservation value from a state and/or regional perspective. The largest of these is a cheatgrass/needle-and-thread grass/Indian ricegrass community, an element occurrence of the bitterbrush/Indian ricegrass sand dune complex community type, consisting of 97 ha (241 ac). The other two communities are much smaller. The needle-and-thread grass/cheatgrass community, an element occurrence of the sagebrush/needle-and-thread grass community type, consists of 5 ha (12 ac). The Sandberg's bluegrass/cheatgrass community, an element occurrence of the big sagebrush/bluebunch wheatgrass community type, consists of 1.5 ha (4 ac). These and other habitats that could be disturbed or eliminated by excavation of borrow materials within Borrow Area C are discussed in detail in Volume II, Appendix I of the HSW EIS. An ecological resource review was conducted in support of the TC&WM EIS (Sackschewsky 2003, [Sackschewsky, M.R., 2003, *Biological Review for the "Hanford Solid Waste EIS" – Borrow Area C (600 Area), Stockpile and Conveyance Road Area (600 Area), Environmental Restoration Disposal Facility (ERDF) (600 Area), Central Waste Complex (CWC) Expansion (200 West), 218-W-5 Expansion Area (200 West), New Waste Processing Facility (200 West), Undeveloped Portion of 218-W-4C (200 West), Western Half and Northeastern Corner of 218-W-6 (200 West), Disposal Facility Near Plutonium-Uranium Extraction (PUREX) Facility (200 East), ECR #2002-600-012b*, PNNL-14233, Pacific Northwest National Laboratory, Richland, Washington, April] and Sackschewsky and Downs 2007 [Sackschewsky, M.R., and J.L. Downs, 2007, *Ecological Data in Support of the "Tank Closure and Waste Management Environmental Impact Statement,"* Part 2: "Results of Spring 2007 Field Surveys," PNNL-16620, Pacific Northwest National Laboratory, Richland, Washington, May); results are discussed therein in Chapter 3, Section 3.2.7. DOE typically would establish measures to avoid or mitigate these potential consequences before proceeding with field work.

A Memorandum-of-Agreement (MOA) between DOE, the Washington State Department of Archaeology and Historic Preservation, and the Advisory Council on Historic Preservation was previously executed for a limited area (8-11 acres) within Borrow Area C (MOA-1, April 6, 2009) for constructing engineered barriers at two liquid disposal cribs within the U Area Closure Zone. DOE invited the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes and Bands of the Yakama Nation, the Nez Perce Tribe, and the Wanapum to sign MOA-1 as concurring parties; however, the Tribes declined to sign the MOA-1. The MOA was amended (MOA-2) to address the specific needs associated with closure of NRDWL and SWL. The proposed amended MOA-2, *Amended Memorandum of Agreement for Use of the Borrow Source at Area C, Hanford Site, Richland, Washington, Between the U.S. Department of Energy and the Washington State Historic Preservation Office with the Participation of Consulting*

Parties: Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Wanapum, was exchanged with the Tribes and is included in Appendix B. An attendant draft Implementation Plan is included as Appendix C. A cultural resource review and ecological resource review have been conducted for the proposed activity, which includes Borrow Area C; the reviews are included in Appendix A and D, respectively.

As noted previously for this revised EA, the analysis of borrow material for barrier construction considers the use of the Hanford Site's Borrow Area C, consistent with the land use designation [i.e., conservation (Mining)] established in the in the ROD for the HCP EIS. However after consideration of Tribal concerns voiced during several 2011 consultations on this EA, DOE intends to conduct a separate future NEPA review to analyze impacts of using Borrow Area C and other borrow sources located on the Hanford Site. This future NEPA document will be completed before using any fine-grained borrow source material for engineered barrier construction at NRDWL/SWL.

1.3.3 Barrier Effectiveness

DOE's proposed action (closing landfills under RCRA by installing a barrier over waste left in place) is protective of human health and the environment and is compliant with applicable regulations. The placement of landfill caps is the most commonly used remedy for landfill closures. It is a proven, safe and effective method for reducing environmental risks from most closed landfill sites. There have been isolated incidents associated with barriers which have been attributed to improper location (e.g., areas with high precipitation rates, areas with shallow groundwater) or poor engineering design and construction (*Enhancements to Natural Attenuation: Selected Case Studies*, WSRC-STI-2007-00250; and *Water Balance Covers for Waste Containment-Principles and Practice*, Albright et al. 2010).

The effectiveness of ET covers has been well documented and according to EPA fact sheet on ET barriers (EPA 2011, http://www.epa.gov/tio/download/remed/epa542f03015.pdf, or http://cluin.org/products/altcovers/), there are over 220 proposed, approved, and installed sites having ET covers in the United States (refer to Figure 1-6). Table 1-3 reflects data extracted from EPA 2011 for EPA Region 10, which oversees the Hanford Site. The ET barrier is becoming the barrier of choice in arid and semi-arid areas throughout the world due to a variety of reasons including actual performance of keeping water out of the buried waste via the combined processes of evaporation and transpiration (collectively called evapotranspiration), inferred longetivity from natural analogue soils, and minimal maintenance. The actual performance of ET barriers has been shown to be superior to the standard RCRA Subtitle C barrier that is composed of clay and or geosynthetic liners. It has been demonstrated (Dwyer 2003), that the ET covers generally have less percolation than the Subtitle D cover for each year shown and equivalent performance to a RCRA Subtitle C barrier (additional information may be found at http://www.sandia.gov/caps/ALCD_report.pdf).

There are essentially two types of evapotranspiration (ET) barriers: (1) monolithic; and (2) capillary. Both types function as a giant sponge absorbing (and adsorbing) water during dormant periods of transpiration, limited evaporation, and actively re-releasing water into the atmosphere through the collective ET process. Both require a fine-textured soil component (e.g., silt, silt-loam, loam, etc.) with desired properties like high-water-holding capacity, capability of supporting various plant communities, little or no shrinks-swell or frost heave problems, minimal erosion, etc. The monolithic barrier contains a single (i.e., 'mono') layer of fine-textured soil like a silt-loam. A capillary barrier consists of a fine-layer (e.g., silt-loam) over a coarse-textured (e.g., loamy sand) layer. Due to soil physical properties, a capillary barrier can be slightly more protective than a monolithic barrier and requires less material. However capillary barriers should not be used at sites where subsidence has occurred (e.g., NRDWL/SWL) or is

expected to occur. Refer to Table 1-3 for location of proposed, approved, and installed sites in the United States having ET covers.

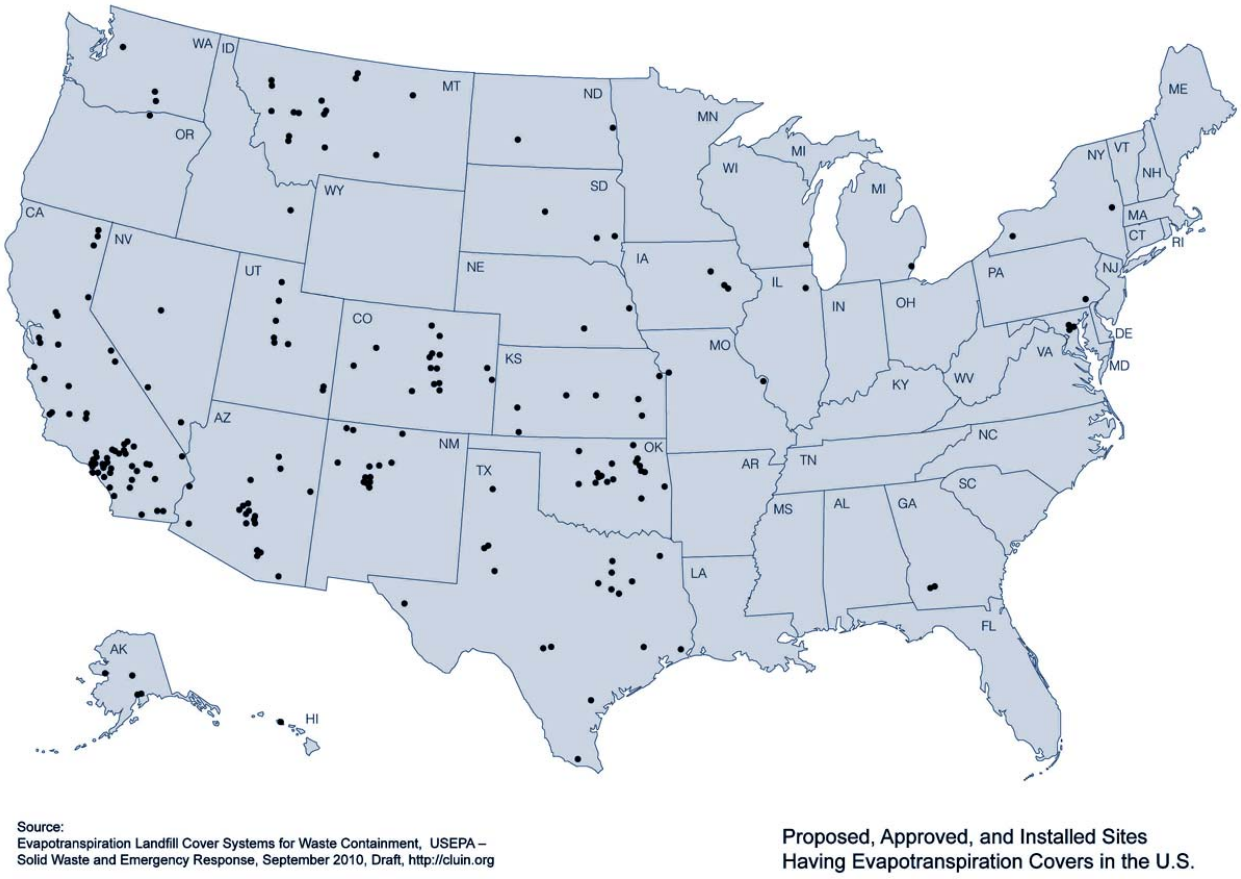


Figure 1-6. Evapotranspiration (ET) Covers in the United States

For more information on ET covers see the following:

U.S. EPA, Evapotranspiration Landfill Cover Systems Fact Sheet at:

http://www.epa.gov/tio/download/remed/epa542f03015.pdf

Or

U.S. EPA Alternative Landfill Cover Project Profiles at:

http://cluin.org/products/altcovers/

Or

U.S. EPA Evapotranspiration Covers at:

http://www.clu-in.org/products/evap/

Table 1-3. Proposed, Approved, and Installed Sites Having Evapotranspiration Covers; Region 10, U.S. Environmental Protection Agency

Site	Program	Type of Site	Scale	Status	Type of Cover
Anchorage Pilot Study Site, Anchorage, AK	RCRA	Municipal Solid Waste Site (MSW)	Demonstration	Complete	Monolithic
City of Elim, Landfill, Elim, AK	RCRA	MSW	Full scale	Proposed	Monolithic
Elmendorf Air Force Base, Anchorage, AK	RCRA	MSW	Full scale	Installed	Monolithic
Minchumina Landfill, Lake Minchumina, AK	RCRA	MSW	Full scale	Proposed	Monolithic
Idaho National Engineering Laboratory, Idaho Falls, ID	CERCLA	Hazardous Waste Site – generally concerned with cleanup activities	Full Scale	Installed	Capillary Break
Finley Buttes Regional Landfill, Boardman, OR	Alternative Cover Assessment Program	MSW	Full scale	Installed	Monolithic
Duvall Custodial Landfill	RCRA	MSW	Full Scale	Installed	Monolithic
Hanford 200-Area (USDOE), Richland, WA Prototype Barrier (BP-1)	CERCLA	Radioactive waste	Demonstration	Installed	Capillary Break
Nonradioactive Dangerous Waste Solid Waste Landfill (DOE Hanford)	RCRA	Hazardous Waste Site – generally concerned with cleanup activities	Full scale	Proposed	Monolithic

1

In addition to the aforementioned 220 ET cover sites scattered throughout the United States (refer to Figure 1-6), 17 years of Hanford Site-specific performance data from the Hanford Prototype Barrier (PNNL-14143), 24 years of data from the FLTF (Fayer and Gee, 2006), and study of natural barrier analogs demonstrate successful cover performance and provide a strong technical basis for the design and operation of covers under local Hanford Site conditions. There have been only three recorded runoff events observed at the Hanford prototype barrier; the most recent runoff event occurred after half of the Hanford Prototype Barrier was intentionally burned (September 2008) to study a variety of subjects including post-fire barrier performance. Before the fire, runoff had been recorded at the barrier on only two occasions, once when the surface was bare, and once after a rapid snowmelt event on frozen surface soil. In the winter of 1997, Chinook winds on frozen surface soils resulted in 36.3 mm (1.4 in.) of surface runoff with no sediment loss. In January 2009, following the fire, a total of 1.6 L (0.4 gal) of runoff was recorded. This is equivalent to 0.016 mm (0.006 in.); this value is quite small compared to previous events but the first observed in over 15 years. It can be attributed directly to the effects of the fire.

In the mid 1980s, Pacific Northwest Laboratory and Westinghouse Hanford Company (WHC) began construction on 18 field lysimeters (14 drainage lysimeters and 4 precision weighing lysimeters). Program objectives included:

- Test engineered barrier concepts
- Demonstrate that various barrier designs meet performance criteria for isolating buried waste
- An assessment of how well barriers perform in controlling biointrusion, water infiltration, erosion, and evaluating interactions between environmental variables (e.g., precipitation duration and intensity)

In November 1987, tests were begun to measure infiltration, evapotranspiration (ET), soil-water re-distribution and drainage. Almost 24 years of data have been gathered (to date). This data has been incorporated into a variety of barrier components including: current barrier designs; evaluations of key barrier components (e.g., barrier thickness and rainstorm events; types and amounts of vegetation; etc.); and calibration and testing of various models used for predicting long-term barrier performance.

Engineering evaluations at the Sandia National Laboratories (SNL) (a wetter climate than Hanford [23% more average annual precipitation]), including the use of models employing site specific data to simulate a variety of anticipated site conditions (extreme rainfall, cover types, etc.) indicate that ET barriers result in the reduction of percolation rates by over 90 percent, yielding very little (an average of less than 2 mm/year) water that would infiltrate through the ET barrier (*Alternative Landfill Cover Demonstration (ALCD)*, Sandia National Laboratories Website). The outcome is less percolation down into the waste to form potentially hazardous leachate, which could then subsequently migrate through the vadose zone and possibly to the groundwater. The closure plan (DOE/RL-90-17, Rev. 2) describes the results of preliminary modeling performed on the proposed barrier that demonstrates its effectiveness.

It is noted that in the long-term, barriers do not totally prevent percolation under all conditions, nor are they designed to do so. Based upon local data (PNNL-14143), an ET barrier of 1 m thickness will reduce average percolation rates from >50 mm/yr to < 0.5 mm/yr on average. Therefore technically, a very small quantity of percolation can occur but varies from year to year, based on rainfall, snowfall and other climatic conditions. In the closure plan (DOE/RL-90-17, Rev. 2), modeling was completed for barrier conceptual design using onsite meteorological data. The Alternative Landfill Technologies Team at the Interstate Technology and Regulatory Council (ITRC) (which is a coalition of state environmental regulators, industry, and stakeholders whose primary objective is to streamline regulatory acceptance

(innovative environmental decision-making) suggested a conservative but reasonable approach to modeling cover performance is to use the wettest 10-year cycle on record. The data used for the proposed alternative cover used Hanford precipitation data between 1989-1998. The Hanford Site received 115% of the normal precipitation that included the two wettest years on record, the wettest month on record, the wettest winter on record, and the second-highest snow accumulation on record. This is equivalent of a 150-year frequency 24-hour storm. The model used in this analysis predicted a 0.09 mm/year flux. The equivalent theoretical performance of EPA's prescriptive design for a RCRA Subtitle C (hazardous/dangerous waste) final cover is a performance goal of 3 mm/year flux. The anticipated flux based on a 1000-year storm event shows a flux of 0.09 mm/year. Studies discussed in the closure plan (DOE/RL-90-17) found that climate change would be 28% wetter than current conditions. The model results show that a 1-meter thick cover should be able to withstand climate change impacts. However, under conditions where all of the water is lost via runoff or through evaporation, there is no infiltration from many precipitation events. Infiltration is the process of the water entering the soil via pores, fractures, root channels, etc., whereas percolation is atmospheric water that has entered the surface soil profile (infiltrated) and has percolated into the soil (i.e., infiltration is the rate at which water enters the soil and percolation is the rate that water moves through the soil). Although some water may infiltrate into the surface of the engineered barrier and percolate into the barrier, in most instances this water will be re-directed back to the atmosphere above via the collective processes of evaporation and transpiration (collectively called evapotranspiration).

Piepho MG and MW Benecke, 2007, *Effect of Waste Depth on Barrier Effectiveness,* SGW-34059, Rev. 0, Fluor Government Group, Richland, Washington found the following:

- A surface engineered barrier (cover) significantly protects groundwater from contaminants that are at the 30-meter depth
- A surface engineered barrier delays the travel time of contaminants to groundwater
- A surface engineered barrier decreases the peak concentrations of contaminants that make it to groundwater.

Further, based upon a detailed evaluation (PNNL-17134) of nearby silt-loam natural analog soils (and associated characteristics such as erosion [wind and water], frost heave, cracking/shrink-swell clays, etc.), it is projected that these barriers have the potential to last several thousand years. The proposed barrier design includes provisions for a 15% (by weight) mixture of gravel admix in the upper 20 cm of silt-loam material. Wind tunnel studies show that blending the gravel admix into the soil at this rate reduces wind erosion by over 96%. It is expected that over time (with the surface being subject to soil deflation, i.e., soil wind erosion) a desert pavement will form that armors the surface of the barrier against excessive degradation. Depending on the location and physical make-up, there are some soil environments where soil thickness is increasing (e.g., dunal environments) which can mitigate degradation. Finally, under post-closure care, the barrier is routinely inspected for evidence of degradation and corrective action will be taken to mitigate the effects of degradation.

1.4 Separate but Related Actions

Separate but related actions to the proposed closure of NRDWL and SWL are addressed in the following sections.

1.4.1 Cultural Program Activities

Section 106 of the *National Historic Preservation Act of 1966* (NHPA) requires taking into account the effect of federal undertakings on historical properties and objects before taking action. The definition of undertaking in 36 CFR 800.16 is very broad, including federally funded or permitted projects, activities, and programs. DOE/RL-98-10, *Hanford Cultural Resources Management Plan* (HCRMP) focuses on two major categories of activities at Hanford potentially affecting cultural resources: disturbing soil (digging, drilling, moving, etc) and disturbing (demolishing, decontaminating, etc.) historical buildings. DOE implements NHPA requirements in coordination with the State Historic Preservation Officer (SHPO) and Tribal Nations located in the vicinity of the Hanford Site.

1.4.2 Resource Conservation and Recovery Act Decisions

Wastes that contain hazardous constituents under RCRA requirements are currently regulated under Washington State *Hazardous Waste Management Act of 1985* (HWMA) requirements (RCW 70.105) and the implementing Dangerous Waste regulations in WAC 173-303. Closure plans prepared consistent with these requirements are subject to approval by Ecology. As noted in Section 2.1.1, a closure plan (DOE/RL-90-17, Rev. 2) and groundwater monitoring plan (DOE/RL-2010-28, Rev. 1) have been prepared to address closure requirements for NRDWL and submitted to Ecology for approval (DOE 2010).

1.4.3 Hanford Federal Facility Agreement and Consent Order Decisions

The *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989) outlines the approach that DOE will take for permitting and closure of the Hanford RCRA/HWMA-regulated treatment, storage, and disposal units. These two landfills are included in a draft remedial investigation/feasibility study work plan completed in September 2007 (DOE/RL-2004-60). The remedial investigation/feasibility study process under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), or closure in accordance with applicable RCW 70.105 and WAC 173-303 regulations, will be used to reach a decision that will meet requirements for both National Priorities List cleanup and RCRA/HWMA corrective action (DOE/RL-2004-60).

1.4.4 Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement

The purpose of DOE/EIS-0222F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS) was to facilitate decision-making about the Hanford Site's uses and facilities. DOE's decision attempted to balance its continuing land-use needs at Hanford with its desire to preserve important ecological and cultural values of the site and allow potential economic development of some areas of the Hanford Site. The ROD was issued on November 12, 1999 (64 FR 61615).

DOE completed a Supplement Analysis (DOE/EIS-0222-SA-01, *Supplement Analysis. Hanford Comprehensive Land-Use Plan Environmental Impact Statement*) to the HCP EIS in 2008 to help determine whether the existing HCP EIS remains adequate, or whether a new EIS, or a supplement to the existing EIS, should be prepared. In the SA, DOE did not identify significant changes in circumstances or substantial new information that have evolved since 1999 that would affect the basis for its decision as documented in the HCP EIS ROD. DOE does not plan to prepare a new EIS or a supplement to the existing EIS at this time. An amended ROD was issued on September 26, 2008 (73 FR 55824).

The designated land use for the area where the proposed activities that are the subject of this EA would take place (i.e., NRDWL/SWL closure and Borrow Area C) is conservation (Mining). Figure 1-7, extracted from the HCP EIS SA, shows the final land use plan designations established in the 1999 DOE

ROD (also known as the Comprehensive Land Use Plan, or CLUP) for the Hanford Site based on the final HCP EIS (64 FR 61615).

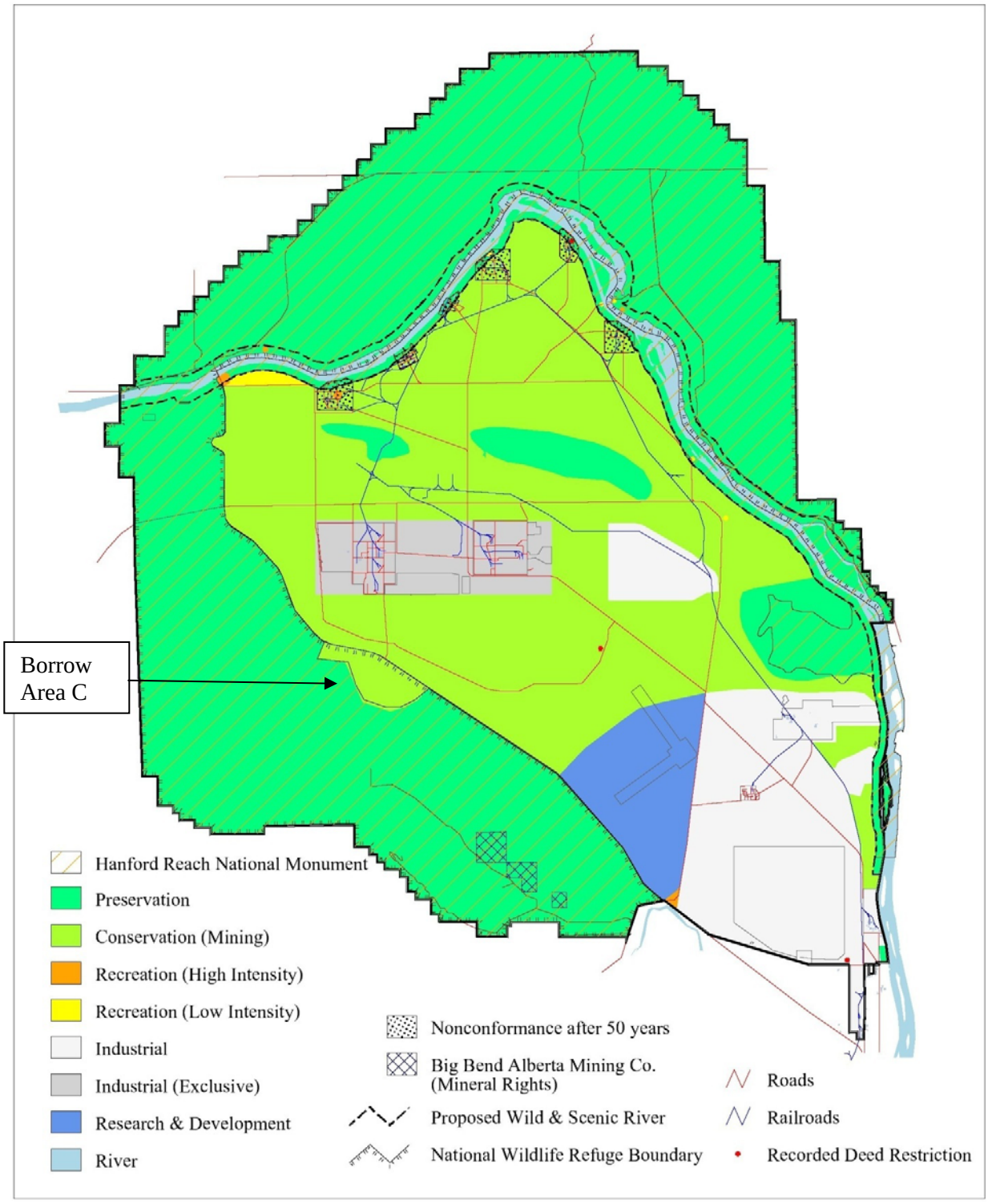


Figure 1-7. Land Use on the Hanford Site including Hanford Reach National Monument and Location of Borrow Area C

In the HCP EIS, the land use designations were defined as follows:

- **Industrial-Exclusive**: An area suitable and desirable for treatment, storage, and disposal of hazardous, dangerous, radioactive, and nonradioactive wastes. Includes related activities consistent with Industrial-Exclusive uses.

- **Industrial**: An area suitable and desirable for activities, such as reactor operations, rail, barge transport facilities, mining, manufacturing, food processing, assembly, warehouse, and distribution operations. Includes related activities consistent with Industrial uses.

- **Preservation**: An area managed for the preservation of archeological, cultural, ecological, and natural resources. No new consumptive uses (i.e., mining or extraction of nonrenewable resources) would be allowed within this area. Limited public access would be consistent with resource preservation. Includes activities related to Preservation uses.

- **Conservation (Mining)**: An area reserved for the management and protection of archeological, cultural, ecological, and natural resources. Limited and managed mining (e.g., quarrying for sand, gravel, basalt, and topsoil for governmental purposes) could occur as a special use (e.g., a permit would be required) within appropriate areas. Limited public access would be consistent with resource conservation. Includes activities related to Conservation (Mining), consistent with the protection of archeological, cultural, ecological, and natural resources.

As noted previously, the HCP EIS SA (DOE/EIS-0222-SA-01) and amended ROD (73 FR 55824) supported the conclusions and clarified the decisions published in the 1999 ROD. The actions evaluated in this EA would propose no changes to the existing land uses established in the HCP EIS.

1.4.5 Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement

The *Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement* (CCP EIS) (USFWS 2008) establishes USFWS goals and objectives for management of the Hanford Reach National Monument for the next 15 years. DOE participated in the preparation of the CCP EIS as a cooperating agency. The subsequent CCP to be issued by the USFWS is intended to provide the framework for conserving natural, cultural, and recreational resources; managing visitor use; developing facilities; and addressing day-to-day operations of the Monument.

The ROD, signed on September 25, 2008, selected the USFWS-preferred alternative (Alternative C1). Alternative C1 incorporates several components addressing a variety of needs including fish and wildlife sanctuary, habitat restoration and protection, public safety, and the National Wildlife Refuge System's six priority public uses. It is, however, the unique combination of these components that contributes most to achieving the Monument's purposes and goals. Alternative C1 strengthens the monitoring of fish, wildlife, habitat, and public uses on the Monument, which will provide the means to better respond to rapidly changing conditions within the surrounding environment. Alternative C1 was selected for implementation because it provides the greatest number of opportunities to contribute to the fish, wildlife and habitat needs of the Mid-Columbia River Basin (http://www.thefederalregister.com/d.p/2008-11-28-E8-28214).

1.4.6 The Tank Closure and Waste Management Environmental Impact Statement

The TC&WM EIS has been prepared to address proposed actions relating to closure of single-shell tanks, current and expanded waste management activities, and the decommissioning of the Fast Flux Test Facility (71 FR 5655). It also provides a comprehensive analysis of the cumulative impacts of other activities taking place or planned at the Hanford Site, including remediation activities. The EIS includes

analysis of the potential maximum development of Borrow Area C for purposes of implementing the proposed actions and/or alternatives evaluated. The EIS also includes analysis of potential impacts on cultural, historical, paleontological, and visual resources, as well as Native American interests; and it presents a discussion of potential mitigation actions that could be taken to reduce or minimize impacts associated with the proposed actions and alternatives. The Settlement Agreement executed by DOE and the State of Washington on January 6, 2006 indicates that when the Final TC&WM EIS is completed, it will supersede the HSW EIS. In parallel with the TC&WM EIS, DOE has initiated the NHPA Section 106 process, based on a determination that the TC&WM EIS proposed actions would likely result in adverse effects as defined under that law. As noted in the TC&WM EIS (Chapter 8), DOE has submitted documentation to the State Historic Preservation Officer regarding the determination of eligibility for the portion of the *Laliik* traditional cultural property (including Rattlesnake Mountain) that is under DOE's ownership and management responsibility. In addition, DOE initiated consultations under Section 106 with the State Historic Preservation Officer (SHPO), Advisory Council on Historic Preservation (ACHP), and American Indian tribes on the possible adverse effects of the use of Borrow Area C for the proposed actions being evaluated in the TC&WM EIS. DOE also exchanged with the tribes, the SHPO, and the ACHP an initial draft Memorandum of Agreement (MOA) addressing the potential adverse effects with proposed mitigations. Copies of the correspondence between DOE and the State Historic Preservation Officer are provided in Appendix C of the TC&WM EIS.

DOE prepared the initial interim action EA to take advantage of the unique potential funding opportunity provided by the *American Recovery and Reinvestment Act of 2009* (ARRA). However due to extensive delays, ARRA funds no longer are available. In light of this, the project is issuing this revised EA, and will take advantage of any near-term funding opportunities as they become available (e.g., carryover or other project efficiencies). Consistent with the requirements of Council on Environmental Quality (CEQ) regulations (40 CFR 1506.1(c)), DOE does not anticipate that the proposed closure activities would prejudice its decision or limit its ability to select from among the proposed actions being evaluated in the TC&WM EIS concerning closure of the single-shell tanks; supplemental technologies to augment the high-level waste treatment process at the Waste Treatment Plant; continuing or expanding waste management capabilities; and determining an appropriate end state for the Fast Flux Test Facility.

The TC&WM EIS addresses the potential mitigation actions that may be appropriate in order to implement the DOE-selected preferred alternative(s). Some of these mitigation actions may also benefit the areas within the scope of this EA. The final TC&WM EIS would be based on DOE's consideration of all the Tribal Nation input and public comments that it receives. Any ROD issued based on the final TC&WM EIS analyses provides DOE with the opportunity to address any further mitigation concerns that may be associated with implementing the preferred alternative(s) or the closure activities proposed in this EA.

1.5 Basis for Revision

This is a revised draft EA. The initial draft EA was issued in May 2010, for a 30-day public comment period (the comment period was extended for an additional 30 days). Ecology is a cooperating agency (40 CFR 1501.6 and 1508.5) on this revised EA (Ecology 2010a).

Of the comments received, six themes were identified and are described in Table 1-4. This revised draft EA provides clarification and additional details in those areas; sections in the EA where text was and and/or revised are included in Table 1-4.

Table 1-4. Comments Received on Draft EA

Issue	Synopsis	Revised Section(s)
Waste Inventory	Commenters questioned the inventory presented in the EA. Issues included accuracy, completeness, reliance on the TC&WM EIS, and depth and breadth of detail.	Sections 1.3.1.1, 1.3.1.2
Groundwater Contamination	Commenters expressed concern about the nature and extent of groundwater contamination that has occurred as a result of waste disposal operations at NRDWL/SWL.	Sections 1.3.1.1, 1.3.1.2, 3.2, 4.2.1.1
Alternatives; Selective Retrieval	Commenters felt that the range of alternatives evaluated in the EA should be expanded to address more selective retrieval options; specifically, removal of some wastes from NRDWL only, and 'selective' retrieval of the more mobile contaminants.	Sections 2.3, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 4.1.2, 4.2.2, 4.3.2, 4.4.2, 4.5.2, 4.6.2, 4.7.2, 4.8.2
Barrier Effectiveness	Commenters were concerned about the general effectiveness of the ET barrier, referring to discussions in the TC&WM EIS.	Section 1.3.3
Barrier Design	Commenters expressed concern about the barrier design in general, referring to lack of details regarding engineering (cover thickness, etc).	Sections 1.3.3, 2.1.1
Use of Borrow Area C	Commenters were concerned about Borrow Area C; the location (as compared to McGee Ranch), specific resource impacts (e.g., cultural, visual), and revegetation.	Sections 1.3.2, 2.1.2, 4.1.1.2, 4.2.1.2, 4.3.1.2, 4.4.1.2, 4.5.1.2, 4.6.1.2, 4.6.3.2, 4.6.4.2, 4.7.1.2, 4.8.1.2, 4.9.1.1.2, 4.9.2.1.2, 4.9.3.1.2, 4.9.4.1.2, 4.9.5.1.2, 4.9.6.1.2, Appendix E

1

2

2 Proposed Action and Alternatives

This section describes DOE's proposed action and alternatives to the proposed action, including the No-Action Alternative. It should be noted that closure plans described for the proposed action are based on conceptual plans. The final designs, plans, and schedules as ultimately approved for implementation may differ somewhat from those discussed in this EA. However, the nature, scope, and environmental impacts of the proposed action described here are expected to substantially reflect and adequately encompass those associated with actual project implementation. All final plans and schedules are subject to review and approval by Ecology prior to implementation.

2.1 Proposed Action

DOE proposes to close the non-operating NRDWL and SWL by installation of a barrier over waste left in place. Proposed closure and postclosure activities have been addressed in the NRDWL/SWL Closure Plan (DOE/RL-90-17, Rev. 2), which has been submitted to Ecology for approval (DOE 2010). The aforementioned closure plan (DOE/RL-90-17, Rev. 2) has been submitted to Ecology in their capacity as the regulatory agency overseeing WAC 173-303, and WAC 173-350 (refer to Section 1.3.1). Activities associated with the proposed action would take place at three fixed locations on the Hanford Site (refer to Figure 2-1).

2.1.1 NRDWL/SWL

Closure activities would focus on final barrier installation including regulatory oversight and quality control of the unit during cover installation and appropriate certifications. An ET barrier is planned for the NRDWL and SWL (Figure 2-2). The ET barrier would consist of a fine-grained, low-permeability soil and a top layer (20-cm thick) of the same fine-grained soil modified with 15 percent by weight pea gravel to form an erosion resistant top soil that will sustain native vegetation. The final barrier design must be equivalent or superior to a RCRA Subtitle C cover system.

The design basis for the barrier, along with engineering details, is provided in the closure plan (DOE/RL-90-17, Rev. 2). A higher amount of drainage (flux) is anticipated at the side slopes (compared to the main barrier) due to the low water storage properties of the side slope material (4- to 6-in. minus pit run gravel) and the reduced thickness as the barrier slopes to match final grade. However, the functional barrier is oversized such that the top of the side slopes overhang at least 16 m (50 ft) from the edge of the nearest trench. Moisture measurements under the prototype barrier indicate that lateral movement of water from side slope drainage to under the functional portion of the barrier is small, and is limited to about one meter (~3 feet) at a vertical location a meter or two (3 to 6 ft) beneath the barrier. However, there has been no attempt to measure lateral movement of moisture for depths greater than a few meters below the barrier (*200-BP-1 Prototype Hanford Barrier Annual Monitoring Report for Fiscal Years 2005 Through 2007,* PNNL-17176).

During definitive design the amount of barrier overhang would be evaluated using computer models to verify that the lateral extent of the barrier and its sideslopes provide sufficient distance to prevent subsurface water infiltrating at the side slopes from migrating laterally into the waste. Computer simulations conducted by Dr. Anderson Ward (PNNL-14143) indicate an overlap of 50 ft would be more than sufficient for the edge effects and lateral flow. If additional modeling indicates otherwise, the amount of overhang would be expanded as required. As the side slopes would contain some fines it is anticipated that over time the side slopes along with the main barrier would eventually become vegetated. Another option would be to vegetate the sideslope post-barrier construction.

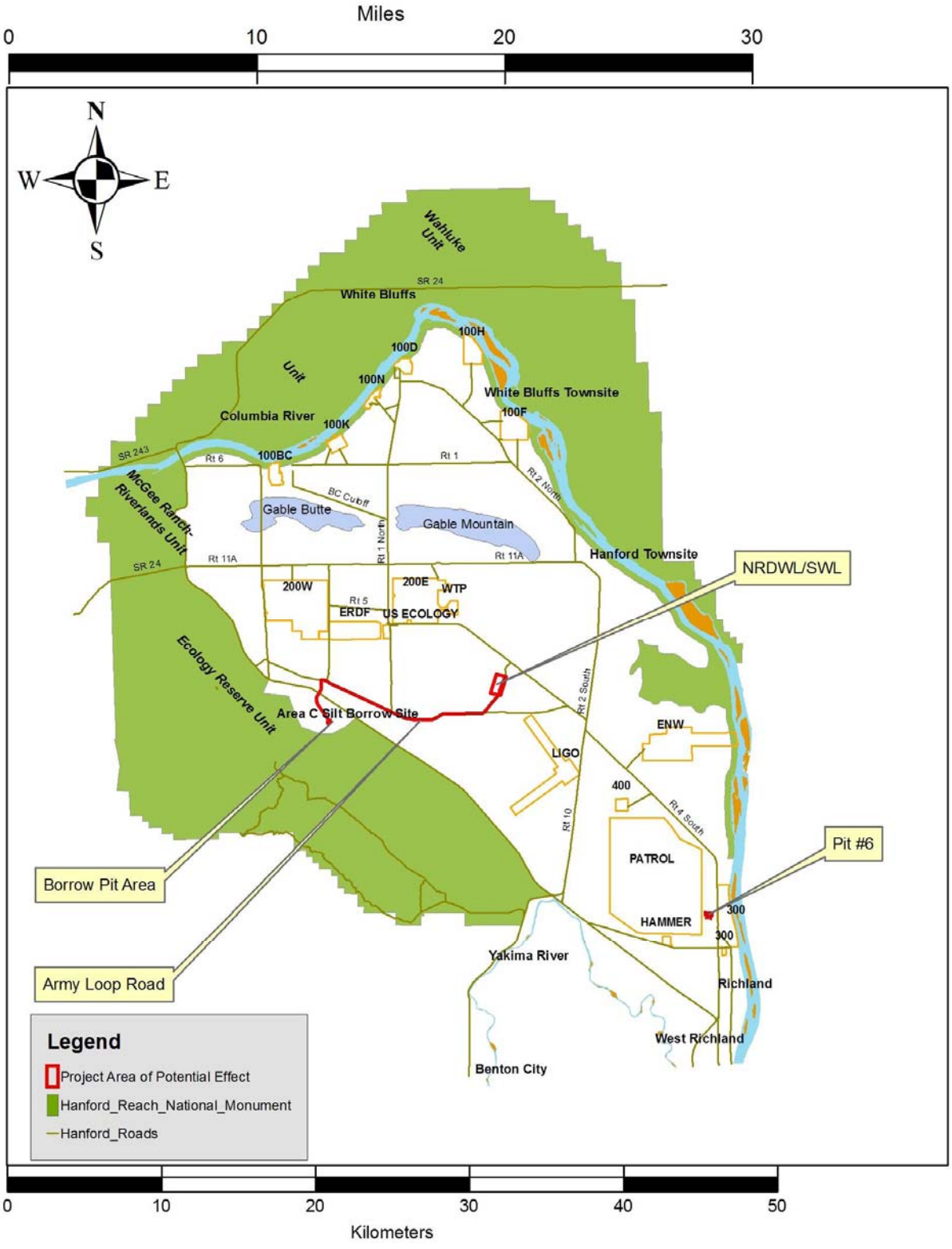


Figure 2-1. Location of Project Areas in Relation to the Hanford Site, Richland, Washington

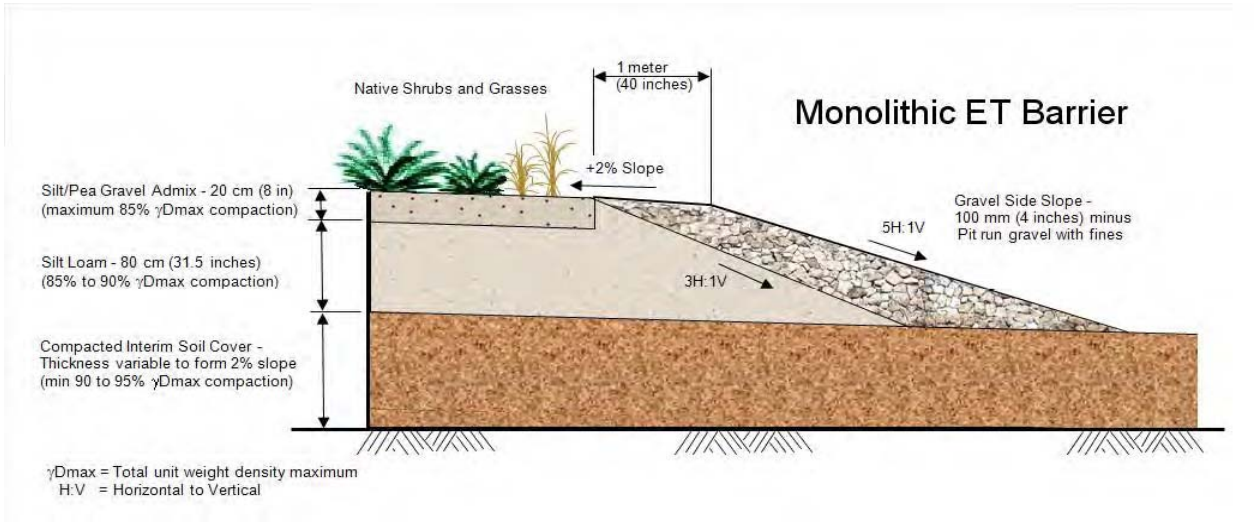


Figure 2-2. Typical Cross Section of Evapotranspiration Barrier (or Monolithic ET Barrier)

The proposed engineered barrier installation at NRDWL/SWL would be protective of groundwater and retard further migration of contaminants that may reside in the vadose zone below the landfills. Computer modeling on the performance of the proposed 1 m ET barrier for NRDWL/SWL indicates that less than an average of 0.5 mm of precipitation per year will infiltrate through the barrier and enter the waste thereby producing little or no leachate (DOE/RL-90-17, Rev. 2). In addition, the barrier would extend beyond the footprint of the landfills, thereby minimizing the lateral and vertical flow into the waste.

2.1.2 Borrow Area C

As noted previously (refer to Section 1.3.2) for this revised EA, the analysis of borrow material for barrier construction considers the use of the Hanford Site's Borrow Area C, consistent with the land use designation [i.e., conservation (Mining)] established in the in the ROD for the HCP EIS. However after consideration of Tribal concerns voiced during several 2011 consultations on this EA, DOE intends to conduct a separate future NEPA review to analyze impacts of using Borrow Area C and other borrow sources located on the Hanford Site. This future NEPA document will be completed before using any fine-grained borrow source material for engineered barrier construction at NRDWL/SWL.

It is expected that less than 2 percent (45 ac) of the total area of Borrow Area C would be required for capping NRDWL/SWL. Mining that material would consist of: scraping off and stockpiling the surface soil (for enhanced site reclamation, coarser sands, and gravels in order to harvest the silt-loam material to the depth of suitable material. Any topsoil rich in beneficial materials such as bacteria, organic matter, and mycorrhizae would be stockpiled and utilized in the reclamation effort. Excavations at Borrow Area C are expected to range from 10-20 ft. below the existing grade and generally more shallow compared to typical gravel or borrow pits due to the limits of suitable material. Borrow source materials (e.g., topsoil and cobble or riprap) would be tested and verified by the contractor before use and during construction to ensure it meets design specifications.

2.1.3 Other Activities Associated with the Proposed Action

Gravel for the side slopes could be obtained from existing onsite borrow area(s) or from an offsite commercial source. A potential onsite borrow location for such gravel is Pit #6, located west of the 300 Area (in the 600 Area of the Hanford Site) (Figure 2-1). Approximately 12,000 yd^3 of 4-in. minus pit run gravel would need to be extracted from Pit #6. This would require the expansion of Pit #6 to

approximately half an acre (and 15 ft deep). Environmental review of obtaining gravel borrow materials from existing active borrow pits and quarries on the Hanford Site (including Pit #6) was addressed in DOE/EA-1403, *Use of Existing Borrow Areas, Hanford Site, Richland, Washington* (October 2001). A Finding of No Significant Impact was issued on October 10, 2001.

Additionally, Army Loop Road (Figure 2-1) would be used to transport material from Borrow Area C to NRDWL/SWL. Originally this road was constructed at a width of 6 m (20 ft), but currently only about 5.5 m (18 ft) are passable because of age deterioration and vegetation encroachment. Army Loop Road from Beloit Avenue to the northeastern corner of the landfill area would need to be upgraded and repaired to provide for safe, two-way traffic. Road repairs would consist of clearing existing road, expanding existing road, and laying gravel. Although the road would be used to transport material from Borrow Area C for cover installation, dust suppressants would be applied routinely, it would be graded, and additional gravel would be added as needed. Once the NRDWL/SWL cover is installed, road maintenance would return to routine maintenance.

2.2 Alternatives Considered

The following sections address alternatives considered, including the No Action Alternative.

2.2.1 No Action Alternative

Under the No-Action Alternative, the non-operating NRDWL and SWL would remain in place with minimum ongoing maintenance. The No Action Alternative is not protective of human health and the environment, is not regulatory compliant, and does not meet DOE's purpose and need to close NRDWL and SWL as described in closure plans submitted to Ecology for approval. It is included here as required by Council on Environmental Quality (CEQ) and DOE NEPA regulations, for purposes of comparison to the potential impacts from the proposed action and other alternatives.

2.2.2 Partial Removal, Haul and Disposal (RHD)

Partial RHD alternative consists of removal of all waste material from both landfills and impacted soils up to 10 ft below the waste material. This represents a total of 30 ft below landfill surface (bls). This represents a volume of approximately 3.5 million yd^3. The waste material is located in trenches as both bulk, wrapped and drummed/containerized material. This material would be removed by common industrial waste excavation methods (and re-packaging as needed). It is estimated to consist of one-half the total excavation volume. Removal of inter-trench soils (soil excavation) would be by conventional soil removal methods, assuming the soil is not contaminated and would not require special handling. All waste removal activities would require extensive environmental monitoring and oversight. It is estimated that approximately 2.5 million yd^3 would be contaminated and would be disposed of at the Hanford Site's Environmental Restoration Disposal Facility (ERDF); approximately 1 million yd^3 (of the original 3.5 million yd^3 removed) could be returned into the excavation. Replacement soil (approximately 2.5 million yd^3 could be obtained from existing onsite borrow source(s), or potential future ERDF expansion (i.e., soil removed during an approved ERDF expansion). The replacement fill would be placed in the excavation, compacted and filled to grade; final grade would be restored with native seed source. However, because it is not likely to be a clean closure (i.e., no residual contamination), regulations would require that a barrier be placed over the remaining contaminated soils. For purposes of analysis, a final barrier similar to the proposed action was assumed to be required to be installed at the site.

2.2.3 Complete RHD (excavation to groundwater)

The Complete RHD Alternative would consist of removal of all waste material from the landfills and all potential impacted vadose zone soils to groundwater (total 120 ft bls). Removal would be conducted in

stages. The top 30 ft would be removed as in the Partial RHD alternative, then a deep excavation completed to groundwater (approx 120 ft bls). This represents a total volume of approximately 24 million yd^3. Excavation depth could be achieved by a combination of methods, including open pit mining, sheet pile, benching, etc.

All waste and soil from directly below the landfills would be disposed of at ERDF. Approximately 15 million yd^3 are expected to be disposed of at ERDF. The remainder (approximately 9 million yd^3) would be stockpiled and returned to the excavation as fill. Additional soil needed for mining zone stability and fill (approximately 15 million yd^3) also would be stockpiled (obtained from existing onsite borrow source or and assumed ERDF expansion spoil piles). Material would be placed in the excavation, compacted/filled to grade, then the site restored with native seed source. Because it is more likely to be a clean closure (no residual contamination), regulations do not require that a barrier be placed over the remaining soils. For comparison purposes, no final barrier was assumed to be required to be installed at the site.

2.3 Alternatives Considered but Not Analyzed in Detail

DOE has considered selective removal of waste materials from NRDWL/SWL, but these alternative approaches are not analyzed in detail, for reasons that are discussed in Sections 2.3.1 through 2.3.4. Selective removal would entail focusing not on a volume, but on a particular type of waste previously disposed in NRDWL/SWL. Four waste types were considered: sanitary solid waste; asbestos waste; liquid trench waste; and drummed dangerous waste.

There are a number of factors that must be evaluated when considering waste removal options. These include a range of factors including waste characteristics (mobility and toxicity), waste packaging, degree of containerization, methods of disposal and placement, accurate location of selected waste, waste volume and depth, complexity of the excavation process, geologic setting, safety and worker chemical exposure, construction risk to workers, environmental risks, waste transport and final disposition of waste, and other site specific factors.

Selective removal would result in the disposal of excavated waste from NRDWL or SWL taken to ERDF (where it likely would be placed below another engineered ET barrier). The proposed engineered barrier is required for any waste or contaminants left in place under all the selective removal scenarios for the four waste types discussed below. This selective removal action would be no more protective than leaving the waste in place and installing an ET barrier at NRDWL/SWL. Based on past and current groundwater monitoring trends, it is likely that most of the uncontainerized mobile constituents have already impacted groundwater. Although ERDF is a lined disposal facility, barriers at either disposal location would be designed to minimize infiltration of precipitation and be equally protective. The primary function of ERDF's liner is for the operational period only when the landfill is open to atmospheric or dust suppression water after it percolates through the waste down to the liner/leachate collection system.

The selective (individual) removal of the various types of waste materials (solid waste, drummed material asbestos, etc) does not offer any advantage over the removal of all of the waste material. The selective removal of wastes from NRDWL/SWL, as discussed below in Sections 2.3.1 through 2.3.4) poses a greater potential for industrial worker exposure and environmental risk than installation of an engineered ET barrier (the proposed action) due to the potential for release and exposure from several waste sources.

2.3.1 Selective Removal of Sanitary Solid Waste

Typically, sanitary solid waste does not pose a threat to human health and the environment when properly isolated. The primary risk exposure route for sanitary landfills is the potential consumption of

groundwater impacted by contaminants mobilized in the solid waste leachate. Typical contaminants from sanitary landfills may include toxic organics, pathogens, biochemical oxygen demand, nitrogen, heavy metals, polychlorinated biphenyls, pesticides and herbicides. However, leachate characteristics vary greatly depending on the age of the landfill, the nature of the waste placed in the landfill and percolation rates. When percolation is reduced, the threat to groundwater is also reduced.

The proposed barrier installation identified in the proposed action would minimize infiltration of precipitation into the sanitary solid waste thereby limiting impacts to groundwater. Therefore, in its current location with the barrier installed, sanitary wastes would not be expected to pose an environmental impact. However, the removal, haul, and final disposition of sanitary solid waste to another landfill with a similar final barrier could result in unnecessary additional industrial risks to site workers during transport of the waste, as well as transportation impacts and substantial additional project costs.

2.3.2 Selective Removal of Asbestos Waste

Disturbance of in-place asbestos should be avoided. The asbestos waste was well secured at the time of disposal per 40 CFR 61, Subpart M, requirements. The asbestos waste is not mobile in the vadose zone or groundwater, and poses no threat in its current location so long as it stays secured, properly covered, and undisturbed. The removal and relocation of asbestos to ERDF would potentially result in unacceptable worker exposure and potential release to the work environment.

The primary risk exposure route for asbestos is inhalation. Therefore, exhuming, transporting, and re-burying asbestos waste from one secure and safe location to another safe and secure location increases the risk for human exposure. In addition, asbestos is generally not mobilized in the liquid form; therefore, it poses little or no threat to groundwater. Selective removal of asbestos waste material was not considered further since removal may increase environmental risk, result in transportation impacts, and also increase costs.

2.3.3 Selective Removal of Liquid Trench Waste

Due to the hydraulic drives associated with large quantities of liquids disposed; the coarse, thin, highly-permeable cover; the amount of time passed since the last disposal event (24 years); the depth to groundwater below ground surface (which is around 40 meters [128 feet]), the majority of mobile contaminants disposed in the liquid waste trenches likely have migrated deeper into the vadose zone and into the groundwater as evidenced by the historical groundwater trends and current groundwater conditions (DOE/RL-90-17, Rev. 2). Although considered one of the leading causes of releases from NRDWL/SWL, due to the mobility of the contaminants that were placed in NRDWL/SWL, it is unlikely that any substantial quantity of solid source material remains within the liquid disposal trenches. In addition, barrier installation would retard further migration of any remaining contaminants in the vadose zone and support protection of groundwater. Thus, there would be little net value in excavating the liquid waste trenches and therefore excavation was not considered further.

2.3.4 Selective Removal of Drummed Dangerous Waste

The drummed dangerous waste was typically adsorbed or solidified such that free liquids were minimized at the time of disposal or in other cases were double-contained and well-secured in place. Removing and relocating large quantities of drummed material to ERDF potentially could result in unacceptable industrial worker exposure and release to the environment (e.g., rupturing a drum during exhumation). The side slopes required to excavate the drum trenches likely also would expose the adjacent asbestos materials, resulting in potential asbestos exposure unless substantial engineering controls were implemented during excavation. Finally, a barrier over NRDWL likely would still be required after the drums were removed since it is unlikely that clean closure could be achieved.

The drummed dangerous waste is not considered a substantial source of releases from NRDWL/SWL compared to the releases from the liquid trenches because of several factors: the age of the drums and the associated observed, on-site corrosion rates (from the TRU Retrieval Project, which indicate most of the drums are still intact); the presence of absorbents and solidifiers in the drums to minimize or prevent leachate formation after drum corrosion; and the types and levels of contaminants observed in the groundwater. Selective removal of drummed dangerous waste material was not considered further since removal may increase environmental risk, still require a barrier, result in transportation impacts and also increase costs.

This page intentionally left blank.

3 Affected Environment

Aspects of Hanford lands and their environs that might be affected by the proposed action are described in this section. In accordance with DOE's "sliding scale" guidance (DOE 2004), the description of the affected environment in this section emphasizes the resource areas and considerations most likely to be affected by the proposed action and highlights information that is necessary to assess or understand the potential environmental impacts. Additional details specific to the Hanford Site environment may be found in *Hanford Site National Environmental Policy Act (NEPA) Characterization* (PNNL-6415) and Chapter 3 ("Affected Environment") of the TC&WM EIS.

3.1 Land Use

As noted in Section 1.4.4, land use for the primary locations which are the subject of this EA was designated as Conservation (Mining) in the 1999 DOE ROD for the HCP EIS (64 FR 61615). A Supplement Analysis (DOE/EIS-0222-SA-01) and an amended ROD issued in 2008 (73 FR 55824) supported the conclusions and clarified the decisions published in the 1999 ROD.

3.2 Water Quality

Groundwater under Hanford occurs in confined and unconfined aquifer systems. Groundwater flow within the unconfined aquifer in the vicinity of NRDWL and SWL is generally to the east-southeast and generally west to east in the confined aquifer. The Hanford formation immediately underlying the area consists mainly of sand-dominated sediments. Depth to the water table located near the contact between the Hanford and Ringold Formations varies from 40 m to 43 m (131 ft to 141 ft). As noted in Sections 1.3.1.1 and 1.3.1.2, at the present time COC contamination levels in the groundwater related to NRDWL/SWL are generally at or below detection levels. Additional details for NRDWL/SWL groundwater are found in the groundwater monitoring plan (DOE/RL-2010-28).

Groundwater flow below Borrow Area C is generally to the east and northeast. Depth to the water table is estimated to average approximately 52 m (170 ft). No groundwater monitoring wells have been developed in Borrow Area C, although there are some existing water supply wells nearby.

3.3 Cultural and Historical Resources

The Hanford Site contains an extensive record of human occupation documenting a series of overlapping cultural landscapes stretching back thousands of years, each layer of which tells the story of how people have used the landscape. Three distinct landscapes are defined—the Native American Cultural Landscape, the Early Settlers and Farming Landscape, and the Manhattan Project and Cold War Era Cultural Landscape. Archaeological sites, archaeological features, artifacts, and historic buildings are prevalent on the Hanford Site. In addition, several places have had, and continue to have, traditional roles in Native American creation beliefs and the cultural heritage of the Wanapum, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Yakama Nation. These places include, but are not limited to, the Columbia River, Gable Mountain, Gable Butte, and Rattlesnake Mountain. Borrow Area C is located within the National Register of Historic Places-eligible traditional cultural property at the base of Rattlesnake Mountain, known by Native American Tribes as *Laliik*, portions of which are on the Hanford Site. DOE, in consultation and cooperation with other agencies, prepared the proposed amended MOA (MOA-2, Appendix B) and attendant draft implementation plan (Appendix C). Therein, DOE has determined that excavation activities at Borrow Area C will result in potential adverse effects to a National Register-eligible historic property (i.e., *Laliik)*. Potential adverse effects include viewshed

impacts as well as loss of native vegetation and habitat. A detailed description of how each of these landscapes is derived from the NEPA Characterization Report (PNNL-6415) and from the HCRMP.

The cultural setting of the area of potential effect for this EA is derived from PNNL-19381, *Cultural Resources Review for Closure of the Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill, 600 Area, Hanford Site, Benton County, Washington, HCRC# 2010-600-018* (May 2010). A large portion of the project area is located just south of the 200 East and 200 West Areas, two of the original Hanford Site areas established for the Manhattan Project in 1943. Army Loop Road, also called Valley Road, was constructed by the U.S. Army Corps of Engineers shortly after Hanford lands were allocated for use for Manhattan Project operations. The road was constructed just south of the 200 Areas and connected Route 4 South on its east side with Route 11-A, or Hanford-Cold Creek Road, on its west side. Army Loop Road played an important role in the matrix of anti-aircraft artillery (AAA) sites in place from 1950 to 1958. AAA sites were established as air defense systems to protect the reactors and chemical separation plants associated with Manhattan Project operations. Sixteen AAA sites were strategically placed in areas along the North Slope, the Riverlands Area, the 100 Areas, and the 200 Areas. Four of these AAA sites were located along Army Loop Road, just south of the 200 Areas. The road connected these AAA sites with one another and provided an easy avenue for communication and transport. Cultural resources surveys of the portions of the project area and within the vicinity of the project area have located mostly historic era and pre-contact era isolated finds. Ethno-historic documentation indicates that during prehistoric and ethno-historic times, people occasionally hunted in the area; travel occurred along the trail that later became known as the White Bluffs Road, which runs from White Bluffs to Rattlesnake Springs and beyond. A suite of cultural resource reviews addressing Borrow Area C have been conducted, and are listed in Table 3-1.

Table 3-1. Borrow Area C Cultural Resource Review Documentation

Cultural Resource Review Title	Scope	Cultural Resource Document Number
Tank Closure and Waste Management EIS (2007)	Entire Project Scope which includes most of the Central Plateau as well as all of Borrow Area C	HCRC #2007-600-018
ALE Reserve Quarry Borrow Site (2006)	145 acres within Borrow Area C	HCRC #2006-600-008
Haul road to the ALE Reserve Quarry (2005)	149 Acres within Borrow Area C	HCRC #2005-600-012
Area C Sampling (2003)	52 acres within Borrow Area C	HCRC #2003-600-023
Solid Waste EIS Area C (2002)	Borrow Area C (~2,283 acres)	HCRC #2002-600-012

The Hanford Site was predominantly used for travel and migration and likely sheep herding and grazing. Most of the project area of potential effect (APE) was owned by the Northern Pacific Railroad Company under a land patent granted in November 1895. The land was acquired under an 1864 railroad grant for the construction of a railway from Lake Superior to Puget Sound. The remainder of the land covered by the APE was owned by the State of Washington or was free land, with no owners listed. The 1916 Coyote Rapids topographic map depicts the Cold Creek Road just north of the area targeted for silt-loam borrow material. Cold Creek Road is depicted as a dirt road, running approximately west-east, just north of Cold Creek. The 1916 map did not indicate any evidence of permanent historic settlement in the project area,

with the exception of the Benson Ranch located approximately 2.5 mi northwest of the area targeted for silt-loam borrow soil. Maps from the 1943 Metsker's Atlas of Benton County indicate that land ownership in the project area was associated predominantly with public entities such as Northern Pacific Railroad Company, J. M. Coleman Company, the State of Washington, and the United States of America. Private ownership in the area includes Jesse O. Thomas Junior and Ina C. Wenner. Aerial photographs from 1943 depict the project area as largely undeveloped and, given the land ownership in the area, likely used for animal grazing as well as travel.

Pit #6 is located just west of the 300 Area of the Hanford Site. Much of the 300 Area has seen extensive disturbance in conjunction with industrial growth associated with the Manhattan Project and Cold War operations. Prior to 1943, the 300 Area was known to have been utilized by American Indian tribes for camp sites during pre-contact times, particularly in areas adjacent to the Columbia River. Many of the pre contact archaeological resources within the 300 Area are located on the river shoreline on the east side of the 300 Area. The area was also an important location for Euro-American settlers, providing the basis for a developed farming community known as Fruitvale. The 300 Area was also a major part of the Richland Irrigation District; the Richland ditch ran approximately parallel to the 300 Area on the west side of State Route 4. A number of historic sites and isolated finds have also been recorded within the vicinity of the 300 Area, with most of these dating to these earlier agricultural times.

Historically, the area associated with Pit #6 was owned, almost exclusively, by private owners. Northern Pacific Railroad still held land claims from the 1864 railroad grant discussed above, but the area was predominantly privately owned. Private ownership in the area included John D. McCarthy, Olaf T. Melde, Elam D. Young, and Harriet E. Pass. Each of these was sale-cash entries that were all granted in the early 1900s (1911–1918). These early settlers were likely the beginning of what was to become Fruitvale. The 1916 Pasco topographic map shows that the area within the vicinity of Pit #6 saw a boom in development with the installation of numerous roadways and structures not seen on the previous 1880 general land office maps. The name Fruitvale appears on the map, and a number of irrigation ditches/drainages also are depicted, including the Richland ditch, located just west of Pit #6. A number of primary and secondary roadways were constructed along what is now the 300 Area, connecting Fruitvale with Richland to the south. Maps from the 1943 Metsker's Atlas of Benton County indicate that the area that had previously been privately owned now belonged to public entities, including the United States, Benton County, and the Richland Irrigation District. Fruitvale still appears on the map, along with an increase in the number of primary roadways throughout the area. It is apparent that the area witnessed a large degree of development from the previous 1916 U.S. Geological Survey (USGS), especially down toward the city of Richland. On the 1943 map, the Richland ditch is depicted running roughly north-south on the west side of Pit #6, with other minor irrigation ditches/canals branching off it. The increase in the amount of public land associated with the irrigation canals likely highlights the importance that these canals played in the agricultural setting within this area during this period of time.

3.4 Ecological Resources

The Hanford Site contains an array of plant and animal species with a variety of habitat. NRDWL and SWL are highly disturbed portions of the 600 Area of the Hanford Site; very little native vegetation currently is found in the immediate vicinity of these facilities as they have been heavily disturbed during waste disposal operations. Borrow Area C burned during the 24 Command Fire in 2000; the predominant vegetation canopy cover in this area is cheatgrass. Additional details specific to the Hanford Site environment may be found in PNNL-6415 and Chapter 3 ("Affected Environment") of the TC&WM EIS.

For this EA, a specific ecological resources review (ECR) (ECR #2010-600-018) has been prepared to address the closure of NRDWL and SWL. The ECR #2010-600-018 is provided in Appendix D. The state

and federally listed threatened and endangered plant and animal species of potential interest were identified by examining published state and federal resource listings. Priority habitats and flora and fauna species of concern are identified by Washington Department of Fish and Wildlife (2008a, 2008b) and Washington State Department of Natural Resources (2009). Lists of animal and plant species considered endangered, threatened, proposed, or candidate by the USFWS are maintained at 50 CFR 17.11 and 50 CFR 17.12; the list of birds protected under the *Migratory Bird Treaty Act* is maintained at 50 CFR 10.13.

3.5 Transportation

The regional highway network in the vicinity of the Hanford Site consists of several main routes: a DOE-maintained road network within the Hanford Site State Route 240, and State Route 24. At peak periods, commuter traffic is often heavy on all primary routes to and from the Hanford Site, including State Routes 240 and 24. The Washington State Department of Transportation recently widened State Route 240 between the cities of Richland and Kennewick and revised traffic flow to relieve congestion.

Existing roadways provide access to NRDWL/SWL, and are adequate to support the ongoing, intermittent monitoring activities. A paved access road for Borrow Area C was constructed in 2006.

3.6 Human Health and Safety

The DOE records occupational injuries and illnesses in two primary categories pertinent to DOE NEPA analysis:

- Total recordable cases (TRC) are the total number of work-related injuries or illnesses that resulted in death, days away from work, job transfer or restriction, or “other recordable case" as identified in the Occupational Safety and Health Administration (OSHA) Form 300, Log of Work-Related Injury and Illness (OSHA 2007).

- Lost workday cases represent the number of cases recorded resulting in days away from work or days of restricted work activity (DART), or both.

TRC rates for U.S. Department of Energy, Richland Operations Office (DOE-RL) averaged 1.1 cases per 200,000 worker hours during the period from 2003 through 2008, and DART rates averaged 0.5 per 200,000 worker hours. Comparable average rates over the same period for all DOE offices and contractors were 1.6 TRC and 0.7 DART cases per 200,000 worker hours. Rates for construction activities at DOE facilities were slightly higher during the same period, at 1.8 and 0.7 cases per 200,000 worker hours, respectively (DOE/EA-1660F). For comparison, rates for U.S. industry during 2003–2007 were 4.6 TRC and 2.4 DART cases per 200,000 worker hours (BLS 2008). No TRC or DART cases have been documented associated with ongoing NRDWL/SWL monitoring activities.

3.7 Waste Management

As a part of the proposed action, existing permitted waste disposal facilities would be used for disposal of nonhazardous closure debris and potentially hazardous waste generated during closure activities. It is expected that the majority of the waste would be transported to the ERDF at Hanford. ERDF is composed of double-lined cells and can be expanded as necessary to accommodate wastes from environmental remediation activities at the Hanford Site. The facility can accept hazardous waste, low-level radioactive waste, and mixed low-level waste (containing both radioactive and hazardous constituents) that meets the facility’s waste acceptance criteria (HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria)*.

3.8 Aesthetic and Scenic Resources

Hanford Site lies in the Pasco Basin of the Columbia Plateau northwest of the city of Richland, where the Yakima and Columbia Rivers join. The land in the vicinity of Hanford ranges from generally flat to gently rolling (the land in the vicinity of the NRDWL and SWL is generally flat). Rattlesnake Mountain, rising to 1,060 m (3,480 ft) above mean sea level, forms the southwestern boundary of the site. Gable Mountain and Gable Butte are the highest landforms within the site, rising to a height of 329 m (1,081 ft) and 238 m (782 ft), respectively. The Columbia River flows through the northern part of the site, and turning south forms part of the eastern site boundary. White Bluffs, steep whitish-brown bluffs adjacent to the river, are a striking feature of the landscape Hanford facilities can be seen from elevated locations such as Gable Mountain, Gable Butte, Rattlesnake Mountain, and other parts of the Rattlesnake Hills along the western perimeter. Site facilities also are visible from State Routes 240 and 24 and the Columbia River. Because of terrain features, distances involved, the size of Hanford Site, and the size of individual structures, not all facilities are visible from the highways or the Columbia River (refer to Section 3.2.1.2 of the TC&WM EIS)

The landscape adjacent to Hanford consists primarily of rural rangeland and farms. The city of Richland, part of the Kennewick, Pasco, and Richland (Tri-Cities) area, is the only adjoining urban area. Viewpoints affected by DOE facilities are primarily associated with the public access roadways, including State Routes 24 and 240, Horn Rapids Road, Route 4 South, and Stevens Drive; the Columbia River bluffs, and the northern edge of the city of Richland. The Energy Northwest nuclear reactors and DOE facilities are brightly lit at night and are highly visible from many areas. Developed areas are consistent with a Bureau of Land Management (BLM) Visual Resource Management (VRM) Class IV rating, and for the remainder of Hanford VRM ratings range from Class II to Class III. Management activities within Class II and III areas may be seen but should not dominate the view; those in Class IV areas dominate the view and typically are the focus of viewer attention.

Borrow Area C, with the exception of a roadway completed in 2006, is an undeveloped area on the south side of State Route 240. It is generally indistinguishable from the Fitzner-Eberhardt Arid Lands Ecology Reserve, which surrounds it on three sides. Since the 24 Command Fire burned the area in 2000, the original vegetation of the area has changed substantially and it now appears as grassland with little shrub component. The majority of Borrow Area C surface was burned by the recent 2007 Wautoma Wildland Fire. Due to the presence of the road across a portion of the site, Borrow Area C is consistent with a BLM VRM Class II rating. It is readily visible from State Route 240 (located immediately adjacent to Borrow Area C), and Rattlesnake Mountain, about 6.4 km (4 mi) to the south. It is also visible in the distance from Gable Mountain, 12.9 km (8 mi) to the northeast, and Gable Butte, 11.3 km (7 mi) to the north.

3.9 Other Resource Areas

In accordance with DOE's NEPA guidance on development of the Affected Environment section and applying the "sliding scale" approach in this guidance (DOE 2004), DOE has determined that the following resource areas are not as likely to be affected by the proposed action and are therefore presented in less detail.

3.9.1 Air Quality

Air quality within the region in general, and in the immediate vicinity of NRDWL/SWL and Borrow Area C, is generally good with occasional exceptions caused by blowing dust. Atmospheric dispersion is relatively good with infrequent periods of stagnation occurring mostly during winter months. Air quality within Benton County has been designated as being in attainment with all EPA and State of Washington

nonradiological air quality standards. Additional details regarding Hanford Site air quality is provided in Section 3.2.4 of the TC&WM EIS.

3.9.2 Geology and Soils

Hanford lies within the Columbia Basin, which comprises the northern part of the Columbia Plateau physiographic province and the Columbia River flood-basalt geologic province (PNNL-6415). Thus, the extent of the Columbia Basin is generally defined as that area underlain by the Columbia River Basalt Group. Within this region, Hanford lies within the Pasco Basin, a structural and topographic depression of generally lower-relief plains and anticlinal ridges. Elevations across the central portion of the basin and Hanford range from about 119 m (390 ft) above mean sea level at the Columbia River to 229 m (750 ft) above mean sea level across the 200 Areas. The Pasco Basin is bounded on the north by the Saddle Mountains; on the west by Hog Ranch–Naneum Ridge and the eastern extension of Umtanum and Yakima Ridges; on the south by Rattlesnake Mountain and the Rattlesnake Hills; and on the east by the Palouse Slope. Two east-west trending ridges, Gable Butte and Gable Mountain, lie in the central portion of Hanford between the 100 and 200 Areas. These features reflect the eastern extension of Umtanum Ridge into Hanford.

Most of the geologic features visible in the Columbia Basin occurred during the last 18 million years when layers of molten lava began flooding across the Northwest, creating what is now one of the largest continental volcanic provinces. Cataclysmic floods millions of years later cut through the basalt layers. Rattlesnake Mountain is basaltic bedrock that has faulted and been folded in a narrow, asymmetrical anticlinal ridge.

Surface geology across the APE is characterized by flood and wind deposits that occur as dunes that trend in a southwest to northeast direction, along the predominant wind direction. Gravel Pit #6 consists of exposed gravels that were deposited during the Ice Age (Pleistocene) floods from glacial Lake Missoula. The edge of Pit # 6 is characterized by sand dunes consisting of flood deposits that have been reshaped by wind over the past 13,000 years. The stretch of land between Borrow Area C and the NRDWL/SWL is characterized by slow-moving water deposits (slackwater deposits) from the Pleistocene floods. Above these slackwater deposits lay interspersed dunes created from wind-carved flood deposits, similar to those seen at the edges of Pit #6. The area targeted for borrow silt-loam material for the current project falls within the alluvial plain zone within Borrow Area C.

3.9.3 Noise

Because of the distance from general public roads and access, man-made noise is rarely intrusive at the Hanford Site, including NRDWL/SWL and Borrow Area C.

3.9.4 Floodplains and Wetlands

The NRDWL and SWL are approximately 13 kilometers (8 miles) from the Columbia River, and do not lie within a floodplain. No perennial surface-water features, including streams and ponds, have been documented within the boundaries of Borrow Area C. However, portions of the area lie within the probable maximum flood zone associated with Cold Creek (refer to Section 3.2.6.1.4 and Figure 3-11 of the TC&WM EIS for additional details). This ephemeral stream may only contain water after large precipitation or snowmelt events before the water rapidly infiltrates into the subsurface

There are no wetlands located in the vicinity of NRDWL, SWL, or Borrow Area C.

3.9.5 Socioeconomics and Environmental Justice

Activities on the Hanford Site play a substantial role in the socioeconomics of the Tri-Cities. DOE and its contractors comprise the largest single source of employment in the Tri-Cities. Fiscal year (FY) 2006 year-end employment for all DOE contractors was 9,707. In addition to these totals, Bechtel National, Inc., which is responsible for the design, building, and start up of the Waste Treatment Plant, employed 1,647 staff at the end of FY 2006. Based on employee records as of April 2007, over 90 percent of DOE contractor employees live in Benton and Franklin counties (PNNL-6415).

An estimated 160,600 people lived in Benton County and 64,200 lived in Franklin County during 2006, totaling 224,800, an increase of over 17 percent from the Census 2000 figure. During 2006, Benton and Franklin counties accounted for 3.5 percent of Washington's population (PNNL-6415). U.S. Census Bureau data indicate the 2010 population estimate for Benton County has increased to approximately 175,200, and Franklin County is approximately 78,2000 [U.S. Census Bureau website (as of August 9, 2011), "State and County QuickFacts," (http://quickfacts.census.gov/qfd/index.html].

Population estimates and percentages by race for Benton, Franklin, Grant, Adams, and Yakima counties and within the 80-km (50-mile) radius of the Hanford Site from the 2010 Census indicate Asians and individuals of Hispanic origin from Benton and Franklin counties represent lower and higher proportions of the population, respectively, than in the State of Washington as a whole.

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority and low-income populations. Minority persons are those who identify themselves as Hispanic or Latino, Asian, Black or African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or multiracial (with at least one race designated as a minority race under CEQ guidelines) (refer to TC&WM EIS, Appendix J). CEQ recognizes that many minority and low-income populations derive part of their sustenance from subsistence hunting, fishing, and gathering activities (sometimes for species unlike those consumed by the majority population) or depend on water supplies or other resources that are atypical or are used at different rates than they are by other groups. These differential patterns of resource use are to be identified where practical and appropriate.

American Indians of various tribal affiliations live in the greater Columbia Basin, and several rely at least partly on natural resources for subsistence. For example, there is some dependence on natural resources for dietary subsistence by some members of the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Confederated Tribes and Bands of the Yakama Nation. The Wanapum also are historical residents of the Hanford Site. Although not signatory to any treaty with the United States and therefore not a federally recognized Tribe; the Wanapum and their interests in the area have been acknowledged. American Indian tribes have historically lived on what is now Hanford and continue to live adjacent to the site. They fish on the Columbia River and gather food resources near Hanford. Some tribes are also recognized to have cultural and religious ties to the site.

3.9.6 Greenhouse Gases

Executive Order 13423, 'Strengthening Federal Environmental, Energy, and Transportation Management' (January 29, 2007; 72 FR 3919) calls for Federal agencies to improve energy efficiency and reduce greenhouse gas emissions of the agency, through reduction of energy intensity by (i) 3 percent annually through the end of FY 2015, or (ii) 30 percent by the end of FY 2015, relative to the baseline of the agency's energy use in FY 2003. On October 5, 2009, Executive Order 13514 was signed, establishing an integrated strategy towards sustainability in the Federal government and making reduction of greenhouse gas emissions a priority for agencies.

Greenhouse gas emissions in the Hanford region include carbon dioxide from multiple sources, including the burning of natural gas and fuel oil for home and commercial heating and the use of gasoline and diesel fuel to power automobiles, trucks, construction equipment, and other vehicles. Generation of electricity results in carbon dioxide emissions in parts of the State of Washington and the United States. In the region near Hanford, most of the electricity (97 percent) is supplied by a combination of hydroelectric dams, nuclear power plants, and wind turbines. These types of power production generate little carbon dioxide (Section 6.5.3, TC&WM EIS).

4 Environmental Consequences and Mitigation

The environmental consequences described in this section would result principally from closure of NRDWL and SWL. Potential impacts in the environs of Hanford as a result of implementing the proposed action, Partial RHD or Complete RHD alternatives, are described in the following sections.

The No Action alternative would result in continued monitoring of the non-operational landfills with no barrier installation at NRDWL or SWL, nor activity at Borrow Area C or Pit #6. Thus, none of the environmental impacts associated with the proposed action, or Partial RHD or Complete RHD, would occur. The pervious, temporary operational cover of both landfills was never intended to keep water out with the primary cover functions being aesthetics, mitigation of blowing debris, and minimization of animal intrusion into the waste. The coarse operational cover over both landfills currently allows atmospheric water to percolate into both landfills, which would eventually lead to eventual container degradation (i.e., corrosion) and could eventually lead to more vadose zone and groundwater contamination. Because the surface of NRDWL/SWL is disturbed and the majority of Borrow Source C has been burned, both areas contain a large percentage of invasive plant species which may continue to inhibit re-establishment of native vegetation. No transportation impacts would be incurred. The potential for continued unmitigated migration of contaminants from the landfills would exist, but as noted in Section 3.1 contaminant concentrations (already well below levels of concern) are decreasing with time. The No Action alternative is not discussed further.

4.1 Land Use

Property associated with NRDWL and SWL, and Borrow Area C has been designated as Conservation (Mining) (refer to Section 1.4.4 for definition). This designation was provided in the 1999 DOE ROD for the HCP EIS (64 FR 61615), as well as in the 2008 Amended ROD for the HCP EIS (73 FR 55824).

4.1.1 Proposed Action

4.1.1.1 NRDWL/SWL

The proposed action identifies an impacted area of ~130 ac for NRDWL/SWL (DOE 2010). The current land use (i.e., disposal location for nonradioactive Hanford wastes) and land use designation [i.e., Conservation (Mining)] would not change.

4.1.1.2 Borrow Area C

As noted previously (refer to Section 1.3.2) for this revised EA, the analysis of borrow material for barrier construction considers the use of the Hanford Site's Borrow Area C, consistent with the land use designation [i.e., conservation (Mining)] established in the in the ROD for the HCP EIS. However after consideration of Tribal concerns voiced during several 2011 consultations on this EA, DOE intends to conduct a separate future NEPA review to analyze impacts of using Borrow Area C and other borrow sources located on the Hanford Site. This future NEPA document will be completed before using any fine-grained borrow source material for engineered barrier construction at NRDWL/SWL.

It is expected that less than 2 percent (45 ac) of the entire Borrow Area C would be required for capping NRDWL/SWL. Approximately 450,000 yd^3 of fine-grained soil would be removed, and transported to NRDWL and SWL. The current land use and land use designation [i.e., Conservation (Mining)] would not change. Details on additional NEPA documentation associated with Borrow Area C may be found in Appendix E.

4.1.1.3 Pit 6

Approximately 12,000 yd^3 of 4-in. minus pit run gravel would need to be extracted from an onsite pit or from an offsite commercial source. For purposes of analysis, this EA considers an onsite source; Pit #6. This would require the expansion of Pit #6 to approximately half an acre (and 15 ft. deep). Environmental review of obtaining gravel borrow materials from existing active borrow pits and quarries on the Hanford Site (including Pit #6) was addressed in DOE/EA-1403, *Use of Existing Borrow Areas, Hanford Site, Richland, Washington* (October 2001). A Finding of No Significant Impact was issued on October 10, 2001. The current land use and land use designation [i.e., Industrial (exclusive)] would not change.

4.1.1.4 Mitigation

Specific mitigation activities could include grading, recontouring, and revegetation. Additionally, soil stabilization techniques used around sites to contain wind erosion and application of wetting agents for dust suppression could be conducted. Additional mitigation may be identified in the future NEPA analysis of use of Borrow Area C and other borrow sources located on the Hanford Site.

4.1.2 Alternatives

Alternatives to the proposed action are Partial RHD and Complete RHD.

4.1.2.1 Partial RHD

Existing borrow sites or ERDF expansion soil stockpiles could be used for fill to support Partial RHD. Further, land disturbance beyond the existing footprint of NRDWL/SWL would be expected to occur as a result of stockpile and deep excavation mining stability requirements.

4.1.2.2 Complete RHD

Existing borrow sites or ERDF expansion soil stockpiles could be used for fill to support Complete RHD. Further, large areas (several hundred additional acres) of land disturbance beyond the existing footprint of NRDWL/SWL would be expected to occur as a result of stockpile and deep excavation mining stability requirements.

4.2 Water Quality

4.2.1 Proposed Action

4.2.1.1 NRDWL/SWL

The current operational covers were never intended to keep water out of the disposal sites. The installation of an ET barrier is expected to stop or limit the leaching of contaminants from NRDWL/SWL source material to the underlying vadose zone and groundwater. In addition, the ET barrier also results in reduced deep vadose zone percolation which retards further movement of contaminants already within the vadose zone. Furthermore, one of the primary reasons for installing an engineered ET barrier is to minimize future leachate formation by stopping or limiting the amount of percolation that comes into contact with the waste. Any incremental increase attributed to NRDWL and/or SWL releases to existing plumes has been evaluated by examining current and future expected groundwater conditions by utilizing existing groundwater monitoring data and predictive computer simulations (with input data from the Hanford Prototype Barrier, the Lysimter Test Facility, and natural analogue soils). It is expected that with a barrier in place future releases from NRDWL/SWL would be minimal. Piepho and Benecke (2007) found the following regarding engineered surface barriers:

- Surface barriers significantly protect groundwater from vadose zone contaminants that are from the surface down to approximately 30 meters (100 feet)
- Surface barriers delay travel times of vadose zone contaminants to the groundwater
- Surface barriers decrease the peak concentrations of contaminants that make it to groundwater.

The presence of chemicals disposed of in NRDWL and SWL are not expected to substantially impact water quality on the Hanford Site. NRDWL (Table 1) and SWL were considered in the cumulative impacts addressed in the TC&WM EIS. Section 6.3.6, "Water Resources" concludes:

> "Ongoing and future actions to cleanup the Central Plateau, as well as individual facility D&D actions, combined with actions associated with the *TC & WM EIS* alternative combinations (see Chapter 4, Section 4.4.5), are not expected to contribute to direct cumulative impacts on water resources."
>
> And
>
> "Ongoing and future DOE actions, including many associated with the *TC & WM EIS* alternative combinations, would have a positive, short-term and long-term effect on water resources. Site-wide cleanup and closure actions and facility D&D would remove and immobilize contaminants in the Hanford vadose zone and prevent or delay their entry into the groundwater and ultimately to the Columbia River."

Therefore, the proposed action (barrier installation) is intended to further reduce the small, incremental contribution of NRDWL chemicals potentially impacting groundwater to the entire inventory of chemicals addressed in the TC&WM EIS cumulative impacts.

4.2.1.2 Borrow Area C

Excavation activities taking place on the surface at Borrow Area C would be expected to have little to no impact to groundwater.

4.2.1.3 Mitigation

Final installation of the barrier would provide mitigation of environmental impacts to groundwater.

4.2.2 Alternatives

4.2.2.1 Partial RHD

Removal of potential source contamination to the groundwater would be expected to have a net positive impact in the long-term.

4.2.2.2 Complete RHD

Removal of potential source contamination to the groundwater would be expected to have a net positive impact in the long-term.

4.3 Cultural and Historical Resources

A cultural resources review (CRR, PNNL-19381) has been prepared to address the closure of NRDWL and SWL. That review is included in Appendix A.

The APE in the CRR includes four main areas of interest: 1) the NRDWL/SWL area, 2) the area targeted for silt-loam borrow soil (Area C), 3) Pit #6, and 4) Army Loop Road. In accordance with 36 CFR 800, the Washington State Historic Preservation Office, Yakama Nation, Nez Perce Tribe, Wanapum, Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Colville Reservation were notified of the APE on March 8, 2010. A cultural resources field inventory of all unsurveyed portions of the project APE was completed between March 16 and March 24, 2010. The inventory included documenting the Army Loop Road on a Historic Property Inventory form and updating two previously recorded anti-aircraft artillery sites (45BN1052 and HT-92-030) eligible for the National Register of Historic Places.

The National Register of Historic Places evaluation of Army Loop Road (PNNL-19381) determined that Army Loop Road is not eligible as a contributing property to the Manhattan Project/Cold War Era Historic District. Project activities will result in an adverse effect to this property because they will cause direct impacts to the property. By documenting Army Loop Road on a Historic Property Inventory form, all mitigation has been completed in accordance with DOE/RL-97-56, *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan.* Archaeological sites 45BN1052 and HT-94-030 will not be adversely affected by project activities because they will be avoided.

4.3.1 Proposed Action

4.3.1.1 NRDWL/SWL

No cultural or historic resources are known to be directly associated with NRDWL/SWL (PNNL-19381).

4.3.1.2 Borrow Area C

As noted in Table 3-1 and Section 4.3, a CRR has been prepared to address the closure of NRDWL and SWL and included Borrow Area C (the CRR is provided in Appendix A). Additionally, an existing MOA was amended to address borrow source material from Borrow Area C (MOA-2, Appendix B). In addition, an attendant draft implementation plan is provided in Appendix C.

Borrow Area C is located within the National Register of Historic Places-eligible traditional cultural property known by Native American Tribes as *Laliik*, portions of which are on the Hanford Site. DOE, in consultation and cooperation with other agencies, has prepared the final proposed amended MOA (Appendix B). Therein, DOE has determined that excavation activities at Borrow Area C will result in an adverse effect to National Register-eligible historic property (i.e., *Laliik)*. Potential adverse effects include viewshed impacts as well as loss of native vegetation and habitat.

There is a reasonable likelihood that archaeological sites are located within Area C (PNNL-19381). However, any sites are likely to be buried, as field reconnaissance failed to locate any on the surface. Little is known about the pre-contact use of the Cold Creek Valley; thus, any sites located there would provide an opportunity to gain new knowledge about prehistoric life. Further, if campsites or village sites were found, human remains and possibly cemeteries might also be located there.

4.3.1.3 Mitigation

Proposed mitigation associated with cultural resources is addressed in the CRR, and the MOA/draft implementation plan (Appendices A, B and C, respectively). As discussed therein, some proposed mitigation measures include:

- Complete culturally relevant native plant re-vegetation strategy within 12 months of signing MOA
- Update habitat quality determination for the 45-acre portion used within 6 months of signing MOA
- Develop long-term reclamation plans within 12 months of signing MOA

- Implement long-term reclamation that would include topographic re-contouring and permanent native plant cover
- Implement five-year annual monitoring plan to confirm success of reclamation of health and wildlife
- Coordinate construction schedule with Tribes to avoid interference with Tribal ceremonies
- Coordinate future cultural and ecological surveys and revegetation efforts with Tribes
- Implement interim soil stabilization controls through the use of soil tackifiers and dust suppressants
- Monitor viewshed on a seasonal basis
- Conduct routine periodic cultural resource monitoring with tribal participation during excavation. All activities will adhere to the "Inadvertent Discovery of Human Remains protocols and Unanticipated Discovery Protocols" in compliance with the *Native American Graves Protection and Repatriation Act* (NAGPRA) and implementing regulations (43 CFR Part 10)
- Provide quarterly electronic reporting to all parties on the implementation of all MOA/Implementation Plan stipulations as well as providing annual reporting to all parties on the implementation and results of monitoring revegetation/reclamation.

Additionally, preferential expansion of Army Loop Road would be implemented to mitigate impacts to archaeological sites (refer to Appendix A).

4.3.2 Alternatives

4.3.2.1 Partial RHD

No additional cultural resources would be expected to be identified as a result of Partial RHD. None have been identified associated with NRDWL/SWL. Cultural resources have been addressed for ERDF in ERDF NEPA Roadmap, DOE-RL-94-41, and for potential borrow sites in the aforementioned DOE/EA-1403, *Use of Existing Borrow Areas, Hanford Site, Richland, Washington*.

4.3.2.2 Complete RHD

No additional cultural resources would be expected to be identified as a result of Complete RHD. See Section 4.3.2.1.

4.4 Ecological Resources

Five areas of interest were evaluated in a specific ECR (ECR #2010-600-018, Appendix D). Those five areas were: (1) NRDWL/SWL; (2) and NRDWL/SWL support area; (3) 45 acres within the 145 acre initial borrow site development area of Borrow Area C; (4) Army Loop Road between Beloit Avenue and the northeast corner of the NRDWL; and (5) existing Hanford Site gravel pit #6.

4.4.1 Proposed Action

4.4.1.1 NRDWL/SWL

Key findings of the aforementioned ECR #2010-600-018 (Appendix D) for NRDWL/SWL are summarized as follows.

- No plant or animal species protected under the federal *Endangered Species Act* (ESA), candidates for such protection, or species listed by the Washington state government as threatened or endangered were observed on or in the vicinity of the NRDWL/SWL closure project areas of potential effect. There is some native or natural habitat present in the vicinity of the NRDWL and SWL.

- The entire support area beyond the NRDWL/SWL footprint is a part of the Washington State Natural Heritage Program element occurrence of the bitterbrush/Indian rice sand dune complex on the Hanford Site. Element occurrences are classified by DOE as level IV biological resources, the highest level on the Hanford Site; such resources justify preservation as the primary management option.
- A support area (e.g., for equipment storage and laydown, trailers) could impact ~106 acres. Development of this area would substantially adversely affect the bitterbrush/Indian ricegrass sand dune complex element occurrence.
- There is a potential for nesting and/or migratory bird species to be present especially during the nesting season of migratory birds on the Hanford Site, generally March 15 through July 31.

Ground-disturbing activities, such as those associated with the use of heavy equipment, may damage habitat and transport, spread, and increase noxious weedy species. Such actions, with appropriate mitigation (refer to Appendix D) would not be expected to result in adverse impacts to protected species, priority habitats, or other biological resources of concern.

4.4.1.2 Borrow Area C

The aforementioned ECR #2010-600-018 for NRDWL/SWL included Borrow Area C; as noted the ECR is provided in Appendix D. The potential impacts identified in Section 5.3.1 for NRDWL/SWL also apply to Borrow Area C, and are not repeated here. Refer to Appendix D for additional details.

4.4.1.3 Mitigation

Potential mitigation activities are identified in Appendix D. Key recommendations include:

- The proposed support area adjacent to NRDWL/SWL (e.g., for equipment storage and laydown) would require a project-specific Biological Mitigation Plan, which would address mitigation alternatives of avoidance, minimization, rectification, and/or compensation (additional discussion provided in Appendix D).
- All sites would be revegetated with native plants per BRMaP resulting in an enhanced ecological resource compared to present-day site conditions. Furthermore, the success of these revegetation efforts will be evaluated based on plant/animal compatibility until revegetation goals are met.
- The stabilized dune areas near Highway 240 will be avoided for Borrow Source C development.
- Resurvey areas, as appropriate, during the nesting/growing season prior to commencement of ground disturbing work
- Avoid, where feasible, off-road travel and travel beyond the project footprint to minimize transport of weed seeds.

Additionally, preferential expansion of Army Loop Road would be implemented to mitigate impacts to habitat (refer to Appendix D).

4.4.2 Alternatives

4.4.2.1 Partial RHD

Potential ecological impacts associated with Partial RHD would be expected to be similar to, or slightly greater than, those associated with the proposed action. A greater land surface area would be disturbed, with attendant disturbance of existing native flora and fauna that are outside the current disturbed area that contains mostly non-native plant species (e.g., cheatgrass).

4.4.2.2 Complete RHD

Potential ecological impacts associated with Complete RHD would be expected to be greater than those associated with Partial RHD (and thus greater than those associated with the proposed action). A substantially greater land surface area would be disturbed (several hundred acres), with attendant disturbance of existing native flora and fauna that are outside the current disturbed area that contains mostly non-native plant species (e.g., cheatgrass).

4.5 Transportation

Potential impacts on traffic and transportation associated with closure activities are described in the following section.

4.5.1 Proposed Action

4.5.1.1 NRDWL/SWL

Heavy equipment, such as trucks, would be used to haul barrier material to NRDWL and SWL. For this EA, the barrier materials would be transported from Area C (for silt-loam), as well as some other location [e.g., pea gravel could be obtained from existing borrow pit(s) on site or from a commercial distributor in Benton/Franklin/Yakima County]. Miscellaneous wastes generated during closure activities could be transported from NRDWL/SWL to an appropriate disposal facility on the Hanford Site (ERDF, Central Waste Complex), or to offsite, non-hazardous disposal facilities.

Accident, injury, and fatality statistics from traffic accidents involving transport of construction materials and wastes were compiled in Saricks and Tompkins (1999). In that document, the composite accident, injury, and fatality rates for heavy-combination trucks on all road types in the State of Washington were 2.05E-07 accidents/truck-km, 1.4E-07 injuries/truck-km, and 5.3E-09 fatalities/truck-km. The proposed action could result in approximately 1,000,000 truck-km. Based on the aforementioned conversion rates, this amount of traffic would not be expected to result in an accident, injury, or fatality (0.2 accidents, 0.1 injuries, and 0.005 fatalities). More recent State of Washington (calendar year 2009) crash data are presented in Table 4-1. None of the crash facts are associated with Hanford Site operations; these more recent data support minimal transportation impacts associated with the proposed action.

Table 4-1. State of Washington 2009 Transportation Crash Statistics

30 Large Trucks Involved in Fatal Crashes[a]
31 Fatalities in Crashes Involving Large Trucks[a]
1,131 Large Trucks Involved in Non-Fatal Crashes[b]
106 Large Trucks Involved in Injury Crashes[b]
125 Injuries in Crashes Involving Large Trucks[b]
1,025 Large Trucks Involved in Towaway Crashes[b]
29 Large Trucks Involved in Hazmat (HM) Placard Crashes[b]

From: http://ai.fmcsa.dot.gov/CrashProfile/CrashProfileMainNew.asp?STATE_ID=WA&dy=2009

a. Fatality Analysis Reporting System (FARS).

b. Motor Carrier Management Information System (MCMIS).

It is estimated that approximately 16,000 truck trips would be required to transport barrier material from Borrow Area C to NRDWL/SWL. Assuming approximately 10 mi (16 km) per truck trip, this equates to 2.6 E4 truck-km. Multiplying by 2.05E-07 accidents/truck-km, 1.4E-07 injuries/truck-km, and 5.3E-09 fatalities/truck-km (Saricks and Tompkins 1999), the proposed action would result in a calculated 0.005 accidents; 0.004 injuries; and 0.0001 fatality. A very small increase in these numbers could be expected from the additional transportation of material from Pit #6.

4.5.1.2 Borrow Area C

As noted in Section 4.5.1.1, it is estimated that approximately 16,000 truck trips would be required to transport barrier material from Borrow Area C to NRDWL/SWL. No (i.e., less than 1) accidents, injuries or fatalities would be expected.

4.5.1.3 Mitigation

The potential transportation consequences from the proposed action would be mitigated by limiting transportation routes to minimal distances on public roadways (e.g., only crossing State Route 240). The already low accidents, injuries or fatalities estimates would be expected to be less, because the proposed actions do not occur on public roadways. Occasional interference with normal traffic flow onsite or offsite could be mitigated by appropriate administrative controls (e.g., warning signs and traffic markers) and scheduling truck traffic during nonpeak hours.

4.5.2 Alternatives

4.5.2.1 Partial RHD

Transportation impacts for Partial RHD would be expected to be greater than those for the proposed action. Additional trips to remove contaminated soil from NRDWL/SWL and associated transportation to ERDF, and trips from ERDF to NRDWL/SWL with backfill material would increase the overall truck transportation mileage and therefore increase the potential for accidents.

It is estimated that approximately 115,000 truck trips would be required to transport contaminated material from NRDWL/SWL to ERDF, and approximately 83,000 truck trips to transport backfill material from ERDF to NRDWL/SWL; a total of 198,000 truck trips. Assuming approximately 10 mi (16 km) per truck trip, this equates to 3.2 E6 truck-km. Multiplying by 2.05 E-07 accidents/truck-km, 1.4E-07 injuries/truck-km, and 5.3E-09 fatalities/truck-km (Saricks and Tompkins 1999), the proposed action would result in a calculated 0.66 accidents; 0.45 injuries; and 0.02 fatality. A very small increase in these numbers could be expected from the additional transportation of material from Pit #6.

4.5.2.2 Complete RHD

Transportation impacts for Complete RHD would be expected to be greater than those for Partial RHD. Additional trips to remove contaminated soil from NRDWL/SWL and associated transportation to ERDF, and trips from ERDF to NRDWL/SWL with backfill material would increase the overall truck transportation mileage and therefore increase the potential for accidents.

It is estimated that approximately 1,270,000 truck trips would be required to transport contaminated material from NRDWL/SWL to ERDF, and approximately 889,000 truck trips to transport backfill material from ERDF to NRDWL/SWL; a total of approximately 2.2 E6 truck trips.. Assuming approximately 10 mi (16 km) per truck trip, this equates to 3.5 E7 truck-km. Multiplying by 2.05 E-07 accidents/truck-km, 1.4E-07 injuries/truck-km, and 5.3E-09 fatalities/truck-km (Saricks and Tompkins), the proposed action would result in a calculated 7.2 accidents; 4.9 injuries; and 0.2 fatality.

4.6 Human Health and Safety

4.6.1 Potential Radiological/Hazardous Chemical Contamination, Proposed Action

4.6.1.1 NRDWL/SWL

Only small amounts of radiological materials, if any, are expected to be encountered during closure activities; such radiological contamination is attributed to upgradient groundwater sources (*Remedial Investigation Report for the 200-PO-1 Groundwater Operable Unit* [DOE/RL-2009-85, Draft A]). This radiological contamination would be present during groundwater sampling activities (i.e., during extraction of groundwater samples for chemical analysis) and installation of wells (i.e., contaminated cuttings or other investigation derived wastes) but is not related to NRDWL/SWL wastes. Since closure activities are associated with installation of a barrier, minimal intrusion into disposed hazardous waste is anticipated. Therefore, only some small amounts of hazardous materials would be expected to be encountered during closure of NRDWL and SWL.

4.6.1.2 Borrow Area C

No radiological or hazardous chemical contamination would be expected to be encountered during retrieval of material from Borrow Area C.

4.6.1.3 Mitigation

Appropriate measures would be taken to protect workers during the construction operations and to contain any waste materials generated for disposal at permitted facilities. Examples would include appropriate personnel training and protective clothing during barrier construction.

4.6.2 Potential Radiological/Hazardous Chemical Contamination, Alternatives

4.6.2.1 Partial RHD

No additional radiological materials would be expected to be encountered during Partial RHD when compared to the proposed action.

There would be potential exposure to previously disposed hazardous/toxic (e.g., asbestos) wastes in NRDWL/SWL during retrieval operations. As noted in Tables 2-1 and 2-2, workers could be exposed to toxic organics, metals and asbestos.

4.6.2.2 Complete RHD

There could be an increased potential to encounter radiological materials during Complete RHD when compared to Partial RHD or the proposed action. Complete RHD involves excavation to groundwater, which does exhibit some radiological contamination (not originated from NRDWL or SWL; refer to Section 4.6.1.1)

There would be even greater potential exposure to hazardous chemicals during Complete RHD retrieval operations when compared to Partial RHD. Removal of previously disposed materials, as well as a large quantity of soil beneath the landfills) provides a larger source term for worker exposure.

4.6.3 Potential Industrial Hazards, Proposed Action

4.6.3.1 NRDWL/SWL

The closure activities are estimated to require an additional 100,000 labor hours. DOE construction experience has resulted in 1.8 cases of recordable injury/illness per 200,000 labor hours during 2003 to 2008 (DOE/EA-1660F). For perspective the 1.8 recordable injury/illness per 200,000 labor hours

extrapolates to 0.9 injury/illnesses per the 100,000 labor hours estimate. Thus, no (i.e., 0.9, or less than 1) injuries or occupational illness are expected to occur as a result of implementing the proposed actions.

4.6.3.2 Borrow Area C

Refer to Section 4.6.3.1 for impacts associated with industrial hazards.

4.6.3.3 Mitigation

Personnel would receive appropriate training for the industrial hazards that may be present during construction and operational phases of the proposed action. Equipment appropriate for specific tasks would be used. There would be a site-specific health and safety plan written for all tasks associated with the proposed closure activities.

4.6.4 Potential Industrial Hazards, Alternatives

4.6.4.1 Partial RHD

It would be expected that while the industrial hazards encountered during Partial RHD would be similar to those associated with the proposed action, the potential impacts would be greater since the magnitude of work and duration of potential exposure to industrial hazards are greater. For example, the number of truck trips associated with Partial RHD is greater than with the proposed action (refer to Section 4.5.2.1), thus increasing the frequency of routine maintenance for trucks, and a greater potential for minor worker injuries (e.g., abrasions resulting from repair work).

4.6.4.2 Complete RHD

Similar to the discussion in Section 4.6.4.1, the potential for minor worker injuries would be expected to increase for Complete RHD (compared to Partial RHD) primarily because of increased truck trip requirements and duration of the project (refer to Section 4.5.2.2).

4.7 Waste Management

4.7.1 Proposed Action

4.7.1.1 NRDWL/SWL

It would be expected that the majority of nonhazardous closure debris and any potentially hazardous waste generated during closure activities associated with the proposed action would be transported to ERDF at Hanford. The facility can accept hazardous waste, low-level radioactive waste, and mixed low-level waste (containing both radioactive and hazardous constituents) that meets the facility's waste acceptance criteria. Wastes would be sampled and characterized as necessary to ensure appropriate transport and disposal criteria are met. The small (less than 1 ton) of wastes expected to be generated during implementation of the proposed action would be manageable within the existing capacity of ERDF. For perspective, the ERDF received over 2,300,000 tons of waste in fiscal year 2010 and over 790,000 tons in fiscal year 2009.

Liquid wastes, primarily consisting of waste water and sanitary sewage generated using portable facilities would be generated during closure activities, and likely would be collected by a commercial vendor and sent to the City of Richland's Publicly Owned Treatment Works for processing.

4.7.1.2 Borrow Area C

Only a small amount of waste (e.g., rags, construction debris, etc.) would be expected to result from retrieval of material from Borrow Area C. This waste would be appropriately packaged and disposed of at existing Hanford Site facility (s).

Liquid wastes, primarily consisting of waste water and sanitary sewage generated using portable facilities would be generated during closure activities, and likely would be collected by a commercial vendor and sent to the City of Richland's Publicly Owned Treatment Works for processing.

4.7.1.3 Mitigation

Consistent with the requirements and guidance of regulations and executive orders, including the *Pollution Prevention Act of 1990*, DOE incorporates pollution prevention and waste minimization practices in construction activities. Examples of mitigation include:

- Equipment or technology selection or modification, process or procedure modification, reformulation or redesign of products, substitution of raw material, and waste segregation.
- Efficiency in the use of raw materials, energy, water, or other resources.
- Recycling to reduce the amount of waste materials and pollutants destined for release, treatment, storage, and disposal.

4.7.2 Alternatives

4.7.2.1 Partial RHD

Compared to the approximately 1 ton of waste projected to be generated and disposed of in ERDF for the proposed action (refer to Section 4.7.1.1), a substantial amount (approximately 2.1 million tons of contaminated material and soil) would be removed from NRDWL/SWL in the Partial RHD alternative for transport to ERDF for disposal. Ongoing waste management activities at Hanford would be evaluated to determine the need for ERDF expansion to accommodate NRDWL/SWL wastes.

4.7.2.2 Complete RHD

Compared to the approximately 1 ton of waste projected to be generated and disposed of in ERDF for the proposed action (refer to Section 4.7.1.1), a much greater amount (approximately 24 million tons of contaminated material and soil) would be removed from NRDWL/SWL in the Complete RHD alternative for transport to ERDF for disposal. Ongoing waste management activities at Hanford would be evaluated to determine the need for ERDF expansion to accommodate NRDWL/SWL wastes.

4.8 Aesthetic and Scenic Resources

4.8.1 Proposed Action

4.8.1.1 NRDWL/SWL

Closure activities at NRDWL and SWL proposed in this EA are not expected to adversely impact visual resources by installation of a barrier. Because of the remoteness of the area, visual impact from outside the Hanford boundary is minimal. However, the proposed barrier could be visible to some potential users from locations within the Hanford Reach National Monument lands. In fact, the proposed action could enhance current aesthetic and scenic resources by establishing several native species in an area that is sparsely vegetated with both invading and non-native plant species.

4.8.1.2 Borrow Area C

Visual impacts pertaining to Area C have been identified in the aforementioned amended MOA (Appendix A). Potential aesthetic and scenic resource impacts associated with development of Borrow Area C were addressed in the HSW EIS and the TC&WM EIS (refer to Appendix E). The operation of the borrow pit would not be visible from vehicles using State Route 240 from the southwest until they are approximately three-quarters of the way past the site. The reason for this restriction in the viewshed is the elevated terrain adjacent to State Route 240, separating Area C from the road. Travelers coming from the northwest on State Route 240 would notice the site sooner and would be able to observe the activities in passing. The pits, themselves, would be located a minimum of 152 m (500 ft) from State Route 240.

As noted in the HSW EIS, the Area C borrow pits would be within the northerly viewshed from Rattlesnake Mountain (*Laliik*). An aerial schematic of the viewshed showing Borrow Area C looking from above *Laliik* is shown in Figure 4-1. Figures 4-2 through 4-4 provide a ground-level view perspective of Borrow Area C from several locations on top of *Laliik.* Development of the entire Borrow Area C would result in the BLM visual resource management rating temporarily changing from Class II to IV (HSW EIS). However, the development of Borrow Area C for the NRDWL/SWL closure involves small size (45 acres), shallow depth (less than 30 ft) and short duration of excavation activities and reclamation activities that include topographic recontouring and site revegetation with native plant species (per requirements set forth in the BRMaP). Therefore, no permanent change in the BLM visual resource management rating is expected. In fact, the proposed action could enhance current aesthetic and scenic resources by establishing several native species in an area that is sparsely vegetated with both invading and non-native plant species due to recent fires that have devastated much of the native flora.

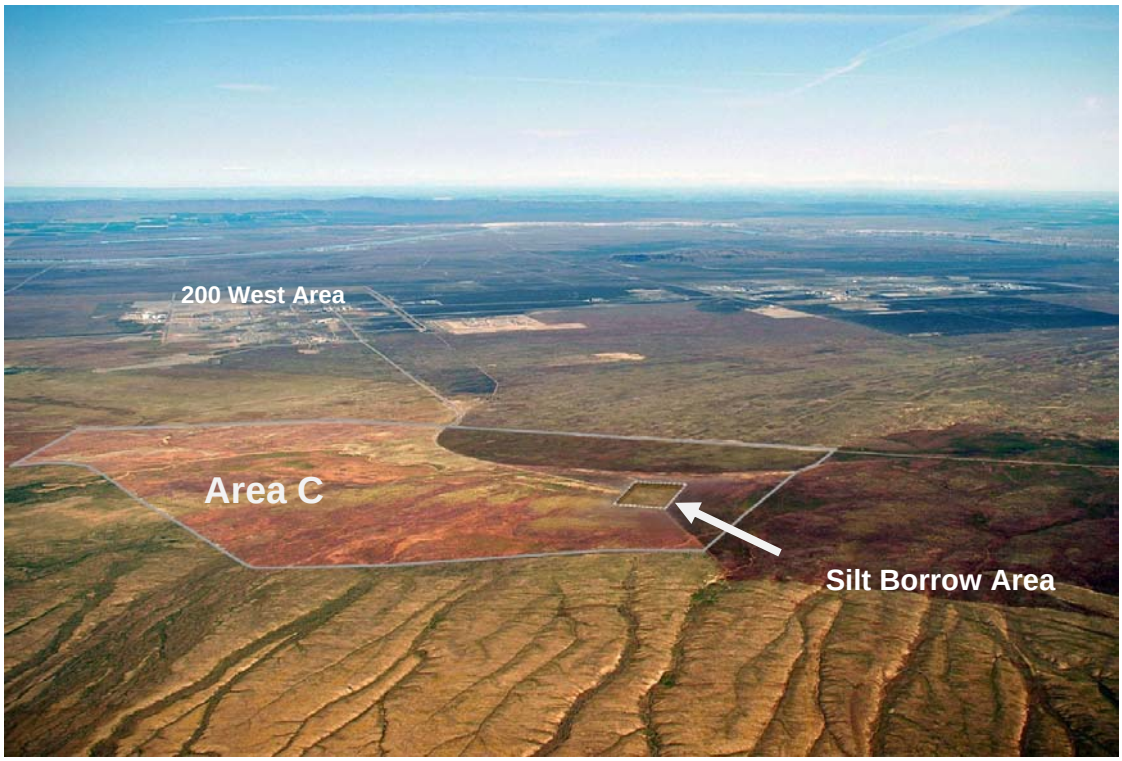


Figure 4-1. Aerial Schematic of Viewshed including Borrow Area C Looking from above *Laliik*

Figure 4-2. View from Top of *Laliik* (from East of the Communication Tower) Overlooking Borrow Area C (showing Approximate Terminus of Access Road)

Figure 4-3. View from Top of *Laliik* (Looking Northward from East of Figure 4-2 Viewpoint)

Figure 4-4. View from Top of *Laliik* (Looking Northward from Further East of Figure 4-2 Viewpoint)

In the HSW EIS analysis, the operation of the Area C borrow pits for all the Hanford barriers was evaluated, indicating that a maximum of approximately 70 pits would be excavated. As considered in the HSW EIS analysis, during the 12 plus years of the site's operational life, stockpiles of sand, gravel, rock, and silt/loam would be located within 305 m (1,000 ft) of State Route 240. Although the HSW EIS states that the individual borrow pits would be restored when their useful life ends, in actuality, these pits would be reclaimed. The reclamation would include spreading of the saved topsoil from the borrow source activities and re-seeding the area. After extraction of resources from the borrow pit area is complete, the site pit slopes would be re-graded and irregular terrain lines installed to blend the site with the surrounding terrain. Minimal to no permanent adverse aesthetic or scenic impacts would be expected. Refer to Appendix E for additional discussion of potential aesthetic impacts (HSW EIS and TC&WM EIS) to Borrow Area C.

Elk occupying the ALE site are sometimes seen from State Route 240. Operations at Borrow Area C might reduce the likelihood of sighting these animals near Borrow Area C because they might migrate farther away from where they might be seen from the highway as a result of these activities.

4.8.1.3 Mitigation

Fugitive dust associated with development and operation of Borrow Area C is a recognized, potential problem, and, as a result, a program would be undertaken to keep fugitive dust controlled during site development, operation, post-closure, and the interim period between revegetation and actual vegetation establishment.

Upon completion of work, excavations in Borrow Area C would be recontoured and revegetated, thereby lessening the visual impact. Air monitoring would be conducted both up- and down-gradient of the

disturbed areas and the data would be used for a variety of reasons, including iterative feedback into an active particulate suppressant program.

4.8.2 Alternatives

4.8.2.1 Partial RHD

As with the proposed action (Section 4.8.1.1), because of the remoteness of the area, visual impact from outside the Hanford boundary for Partial RHD would be expected to be small. The proposed removal and subsequent cover could be visible to some potential users from locations within the Hanford Reach National Monument lands.

Partial RHD does involve use of Borrow Area C and backfill material that is similar to native material (e.g., spoil piles from ERDF) since a barrier would still be a requirement; therefore, potential visual impacts described for Borrow Area C (Section 4.8.1.2) would be expected to be similar.

4.8.2.2 Complete RHD

Complete RHD would involve larger-scale excavation of several hundred acres at the NRDWL/SWL site (compared to Partial RHD [Section 4.8.2.1]). Such excavations could be achieved by a combination of methods, including open pit mining, sheet pile, benching, etc.

Complete RHD does not involve the use of Borrow Area C (because no barrier is assumed, refer to Section 2.2.3). However, approximately 15 million yd^3 of additional soil (refer to Section 2.2.3) of additional soild would be needed for mining zone stability and fill. The final size of the open pit to complete the RHD would be substantially larger than the original 77 acre footprint from the two landfills due to the stepped-function mining technique used (i.e., benching) to excavate down to approximately 40 meters (130 feet) bgs.

4.9 Other Resource Areas

Activities proposed in this EA are expected to result in environmental consequences similar to those of most routine construction projects encountered at a commercial industrial site. For many types of resources, these impacts are expected to be negligible because of their temporary nature and the remote locations at which the activities would take place. The anticipated impacts on other resources are discussed in the following sections.

4.9.1 Air Quality

Air quality impacts focus on four criteria pollutants: nitrogen dioxide, sulfur dioxide, carbon monoxide and particulate matter with aerodynamic diameters of 10 microns or smaller.

4.9.1.1 Proposed Action

4.9.1.1.1 NRDWL/SWL

Operation of trucks and diesel-powered construction equipment would be expected to introduce quantities of NO_2, SO_2, CO, particulates, and other pollutants to the atmosphere, typical of similar-sized construction projects. These releases would not be expected to cause any air-quality standards to be exceeded at locations that are routinely occupied for any substantial period of time. As needed, dust generated during soil excavation or barrier placement activities and vehicle movement over unpaved areas would be minimized by watering or other dust-control measures. Routine traffic to maintain roads and equipment may occasionally generate dust, depending on wind conditions during transit; however, no substantial air-quality impacts associated with implementing the proposed action would be expected.

4.9.1.1.2 Borrow Area C

Maximum Air Quality Impacts to the Public from Borrow Area C activities were quantified in, and bounded by, Table 5.6 of the HSW EIS. That is, for about 2,288 ac addressed in the HSW EIS, emissions were substantially below (i.e., highest of 36 percent) of ambient air quality standards for NO_2, SO_2, CO, and particulate matter. The HSW EIS data for maximum air quality impacts associated with Borrow Area C are reproduced in Table 4-2.

Table 4-2. Maximum Air Quality Impacts to the Public from Area C (Borrow Pit) Activities (reproduced from HSW EIS)

Pollutant	Averaging Time	Ambient Air Quality Standard ($\mu g/m^3$)	Maximum Air Quality Impacts	
			Maximum Pollutant Concentration ($\mu g/m^3$)	Percent of Standard
PM_{10}	24 hr	150	21	14
	Annual	50	0.19	0.38
SO_2	1 hr	1,000	260	26
	3 hr	1,300	200	15
	24 hr	260	0.44	0.17
	Annual	50	0.0035	0.0070
CO	1 hr	40,000	6,300	16
	8 hr	10,000	3,600	36
NO_2	Annual	100	0.16	0.16

It would be expected that impacts associated with 45 acres would be proportionally less than those for the 2,288 acres.

4.9.1.1.3 Mitigation

DOE could mitigate potential air quality impacts by employing a cadre of techniques, including:

- applying soil fixatives during excavation activities
- use of energy-efficient fuels
- air monitoring would be conducted both up- and down-gradient of the borrow source activities. These data would be used in support of an on-going dust suppressant program that would be active during excavation, post-excavation, and up to site reclamation/revegetation.

4.9.1.2 Alternatives

4.9.1.2.1 Partial RHD

The volume of soil removal (from NRDWL/SWL and ERDF) and vehicular exhaust during transportation activities would be expected to have greater potential impact to air quality when compared to the proposed action.

4.9.1.2.2 Complete RHD

The volume of soil removal (from NRDWL/SWL and ERDF) and vehicular exhaust during transportation activities would be expected to have greater potential impact to air quality when compared to the proposed action due to the magnitude and duration of deep excavation operations.

4.9.2 Geology and Soils

4.9.2.1 Proposed Action

4.9.2.1.1 NRDWL/SWL

Minimal impacts would be expected on geological resources, which consist principally of basalt outcrops, Rupert Sand, and Burbank Loamy Sand, underlain by Ice Age Flood gravels, which are locally abundant.

4.9.2.1.2 Borrow Area C

The quantities of any materials necessary for recontouring involved would be relatively small and are readily available from Borrow Area C.

As noted previously (refer to Section 1.3.2) for this revised EA, the analysis of borrow material for barrier construction considers the use of the Hanford Site's Borrow Area C, consistent with the land use designation [i.e., conservation (Mining)] established in the in the ROD for the HCP EIS. However after consideration of Tribal concerns voiced during several 2011 consultations on this EA, DOE intends to conduct a separate future NEPA review to analyze impacts of using Borrow Area C and other borrow sources located on the Hanford Site. This future NEPA document will be completed before using any fine-grained borrow source material for engineered barrier construction at NRDWL/SWL.

4.9.2.1.3 Mitigation

No additional mitigation measures associated with geological resources are anticipated. Mitigation measures for the borrow material source sites (from Borrow Area C and Pit #6) have been addressed in the HCP EIS. In addition, the thin topsoil would be stockpiled adjacent to the borrow source excavation area. Once the excavation is completed, the topsoil would be spread over the recontoured surface to assist in the revegetation process. Additional mitigation may be identified in the future NEPA analysis of use of Borrow Area C and other borrow sources located on the Hanford Site.

4.9.2.2 Alternatives

4.9.2.2.1 Partial RHD

Impacts associated with Partial RHD would be expected to be greater than those for the proposed action because of the magnitude of materials (contaminated soil hauled to ERDF and backfill material transported from ERDF to NRDWL/SWL; refer to Sections 2.2.2 and 4.5.2.1).

4.9.2.2.2 Complete RHD

Impacts associated with Complete RHD would be expected to be greater than those for Partial RHD because of the magnitude of materials (contaminated soil hauled to ERDF and backfill material transported from ERDF to NRDWL/SWL; refer to Sections 2.2.3 and 4.5.2.2).

4.9.3 Noise

Noise is defined technically as sound that is unwanted and perceived as a nuisance by humans. For protection of the public, WAC 173-60 has established a limit for daytime residential noise levels of 70 decibels (dBA) and a nighttime limit of 50 dBA at industrial site boundaries.

4.9.3.1 Proposed Action

4.9.3.1.1 NRDWL/SWL

Construction and demolition activities would generate noise typical of using heavy equipment and transport of materials. Noise impacts are assessed by establishing regions of influence for residential, commercial, and industrial receptors, with maximum allowable noise levels established for each region (WAC 173-60). Because of the geographically-isolated nature of NRDWL/SWL, all receptors would be located well beyond the applicable "region of influence," within which noise levels are limited to specified levels.

4.9.3.1.2 Borrow Area C

Material for capping would be acquired from Borrow Area C and would result in higher, but localized, noise levels from use of heavy equipment. In the absence of prolonged presence of the public in the vicinity, these noise levels likely would not result in a noticeable impact. Because there are no residential areas in the vicinity, state standards for noise would not be exceeded. No actual human habitations would be located within 10 km (6.2 mi) of the boundary of the Industrial-Exclusive zone surrounding the Borrow Area C borrow thus ensuring that WAC limits would not be exceeded. It is highly unlikely that audible sounds from construction equipment would be detected on the top of Laaik considering a horizontal distance of greater than one mile and a vertical drop of 2-3,000 feet from the proposed 45 acre borrow source area.

4.9.3.1.3 Mitigation

Mitigation actions could include use of hearing protection and noise suppression equipment during construction for standard worker protection. In the event that audible noise could be detected at the top of Rattlesnake Mountain (*Laliik*) during religious ceremonies, there are provisions with the MOA (Appendix B) to mitigate this.

4.9.3.2 Alternatives

4.9.3.2.1 Partial RHD

Potential impacts for Partial RHD would be expected to be similar to or slightly greater than those identified for the proposed action (Section 4.9.3.1.1) due to the magnitude and duration of operations.

4.9.3.2.2 Complete RHD

Potential impacts for Complete RHD would be expected to be greater than those identified for partial RHD (Section 4.9.3.2.1).

4.9.4 Floodplains and Wetlands

4.9.4.1 Proposed Action

4.9.4.1.1 NRDWL/SWL

Due to the isolated location of NRDWL and SWL (approximately 4 miles from the Columbia River and approximately 300 feet higher than the elevation of the Columbia River, and is not within the bounds of the 100-year floodplain), no potential impacts have been identified to floodplains or wetlands.

4.9.4.1.2 Borrow Area C

Due to the location of Borrow Area C (approximately 6 miles from the Columbia River and 400 feet higher than the elevation of the Columbia River, and is not within the bounds of the 100-year floodplain), no potential impacts have been identified to floodplains or wetlands.

4.9.4.1.3 Mitigation

No floodplains or wetlands mitigation activities have been identified due to the location of all sites analyzed.

4.9.4.2 Alternatives

4.9.4.2.1 Partial RHD

Due to the location of NRDWL and SWL, no potential impacts have been identified to floodplains or wetlands.

4.9.4.2.2 Complete RHD

Due to the location of NRDWL and SWL, no potential impacts have been identified to floodplains or wetlands.

4.9.5 Socioeconomics and Environmental Justice

Environmental justice under Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629), is concerned with assessing the extent to which there may be a disproportionate and adverse impact from a proposed action among minority and low-income populations, in which the impacts are notable compared to those experienced by the rest of the population. Adverse impacts are defined as negative changes to the existing conditions in the natural environment (for example, land, air, water, wildlife, vegetation) or in the human environment (for example, employment, health, land use).

4.9.5.1 Proposed Action

For purposes of this analysis, it was estimated that about 200,000 labor hours would be required to complete the proposed actions over the life of the project. The work is expected to be accomplished largely using employees from the local workforce. Total nonagricultural employment in Benton and Franklin Counties is over 100,000 people (Schau 2006), so even if construction creates additional service sector jobs, the total increase in employment as a result of the proposed action would be less than 1 percent of the current employment level.

4.9.5.1.1 NRDWL/SWL

Because access to the Hanford Site is restricted, the potential environmental impacts that may result from the proposed action as described in this EA would be associated with onsite activities and would not be expected to affect populations residing outside Hanford Site boundaries. The proposed activities within

the scope of this EA also would not be reasonably expected to affect onsite workers in an appreciable way. Members of the public or Native American Tribes that come onsite for approved activities are subject to the same safety and protective procedures that apply to authorized onsite workers. The expected environmental impacts associated with the proposed action and alternatives are minimal and would not have the potential to cause disproportionately high and adverse impacts on minority, low-income, or Native American Tribal populations in the vicinity of the Hanford Site.

4.9.5.1.2 Borrow Area C

Native American affiliations near the Hanford Site include Rattlesnake Mountain, Gable Mountain, Gable Butte, and other culturally significant sites with respect to their creation beliefs and cultural heritage. Although the potential for impacts is considered to be low, there could be a disproportionate and high adverse impact associated with the restricted access by Native American Tribes for traditional cultural activities on the Hanford Site during the construction phase of the proposed action.

4.9.5.1.3 Mitigation

Mitigation of impacts to Native American Tribes is addressed in the MOA (Appendix B). As examples (refer to Section 4.1.5.3), mitigation could include:

- Coordinate construction schedule with Tribes to avoid interference with Tribal ceremonies
- Coordinate ecological surveys and revegetation efforts with Tribes

4.9.5.2 Alternatives

4.9.5.2.1 Partial RHD

Near-term impacts from Partial RHD would be expected to be similar to, or slightly larger than, those presented for the proposed action in Section 4.9.5.1.1, due to the use of Borrow Area C and personnel requirements associated with removal/haul operations of larger volumes of soil.

4.9.5.2.2 Complete RHD

Near-term impacts from Complete RHD would be expected to be similar to, or slightly larger than, those presented for Partial RHD, due to personnel requirements associated with removal/haul operations of larger volumes of soil. However, since the use of Borrow Area C would not be required there would not be a potential for disproportionate and adverse impact to Native American Tribes for traditional cultural activities on the Hanford Site (refer to Section 4.9.5.1.2).

4.9.6 Resource Use

4.9.6.1 Proposed Action

4.9.6.1.1 NRDWL/SWL

The proposed action would require relatively small quantities of resources for closure activities, operation of equipment, transportation of materials and waste, and road maintenance. The materials required include common fossil fuels to operate vehicles and backup electrical generators, none of which are unique or in limited supply. Therefore, their use would not be expected to affect availability of these resources regionally or locally.

4.9.6.1.2 Borrow Area C

Borrow materials would come from Borrow Area C (and Hanford Site Pit #6 for pit-run gravel). Offsite commercial sources of gravel also could be used. The use of borrow materials would represent an irreversible and irretrievable commitment of resources.

4.9.6.1.3 Mitigation

Mitigation includes use of energy-efficient fuels and equipment, waste minimization, and recycling programs. Additional mitigation may be identified in the future NEPA analysis of use of Borrow Area C and other borrow sources located on the Hanford Site.

4.9.6.2 Alternatives

4.9.6.2.1 Partial RHD

Additional resources would be required to support RHD activities. For example, fuel consumption would be expected to be greater for Partial RHD (compared to the proposed action) due to a greater number of truck trips (refer to Section 4.5.2.1). In addition, coarse-textured backfill material (e.g., spoil piles from ERDF) would be required to backfill the partial RHD (Section 2.2.2).

4.9.6.2.2 Complete RHD

Additional resources would be required to support RHD activities. For example, fuel consumption would be expected to be substantially greater for Complete RHD (compared to the proposed action) due to a greater number of truck trips (refer to Section 4.5.2.2). In addition, coarse-textured backfill material (e.g., spoil piles from ERDF) would be required to backfill the partial RHD (Section 2.2.3). This would be partially offset by the fact that there would be no need for construction of an engineered barrier requiring silt-loam material from Borrow Source C.

4.10 Cumulative Impacts

Cumulative impacts that might be associated with implementing the proposed landfill closure activities are summarized in this section.

In 40 CFR 1508.7, the CEQ defines cumulative impact as:

> …the impact on the environment from the incremental impact of the action when added to other past, present, and reasonably future actions regardless of what agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

However, CEQ cautioned that, “The continuing challenge of cumulative effects analysis is to focus on important cumulative issues…” (CEQ 1997a).

The volume of waste disposed in NRDWL and SWL have been considered in the analysis of cumulative impacts presented in the TC&WM EIS (as part of “Other DOE Actions at Hanford,” Section 6.3.12.2). It is unlikely that there would be major impacts on the waste management infrastructure at Hanford because sufficient capacity exists or would be constructed under the preferred Waste Management alternatives presented in the TC&WM EIS.

Based on the results of analyses presented in the previous sections, impacts in all resource areas were projected to be minimal. Past, present, and reasonably foreseeable future actions that may contribute to cumulative impacts include those located within the region of influence considered. Examples of past

Hanford activities include operation of the fuel fabrication plants, production reactors, Plutonium Uranium Extraction (PUREX) Plant and other fuel reprocessing facilities, Plutonium Finishing Plant, and research facilities, as well as waste treatment and disposal activities.

Current Hanford activities include site cleanup, waste disposal, and tank waste stabilization. Environmental restoration activities being performed under RCRA and *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) in accordance with the Tri-Party Agreement requirements. Major environmental restoration activities currently planned or underway include:

- Environmental restoration activities in the 100 and 200 Areas
- Disposition of the five canyon facilities
- Decommissioning of eight surplus production reactors
- Remediation and closure of the 300 Area facilities and OUs
- Retrieval of transuranic waste
- Operation of ERDF
- Construction of the Waste Treatment Plant

Non-DOE activities at Hanford include the following:

- Continued transport of U.S. Navy reactor compartments from the Columbia River and their disposal in trench 218-E-12B in the 200-East Area
- Continued operation of the Columbia Generating Station
- Continued operation of the US Ecology Commercial Low-Level Radioactive Waste Disposal Facility
- Management of the Hanford Reach of the Columbia River as a national monument and a national wildlife refuge
- Continued operation of AREVA NP, Inc. who operates a fuel fabrication facility (just south of Hanford)
- Continued operation of the PERMA-Fix Northwest, who which treats low-level radioactive waste and mixed low-level radioactive waste (located south of Hanford)
- Continued operation of IsoRay Medical, Inc., who produces medical isotopes for commercial use (just east of the Hanford boundary)
- Continued operation of Moravek Biochemicals, who manufactures radiochemicals and inorganic compounds for industrial use (located in Richland, Washington)

Potential future actions at the Hanford Site have been addressed in the following documents:

- *Draft Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement* (GTCC EIS), DOE/EIS-0375 (72 FR 40135); Hanford is being considered as a candidate location for a new Greater-Than-Class C waste disposal facility.
- *Final Long-Term Management and Storage of Elemental Mercury Environmental Impact Statement* (DOE/EIS-0423) (74 FR 31723); Hanford was considered as a candidate host site for the long-term management and storage of elemental mercury in the draft of DOE/EIS-0423. In the Final DOE/EIS-

0423, the preferred alternative is the Waste Control Specialists site located near Andrews, TX. No Record of Decision has been issued to date.

Consequences of closing NRDWL and SWL are expected to be less than those associated with cleanup of other sites within Hanford. Appropriate mitigation would further reduce potential impacts (e.g., mitigation associated with the proposed NRDWL/SWL support area). Activities are expected to be accomplished using the local workforce and would not impact regional or site-wide labor availability. Because of the temporary nature of the activities and their remote location, short-term cumulative impacts on air quality or noise with other Hanford or regional construction and cleanup projects would be minimal. Wastes generated during the proposed activities would be manageable within the capacities of existing facilities. Restoration of formerly disturbed areas to a more natural state is expected to result in a net benefit to the ecological and visual resources within the region.

A detailed analysis of cumulative impacts on the Hanford Site is provided in Chapter 6 of the TC&WM EIS. Specifically addressing NRDWL and SWL, the TC&WM EIS (Section 6.3.12.2.3) states:

> "The TPA outlines the approach that DOE will take for permitting and closure of the Hanford RCRA regulated treatment, storage, and disposal units. These two landfills are included in a draft remedial investigation/feasibility study work plan completed in September 2007 (DOE 2007b). The remedial investigation/feasibility study process will be used to reach a decision that will meet requirements for both National Priorities List cleanup and RCRA corrective action."[4]

The proposed action would be expected to have negligible contribution to long-term negative cumulative impacts. However, the only real long-term cumulative impacts from the proposed action could be positive; protection of human health and the environment; improvement of visual aesthetics; and enhancement of ecological/biological resources. NRDWL and SWL do not contain radiological constituents of potential concern (COPCs) identified in Section 6.4 of the TC&WM EIS. The chemical inventory of NRDWL (Section 2.1, Table 1 of the EA) shows approximately (rounded) 26 kg of chromium and 11,000 kg of nitrate; this may be compared to the 340,000 kg of chromium and 74,200,000 kg of nitrate from 'other activities' (not including the contribution from tank closure, Fast Flux Test Facility, or waste management) considered in the TC&WM for release to groundwater (TC&WM EIS, Table 6-12).

As noted previously in Section 5.8.2, the presence of chemicals disposed of in NRDWL and SWL would not be expected to substantially impact water quality on the Hanford Site after an engineered ET barrier is installed. Any incremental contribution attributed to NRDWL and/or SWL releases to existing regional plumes (200-PO-1 OU) has been demonstrated to be minimal and would not be expected to impact groundwater disposition decisions to be rendered under CERCLA and the ROD for 200-PO-1 OU. In addition, the proposed ET barrier reduces the likelihood of future releases or impacts since it reduces leachate formation and retards vadose zone transport of contaminants. Furthermore, the primary reason for installing an engineered ET barrier is to minimize future leachate formation by stopping or severely limiting the amount of percolation that comes into contact with the waste.

4.11 Costs

Rough-order-of-magnitude costs for the alternatives are shown in Table 4-3 and are provided for perspective.

[4] NOTE: DOE 2007b refers to DOE/RL-2004-60.

Table 4-3. Rough-Order–of-Magnitude Costs for the Alternatives

Alternative	Total Capital Cost	Non-Discounted Annual and Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
No Action*	$1,000,000	$7,000,000	$8,000,000	$5,600,000
RHD to 30 ft bls	$400,000,000	$8,000,000	$408,000,000	$395,000,000
RHD to 138 ft bls	$4,200,000,000	$0	$4,200,000,000	$3,500,000,000
ET Barrier	$24,000,000	$12,000,000	$36,000,000	$31,200,000

bls = below landfill surface

ET = evapotranspiration

RHD = removal, haul, and disposal

*No Action costs do not include any future vadose zone and groundwater remediation costs, which would be incurred in the future. This is due to the thin coarse-textured operational cover allowing the majority of atmospheric water to percolate into the waste, subsequently degrading containers and mobilizing leachate to groundwater.

The cost estimates for the NRDWL/SWL Closure were developed for NEPA EA alternative comparison purposes and include all probable and significant life cycle costs including material, equipment and labor to construct the barriers, complete excavations, as appropriate and ongoing operation, maintenance and groundwater monitoring (OM&M) costs. The complete RHD alternative does not include OM&M costs since none would be anticipated. The cost estimate methods were completed in accordance with EPA/540/R-00/002, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study***,** OSWER 9355.0-75 (EPA 2000). The cost estimates are based on actual pricing information derived from historical experience. Historical information from similar Hanford Site planning was applied to the estimate. The unit costs associated with each one of the quantity estimates may have been factored/adjusted by the estimator and/or task lead, as appropriate, to reflect influences by the contract, work site, or other identified special conditions. The costs are presented as net present worth values. The net present worth method establishes a common baseline for evaluating costs that occur during different time periods, thus allowing for direct cost comparisons between different alternatives. The net present worth value represents the dollars that would need to be set aside today, at the defined interest rate (i.e., 30-year interest rate of 2.7 percent), to ensure that funds would be available in the future as they are needed to perform the remedial alternative.

5 Environmental Permits and Regulatory Requirements

It is the policy of DOE to carry out its operations in compliance with all federal, state, and local laws and regulations; Presidential executive orders; DOE orders; and procedures. Both federal and state laws apply to closure activities. Based on the types of activities to be conducted, it is anticipated that the following environmental requirements would be most applicable.

- **Hazardous Waste Management**. RCRA, HWMA (RCW 70.105), and WAC 173-303 apply to the generation, transport, treatment, storage, and disposal of hazardous and dangerous wastes. Washington State Dangerous Waste regulations require treatment of many hazardous wastes before they can be disposed of in landfills. HWMA permits are required for the treatment, storage, or disposal of hazardous wastes. Ecology has been authorized by EPA to administer the federal RCRA program within Washington, using its own dangerous waste regulation program in lieu of major portions of the RCRA program. The state regulations include a larger universe of regulated materials than the federal hazardous waste program.

  As noted previously, a closure plan has been submitted to Ecology (DOE 2010) in their capacity as the regulatory agency overseeing WAC 173-303 and WAC 173-350. This initiates the review/approval process, including a 45-day public review process, of the Tri-Party Agreement Action Plan (Section 9.2.2, "Part B Permit Applications and Closure/Postclosure Plans") (Ecology et al. 1989).

  Ecology has determined (Ecology 2010b) that the same closure/final barrier, post-closure care, groundwater monitoring, and other applicable requirements developed for NRDWL will apply to SWL as a corrective action pursuant to WAC 173-303-64620. The requirements of WAC 173-350 will be satisfied through the deferral option in WAC 173-350-710(8). Ecology will waive the solid waste permitting requirement by deferring to the Hanford Facility Dangerous Waste Permit that will include corrective action requirements pursuant to WAC 173-303-64620.

- **Protection of Plant and Animal Species**. The *Endangered Species Act, Bald and Golden Eagle Protection Act*, and *Migratory Bird Treaty Act* all identify requirements that must be met to protect native plant and animal species and the ecosystems upon which they depend. Two laws are most pertinent to the proposed action: (1) the *Endangered Species Act* requires that if a federal action may affect a threatened or endangered species or designated critical habitat, the agency must consult with the USFWS or National Marine Fisheries Service to ensure the action is not likely to jeopardize the continued existence of these species, and (2) the *Migratory Bird Treaty Act* prohibits harm to migratory birds, their nests, or eggs.

- **Cultural and Historic Resource Protection**. Federal agencies must preserve and protect cultural resources in a spirit of stewardship to the extent feasible given the agency's mission. DOE responsibilities are defined by a number of laws, regulations and policies, including the *National Historic Preservation Act*, the *Native American Graves Protection and Repatriation Act*, and the *DOE Native American Indian & Alaska Native Tribal Government Policy* (DOE 1992, 2006). In particular, the *National Historic Preservation Act* is the law most relevant to the proposed action; it requires that agencies consider the effects of their actions on historic properties included or eligible for inclusion in the National Register of Historic Places.

- **Air Pollution Notice of Construction and Approval Order**. These regulations require the submission of a Notice of Construction application to the Benton Clean Air Authority, and its review and approval, before a new emission source such as a diesel generator may be installed and operated.

The application must demonstrate that installed equipment uses the Best Available Control Technology for regulated air emissions. The regulatory drivers are 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants;" WAC 173-400, "General Regulations for Air Pollution Sources;" WAC 173-401, "Operating Permit Regulations;" WAC 173-460, "Controls for New Sources of Toxic Air Pollutants;" and "Benton Clean Air Authority Regulation 1" (Benton Clean Air Authority 2005). The responsible agency is the Benton Clean Air Authority.

- **Transportation**. Transportation regulations include the submission of an Application for General Permit for United States Government Agencies for construction, operation, and maintenance of an approach for hauling material across State roads. DOE has been issued State Permit No. 44422 by the Washington State Department of Transportation (under WAC 468-34, "Utility lines-franchises and permits") for hauling material across State Route 240; special provisions include use restrictions and signage.

- **State Environmental Policy Act.** The *State Environmental Policy Act of 1971* (SEPA) is a Washington State law that, similar to the federal NEPA statue, requires state and local agencies to consider the likely environmental consequences of a proposed action, including issuance of permits, before approving or denying the proposal. SEPA rules are found in Chapter 197-11 of the Washington Administrative Code.

- **Socioeconomics and Environmental Justice.** Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629), directs Federal agencies in the Executive Branch to consider environmental justice so that their programs will not have "…disproportionately high and adverse human health or environmental effects…" on minority and low-income populations. Executive Order 12898 further directed Federal agencies to consider effects to "populations with differential patterns of subsistence consumption of fish and wildlife." The Executive Branch agencies also were directed to develop plans for carrying out the order. The CEQ provided additional guidance later for integrating environmental justice into the National Environmental Policy Act process in a December 1997 document, *Environmental Justice Guidance Under the National Environmental Policy Act* (CEQ 1997b).

- **Solid Waste Management.** DOE is implementing Executive Order 13123 (64 FR 30851), Greening the Government Through Efficient Energy Management; Executive Order 13148 (65 FR 24595), Greening the Government Through Leadership in Environmental Management; and associated DOE orders or guidelines, by reducing toxic chemical use and encouraging the development and use of clean and energy-efficient technologies. Program components include waste minimization, recycling, source reduction, energy-efficient building construction, and buying practices that give preference to products made from recycled materials. Closure activities and waste management activities would be conducted in accordance with this program. Implementation of the pollution prevention and waste minimization programs would also minimize the generation of secondary wastes.

6 Notice to Tribal and Government Agencies and Other Interested Parties

6.1 Initial Draft EA

On March 17, DOE issued a letter providing formal notification of DOE's intent to complete an interim action NEPA EA to analyze the environmental consequences of proposed closure activities for the NRDWL and SWL. That letter was addressed to the Nez Perce Tribe, the Wanapum, EPA, the Confederated Tribes of the Umatilla Indian Reservation, Ecology, the Confederated Tribes and Bands of the Yakama Nation, the Hanford Advisor Board, and the Oregon Department of Energy.

On Thursday, March 18, 2010, DOE issued a "Notice of Upcoming Comment Period." This electronic notice was provided to an estimated 700 individuals consisting of Tribal and government agencies, and other interested parties. Development of the EA discussed with Tribal Nations, Hanford Advisory Board, and Ecology.

An EA fact sheet (electronic and hardcopy) was issued to ~2300 recipients on the Hanford Site stakeholder distribution list.

On Thursday, May 13, 2010, the Tri-City Herald contained a notice announcing a 30-day public comment period on the EA. The availability of the EA for comment also was provided on the Hanford Events Calendar. The public comment period was extended for 30 days based on public request; the entire public comment period ran from May 13, 2010, to July 13, 2011.

Comments have been received on the initial draft EA, and have been considered in the development of this revised EA.

Ecology is a cooperating agency (40 CFR 1501.6 and 1508.5) on this revised EA (Ecology 2010a).

6.2 Revised Draft EA

Advance notice of DOE's intent to prepare this revised EA (November 10, 2010) and briefings as requested were provided to various Tribal governments, agencies, and other organizations. In addition, the revised draft EA was provided to the following for review and comment.

- Nez Perce Tribe
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes and Bands of the Yakama Nation
- Confederated Tribes of the Colville Indian Reservation
- Wanapum
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- Ecology
- Oregon Department of Energy
- Franklin County
- Hanford Advisory Board
- Benton County
- City of Richland.

The Final EA will be made available in the DOE Public Reading Room (Consolidated Information Center at Washington State University-Tri-Cities) and through the DOE Richland Operations Office website (http://www.hanford.gov/rl/?page=86&parent=52).

7 References

7.1 Regulations, Notices, and Laws

7.1.1 Code of Federal Regulations (CFR) (Online at http://www.gpoaccess.gov/cfr/index.html)

36 CFR 800, "Protection of Historic Properties," *Code of Federal Regulations,* U.S. Department of Energy.

40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations,* U.S. Environmental Protection Agency.

40 CFR 1500-1508, "Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act," *Code of Federal Regulations,* U.S. Environmental Protection Agency.

50 CFR 10.13, "List of Migratory Birds," *Code of Federal Regulations,* U.S. Department of the Interior.

50 CFR 17.11, "Endangered and Threatened Wildlife," *Code of Federal Regulations,* U.S. Department of the Interior.

50 CFR 17.12, "Endangered and Threatened Plants," *Code of Federal Regulations,* U.S. Department of the Interior.

7.1.2 Federal Register (FR) Notices (online at http://www.gpoaccess.gov/fr/index.html)

59 FR 7629, "Executive Order 12898 of February 11, 1994: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," *Federal Register* (February 16, 1994). Online at http://www.epa.gov/fedreg/eo/eo12898.htm

64 FR 30851, "Executive Order 13123 of June 3, 1999: Greening the Government through Efficient Energy Management," *Federal Register* (June 8, 1999). Online at http://www1.eere.energy.gov/femp/pdfs/eo13123.pdf

64 FR 61615, "Record of Decision: Hanford Comprehensive Land-Use Environmental Impact Statement," *Federal Register* (November 12, 1999). Online at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=1999_register&docid=99-29325-filed.pdf

65 FR 24595, "Executive Order 13148 of April 21, 2000: Greening the Government through Leadership in Environmental Management," *Federal Register* (April 26, 2000). Online at http://ceq.hss.doe.gov/nepa/regs/eos/eo13148.html

71 FR 5655, "Notice of Intent To Prepare the Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA." Online at http://nepa.energy.gov/nepa_documents/noi/5655.pdf

72 FR 3919, "Executive Order 13423 of January 24, 2007. Strengthening Federal Environmental, Energy, and Transportation Management." *Federal Register* (January 26, 2007). http://edocket.access.gpo.gov/2007/pdf/07-374.pdf

74 FR 52117, "Executive Order 13514 of October 5, 2009. Federal Leadership in Environmental, Energy, and Economic Performance," *Federal Register* (October 8, 2009). http://edocket.access.gpo.gov/2009/pdf/E9-24518.pdf

73 FR 55824, "Amended Record of Decision for the Hanford Comprehensive Land-Use Plan Environmental Impact Statement," *Federal Register* (September 26, 2008). Online at http://edocket.access.gpo.gov/2008/pdf/E8-22676.pdf

73 FR 72519, "Hanford Reach National Monument; Adams, Benton, Franklin, and Grant Counties, Washington," *Federal Register* (November 28, 2008). Online at http://edocket.access.gpo.gov/2008/pdf/E8-28214.pdf

7.1.3 United States Code (USC) (online at http://www.gpoaccess.gov/uscode/index.html)

16 USC 470 et seq. *National Historic Preservation Act of 1966*. Public Law 89-665, as amended. Online at http://www.achp.gov/docs/nhpa%202008-final.pdf

16 USC 668 et seq. *Bald and Golden Eagle Protection Act of 1940*. Public Law 95-616, as amended. Online at http://www.fws.gov/migratorybirds/mbpermits/regulations/BGEPA.PDF

16 USC 703-712. *Migratory Bird Treaty Act*, Ch. 128, as amended. Online at http://www.fws.gov/migratorybirds/mbpermits/regulations/mbta.html

16 USC 1531 et seq. *Endangered Species Act of 1973*. Public Law 100-478, as amended. Online at http://www.fws.gov/endangered/ESA/content.html

25 USC 3001 et seq. *Native American Graves Protection and Repatriation Act*. Public Law 101-601. Online at http://www.nps.gov/history/local-law/FHPL_NAGPRA.pdf

42 USC 4321 et seq. *National Environmental Policy Act of 1969*. Public Law 91-190, as amended. Online at http://www.nepa.gov/nepa/regs/nepa/nepaeqia.htm

42 USC 6901 et seq. *Resource Conservation and Recovery Act of 1976*. Public Law 94-580. Online at http://www.epa.gov/rcraonline/

42 USC 9601 et seq. *Comprehensive Environmental Response, Compensation, and Liability (Superfund) of 1980*. Public Law 107-118, as amended. Online at http://www.epa.gov/superfund/policy/cercla.htm

42 USC 13101 et seq. *Pollution Prevention Act of 1990*. Online at http://www.epa.gov/p2/pubs/p2policy/act1990.htm

American Recovery and Reinvestment Act of 2009, Public Law 111-5. Online at http://www.recovery.gov/About/Pages/The_Act.aspx

7.1.4 State of Washington Administrative Code (WAC)

Chapter 70.105 RCW, "Hazardous Waste Management," Revised Code of Washington, Olympia, Washington. Online at http://apps.leg.wa.gov/rcw/default.aspx?cite=70.105

RCW 70.93, *Washington State Solid Waste Reduction and Recycling Act*.

WAC 173-60, "Maximum Environmental Noise levels," *Washington Administrative Code*, Olympia, Washington. Online at http://apps.leg.wa.gov/wac/default.aspx?cite=173-60&full=true

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, Olympia, Washington. Online at http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303

WAC 173-350, "Solid Waste Handling Standards," *Washington Administrative Code*, Olympia, Washington. Online at http://www.ecy.wa.gov/programs/swfa/facilities/350.html

WAC 173-400, "General Regulations for Air Pollution Sources," *Washington Administrative Code*, Olympia, Washington. Online at http://apps.leg.wa.gov/WAC/default.aspx?cite=173-400

WAC 173-401, "Operating Permit Regulation," *Washington Administrative Code*, Olympia, Washington. Online at http://apps.leg.wa.gov/WAC/default.aspx?cite=173-401

WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," *Washington Administrative Code*, Olympia, Washington. Online at http://apps.leg.wa.gov/WAC/default.aspx?cite=173-460

WAC 197-11, "SEPA Rules," *Washington Administrative Code*, Olympia, Washington. Online at http://apps.leg.wa.gov/WAC/default.aspx?cite=197-11

WAC 468-34, "Utility Lines - Franchises and Permits," *Washington Administrative Code*, Olympia, Washington. Online at http://www.mrsc.org/mc/wac/WAC%20468%20%20TITLE/WAC%20468%20-%2034%20%20CHAPTER/WAC%20468%20-%2034%20%20CHAPTER.htm

7.2 Reference Documents

Albright, W., W. Waugh, and C. Benson, 2007, "Alternative Covers: Enhanced Soil Water Storage and Evapotranspiration in the Source Zone," *Enhancements to Natural Attenuation: Selected Case Studies*, WSRC-STI-2007-00250, Washington Savannah River Company. Available at http://www.dri.edu/images/stories/research/programs/acap/acap-publications/10.pdf

Albright, W. H., C. H. Benson, and W. J. Waugh, 2010, *Water Balance Covers for Waste Containment-Principles and Practice*, ASCE Press, American Society of Civil Engineers, Reston, Va.

Benton Clean Air Authority, 2005, "Regulation 1 of the Benton Clean Air Authority," Benton Clean Air Authority, Richland, Washington. Online at http://www.bcaa.net/Files/PubInfo/bcaareg1_final_27-december-08.pdf

BHI-01115, 1997, *Evaluation of the Soil-Gas Survey at the Nonradioactive Dangerous Waste Landfill*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington. Available at: http://www5.hanford.gov/arpir/?content=findpage&AKey=D197301462.

BLS, 2008, *Industry Injury and Illness Data*, U.S. Department of Labor, Bureau of Labor Statistics, Washington D.C. (Data October 23, 2008, Accessed May 2009). Online at http://www.bls.gov/iif/oshsum.htm.

CEQ, 1997a, *Considering Cumulative Effects Under the National Environmental Policy Act*, Council on Environmental Quality, Executive Office of the President, Washington, D.C. Online at http://gc.energy.gov/NEPA/nepa_documents/TOOLS/GUIDANCE/Volume1/4-11.1-ceq-cumulative-effects.pdf

CEQ, 1997b, *Environmental Justice Guidance Under the National Environmental Policy Act*, Council on Environmental Quality, Executive Office of the President, Washington, D.C. Online at http://gc.energy.gov/NEPA/nepa_documents/TOOLS/GUIDANCE/Volume1/4-12-ceq-environjustice.pdf.

D&D-25575, 2005, *Silt Borrow Source Field Investigation Report*, Fluor Hanford, Richland, Washington. Online at http://www2.hanford.gov/arpir/?content=findpage&AKey=00099839

DHUD, 1976, *Rapid Growth from Energy Projects, Ideas for State and Local Action*, Report HUD-CPD-140, U.S. Department of Housing and Urban Development, Washington, D.C. Online at http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/3e/f8/76.pdf

DOE, 1992, "American Indian Tribal Government Policy," DOE Order 1230.2, U.S. Department of Energy, Washington, D.C. Online at http://www.directives.doe.gov.

DOE, 2004, *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements*, 2nd edition, U.S. Department of Energy, Washington, D.C. Online at http://gc.energy.gov/NEPA/nepa_documents/TOOLS/GUIDANCE/Volume2/2-10-greenbook-recommendations.pdf.

DOE, 2006, "Change to DOE Order 1230.2, Attachment 1. DOE American Indian and Alaska Natives Tribal Government Policy." DOE Notice 144.1, U.S. Department of Energy, Washington, D.C. Online at http://www.directives.doe.gov/pdfs/doe/doetext/neword/144/n1441.html.

DOE, 2007, Letter, R. Whitlam, DAHP, to R. Hastings, RL, "Log No: 062207-07-DOE, Re: *LALIIK* Traditional Cultural Property," dated October 1, 2007.

DOE, 2010, Letter, 11-AMCP-0051, R. Holten, RL; to J. Hedges, Ecology; "Nonradioactive Dangerous Waste Landfill/Solid Waste Landfill Closure/Postclosure Plan, DOE/RL-90-17, Revision 2 and Groundwater Monitoring Plan for the Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill, DOE/RL-2010-28, Revision 1," dated December 20, 2010. Online at http://www2.hanford.gov/arpir/?content=findpage&AKey=1101200568

DOE/EA-1403, 2001, *Environmental Assessment; Use of Existing Borrow Areas, Hanford Site, Richland, Washington* (October 2001).

DOE/EA-1660F, 2009, *Environmental Assessment; Combined Community Communications Facility and Infrastructure Cleanup on the Fitzner/Eberhardt Arid Lands Ecology Reserve, Hanford Site, Richland, Washington.* Online at http://www.hanford.gov/files.cfm/DOE_EA_1660_07-21-09_FINAL31.pdf

DOE/EIS-0222F, 1999, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://www.hanford.gov/doe/eis/hraeis/hraeis.htm.

DOE/EIS-0222-SA-01, 2008, *Supplement Analysis. Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, U.S. Department of Energy, Richland, Washington. Online at http://www.hanford.gov/rl/uploadfiles/SAwith_signed-R1.pdf

DOE/EIS-0286F, 2004, *Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement*, U.S. Department of Energy, Richland, Washington. Online at http://nepa.energy.gov/finalEIS-0286F.htm

DOE/EIS-0375, *Draft Environmental Impact Statement Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste.* Online at http://nepa.energy.gov/1653.htm

DOE/EIS-0391, 2009, *Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington*, U.S. Department of Energy. Online at http://nepa.energy.gov/1148.htm

DOE/EIS-0423, 2011, *Long-Term Management and Storage of Elemental Mercury Environmental Impact Statement*. Online at http://nepa.energy.gov/1630.htm

DOE/RL-90-17, 2010, *Nonradioactive Dangerous Waste Landfill Closure/Postclosure Plan*, Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://www2.hanford.gov/arpir/?content=findpage&AKey=1101200569

DOE/RL-90-17, 2009, *Nonradioactive Dangerous Waste Landfill Closure/Postclosure Plan*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://www2.hanford.gov/arpir/?content=findpage&AKey=0095431 (begins on page 158)

DOE/RL-90-17, 1990, *Nonradioactive Dangerous Waste Landfill Closure/Postclosure Plan*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://www2.hanford.gov/arpir/?content=findpage&AKey=D196020280

DOE/RL-94-41, 1994, *NEPA Roadmap for the Environmental Restoration Disposal Facility Regulatory Package*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://www2.hanford.gov/arpir/?content=findpage&AKey=D196074918.

DOE/RL-97-56, 1998, *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://www.hanford.gov/doe/history/docs/rl97-56/rl97-56.htm

DOE/RL-98-10, 2003, *Hanford Cultural Resources Management Plan*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://www-old.hanford.gov/doe/history/?history=rmp

DOE/RL-2003-24, Revision 0, *Proposed Plan for the 200-UW-1 Operable Unit*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://www5.hanford.gov/arpir/?content=findpage&AKey=DA007725

DOE/RL-2004-60, Rev. 0, 2008, *200-SW-1 Nonradioactive Landfills and Dumps Group Operable Unit and 200-SW-2 Radioactive Landfills and Dumps Group Operable Unit Remedial Investigation/Feasibility Study Work Plan*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://www2.hanford.gov/arpir/?content=findpage&AKey=0901080231

DOE/RL-2008-54, *Hanford Site Solid Waste Landfill Closure Plan*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2009-85, 2010, *Remedial Investigation Report for the 200-PO-1 Groundwater Operable Unit*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2010-28, Rev. 1, *Groundwater Monitoring Plan for the Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Online at http://www2.hanford.gov/arpir/?content=findpage&AKey=1101200570

Ecology, 2010a, letter dated September 23, 2010; from J.A. Hedges, Ecology; to R.A. Holten, DOE; Re: "Letter 10 AMCP-024, dated September 13, 2010, "Development of the Revised National Environmental Policy Act (NEPA) Interim Action Environmental Assessment (EA) for the Closure of the Non-Radioactive Dangerous Waste Landfill (NRDWL) and the Solid Waste Landfill (SWL), Central Plateau, Hanford Site, Richland, Washington (DOE/EA-1707)," Washington State department of Ecology, Richland, Washington. Online at http://www2.hanford.gov/arpir/?content=findpage&AKey=1009270902

Ecology, 2010b, letter dated May 7, 2010, R. Skinnarland, Ecology, to D. Brockman, DOE, "Regulatory Path Forward for Final Closure of Solid Waste Landfill (SWL)," Washington State Department of Ecology, Richland, Washington. Online at http://www2.hanford.gov/arpir/?content=findpage&AKey=1005130014

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington, as amended. Online at http://www.hanford.gov/?page=91&parent=0.

EPA, 2000, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, EPA/540-R-00-002, OSWER 9355.0-75, U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, July, 2000. Available at http://www.epa.gov/superfund/policy/remedy/pdfs/finaldoc.pdf

EPA, 2011, Available at http://cluin.org/download/remed/epa542f11001.pdf

Fayer and Gee, 2006. Fayer, MJ, and GW Gee, 2006. "Multiple-Year Water Balance of Soil Covers in a Semiarid Setting." Journal of Environmental Quality 35(2):366-377.

HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*, Online at http://www.hanford.gov/?page=579

OSHA, 2007, *Log of Work-Related Injury and Illnesses*, U.S. Department of Labor, Occupational Safety and Health Administration, Washington, D.C. Online at http://www.osha.gov/recordkeeping/new-osha300form1-1-04.pdf.

Piepho, M.G. and M.W. Benecke. 2007. Effect of Waste Depth on Barrier Effectiveness. SGW-34059, Rev. 0, Fluor Government Group, Richland, WA

PNNL-6415, 2007, *Hanford Site National Environmental Policy Act (NEPA) Characterization*, Rev. 18, Pacific Northwest National Laboratory, Richland, Washington. Online at http://www.pnl.gov/main/publications/external/technical_reports/PNNL-6415Rev18.pdf.

PNNL-14143, 2002, *The Hanford Site 1000-Year Cap Design Test*, Pacific Northwest National Laboratory, Richland, Washington. Online at http://www.pnl.gov/main/publications/external/technical_reports/PNNL-14143.pdf

PNNL-14428, 2004, *Hanford Area 2000 Population*, Pacific Northwest National Laboratory, Richland, Washington. Online at http://www.pnl.gov/main/publications/external/technical_reports/PNNL-14428.pdf.

PNNL-17134, 2007, *Geotechnical, Hydrogeologic and Vegetation Data Package for 200-UW-1 Waste Site Engineered Surface Barrier Design*, Pacific Northwest National Laboratory, Richland, Washington. Online at http://www.pnl.gov/main/publications/external/technical_reports/PNNL-17134.pdf

PNNL-17176, 2007, *200-BP-1 Prototype Hanford Barrier Annual Monitoring Report for Fiscal Years 2005 Through 2007*, Pacific Northwest National Laboratory, Richland, Washington. Available at http://www.pnl.gov/main/publications/external/technical_reports/PNNL-17176.pdf

PNNL-19381, *Cultural Resources Review for Closure of the Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill, 600 Area, Hanford Site, Benton County, Washington, HCRC# 2010-600-018* (May 2010)

Saricks, C.L., and M.M. Tompkins, 1999, *State-Level Accident Rates of Surface Freight Transportation: A Reexamination*, ANL/ESD/TM-150, Argonne National Laboratory, Argonne, Illinois. Online at http://www.osti.gov/bridge/product.biblio.jsp?query_id=0&page=2&osti_id=12051.

Schau, D, 2006, *Kennewick-Richland-Pasco MSA (Benton and Franklin Counties) Labor Area Summary*, March 2006, Washington State Employment Security Division. Online at http://www.workforceexplorer.com/article.asp?pageid=4&subid=&articleid=6572&segmentid=2.

SNL, 2011, *Alternative Landfill Cover Demonstration (ALCD)*, Sandia National Laboratories, Sandia, New Mexico. Online at http://www.sandia.gov/caps/ALCD.htm

USFWS, 2008, *Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement*, U.S. Fish and Wildlife Service, Portland, Oregon. Online at http://www.fws.gov/hanfordreach/management.html.

Washington Department of Fish and Wildlife, 2008a, *Species of Concern in Washington State*. (Web page dated June 30, 2008, accessed May 2009), Olympia, Washington. Online at http://wdfw.wa.gov/wlm/diversty/soc/soc.htm.

Washington Department of Fish and Wildlife, 2008b, *Priority Habitats and Species*. List (Web page dated August 2008, accessed May 2009), Olympia, Washington. Online at http://wdfw.wa.gov/hab/phshabs.htm.

Washington State Department of Natural Resources, *2009. Washington Natural Heritage Program Plant Ranks*. (Web page dated January 2009, accessed May 2009), Olympia, Washington. Online at http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html.

WHC-SD-EN-TI-199, 1993, *Nonradioactive Dangerous Waste Landfill Soil Gas Survey: Final Data Report*, Westinghouse Hanford Company, Richland, Washington. Available at: http://www5.hanford.gov/arpir/?content=findpage&AKey=D196104390.

This page intentionally left blank.

Appendix A

Reprint of PNNL-20162
Cultural Resources Review for Closure of the Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill in the 600 Area, Hanford Site, Benton County, Washington, HCRC# 2010-600-018R
Published February 2011

This page intentionally left blank.

Appendix B

Final Proposed Amended Memorandum of Agreement (MOA-2)

This page intentionally left blank.

AMENDED MEMORANDUM OF AGREEMENT FOR USE OF THE BORROW SOURCE AT AREA C, HANFORD SITE, RICHLAND, WASHINGTON BETWEEN THE U. S. DEPARTMENT OF ENERGY, THE WASHINGTON STATE HISTORIC PRESERVATION OFFICE, AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION WITH THE PARTICIPATION OF CONSULTING PARTIES: CONFEDERTATED TRIBES AND BANDS OF THE YAKAMA NATION, CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION, THE NEZ PERCE TRIBE, AND THE WANAPUM

WHEREAS, the U.S. Department of Energy (DOE), will be constructing a soil surface barrier over waste sites and/or landfills located on the Hanford Site. This initial barrier will be located on the Hanford Site and will entail use of approximately 450,000 cubic yards of fine-grained soils from borrow source Area C. Borrow source Area C is located in the 600 Area. Construction of a surface barrier will cover a waste site and/or landfill located on the Hanford Site (Figure 1). Excavation will directly disturb approximately 40-acres up to a depth of approximately 15 feet. Approximately 5 additional acres may also be used for work staging areas and to maintain safe access around the excavation area. Transportation related to the use of Borrow Area C will be addressed in project specific NEPA or CERCLA documentation. The surface barrier will be monitored for effectiveness over a period of at least 5 years; and

WHEREAS, DOE conducted a cultural resources review of a larger 145-acre area for Area C borrow source development in June 2006 under HCRC#2006-600-008. This action will focus on the approximately 45 acre development located within the original 145-acre cultural resource review area; and

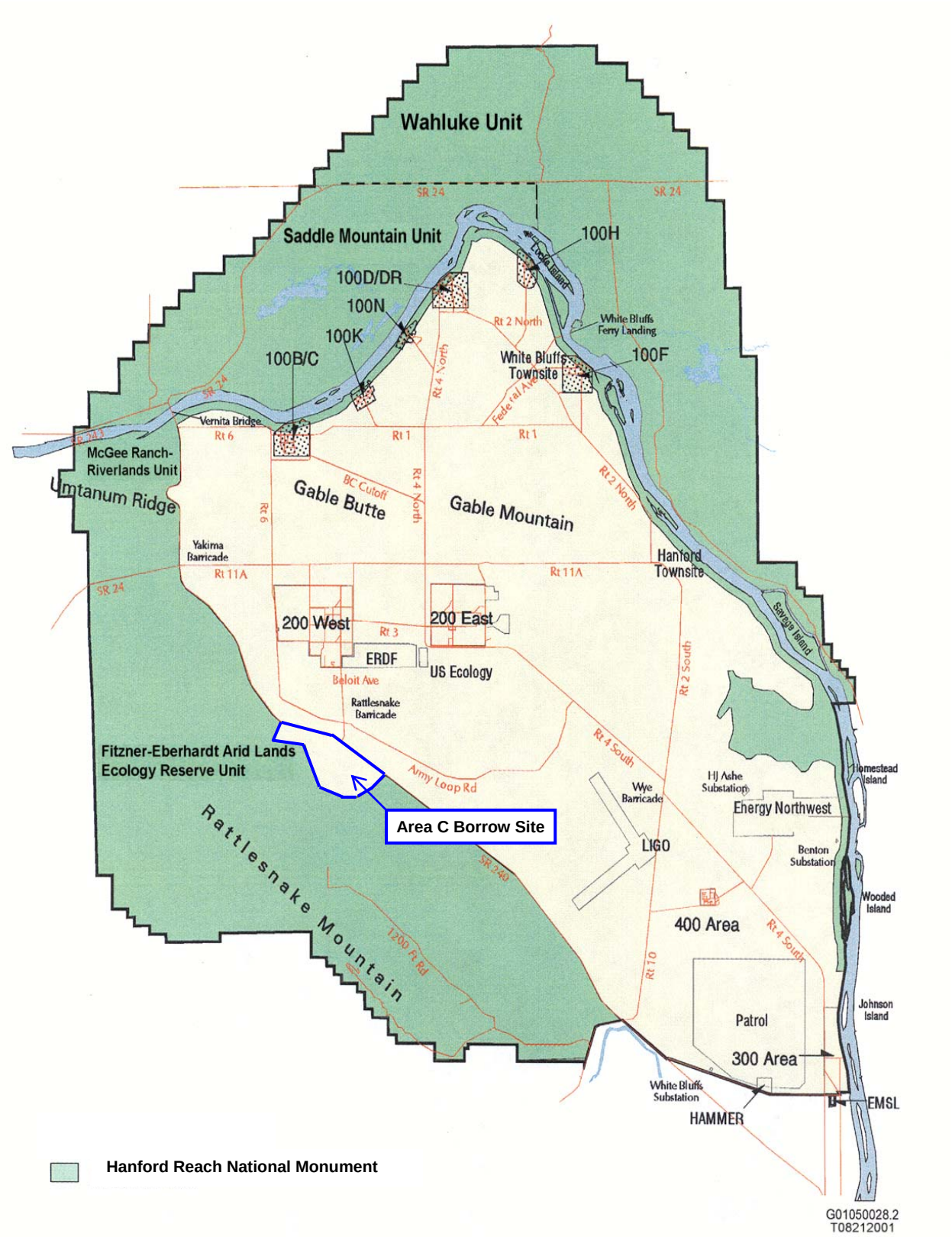
WHEREAS, DOE has determined that excavation activities at the borrow Area C source will result in an adverse effect to National Register-eligible historic property (i.e., portions of a Native American traditional cultural property known as *Laliik).* Potential Adverse effects include viewshed, noise, and air quality impacts as well as loss of native vegetation and habitat; and

WHEREAS, area Tribes (Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Wanapum, herein referred to as Tribes) attach religious and cultural significance to Rattlesnake and Gable Mountains, and tribal access is protected under the American Indian Religious Freedom Act (1979) and Executive Order 13007; and

WHEREAS, DOE has consulted with the Washington State Historic Preservation Officer (SHPO), Advisory Council on Historic Preservation (ACHP), in accordance with Section 106 of the National Historic Preservation Act, 36 CFR Part 800.6(a) to resolve adverse effects on historic properties; and

WHEREAS, DOE seeks to avoid, minimize, or mitigate adverse effects to the National Register-eligible property.

Figure 1 – Hanford Site Map



NOW, THEREFORE, the signatories agree that DOE, will ensure the following stipulations are implemented in order to take into account the effects of the undertaking on historic properties, and that these stipulations shall govern the undertakings and all of its parts until this MOA expires or is terminated.

STIPULATIONS

DOE will ensure that the following stipulations are carried out:

A. MINIMIZATION, MITIGATION, MONITORING AND REPORTING

I. MITIGATE ADVERSE EFFECTS TO CULTURAL INTEGRITY OF HABITAT AND TO TRADITIONAL PLANTS

1. In consultation with the SHPO, ACHP, and Tribes, DOE will complete and distribute a culturally relevant native plant revegetation strategy for this 45 acre project within 12 months of signing this MOA.

2. In consultation with the SHPO, ACHP, and Tribes, DOE will update the habitat quality determination for the 45 acre portion of Area C borrow source, specifically focusing on the stabilized dune areas, within 6 months of signing this MOA.

3. In consultation with the SHPO, ACHP, and Tribes, DOE will implement a 5-year annual monitoring plan to confirm success of reclamation and health of wildlife habitat at the 45-acre area disturbed by project activities.

4. DOE will invite Tribes to participate in ecological surveys and revegetation efforts at Area C. DOE will notify the tribes at least one month prior to the anticipated initiation of surveys and re-vegetation efforts.

II. MINIMIZATION AND AVOIDANCE OF VISUAL, AIR QUALITY AND NOISE IMPACTS

1. To minimize visual and noise effects of project activities, DOE will coordinate timing of construction to assure that these activities do not unnecessarily interfere with Tribal ceremonial activities and religious use of Rattlesnake Mountain (*Laliik*). To assist DOE with implementing this stipulation, the tribes will notify the DOE Indian Nation Program at least one month prior to the anticipated ceremonial activities and religious uses of Rattlesnake Mountain (*Laliik*).

2. To minimize visual and air quality impacts resulting from the excavation, DOE will implement interim soil stabilization controls through the implementation of dust control procedures such as the application of a tackifier and routine watering of the area.

3. To minimize long-term visual and air quality impacts resulting from the excavation, DOE will develop a long-term reclamation plan within 12 months of signing this MOA.

4. To minimize long-term visual and air quality impacts resulting from the excavation, DOE will monitor the viewshed from a culturally relevant perspective on a seasonal basis.

III. CULTURAL RESOURCES MONITORING

1. DOE will conduct routine periodic cultural resources monitoring, with tribal participation, during excavation activities. Additional details are included in the Implementation Plan.
2. DOE will assure that all project activities adhere to Inadvertent Discovery of Human Remains Protocols and Unanticipated Discovery Protocols outlined in the U.S. Department of Energy, Richland Operations Office, Hanford Cultural Resources Management Plan (DOE 2003) and in compliance with the Native American Graves Protection and Repatriation Act (NAGPRA) 1990 and 36 CFR 800.13.

IV. REPORTING

1. DOE will provide quarterly electronic reporting to all parties on the implementation of the stipulations 1-10 in this MOA over the duration of the project. Initiation of these quarterly updates will occur 3 months after earth-moving activities have started at Borrow Area C
2. DOE will provide annual reporting to all parties on the implementation and results of the monitoring plan of the success of revegetation and soil reclamation/ stabilization efforts over the course of the five-year monitoring effort (as per the Revegetation Plan and Reclamation Plan, identified in stipulations 1 and 7).

ADMINISTRATIVE PROVISIONS

Dispute Resolution

The Parties will work together to collaborate and resolve any differences or disputes informally. If necessary, the Parties will elevate significant disputes to the appropriate management levels of the organizations for resolution. At this point the following steps will be followed:

1. Should the SHPO or ACHP raise an objection to an action taken under the MOA, or have a dispute regarding fulfillment of the terms of this MOA, that party will file a written notice with RL.

2. Upon receipt of a written notice from the SHPO or ACHP, RL will consult with the party filing the notice to resolve the dispute. RL will also notify the Tribes of the objection or dispute.

3. If RL cannot resolve the objection or dispute within 60 calendar-days of receipt of the written notice, DOE will forward to the ACHP documentation of the dispute, a written proposal for its resolution, and request the ACHP's comment.

4. Within 30 calendar-days of receipt of the written submittal, the ACHP shall either:

    a. Notify RL that it will not consider the dispute or provide recommendations, in which case the Agency may proceed with the proposed action; or,

b. Concur with RL's proposed response to the dispute, whereupon DOE may proceed in accordance with the agreed-upon response; or,

c. Provide RL with recommendations, which RL will consider in good faith in reaching a final decision regarding a response to the dispute.

5. RL shall take into account any SHPO or ACHP recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection or dispute; RL's responsibility to carry out all actions under this MOA that are not the subject(s) of the objection or dispute shall remain unchanged. While the dispute is being resolved, the MOA continues in effect without change or suspension.

6. If the ACHP or SHPO is contacted by a concurring party Tribe or by a member of the public to discuss a significant concern or objection about implementation of the terms of this MOA, the contacted entity will notify RL of the issue.

7. RL will keep consulting parties and Tribes apprised of any concerns or objections raised and how the concern is resolved.

Amendments The signatories may propose, in writing, and will consider amendments to this MOA. Notice of any proposed amendments will also be provided to the other parties to this MOA.

Effective Date and Termination

This amended MOA will become effective on the date that it has been signed by all signatory parties and then supersedes all provisions of the existing MOA (which was effective April 4, 2009). DOE has committed significant resources to meet the terms of this agreement prior to its effective date, and will continue to commit significant resources to planning and implementing the reclamation. Any signatory party who wishes to terminate the MOA must do so in accordance with the regulations at 36 CFR 800.6(c)(8).

Coordination

RL will ensure that each consulting party is provided a copy of the fully executed MOA as amended.

Signatory Parties:

U.S. Department of Energy

By: _____ Date:_____
David A. Brockman
Manager

Washington State Historic Preservation Office

By: _____ Date:_____
Dr. Allyson Brooks
Washington State Historic Preservation Officer

Advisory Council on Historic Preservation

By: _____ Date:_____
John M. Fowler
Executive Director

Concurring Parties:

Confederated Tribes of the Umatilla Indian Reservation

By: _____ Date:_____

Confederated Tribes and Bands of the Yakama Nation

By: _____ Date:_____

Nez Perce Tribe

By: _____ Date:_____

Wanapum

By: _____ Date:_____

Appendix C

Draft Implementation Plan for Use of Borrow Area C for NRDWL/SWL Closure Project

This page intentionally left blank.

Implementation Plan for Use of the Borrow Source at Area C in the 600 Area of Hanford Site

Introduction

The U.S. Department of Energy (DOE) will be constructing a soil surface barrier over waste sites and/or landfills located on the Hanford Site. Fine-grained soils from the borrow source at Area C, which is located in the 600 Area of the Hanford Site (Figures 1 and 2), has been considered for the barrier construction. To minimize the amount of soils needed from Area C, as well as to provide efficient use of the limited volume of fine-grained soils that are available, supplemental coarse-grained fill material will also be used and will be obtained from a spoil pile at the Environmental Restoration Disposal Facility (ERDF).

Excavation and soil removal will directly disturb approximately 40 acres up to a depth of approximately 15 feet. Approximately 5 additional acres may also be used for work staging areas and to maintain safe access around the excavation area. DOE conducted a cultural resources review of a larger 145-acre area for Area C borrow source development in June 2006 under HCRC#2006-600-008. This Implementation Plan will focus on a much smaller 45-acre development that is within the original 145-acre cultural resource review area (Figure 2).

DOE has previously determined that the DOE-owned portion of Rattlesnake Mountain, which is part of a traditional cultural property known as *Laliik* is eligible for the National Register of Historic Properties. Area C is not part of Rattlesnake Mountain, but is located within the *Laliik* traditional cultural property. As part of its responsibilities under Section 106 of the National Historic Preservation Act (NHPA), DOE has determined that excavation activity at Area C will have adverse effects, including viewshed, noise, and air quality impacts, as well as loss of native vegetation and habitat. Accordingly, DOE has consulted with the Washington State Historic Preservation Officer (SHPO), Advisory Council on Historic Preservation (ACHP), Confederated Tribes of the Umatilla Indian Reservation, Nez Perce, Wanapum, and the Confederated Tribes and Bands of the Yakama Nation, in accordance with Section 106 of the National Historic Preservation Act, 36 CFR Part 800.6(a) to address these adverse effects and has developed a Memorandum of Agreement (MOA) that outlines stipulations identifying steps DOE will take to mitigate the adverse effects. This document is an Implementation Plan describing how DOE will implement the stipulations identified in the MOA.

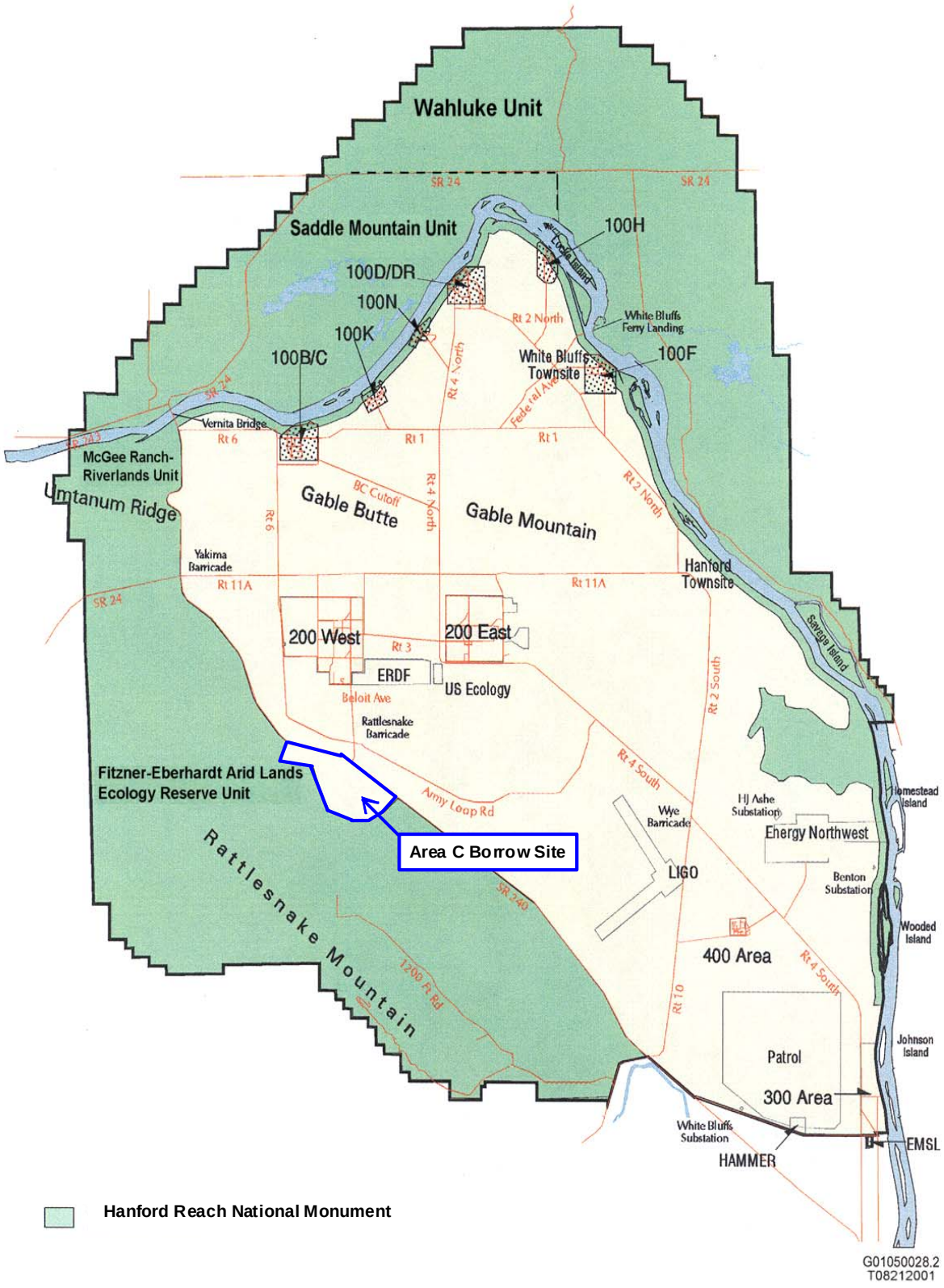


Figure 1. Hanford Site Map

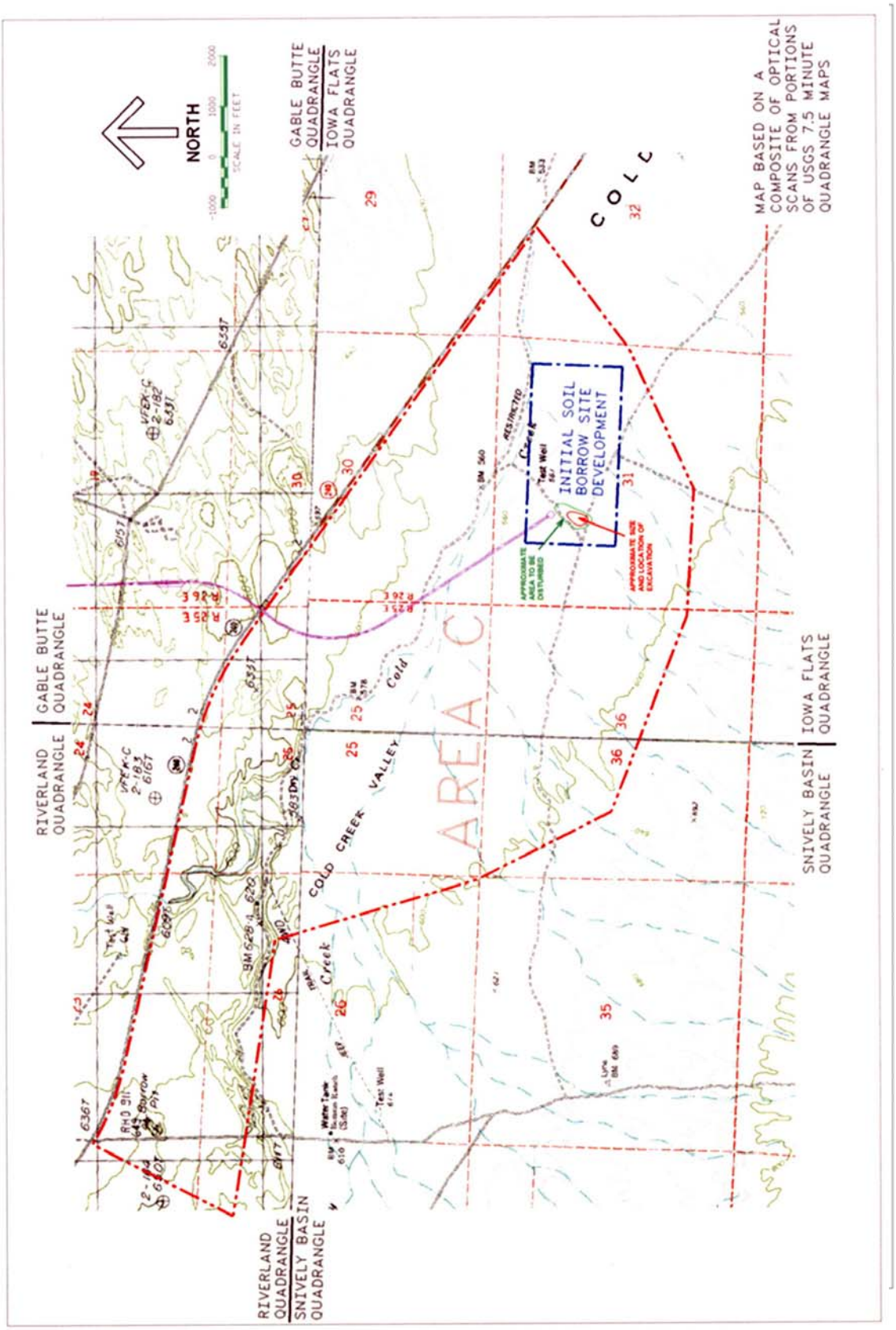


Figure 2. Map of Area C

Minimization, Mitigation, Monitoring and Reporting

(See Part A of the MOA)

Mitigate Impacts to Cultural Integrity of Habitat and Traditional Plants

(See Sub-part A-I of the MOA)

Culturally Relevant Native Plant Re-Vegetation Strategy

(Item A.I.1 of the MOA)

In consultation with Tribes, SHPO, and ACHP, DOE will complete and distribute a reclamation/revegetation plan which will provide detailed information on how DOE intends to restore native vegetation and reclaim the 45-acre area in a culturally relevant manner. DOE will seek early involvement, consultation, and input from the Tribes to achieve culturally relevant re-vegetation of the impacted area. This may include but is not limited to, the collaborative development of a re-vegetation document that could also be used to guide future revegetation of other disturbed areas across the Hanford Site. The revegetation strategy document will be completed within 12 months of signing the MOA.

Update Habitat Quality Determination for Area C Borrow Source

(Item A.I.2 of the MOA)

In consultation with Tribes, DOE will update the habitat quality determination for the Area C borrow source, specifically focusing on the stabilized dune areas, within 6 months of signing the MOA. Any updates will be consistent with the latest version of the Biological Resource Management Plan (BRMaP).

Implementation of an Annual Monitoring Plan to Confirm Success of Revegetation Plan

(Item A.I.3 of the MOA)

In consultation with Tribes, SHPO, and ACHP, DOE will implement a post-reclamation monitoring program for a duration of 5 years to evaluate the success of reclamation and health of wildlife habitat at the 45-acre area disturbed by project activities. Success may be evaluated based upon the following goals:

- Site restoration of plant species at an acceptable plant density and desired species
- Creation of wildlife habitat that reflects normal ecological numbers and diversity for the specified ecological site created
- Minimization of wind and water erosion
- Existence of desired plant species that are fire/wildlife tolerant, competitive with invader species, and are sacred to the tribal nations
- Other goals as created by future meetings that will be incorporated into this reclamation plan

Determination of success indicators to be evaluated will be completed in consultation with Tribes. The annual monitoring strategy will be completed within one year of signing the MOA.

Tribal Participation in Ecological Surveys, Revegetation and Monitoring

(Item A.I.4 of the MOA)

DOE will provide Tribes with a one month advanced notice to participate in ecological surveys, revegetation and monitoring efforts at Area C. The notification matrix developed for the cultural resources group will be modeled.

Minimization and Avoidance of Visual, Air Quality and Audible Impacts

(See Sub-part A-II of the MOA)

Coordination of Timing and Communication of Construction Activities

(Item A.II.5 of the MOA)

DOE will coordinate timing and communication of construction to assure that these activities do not unnecessarily interfere with Tribe's ceremonial activities and religious use of DOE lands. To assist DOE with implementing this coordination, the tribes will provide DOE- RL one month's notice prior to commencing any ceremonial and/or religious use that will require any modifications to DOE-RL's standard borrow-source mining activities. To protect the privacy of the tribe's ceremonial and religious activities, communication (from the tribes to DOE) regarding these activities will be limited to a few (tribal-selected) DOE personnel.

Short-term Stabilization of Area

(Item A.II.6 of the MOA)

To minimize visual and air quality impacts resulting from the excavation, DOE will implement interim soil stabilization controls through the implementation of dust control procedures such as the application of a tackifier and routine watering of the area. Water will be applied for dust suppression and erosion minimization. Application of a tackifier will be used for fugitive dust suppression and mitigation of wind and water erosion.

DOE will consult with Tribes on the appropriateness of the tackifier being used to assure continued viability of the area for the revegetation efforts. Information will be provided within 6 months of actual borrow source removal from Borrow Source C.

Long-Term Reclamation of the Soil at the Area C Borrow Site

(Item A.II.7 of the MOA)

To minimize long-term visual and air quality impacts resulting from the excavation, DOE will develop a long-term reclamation plan in consultation with Tribes. Long-term reclamation may include:

- Topographic re-contouring
- Compaction minimization (when needed)
- Permanent plant cover establishment

The long-term reclamation plan will be completed within 12 months of signing the MOA.

Monitoring and Inadvertent/Unanticipated Discovery Protocols

(See Sub-part A-III of the MOA)

Periodic Monitoring

(Item A.III.9 of the MOA)

It is expected that ground disturbing activities could last up to eight months. DOE will conduct routine periodic cultural resources monitoring during clearing and excavation activities using a qualified cultural resource professional. Using the established notification matrix, DOE will provide notice one month in advance of the commencement of any clearing or excavation activity to invite Tribes to participate in the monitoring. A monitoring letter report, which will be distributed to Tribes and SHPO, will be completed within three months of completion of project ground disturbing activities.

Inadvertent Discoveries

(Item A.III.10 of the MOA)

DOE will assure that all project activities adhere to Inadvertent Discovery of Human Remains Protocols and Post-Review Discovery Protocols outlined in the U. S. Department of Energy, Richland Operations Office, Hanford Cultural Resources Management Plan (HCRMP) (DOE 2003) and in compliance with the Native American Graves Protection and Repatriation Act (NAGPRA) 1990 and 36CFR800.13.

According to the Native American Graves Protection and Repatriation Treatment Plan (Appendix F and Section 5.4 of the HCRMP), in the event there is an inadvertent discovery of human remains or items of cultural patrimony, there are a number of sequential actions that come into play. These are listed as follows in roughly chronological order, although some overlap will occur in the overall process.

- Discovery
- Cessation of activity, if on-going
- Protection of Discovered Items
- Immediate notification of appropriate parties (affected Indian tribes, DOE-RL, DOE-HQ, Benton County Sheriff's Office, appropriate county coroner)
- Professional evaluation of discovery
- Initiation of consultation with affected Indian tribes
- Resumption of activity, if applicable.

In the event cultural resources are uncovered during excavation, and a cultural resources monitor is not present, project personnel are instructed to stop work and notify DOE-RL and cultural resources contractor. The area will be secured until all notifications have been made and a plan for evaluation, recovery/mitigation is developed. Pursuant to 36CFR800.13, Post Review Discovery, DOE must notify SHPO, ACHP and Tribes within 48 hours of such a discovery. SHPO, ACHP and Tribes have 48 hours to respond to this notification and provide recommendations. A report will be distributed within one month of the discovery to all parties describing the resource, and any actions taken to mitigate the impact.

Reporting on Progress

(Sub-part A-IV of the MOA)

Quarterly Reporting

(Item A.IV.11 of the MOA)

During project activities at Area C, DOE will provide quarterly electronic reporting to all parties identified in the MOA on the implementation of the elements of this plan.

Annual Reporting on Success of Revegetation and Reclamation Efforts

(Item A.III.12 of the MOA)

Over the course of a five-year revegetation and reclamation monitoring effort, DOE will provide annual reporting to all parties identified in the MOA on the implementation and results of the monitoring and success of revegetation and soil reclamation/stabilization efforts.

This page intentionally left blank.

Appendix D

Biological Review of the Nonradioactive Dangerous Waste Landfill (NRDWL) and Solid Waste Landfill (SWL) Closure Project; 600 Area; ECR #2010-600-018

This page intentionally left blank.

Pacific Northwest
NATIONAL LABORATORY

9Tel: (509) 371-7187
Fax: (509) 371-7160
michael.sackschewsky@pnl.gov

May 18, 2010

Mr. Michael Jansky
CH2M Hill Plateau Remediation
P.O. Box 1600, MSIN H8-45
Richland, WA 99352

Dear Mr. Jansky:

BIOLOGICAL REVIEW OF THE NON-RADIOACTIVE DANGEROUS WASTE LANDFILL (NRDWL) AND SOLID WASTE LANDFILL (SWL) CLOSURE PROJECT; 600 AREA; ECR #2010-600-018

Project Description:

DOE-RL is proposing to close the Non-Radioactive Dangerous Waste Landfill (NRDWL) and Solid Waste Landfill (SWL), located in the 600 Area of the Hanford Site (Figure 1). This project would impact five areas of interest: (1) NRDWL/SWL; (2) and NRDWL/SWL support area; (3) 45 acres within the 145 acre initial borrow site development area of Borrow Area C; (4) Army Loop Road between Beloit Avenue and the northeast corner of the NRDWL; and (5) gravel pit #6 (Figure 1). The project is anticipated to finish in 2013.

- NRDWL/SWL and support area

  Closure activities would focus on installation of an evapotranspiration (ET) cover over the NRDWL/SWL (the main landfill area) and temporary use of a surrounding staging/laydown support area (Figure 2). The area of potential disturbance for the NRDWL/SWL closure project includes the main landfill footprint (30.5 ha or 76 acres) and the footprint of an additional "support area," which extends from the main landfill perimeter fence to the north 112 m, south 96 m, west 168 m, and east 160 m (49 ha or 121 ac).

902 Battelle Boulevard | P.O. Box 999 | Richland, WA 99352 | 1-888-375-PNNL (7665) | inquiry@pnl.gov | www.pnl.gov

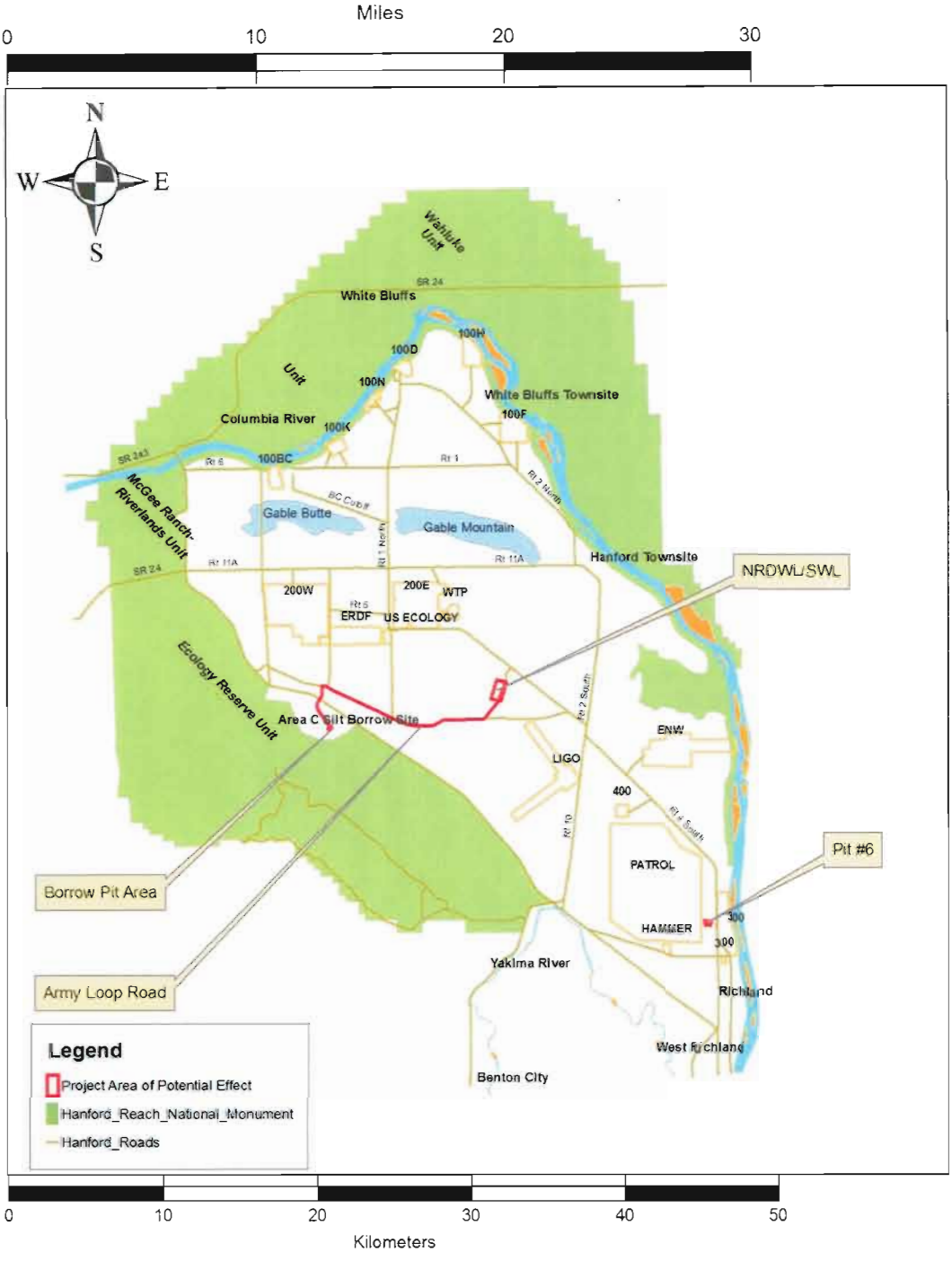


Figure 1. NRDWL/SWL closure project areas of potential effect in the 600 Area of the Hanford Site. Figure taken from Gutzeit et al. (2010).

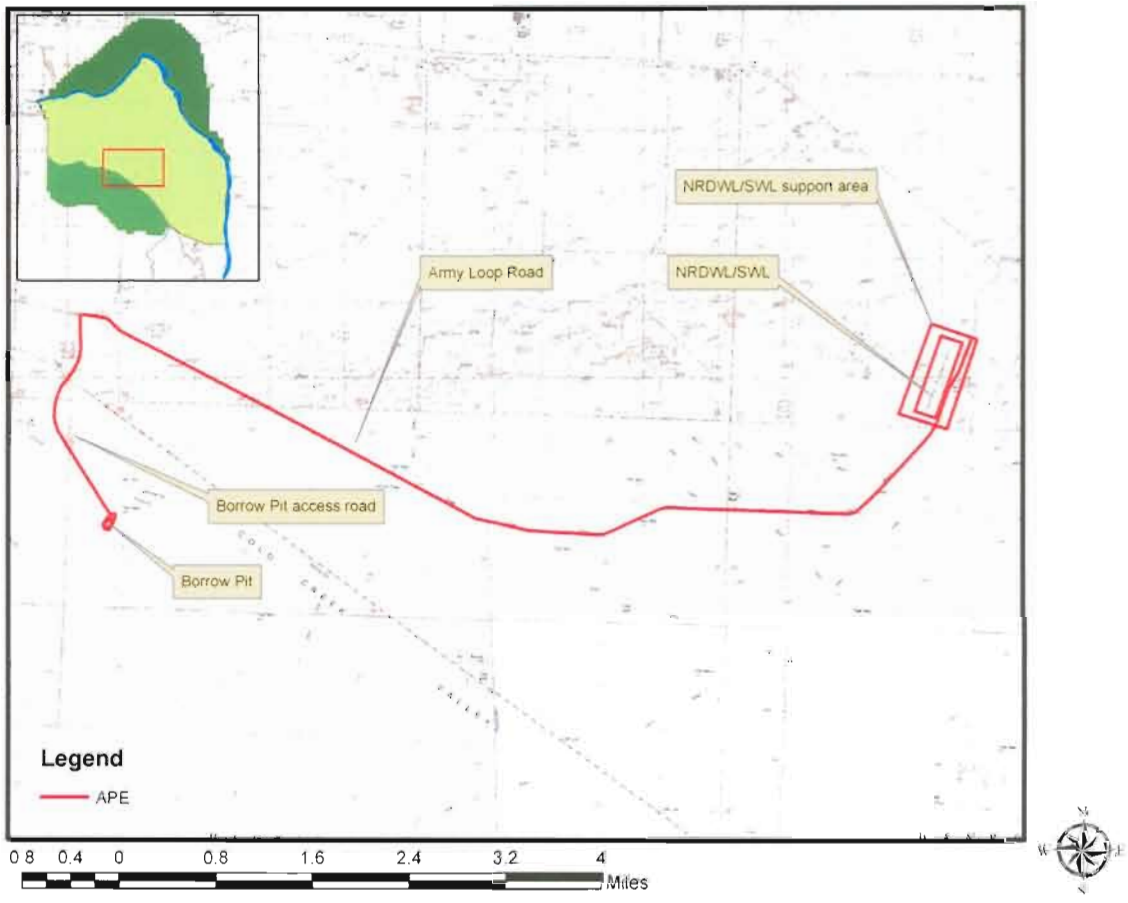


Figure 2. Enlargement of NRDWL/SWL closure project areas of potential effect (APE), excluding Pit #6. Figure taken from Gutzeit et al. (2010).

The ET cover would consist of a 1-m layer of fine-grained, low permeability soil, with the addition of pea-gravel (15 percent by weight) worked into the top 20 cm as an erosion control measure. The ET cover is designed to sustain native vegetation. An effort would also be made to maintain the existing natural dune and serpentine ridge crowns of the NRDWL/SWL to blend into the surrounding landscape.

- 45 acres within Borrow Area C

  Approximately 450,000 yd^3 of fine-grained, low permeability soil would be obtained from a 45 acre area within the west central portion of the 145 acre initial

borrow site development area of Borrow Area C for the ET cover. The specific 45 acre area will be definitively delineated during pre-excavation exploration. Thus, the whole 145 acre initial borrow site development area was considered in this review.

- Army Loop Road between Beloit Avenue and northeast corner of NRDWL

  Upgrades to Army Loop Road from Beloit Avenue to the northeast corner of the NRDWL would be necessary to facilitate transport of borrow material. Army Loop Road was originally 20 feet wide but currently only about 18 ft is passable due to age deterioration and vegetation encroachment. To provide for bi-directional hauling traffic, the road may be cleared 2 ft to its original 20 ft and expanded by 4 ft, for a total of 24 ft in width. Since it is not yet clear which side of the road would be expanded, for the review it was assumed that 8 ft on both sides of the existing roadway would be affected.

  Additionally, upgrades to portions of the existing roadway are needed, including gravel surfacing, which will require regular applications of dust suppressant and periodic, as needed, gravel and additional grading. Once the NRDWL/SWL cover is complete, routine road maintenance will resume.

  Note that the existing borrow area access road (from Highway 240 to the borrow area [Figure 2]) is a two-lane paved road that was originally designed to accommodate bi-directional hauling traffic and thus would not be modified for the NRDWL/SWL closure project.

  Pit #6

  Approximately 12,000 yd^3 of 4-inch minus pit run gravel would be obtained from Pit #6 for the side slopes of the ET cover. (Note that most of the pea gravel for the ET cover would be obtained from an off-site commercial source). Pit #6 is located west of the 300 Area in the 600 Area of the Hanford site (Figure 3).

Survey Objectives:

- Determine the occurrence on and in the near vicinity of the NRDWL/SWL areas of potential effect, described above, of plant and animal species protected under the Endangered Species Act (ESA), candidates for such protection, and species listed as threatened, endangered, candidate, sensitive, or monitor by the state of Washington, and species protected under the Migratory Bird Treaty Act (MBTA).

- Evaluate and quantify the potential impacts of disturbance on priority habitats and protected plant and animal species identified in surveys of the NRDWL/SWL areas of potential effect.

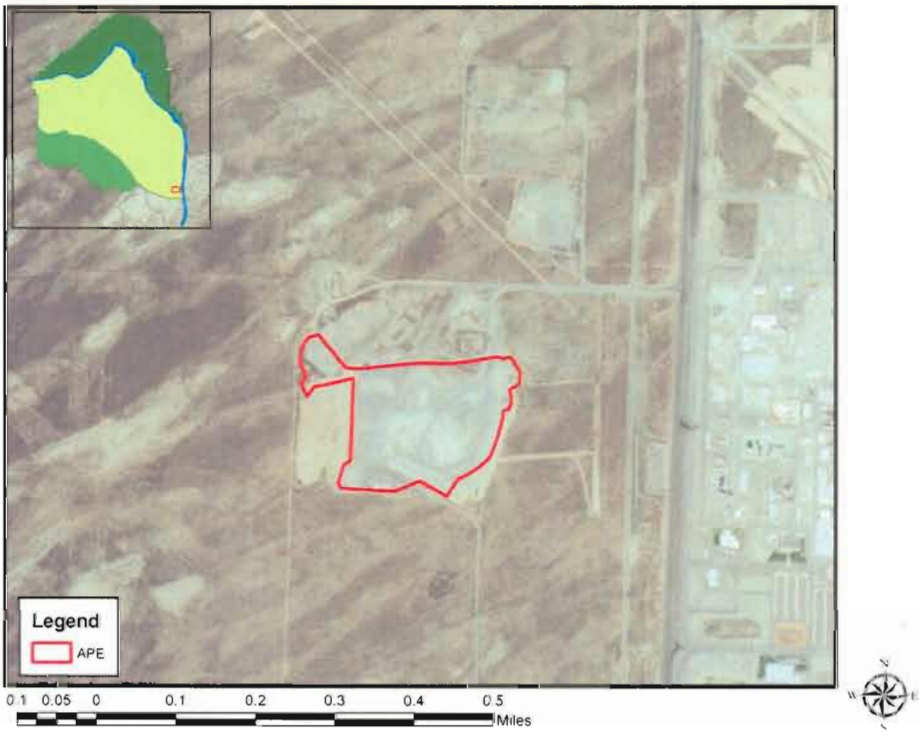


Figure 3. Pit #6 and its area of potential effect in the 600 Area of the Hanford Site, based on a 2006 aerial photo. The 300 Area is partially represented by the buildings to the east, although this area is not labeled in the figure. Figure taken from Gutzeit et al. (2010).

Survey Methods:

- NRDWL/SWL and support area

  Visual and pedestrian reconnaissance (simple walking survey) of the NRDWL/SWL and support area (from the main landfill to the north 112 m, south 96 m, west 168 m, and east 160 m) was performed by J. Becker, K. Hand, and C. Perry on April 14, 2010.

- 145 acre initial borrow site development area

A habitat assessment within the 145 acre initial borrow site development area of Borrow Area C was performed in September, 2009 (*Area C Borrow Site Habitat Assessment*, PNNL-18902 [Sackschewsky and Downs 2009]). Survey methods are detailed in PNNL-18902 and were consistent with those currently used by the Washington Natural Heritage Program (WNHP) for evaluating shrub-steppe communities within Washington. The study consisted of sampling at six locations within the initial borrow site development area. The plant community is relatively homogenous, and the arrangement of the sampling locations was used to ensure that the full extent of variation with the initial borrow site development area was included. The location of each sample is depicted in Figure 4.

Complete ecological compliance reviews have been conducted by PNNL staff for the entire Area C in 2002 (ECR 2002-600-012), for the access road to the initial borrow site in 2005 (ECR 2005-600-012), and for the initial borrow site itself in 2006 (ECR 2006-600-008). Copies of these review reports are available on request.

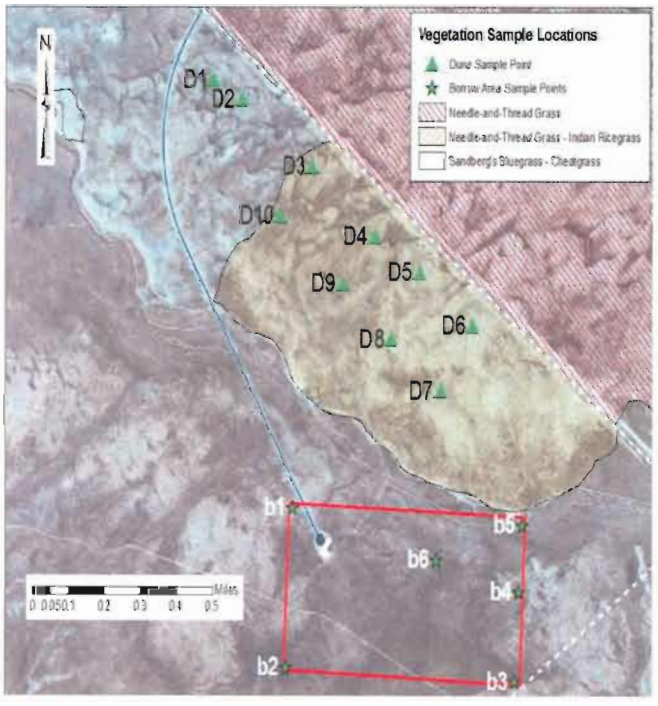


Figure 4. Six sample locations (b1-b6) within the 145 acre initial borrow site development area (outlined in red). Figure taken from Sackschewsky and Downs (2009).

- Army Loop Road between Beloit Avenue and northeast corner of NRDWL

  Pedestrian and visual reconnaissance (simple walking survey) within and near an 8 ft band along on both sides of Army Loop Road between Beloit Avenue and the northeast corner of NRDWL was performed by K. Hand and A. Stegen on March 23, 2010.

- Pit #6

  It was uncertain whether acquisition of 12,000 yd^3 of 4-inch minus pit run gravel from Pit #6 would require the expansion of Pit #6. Therefore, the Pit #6 operations manager, Rusty Knight (Mission Support Alliance) was contacted by J. Becker on April 19, 2010. It was determined that the required material could be obtained from Pit #6 without expansion of the current pit boundaries and no further evaluation of Pit #6 was performed.

- Priority habitats and species of concern

  Priority habitats and species of concern are documented in: Washington Department of Fish and Wildlife (2009a, 2009b), and Washington State Department of Natural Resources (2009). Lists of animal and plant species considered Endangered, Threatened, Proposed, or Candidate by the U.S. Fish and Wildlife Service are maintained at 50 CFR 17.11 and 50 CFR 17.12; the list of birds protected under the MBTA is maintained at 50 CFR 10.13.

- DOE guidance for priority habitats and species

  DOE guidance related to priority habitats and species on the Hanford Site is found in *Hanford Site Biological Resources Management Plan*, DOE/RL 96-32 (DOE 2001a), and *Hanford Site Biological Resources Mitigation Strategy*, DOE/RL 96-87 (DOE 2003).

Survey Results:

- NRDWL vegetation

  Existing soil on the NRDWL is sandy. Overstory vegetation is sparse, consisting of gray rabbitbrush (*Ericameria nauseosus*) (~1% cover), a native shrub. Understory vegetation is also sparse, consisting primarily of Indian ricegrass (*Achnatherum hymenoides*) (5-10% cover), a native bunchgrass, and cheatgrass (*Bromus tectorum*) (~10% cover), an alien annual weed. Other native bunchgrass species observed include Sandberg's bluegrass (*Poa secunda*)

(~1% cover) and needle-and-thread grass (*Hesperostipa comata*) (~1% cover). All other plant species each provided much less than 1% cover.

- SWL vegetation

  Existing soil on the SWL is also sandy. Predominant overstory vegetation on the SWL is gray rabbitbrush, which occurs on the north half of the SWL at ~5% cover and on the south half at ~1% cover. Understory vegetation across the entire SWL consists of cheatgrass (~10% cover), Indian ricegrass (~10% cover), and needle-and-thread grass (1-5% cover). All other plant species each provided much less than 1% cover.

- NRDWL/SWL support area vegetation

  Existing soil in the support area ranges from loose sand on the west and north sides to sand that is more stabilized on the south and east sides due to more prevalent vegetation. Overstory vegetation on the south and east sides is diverse in terms of species, and is comprised of big sagebrush (*Artemisia tridentata*) (~10% cover), bitterbrush (*Purshia tridentata*) (~5% cover), gray rabbitbrush (~1% cover), and green rabbitbrush (*Chrysothamnus viscidiflorus*) (~1% cover). Understory vegetation on the south and east sides is dominated by Sandberg's bluegrass (~25% cover), cheatgrass (~20% cover), and an abundance of native forbs (relative to the north and west sides of the support area and the NRDWL and SWL where native forb diversity is much less). All other plant species each provided much less than 1% cover.

  In contrast, vegetation is sparser on the west and north sides of the support area. Shrub cover is less than one percent, and native grass cover and native forb diversity and density are much less than on the east and south sides.

- Wildlife in the NRDWL/SWL and support area

  Because the NRDWL, SWL, and support area are all adjacent to each other, all wildlife observations associated with these areas are noted together.

  Loggerhead shrikes (*Lanius ludovicianus*), savannah sparrows (*Passerculus sandwichensis*), horned larks (*Eremophila alpestris*), and Western meadowlarks (*Sturnella neglecta*) were observed. However, no nests or indications of nesting behavior of these species were observed. Long-billed curlews (*Numenius americanus*) were also observed. Nesting behavior of this species (returning to the same area on the ground) was observed on the west side of the support area where a nest is likely. A burrowing owl (*Athene cunicularia*) casting was observed just outside an old badger (*Taxidea taxus*) burrow on the west side of

the support area. Burrowing owls are known to nest in old badger burrows. Thus, it is likely that owls have nested in the area, and may yet nest in the area, although the species was not observed during the survey.

Side-blotched lizards (*Uta stansburiana*) and short-horned lizards (*Phrynosoma douglassii*) were observed.

Evidence of use by mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), coyotes (*Canis latrans*), and unidentified small mammals (e.g., mice) was observed.

- 145 acre initial borrow site development area

The 145 acre initial borrow site development area (as well as the rest of Area C) burned during the 24 Command fire in 2000, and sample site B1 (Figure 4) was the only sample site burned in the 2007 Wautoma fire (Sackschewsky and Downs 2009).

Existing soil is fine-grained within the initial borrow site development area. Total vegetation canopy cover across the borrow site plots averaged nearly 59%. Cheatgrass was present in 100% of the sample plots and comprised over three-fourths of the total vegetation canopy cover. Native perennial bunchgrass cover averaged less than 2%; the only grass observed in this category was Sandberg's bluegrass (Sackschewsky and Downs 2009).

Alien forbs, primarily tumble mustard (*Sisymbrium altissimum*), jagged chickweed (*Holosteum umbellatum*), and Russian thistle (*Salsola tragus*) provided 4.6% canopy cover within the borrow area. Native forbs provided about 6.6% canopy cover across the borrow area sampling plots, but about two-thirds of the total measured cover for native forbs was due to turpentine springparsley (*Pterixia terebinthina*) at sample site B1. Where turpentine springparsley occurs, it provides a significant amount of cover, but it occurs in only select microhabitats that are not representative of the borrow area as a whole. Other native forbs comprised less than 1% canopy cover throughout the borrow area (Sackschewsky and Downs 2009).

The 2009 habitat assessment of the initial borrow area (i.e. heavily dominated by cheatgrass and low species diversity) was consistent with the previous ecological compliance surveys of the area noted in the previous section of this letter report.

Migratory birds observed in the area during the previous ecological compliance surveys surveys included horned larks (*Eremophila alpestris*), Western meadowlarks (*Sturnella neglecta*), cliff swallows (*Hirundo pyrrhonota*), and long-

billed curlews (*Numenius americanus*). Cliff swallows are not likely to nest in the area, but horned larks, meadowlarks, and curlews, as well as several other common ground-nesting species, are likely to nest in the borrow area.

Mammals or their sign (e.g., scat, tracks) noted in the vicinity of the initial borrow area during surveys in previous years included badger, coyote, elk, mule deer, black-tailed jackrabbit (*Lepus californicus*), northern pocket gopher (*Thomomys talpoides*), and possibly Townsend's groundsquirrel (*Citellus townsendii*). Evidence of usage of the borrow site area by elk was observed during the 2009 habitat assessment. Side-blotched lizards were observed during the earlier surveys.

- Army Loop Road between Beloit Avenue and northeast corner of NRDWL

Vegetation within and adjacent to an 8-ft band on the south side of Army Loop Road consisted largely of non-native alien species, such as cheatgrass (~20% cover) and Russian thistle (~5% cover). Native shrubs and bunchgrasses were also present but less prevalent, such as gray rabbitbrush (~1% cover), Sandberg's bluegrass (~5% cover), and sand dropseed (*Sporobolus cryptandrus*) (~1% cover). All other plant species, including big sagebrush, each provided less than 1% cover.

Overstory vegetation within and adjacent to an 8-ft band on the north side of Army Loop Road was generally more prevalent than on the south side of the road, consisting of gray rabbitbrush (~15% cover) and big sagebrush (~5% cover). However, understory vegetation on the south side of the road was generally dominated by the same species at about the same cover percentages as on the north side, cheatgrass (~20% cover), sand dropseed (~5% cover), and Sandberg's bluegrass (~1% cover). Native forbs were more prevalent on the north than on the south side of the road. All other plant species each provided much less than 1% cover.

Rush skeleton weed (*Chondrilla juncea*), a Class B noxious weed, was also observed on both sides of Army Loop Road.

Horned larks and Western meadowlarks were the only migratory birds observed. Each species was observed on both the north and south sides of Army Loop Road. Evidence of use by coyotes was also observed in the vicinity.

Considerations and Recommendations:

- No plant or animal species protected under the ESA, candidates for such protection, or species listed by the Washington state government as threatened

or endangered were observed on or in the vicinity of the NRDWL/SWL closure project areas of potential effect.

- Support area habitat

The entire support area beyond the NRDWL/SWL perimeter fence comprises part of the Washington State Natural Heritage Program element occurrence of the bitterbrush/Indian ricegrass sand dune complex on the Hanford Site (Figure 5). The element occurrence data was collected by the Washington State Natural Heritage Program and The Nature Conservancy in the mid-1990s and mapped by PNNL (DOE 2001a).

Element occurrences are classified by the U.S. Department of Energy as level IV biological resources, the highest level on the Hanford Site. Because of their regional and national significance, level IV resources justify preservation as the primary management option. Level IV plant community and habitat resources are of such high quality (i.e., they show little or no indication of human impact or invasion by non-native species, or they have significant wildlife usage) and/or rarity that they cannot be mitigated unless it is by compensatory mitigation via acquisition and protection of in-kind resources off the Hanford Site (DOE 2001a).

It is estimated that the ET cover sideslopes will require use of up to 50 ft (~15 m) in all directions beyond the landfill perimeter fence (e.g., to accommodate tapering the side slope of the landfill cover), comprising ~12% or ~15 ac of the ~121 ac support area. Use of these ~15 ac cannot be avoided. The area generally within 30 ft of the landfill perimeter has been previously disturbed, mostly by a dirt road around the NRDWL/SWL fence. Thus, use of up to 50 ft around the landfill boundary would likely only minimally impact the bitterbrush/Indian ricegrass sand dune complex element occurrence.

A support area (e.g., for equipment storage and laydown, trailers, sanitary facilities) also is needed, which is currently projected to comprise an area well beyond these 50 ft (see support area dimensions in the project description above), totaling an additional ~106 ac. Development of these ~106 ac would substantially adversely affect the bitterbrush/Indian ricegrass sand dune complex element occurrence. Consequently, development of a mitigation action plan that incorporates a combination of mitigation options as described in the Site-wide Biological Resource Mitigation Strategy (BRMiS) (DOE 2003) will be required. Examples of mitigation alternatives are discussed briefly below.

Avoidance – Avoidance may be accomplished by utilizing one or more alternate areas as the support area. Two examples follow.

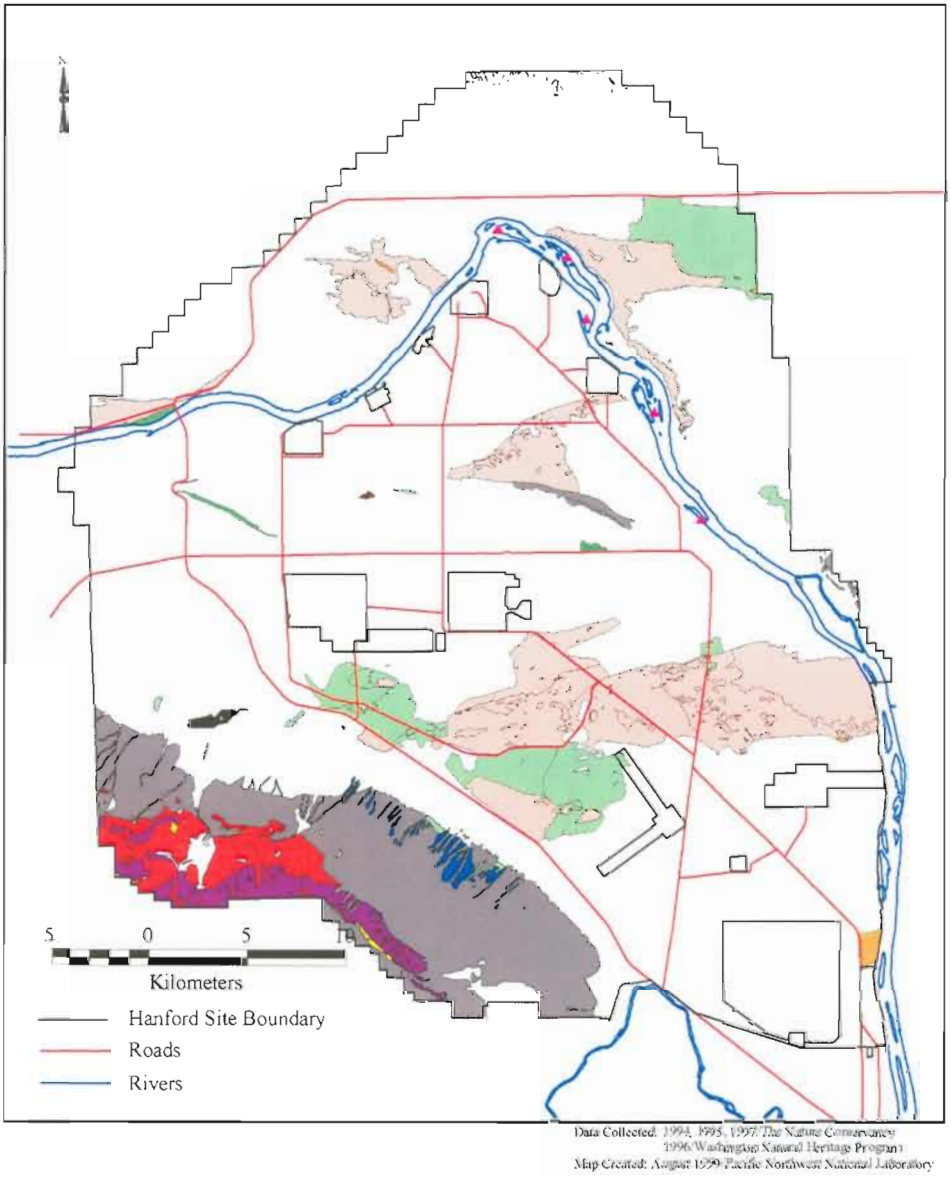


Figure 5. Figure D.21 from DOE (2001) depicting Washington State Natural Heritage Program element occurrences on the Hanford Site, including the bitterbrush/Indian ricegrass sand dune complex colored in pink. The NRDWL/SWL appears as a white rectangle located south of the junction of Route 2 and Army Loop Road. A possible alternative support area is the area in white that spans the east and west sides of Army Loop Road just south of the NRDWL/SWL and north of where Army Loop Road turns to the west.

An area larger than the ~121 ac proposed for the support area is located within less than 0.5 mi of the south end of the NRDWL/SWL. This area spans the east and west sides of Army Loop Road north of where Army Loop Road turns to the west (Figure 5). Based on cursory observations (not a field survey), this alternate support area has more loamy soil dominated by sagebrush and gray rabbitbrush, with an understory dominated mostly by cheatgrass. This area is designated a level III resource (vs the level IV habitat resource in the support area adjacent to the NRDWL/SWL) because it is considered sagebrush dominated shrub-steppe, and is thus subject to compensatory mitigation requirements (DOE 2001a). Note that compensatory mitigation is typically accomplished via planting representative species (e.g. sagebrush) away from the project site at a ratio of 3:1 based on area [DOE 2003]. Mitigation of a level III habitat resource is common on the Hanford Site and would be more readily accomplished than mitigation of the level IV habitat resource described above.

However, a substantial portion of the alternate support area has a very sparse shrub overstory (i.e., much less than 1% cover), and use of it would thus likely not require compensatory mitigation. This area could potentially serve as part or possibly all of the support area, as long as the short distance to the NRDWL/SWL landfill (~0.5 mi) would not preclude it from performing some of the essential functions of a construction support area.

In addition to the alternate support area discussed above, another avoidance-type mitigation method would be to use a portion of the NRDWL/SWL landfill (e.g., 50% [~40 ac]) as an interim support area while the ET cover was being put down on the remainder of the landfill. This option is limited because once the cover is installed, use of this part of the landfill would be highly restricted to avoid damaging the cover, including potentially reducing its ability to support native vegetation. Thus, while a portion of the NRDWL/SWL landfill could potentially be used temporarily as a support area, it would not meet all project requirements for a support area.

Minimization – Minimization may be accomplished by restricting the size of the support area to only that which is necessary. For example, if the ~121 ac evaluated for the support area was a conservative (bounding) estimate, the actual size might be reduced by careful planning. In addition, if the alternate support area discussed above was used, minimization could also be accomplished by reducing the size of the support area and configuring it so as to minimally disturb or entirely avoid disturbing areas with substantial sagebrush cover, thus reducing or negating the need for any compensatory mitigation.

Rectification – Rectification is normally accomplished via revegetation onsite of temporarily disturbed areas (e.g., disturbed areas not occupied by permanent

facilities) with native species. Rectification is not a suitable option for disturbance of a level IV resource (DOE 2001a), such as the bitterbrush/Indian ricegrass sand dune complex element occurrence. However, rectification onsite may be done for a level III resource (DOE 2001a), such as the alternate support area discussed above. For example, rectification could be done on the part of the alternate support area where sagebrush is very sparse and compensatory mitigation would not be required. Rectification could also be done on the part of the alternate support area with appreciable sagebrush cover, and could serve to reduce the associated compensatory mitigation.

In addition, rectification should be implemented on the NRDWL/SWL once the ET cover has been laid down. The cover is designed to sustain native vegetation. A revegetation plan should be developed for the NRDWL/SWL in accordance with Hanford site practices. Because the borrow soil is more loamy than the current NRDWL/SWL and surrounding area soil, which is more sandy, the revegetation species may differ somewhat from the existing plant species in the surrounding area.

Compensation - If the bitterbrush/Indian ricegrass sand dune complex element occurrence (beyond 50 ft from the landfill NRDWL/SWL perimeter fence) is impacted, DOE (2001a) mandates compensatory mitigation via acquisition and protection of in-kind resources off the Hanford Site. The location, acquisition, and protection in perpetuity of a level IV biological resource off the Hanford Site would be more complex and less readily accomplished than compensatory mitigation of a level III resource (e.g., the part of the alternate support area with appreciable sagebrush cover). This is particularly the case for habitat resources that are in good enough condition to be classified by the Washington State Natural Heritage Program as an element occurrence, because much of the native shrub-steppe habitat off the Hanford Site has already been significantly altered.

- Support area plant species

A population of gray cryptantha (*Cryptantha leucophaea*), a Washington State sensitive species (vulnerable or declining and could become endangered or threatened in the state), was observed previously within the support area on the east side of the NRDWL/SWL (ECR 99-600-005 and 99-600-005a), but not during the survey for this project. However, the survey was conducted early in the growing season for this species, and a follow-up survey is recommended.

Gray cryptantha is a level III biological resource because of its current state listing as sensitive. Level III biological resources require mitigation (DOE 2001a), and impacts to this species should be avoided. However, if individuals are destroyed, replacement at a ratio of at least 1:1 would be required (i.e.,

successful transplantation of the individuals that would be affected to a location where they would not be disturbed, or successful propagation and outplanting of the same number of individuals that would be disturbed by the NRDWL/SWL closure project).

- Avian wildlife

  Loggerhead shrikes and burrowing owls are federal species of concern and state candidate species, and long-billed curlews are state monitor species. These three avian species, as well as savannah sparrows, horned larks, and Western meadowlarks, are migratory birds, and as such, are protected under the MBTA.

  Long-billed curlews are nesting in the support area west of the NRDWL/SWL. Burrowing owls likely have nested in the support area west of the NRDWL/SWL, and may currently be nesting in the support area, although owls were not observed during the survey. Loggerhead shrikes may nest in shrubs in the NRDWL/SWL and along Army Loop Road, but would be more likely to nest in the support area habitat, which has a more developed shrub overstory. Sage sparrows (*Amphispiza belli*), a sagebrush obligate species that was not observed during the surveys, is relatively common on the Hanford Site and may also nest in the support area or along Army Loop Road where sagebrush is present. Savannah sparrows, meadowlarks, and horned larks are ground-nesting species and may nest on the ground in any of the project areas, including the 145 acre initial borrow site development area.

  In order to avoid disturbing nesting individuals of these and other migratory bird species, ground-disturbing project work should be undertaken outside the nesting season of migratory birds on the Hanford Site, generally March 15 through July 31. However, if any nesting birds (if not a nest, a pair of birds of the same species or a single bird that will not leave the area when disturbed) are encountered, or bird defensive behaviors (flying at workers, refusal to leave area, strident vocalizations) are observed during work, please contact M. R. Sackschewsky at 371-7187 for further consultation.

- Mammalian wildlife

  Towsend's ground squirrel is a federal species of concern and a state candidate species, and the black-tailed jackrabbit is a state candidate species. Both species may occur in the initial borrow site development area, based on surveys in previous years. This area should be resurveyed prior to ground disturbance.

- 145 acre initial borrow site development area

  Crouching milkvetch (*Astragalus succumbens*) and stalked-pod milkvetch (*Astragalus sclerocarpus*), both Washington State Watch List species, were observed in the cheatgrass/Sandberg's bluegrass/tumble mustard habitat type (which includes the 145 acre initial borrow site development area) in Area C in 2002, and along the borrow area access road route in 2005. These species were not observed during the habitat assessment conducted in 2009; however, it is possible that these species occur within the initial borrow area. Watch List species are not considered species of concern, but are monitored for status and distribution. Both species are relatively common and widespread on the central plateau of the Hanford Site. Thus, removal of some individuals of these species within the initial borrow site development area would not be anticipated to noticeably affect the overall central plateau population.

- Army Loop Road between Beloit Avenue and northeast corner of NRDWL

  Due to the much reduced shrub cover and prevalence of native forbs on the south side of Army Loop Road relative to the north side, road expansion should primarily take place on the south side. However, road widening may take place on the north side, if necessary, in order to avoid disturbing the locations of two cultural resources of concern (post WWII anti-aircraft defense site [H3-421] and the military site with gun revetments [45BN1029]) (Gutzeit et al. 2010). Otherwise, expansion of the north side of the road should be avoided.

  Stalked-pod milkvetch was observed on the north side of Army Loop Road. As noted above, stalked-pod milkvetch is relatively common and widespread on the central plateau of the Hanford Site. Thus, where the north side of Army Loop Road would have to be widened in order to accommodate the two cultural resources of concern on the south side, removal of some individuals of this species, if present, would not be anticipated to noticeably affect the overall central plateau population.

- Pit #6

  Since removal of 12,000 yd^3 of 4-inch minus pit run gravel from Pit #6 would not require the expansion of Pit #6, no associated disturbance of surface biota is anticipated. Further, the biological effects of the current footprint of Pit #6 were evaluated previously in an environmental assessment conducted by DOE (DOE 2001b).

- Use of this review for the EA

  The most recent wildlife survey of the 145 acre initial borrow site development area was conducted in 2006. The surveys of Army Loop Road, NRDWL/SWL, and the support area were conducted at the beginning of the migratory bird nesting season, and thus the nesting activity of some species in the project areas likely had not yet begun.

  The most recent plant survey of the 145 acre initial borrow site development area was conducted in 2009 and was spatially limited to six specific sample areas (PNNL 2009) intended to be representative of the whole area. The surveys of Army Loop Road, NRDWL/SWL, and the support area were conducted at the beginning of the growing season (generally March through June), prior to some of the flora (e.g., gray cryptantha) being in a stage of growth that would permit ready observation and positive identification.

  Thus, the project areas should be resurveyed during the nesting/growing season prior to the commencement of ground disturbing work, which is anticipated for January 2011. Resurvey of the project areas should also include any new areas identified for used as a support area.

- Ground-disturbing activities, such as those associated with the use of heavy equipment, may damage habitat and transport, spread, and increase noxious weedy species. When feasible, off-road travel and travel beyond the project footprint should be avoided, and wheels and undercarriages of vehicles should be washed frequently to minimize transport of weed seeds.

- Develop a project specific Biological Mitigation Plan as early as possible. This is to ensure that the re-survey and support area planning are completed in conjunction with the design and that mitigation requirements are identified.

- Assuming compliance with the above recommendations, no adverse impacts to protected species, priority habitats, or other biological resources of concern are expected to result from the proposed NRDWL/SWL closure project.

Sincerely,

G. M. Becker for

Michael R. Sackschewsky
Compliance Assessment Manager
Ecological Monitoring and Compliance Project

LB:mrs
jmb

REFERENCES

Gutzeit, JL, EP Kennedy, BN Bjornstad, MS Sackschewsky, JJ Sharpe, R DeMaris, M Vino & J Christensen. 2010. *Cultural Resources Review for Closure of the Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill, 600 Area, Hanford Site, Benton County, Washington, HCRC# 2010-600-018.* Pacific Northwest National Laboratory, Richland, Washington.

U.S. Department of Energy (DOE). 2001a. Hanford Site Biological Resources Management Plan. DOE/RL 96-32, Rev. 0. Richland, Washington.

U.S. Department of Energy (DOE). 2001b. Environmental Assessment: Use of Existing Borrow Areas, Hanford Site, Richland, Washington. DOE/EA-1403. Richland, Washington. October.

U.S. Department of Energy (DOE). 2003. Hanford Site Biological Resources Mitigation Strategy. DOE/RL 96-87, Rev. 0. Richland, Washington.

Sackschewsky, M. R. and J. L. Downs. 2009. Area C Borrow Site Habitat Assessment. PNNL-18902. Pacific Northwest National Laboratory. Richland, Washington. December.

Washington Department of Fish and Wildlife. 2009a. Species of Concern in Washington State. http://wdfw.wa.gov/wlm/diversty/soc/soc.htm

Washington Department of Fish and Wildlife. 2009b. Priority Habitats and Species. http://wdfw.wa.gov/hab/phshabs.htm

Washington State Department of Natural Resources. 2009. Washington Natural Heritage Program Plant Ranks. http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html

Appendix E

NEPA Documentation for Borrow Area C

This page intentionally left blank.

NEPA Documentation for Borrow Area C

NEPA Consideration	Source	General discussion	Specific Discussion
Land Use Determination	HCP EIS ROD (64 FR 61615, November 12, 1999), "Basis for the Decision"	The ROD for the HCP EIS documented DOE's decision to set aside Borrow Area C in the HCP EIS for borrow material. In this decision, DOE effectively eliminated McGee Ranch as a source for barrier/cap material. Future consideration of McGee Ranch for borrow material is possible, but would necessitate DOE following procedural steps to change the land use designation for the McGee Ranch (DOE's policies and implementing procedures for land use determination are identified in Chapter 6.0 of the HCP EIS).	From the ROD (Basis for Decision): "Designation of the Wahluke Slope and the Columbia River Corridor buffer zone and river islands for Preservation, and the expansion of the wildlife refuge, are consistent with the DOI ROD for the Hanford Reach EIS, allowing DOE to meet its natural resource trustee mission and safety and buffer zone needs, while protecting cultural resources, sensitive areas and species of concern, and providing for increased High-Intensity and Low-Intensity Recreation in the Columbia River Corridor. The designating of the major portion of the ALE Reserve for Preservation and allowing the incorporation of the ALE Reserve in the proposed wildlife refuge is consistent with current management practices and allows DOE to protect biological and cultural resources. The DOE Preferred Alternative provides for a wildlife corridor through the McGee Ranch, while also allowing DOE to obtain geologic resources at ALE for use in site remediation activities."
Land Use	HSW EIS, Chapter 5, Section 5.1, p 5.8	An impact analysis of up to about 210 acres of Borrow Area C was conducted in the HSW EIS. In the ROD for the HSW EIS (69 FR 39449; Wednesday June 30, 2004), DOE documented its decision (ROD, "Decisions") to use an engineered barrier (cap) at the end of disposal operations for LLBGs and a new lined, combined-use facility closure.	Materials for capping the LLBGs at closure would be obtained from borrow pits in Area C located south of State Route 240 outside of, but adjacent to, the Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE). The ALE boundary as adjusted in the HCP EIS is included within the Hanford Reach National Monument. Area C consists of about 926 ha (2287 ac) and was previously designated for Conservation (Mining) in the Record of Decision (ROD) for the HCP EIS (64 FR 61615). Excavation would occur over up to about 86 ha (210 ac) to provide capping materials for closure of the HSW disposal sites.

NEPA Documentation for Borrow Area C

NEPA Consideration	Source	General discussion	Specific Discussion
Land Use	TC&WM EIS, Chapter 3, Section 3.2.1.1.4, "Borrow Area C Description	Prior to April 1999, McGee Ranch (in the northwest corner of Hanford north of Route 24 and south of the Columbia River) was identified as the primary suitable source of silt, loam, and basalt rock borrow material. Based on public and tribal input received by DOE during the *Hanford Comprehensive Land-Use Plan EIS* process and as recorded in its RODs (64 FR 61615, 73 FR 55824), DOE decided to protect a wildlife corridor through the McGee Ranch and consolidate the many planned borrow areas at Hanford into one location, identified as Borrow Area C (see Figure 3–1), to keep a primary source of geological materials available for Hanford Site remediation activities. Borrow Area C is a large polygonal area 926.3 ha (2,289 ac) in size bordering State Route 240 on the south (see Figure 3–1). Although the area is contiguous with the Fitzner-Eberhardt Arid Lands Ecology Reserve, it is designated for Conservation (Mining) in the *Hanford Comprehensive Land-Use Plan EIS*. Such areas are typically reserved for management and protection of cultural, ecological, and natural resources; however, they may also be used in limited, managed mining activities (DOE 1999a:3-4, 3-18). Borrow Area C is largely undeveloped; consistent with its land use classification; however, a road was built in 2006 to access a portion of the site that will be used to generate borrow material for environmental remediation activities.	

NEPA Documentation for Borrow Area C

NEPA Consideration	Source	General discussion	Specific Discussion
Land Resources	TC&WM EIS, Chapter 2, Tables 2-9, -10, -11	A summary of short-term environmental impacts are provided in the TC&WM EIS for Tank Closure Alternatives (Table 2-9), FFTF Decommissioning Alternatives (Table 2-10), and Waste Management Alternatives (Table 2-11)	Up to 571 hectares (62 percent) of Borrow Area C would be affected (Table 2-9). Up to 3.2 hectares (0.3 percent) of Borrow Area C would be affected (Table 2-10) Up to 159 hectares of Borrow Area C would be affected (Table 2-11)
Air Quality	HSW EIS, Chapter 5, Section 5.2, p 5.16	Air quality impacts focus on four criteria pollutants: nitrogen dioxide, sulfur dioxide, carbon monoxide and particulate matter with aerodynamic diameters of 10 microns or smaller.	Maximum Air Quality Impacts to the Public from Borrow Area C activities were quantified in the HSW EIS (Table 5.6). Emissions were substantially below (i.e., highest of 36 percent) of ambient air quality standards for PM10, SO_2, CO, and NO_2.
Air Quality	TC&WM EIS, Chapter 2, Tables 2-9, -10, -11	A summary of short-term environmental impacts are provided in the TC&WM EIS for Tank Closure Alternatives (Table 2-9), FFTF Decommissioning Alternatives (Table 2-10), and Waste Management Alternatives (Table 2-11)	No specific discussion associated with Borrow Area C.
Water Quality	HSW EIS, Chapter 5, Section 5.3, p 5.30	Area C is not in a physical location to affect either (1) short-term impacts on groundwater quality from operations and construction of Hanford solid waste disposal sites and related facilities; or (2) potential long-term impacts on groundwater and the Columbia River from contaminated releases from Hanford solid waste disposal facilities after closure.	No water quality impacts from use of Borrow Area C would be expected. Any water used for dust suppression during retrieval would not be expected to impact Hanford Site groundwater.
Water Resources	TC&WM EIS, Chapter 2, Tables 2-9, -10, -11	A summary of short-term environmental impacts are provided in the TC&WM EIS for Tank Closure Alternatives (Table 2-9), FFTF Decommissioning Alternatives (Table 2-10), and Waste Management Alternatives (Table 2-11)	Activities in Borrow Area C could encroach on the probable maximum flood zone associated with Cold Creek, especially under Alternatives 6A and 6B (Table 2-11).
Geologic Resources	HSW EIS, Chapter 5, Section 5.4, p 5.96	Impacts on geologic resources result principally from the quantity f borrow materials extracted.	Impacts on geologic resources would result principally from extraction of basalt, sand, gravel, and silt/loam

NEPA Consideration	Source	General discussion	Specific Discussion
			from the Area C borrow pit for use in capping the disposal facilities upon closure. The amounts of these geologic resources committed in the alternative groups are quantified (in Section 5.10 of the HSW EIS).
Geology and Soils	TC&WM EIS, Chapter 2, Tables 2-9, -10, -11	A summary of short-term environmental impacts are provided in the TC&WM EIS for Tank Closure Alternatives (Table 2-9), FFTF Decommissioning Alternatives (Table 2-10), and Waste Management Alternatives (Table 2-11)	Geologic resource requirements, i.e., fill from Borrow Area C (cubic meters): up to 26,000,000 (Table 2-9). Geologic resource requirements (cubic meters): up to 143,000 (Table 2-10). Geologic resource requirements (cubic meters): up to 7,610,000 (Table 2-11).
Ecological Resources	HSW EIS, Chapter 5, Section 5.5, p 5.97	Ecological resources were considered in the HSW EIS. A specific review was conducted. NOTE: A specific ecological review also was completed and documented for the NRDWL/SWL EA (ECR #2010-600-018). **Note**: Although the HSW EIS stated that basalt, sand, and gravel would come from Borrow Area C, in actuality pea gravel would come from a commercial source and basalt from Pit #6.	An ecological resources review was conducted that addressed Borrow Area C [ECR #2002-600-012b (February 2002) – 2289 acres for caps over waste sites]. The bounding analysis was identified as HSW EIS Alternative Group A. Basalt, gravel, and silt/loam for use in capping the HSW disposal facilities would be obtained from borrow pits in Area C, an area of about 926 ha (2288 ac). This area also was burned in the 24 Command Fire; however, some of the pre-fire shrub and understory vegetation survived, so the underlying soil surface has not been as severely affected by wind erosion. The associated stockpile area east of State Route 240 and the area designated for the conveyance roads to the 200 Areas were burned severely in the 24 Command Fire, removing all the vegetation. Excavation of borrow materials would require about 69 ha (170 ac), 70 ha (173 ac), and 73 ha (180 ac) for the Hanford Only, Lower Bound, and Upper Bound waste volumes, respectively. Impacts to habitats and

NEPA Consideration	Source	General discussion	Specific Discussion
			species would depend largely on the locations of borrow pits within Area C. The locations of these areas of disturbance have not yet been determined. Three habitats of concern within Area C may be affected by the excavation of borrow materials, depending on the location of the borrow pits. These and other habitats that could be disturbed or eliminated by excavation of borrow materials within Area C are discussed in detail in Volume II, Appendix I. As noted previously in this section and in Volume II, Appendix I, DOE typically would establish measures to avoid or mitigate these potential consequences before proceeding with construction.
Ecological Resources	TC&WM EIS, Chapter 2, Tables 2-9, -10, -11	A summary of short-term environmental impacts are provided in the TC&WM EIS for Tank Closure Alternatives (Table 2-9), FFTF Decommissioning Alternatives (Table 2-10), and Waste Management Alternatives (Table 2-11). No long-term environmental consequences addressing Borrow Area C were identified.	No sagebrush habitat affected within Borrow Area C. No impact on wetlands or aquatic resources within Borrow Area C. Potential impacts on 4 state-listed special status species within Borrow Area C (Table 2-9). No sagebrush habitat affected within Borrow Area C. No impact on wetlands or aquatic resources within Borrow Area C. Potential impacts on 4 state-listed special status species within Borrow Area C (Table 2-10). No sagebrush habitat affected within Borrow Area C. No impact on wetlands or aquatic resources within Borrow Area C. Potential impacts on 4 state-listed special status species within Borrow Area C (Table 2-11).
Socioeconomics	HSW EIS, Chapter 5, Section 5.6, p 5.114	The primary socioeconomic region of interest is the Richland-Kennewick-Pasco metropolitan statistical area, comprising Benton and Franklin counties in Washington state (Tri-Cities region), where the vast majority of the socioeconomic impacts would be	Implementation of any alternative likely would have very small impacts on the local socioeconomic infrastructure (e.g., housing, schools, medical support, and transportation).

NEPA Documentation for Borrow Area C

NEPA Consideration	Source	General discussion	Specific Discussion
		expected. The socioeconomic impacts are classified in terms of primary and secondary. Changes in Hanford employment and non-labor expenditures associated with possible actions are classified as primary impacts. Additional changes that result in the general regional economy and community as a result of these primary changes are categorized as secondary effects. Examples of secondary impacts include changes in retail and service employment or changes in demand for housing. The total socioeconomic impact in the region is the sum of the primary and secondary impacts.	

NEPA Documentation for Borrow Area C

NEPA Consideration	Source	General discussion	Specific Discussion
Cultural Resources	HSW EIS, Chapter 5, Section 5.7, p 5.126; Volume II, Appendix K	Potential impacts on Hanford Site cultural resources involve impacts to archaeological sites, archaeological features, artifacts, and historic buildings. In addition, several places in the vicinity of the 200 Areas have had, and continue to have, traditional roles in Native American creation beliefs and the cultural heritage of the Wanapum, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Yakama Nation. These places include, but are not limited to, the Columbia River, Gable Mountain, Gable Butte, and Rattlesnake Mountain. NOTE: A specific cultural resources review also was completed and documented for the NRDWL/SWL EA (HCRC#2010-600-018). **Note**: Although the HSW EIS stated that basalt, sand, and gravel would come from Borrow Area C, in actuality pea gravel would come from a commercial source and basalt from Pit #6.	A cultural resources review was conducted that included Borrow Area C [HCRC #2002-600-012 (February 11, 2002) – 2289 acres for caps over waste sites]. The principal potential for impacts on cultural resources in the alternatives is associated with obtaining materials for the Modified RCRA Subtitle C Barrier to be placed over the disposal sites. This material, which includes basalt, sand, gravel, and silt/loam, would be obtained from a borrow pit in Area C. The borrow pit is within an area of about 926 ha (2287 ac), of which about 86 ha would be the maximum area excavated. There is a reasonable likelihood that archaeological sites are located within Area C. However, any sites are likely to be buried, as the field reconnaissance failed to locate any on the surface. Little is known about the pre-contact use of the Cold Creek Valley; thus, any sites located there would provide an opportunity to gain new knowledge about prehistoric life. Further, if campsites or village sites were found, human remains and possibly cemeteries might also be located there.
Cultural Resources	HSW EIS, Volume II, Appendix K, Section K.2	Area C borrow pits would be used for excavation of basalt and fine textured material, such as silt loam, gravel, or sand, for construction of closure covers to be placed over low-level waste (LLW) trenches in Alternative Groups A through E and MLLW trenches in all alternatives. The HCRL conducted a cultural resources review of the 926-ha (2287-ac) Area borrow pit in February 2002.	Staff of HCRL conducted a records and literature search that revealed a small section of Area C had been previously surveyed in 1994 for cultural resources (Duranceau, D. A. 1995. *Site Evaluation Report for Candidate Basalt Quarry Sites*. BHI-00005, Rev. 00, Bechtel Hanford, Inc., Richland, Washington.). Section K.2.2 (p k.8) - For the purposes of this EIS, a cultural resources survey of Area C is recommended prior to the commencement of excavation activities.

NEPA Consideration	Source	General discussion	Specific Discussion
			HCRL staff has conducted a variety of research initiatives to assess the potential cultural resources impacts the project may have. These activities included: historical research; photogrammetry; ethnographic research; and archaeological research and field reconnaissance. The activities are summarized in Section K.2.2; it was noted that if significant archaeological remains are present in Area C, they are most likely buried under wind-blown deposition.
Cultural and Paleontological Resources;	TC&WM EIS, Chapter 2, Tables 2-9, -10, -11	A summary of short-term environmental impacts are provided in the TC&WM EIS for Tank Closure Alternatives (Table 2-9), FFTF Decommissioning Alternatives (Table 2-10), and Waste Management Alternatives (Table 2-11)	No impact on prehistoric, historic, or paleontological resources. Up to 1,409 acres of Borrow Area C could be excavated, impacting American Indian interests. This would be readily visible from Rattlesnake Mountain. Upon completion of work, the area would be recontoured and revegetated, lessening the visual impact (Table 2-9). No impact on prehistoric, historic, or paleontological resources. Excavation activities would impact the view from State Route 240 and higher elevations, including Rattlesnake Mountain, impacting American Indian interests (Table 2-10). No impact on prehistoric, historic, or paleontological resources. Excavation of Borrow Area C would involve 159 hectares. This would change the viewscape from Rattlesnake Mountain and higher elevations, impacting American Indian interests (Table 2-11).
Traffic and Transportation	HSW EIS, Chapter 5, Section 5.8, p 5.131	Traffic and transportation impacts would be associated with the shipment of capping materials from Borrow Area C to Hanford Site locations.	The impacts of transporting construction and capping materials to solid waste management facilities on the Hanford Site are summarized in Table 5.29. The materials that were included in the calculations included concrete, asphalt, gravel/sand, silt/loam,

NEPA Consideration	Source	General discussion	Specific Discussion
			basalt, bentonite, and steel. Although some accidents were predicted to occur, there were no predicted fatalities associated with transport of construction and backfill materials. The impacts of all alternative groups were found to be dominated by transport of gravel/sand, silt/loam, and basalt to use as capping materials. The impacts for the No Action Alternative were found to be dominated by the transport of steel and concrete.
Noise	HSW EIS, Chapter 5, Section 5.9, p 5.147	Noise is defined technically as sound that is unwanted and perceived as a nuisance by humans.	In the HSW EIS, the principal activities associated with Alternative Group A (for the Hanford Only, Lower Bound, or Upper Bound waste volumes) would be modification of the T Plant Complex; construction of deeper and wider trenches; loading, backfilling, and closure of the LLBGs; operation of the WRAP, T Plant, and CWC; operation of pulse driers for MLLW leachate; onsite transport of construction materials and waste; transport of MLLW offsite for treatment; disposal of ILAW in a new disposal facility near the PUREX Plant; and transport of construction materials to the site. Infrequent blasting of rock from the Area C borrow pit would not exceed applicable state standards at the nearest residence. Material for capping LLBGs at closure would be acquired from the Area C borrow pit and would result in higher, but localized, noise levels from use of heavy equipment. In the absence of prolonged presence of the public in the vicinity, these noise levels likely would not result in a noticeable impact. Because there are no residential areas in the vicinity, state standards for noise would not be exceeded. (For protection of the public, Washington Administrative Code (WAC) 173-60 has established a limit for daytime residential noise

NEPA Consideration	Source	General discussion	Specific Discussion
			levels of 70 decibels (dBA) and a nighttime limit of 50 dBA at industrial site boundaries. No actual human habitations would be located within 10 km (6.2 mi) of the boundary of the Industrial-Exclusive zone surrounding the 200 Areas or the Area C borrow pit south of State Route 240, thus ensuring that WAC limits would not be exceeded.)
Resource Commitments	HSW EIS, Chapter 5, Section 5.10, p 5.151	Resource commitments would involve usage of fuel for equipment, as well as capping material (i.e., silt loam).	Various energy and material resources would be committed in the implementation of any of the alternative groups. Estimates of major resources committed are summarized by alternative group in Table 5.32 (p 5.152 of the HSW EIS).
Human Health and Safety Impacts	HSW EIS, Chapter 5, Section 5.11, p 5.154	Potential health impacts to workers and the public are related to: airborne release of radionuclides and chemicals from routine and accident conditions (excluding transportation); waterborne releases (via groundwater) over the long term; construction activities; operations; fugitive releases of criteria pollutants; inadvertent intrusion into disposal facilities. Potential health effects include the following populations of individuals: construction workers – workers involved with construction activities; involved workers – workers directly involved in the activity being discussed; non-involved workers – workers physically near the activity being discussed, but not directly involved in the activity; maximally exposed individual (MEI) from atmospheric release – hypothetical member of the public who receives, through airborne emissions, the highest health impacts from onsite activities; maximally exposed individual from waterborne releases – hypothetical member of the public who receives, through waterborne emissions, the highest health impacts from onsite activities; local	It was noted (Section 5.11.2.2.4 of the HSW EIS). In all alternative groups except the No Action Alternative, a Modified RCRA Subtitle C Barrier would be placed over the HSW disposal facilities. Although Russian thistle roots might occur in the upper layers of the barrier, a 25-cm (10-in.) layer of asphalt just above the trench backfill (at grade) would discourage both deep-rooted plants and burrowing animals. In the No Action Alternative, only the MLLW trenches would be covered with the Modified RCRA Subtitle C Barrier and, as a consequence, avoidance of surface contamination by tumbleweeds would likely rely on use of herbicides or cultivation of certain species like wheatgrass that would choke out the tumbleweeds and provide for evapotranspiration and reduction in infiltration of water into the waste sites.

NEPA Consideration	Source	General discussion	Specific Discussion
		populations – the populations within 50 miles (80 km) of the center of the Hanford Site that are exposed to airborne releases; downstream populations – the entire populations of Pasco, Kennewick, and Richland (Tri-Cities), Washington, and downstream populations represented by Portland, Oregon; maximally exposed individual from inadvertent intrusion into disposal facilities – hypothetical individual receiving the highest impacts following inadvertent intrusion into the disposal facilities; and maximally exposed individual from inadvertent intrusion into disposal facilities – hypothetical individual receiving the highest impacts following inadvertent intrusion into the disposal facilities.	

NEPA Consideration	Source	General discussion	Specific Discussion
Aesthetic and Scenic Resources	HSW EIS, Chapter 5, Section 5.12, p 5.270	Existing aesthetic and scenic resources of the Hanford Site are described in Section 4.8.10 of the HSW EIS). Most facilities are not visible to the public because of the size of the facilities, the size of the Hanford Site, the location of the facilities within the Hanford Site, the terrain and restricted access to the site, and the distance between the viewer and the activity on the site.(a) The exception is the construction, operation, and eventual closure(s) of Borrow Area C. As discussed in the HSW EIS, Borrow Area C is a large polygonal area located adjacent to and south of State Route 240 and centered approximately at the intersection of Beloit Avenue and State Route 240. This site is about 926 ha (2,287 ac) in size and is located next to the Fitzner Eberhardt Arid Lands Ecology Reserve (ALE) but is not part of the Hanford Reach National Monument. The area was designated as conservation (mining) in the Record of Decision (ROD) (64 FR 61615) for the *Final Hanford Comprehensive Land-Use Plan EIS* (DOE 1999). The operation of the borrow pit would not be visible from vehicles using State Route 240 from the southwest until they are approximately three-quarters of the way past the site. The reason for this restriction in the viewshed(b) is the elevated terrain adjacent to State Route 240, separating Area C from the road. Travelers coming from the northwest on State Route 240 would notice the site sooner and would be able to observe the activities in passing. The pits, themselves, would be located a minimum of 152 m (500 ft) from State Route 240. During borrow pit site development, the bringing of utilities from the Hanford 200 West Area to the site would be noticeable by those traveling on State Route 240. The Area C borrow pits would be within the northerly viewshed from	Most facilities are not visible to the public because of the size of the facilities, the size of the Hanford Site, the location of the facilities within the Hanford Site, the terrain and restricted access to the site, and the distance between the viewer and the activity on the site. The exception is the construction, operation, and eventual closures of the Area C borrow pits. The Area C borrow pit site is a large polygonal area located adjacent to and south of State Route 240 and centered approximately at the intersection of Beloit Avenue and State Route 240. This site is about 926 ha (2287 ac) in size and is located next to the Fitzner Eberhardt Arid Lands Ecology Reserve (ALE) but is not part of the Hanford Reach National Monument. The area was designated as conservation (mining) in the Record of Decision (ROD) (64 FR 61615) for the *Final Hanford Comprehensive Land-Use Plan EIS* (DOE 1999). The operation of the borrow pit would not be visible from vehicles using State Route 240 from the southwest until they are approximately three-quarters of the way past the site. The reason for this restriction in the viewshed(b) is the elevated terrain adjacent to State Route 240, separating Area C from the road. Travelers coming from the northwest on State Route 240 would notice the site sooner and would be able to observe the activities in passing. The pits, themselves, would be located a minimum of 152 m (500 ft) from State Route 240. During borrow pit site development, the bringing of utilities from the Hanford 200 West Area to the site would be noticeable by those traveling on State Route 240. The Area C borrow pits would be within the northerly viewshed from Rattlesnake Mountain.

NEPA Consideration	Source	General discussion	Specific Discussion
		Rattlesnake Mountain. During the operation of the Area C borrow pits, a maximum of approximately 70 pits would be excavated, and 86 ha (213 ac) would be disturbed. From the air and State Route 240, the surface terrain will look pockmarked. During the 12 plus years of the site's operational life, stockpiles of sand, gravel, rock, and silt/loam would be located within 305 m (1000 ft) of State Route 240. The individual borrow pits would be restored when their useful life ends. This restoration includes replacing excavated topsoil and re-seeding the area. After extraction of resources from the borrow pit area is complete, the site pit slopes would be re-graded and irregular terrain lines installed to blend the site with the surrounding terrain. No permanent adverse aesthetic or scenic impacts would be expected. Fugitive dust associated with development and operation of the Area C borrow pits is a recognized, potential problem, and, as a result, a program would be undertaken to keep fugitive dust controlled during site development and operation, even during off hours. The use of soil adhesives, the application of water, and the discontinuance of excavation and truck loading activities, when winds are excessive, are some of the control measures that would be employed. As a consequence, fugitive dust from the borrow pit area would not be expected to develop into an adverse aesthetic or scenic impact. Elk occupying the ALE site are sometimes seen from State Route 240. Operation of the borrow pit might reduce the likelihood of sighting these animals near Area C because they might migrate farther away from where they might be seen from the highway as a result	During the operation of the Area C borrow pits, a maximum of approximately 70 pits would be excavated, and 86 ha (213 ac) would be disturbed (Alternative Group B – Upper Bound waste volume). From the air and State Route 240, the surface terrain will look pockmarked. During the 12 plus years of the site's operational life, stockpiles of sand, gravel, rock, and silt/loam would be located within 305 m (1000 ft) of State Route 240. The individual borrow pits would be restored when their useful life ends. This restoration includes replacing excavated topsoil and re-seeding the area. After extraction of resources from the borrow pit area is complete, the site pit slopes would be re-graded and irregular terrain lines installed to blend the site with the surrounding terrain. No permanent adverse aesthetic or scenic impacts would be expected. Fugitive dust associated with development and operation of the Area C borrow pits is a recognized, potential problem, and, as a result, a program would be undertaken to keep fugitive dust controlled during site development and operation, even during off hours. The use of soil adhesives, the application of water, and the discontinuance of excavation and truck loading activities, when winds are excessive, are some of the control measures that would be employed. As a consequence, fugitive dust from the borrow pit area would not be expected to develop into an adverse aesthetic or scenic impact. Elk occupying the ALE site are sometimes seen from State Route 240. Operation of the borrow pit might reduce the likelihood of sighting these animals near Area C because they might migrate farther away from where they might be seen from the highway as a result

NEPA Consideration	Source	General discussion	Specific Discussion
		of these activities. Travelers can see some site facilities in the 200 West Area on an 11-km (7-mi) segment of State Route 240 south of the Yakima Barricade (near the junction of State Route 240 and State Route 24). At the closest approach, facilities associated with waste-management activities are about 3 km (2 mi) distant. Facilities throughout the 200 Areas are visible from elevated locations, such as Gable Mountain, Gable Butte, and Rattlesnake Mountain, and in the distance from atop the bluffs, east of the Columbia River. These locations generally are not points for public viewing because of their restricted access; however, they may be points of viewshed observation important to Native Americans." **Note**: Although the HSW EIS referred to closure and/or restoration, in actuality the activities would involve reclamation.	of these activities.
Aesthetic and Scenic Resources	TC&WM EIS, Chapter 3, Section 3.2.1.2.4, "Borrow Area C Description	Borrow Area C, with the exception of a roadway completed in 2006, is an undeveloped area on the south side of State Route 240 (see Figure 3–1). It is generally indistinguishable from the Fitzner-Eberhardt Arid Lands Ecology Reserve, which surrounds it on three sides. Since the 24 Command Fire burned the area in 2000, the original vegetation of the area has changed substantially and it now appears as grassland with little shrub component. A large portion of Borrow Area C surface also was burned by the recent 2007 Wautoma Wildland Fire. Due to the presence of the road across a portion of the site, Borrow Area C is consistent with a BLM VRM Class II rating. It is readily visible from State Route 240, located immediately adjacent to the area, and Rattlesnake Mountain, about 6.4 km (4 mi) to the south. It is also visible in the distance from Gable	

NEPA Consideration	Source	General discussion	Specific Discussion
		Mountain, 12.9 km (8 mi) to the northeast, and Gable Butte, 11.3 km (7 mi) to the north.	
Visual Resources;	TC&WM EIS, Chapter 2, Tables 2-9, -10, -11	A summary of short-term environmental impacts are provided in the TC&WM EIS for Tank Closure Alternatives (Table 2-9), FFTF Decommissioning Alternatives (Table 2-10), and Waste Management Alternatives (Table 2-11)	Could be a highly noticeable change in the visual character to Borrow Area C, especially as seen from State Route 240 and nearby higher elevations (Table 2-9). Minor change in visual character of Borrow Area C (Table 2-10). Noticeable change in the visual character of the 200 Areas and Borrow Area C, especially from nearby higher elevations, or, in the case of Borrow Area C, State Route 240 (Table 2-11)

NEPA Documentation for Borrow Area C

NEPA Consideration	Source	General discussion	Specific Discussion
Environmental Justice	HSW EIS, Chapter 5, Section 5.13, p 5.275	Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629), directs Federal agencies in the Executive Branch to consider environmental justice so that their programs will not have "…disproportionately high and adverse human health or environmental effects…" on minority and low-income populations. Executive Order 12898 further directed Federal agencies to consider effects to "populations with differential patterns of subsistence consumption of fish and wildlife." The Executive Branch agencies also were directed to develop plans for carrying out the order. The CEQ provided additional guidance later for integrating environmental justice into the National Environmental Policy Act process in a December 1997 document, *Environmental Justice Guidance Under the National Environmental Policy Act* (CEQ 1997b). Environmental justice is concerned with assessing the disproportionate distribution of adverse impacts of an action among minority and low-income populations, in which the impacts are significantly greater than those experienced by the rest of the population. Adverse impacts are defined as negative changes to the existing conditions in the natural environment (for example, land, air, water, wildlife, vegetation) or in the human environment (for example, employment, health, land use).	As stated in the HSW EIS, the pathways through which the potential environmental impacts are associated, with respect to each of the alternative groups, and how they might disproportionately impact minority or low-income groups were reviewed for each of the associated sections of Section 5. The only aspect that exhibited the potential for disproportionate impacts dealt with implications of cultural resources on the Hanford Site with respect to Native Americans. Furthermore, these would be common to all of the alternative groups. Native American affiliations near the Hanford Site include such places as Gable Mountain, Rattlesnake Mountain, and Gable Butte with respect to their creation beliefs and cultural heritage. Thus disproportionate adverse impacts from implementing any of the alternative groups on minority or low-income populations would be limited to those that might be associated with restricted use of Native American traditional cultural places on the Hanford Site. Additional information on cultural resources and aesthetic and scenic resources were addressed in previously.

NEPA Consideration	Source	General discussion	Specific Discussion
Cumulative Impacts	HSW EIS, Chapter 5, Section 5.14, p 5.277	In 40 CFR 1508.7, the Council on Environmental Quality (CEQ) defines cumulative impact as: *"…the impact on the environment from the incremental impact of the action when added to other past, present, and reasonably future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time)."*	The HSW EIS did not consider any change in land use designated by the HCP EIS Record of Decision (64 FR 61615). The HCP EIS took a long-term look at the resources that would be required for the major reasonably foreseeable projects. Capping on the Central Plateau and complete conversion of the Industrial-Exclusive to industrial areas were two of the impacts assumed at that time. The HCP EIS contained the distribution of BRMaP Levels II, III, and IV resources for the DOE preferred alternative— prior to the 24 Command Fire. BRMaP mitigation would have been required for those areas that were designated Level III or Level IV. Assuming that the pre-fire condition represents the edaphic potential of the burned areas, the HCP EIS identified 44,183 ha (109,179 ac) in Conservation (Mining) and 5,064 ha (12,323 ac) in Industrial-Exclusive as BRMaP Level III resources, out of a site resource base of 148,080 ha (365,914 ac). These areas contain no BRMaP Level IV resources. In the HCP EIS, Conservation (Mining) was chosen for 30 percent of the site, while Preservation was chosen for 53 percent of the site. Isolated element occurrences in Area C might qualify as Level III or Level IV but would need to be re-examined nearer the time of the planned disturbance. Geologic resources consisting of sand, gravel, silt/loam, and perhaps basalt would be required in the construction of Modified RCRA Subtitle C Barriers for any of the alternative groups and for the Hanford barrier to cover immobilized low-activity waste (ILAW) as disposed of in the No Action Alternative. The expected quantities of these resources were presented in Section 5.10. The resources would be

NEPA Documentation for Borrow Area C

NEPA Consideration	Source	General discussion	Specific Discussion
			obtained from Area C identified in the HCP EIS (DOE 1999) as Conservation (Mining). In areal extent, the requirements would at most (Alternative Group B) amount to about 10 percent of Area C designated for borrow-pit materials. This HSW EIS does not consider any change in land use designated by the HCP EIS ROD (64 FR 61615). The HCP EIS took a long-term look at the resources that would be required for the major reasonably foreseeable projects. Capping on the Central Plateau and complete conversion of the Industrial-Exclusive to industrial areas were two of the impacts assumed at that time. Appendix D of the HCP EIS discussed using 36.1 million m^3 (47.3 million yd^3) of fine textured soils and developing a basalt source that could yield 15.3 million m^3 (20 million yd^3) of basalt riprap. A maximum of 90 ha (222 ac) of Area C would be used for geologic resource development, out of the 44,183 ha (109,179 ac) reserved by the HCP EIS for Conservation (Mining). In the HCP EIS, Conservation (Mining) was chosen for 30 percent of the site, while Preservation was chosen for 53 percent of the site.

NEPA Consideration	Source	General discussion	Specific Discussion
Cumulative Impacts	TC&WM EIS, Chapter 6	The methodology used in the TC&WM EIS to estimate cumulative impacts **was** divided into four phases: (1) identification of resource areas and appropriate regions of influence (ROIs); (2) identification of reasonably foreseeable future actions; (3) estimation of cumulative impacts; and (4) identification of monitoring and mitigation requirements. The detailed cumulative impacts methodology and a flow chart showing the four phases are presented in Appendix R of the TC&WM EIS.	Section 6.3.1.2, Visual Resources: The relative cumulative visual impacts of the three *TC & WM EIS* alternative combinations would be similar to the combined impacts addressed in Chapter 4, Section 4.4.1.2, because all other recent past, present, and reasonably foreseeable future non-DOE actions within the ROI would remain the same for all of the alternative combinations evaluated. In most cases, activities within the ROI would not change the U.S. Bureau of Land Management Visual Contrast Ratings because projects would be located in or adjacent to areas that are already developed. However, the rating for Borrow Area C would change from Class II to Class III under Alternative Combination 1 and Class IV under Combinations 2 and 3. In the latter case, mining activities would dominate an area that had previously undergone minimal development. Section 6.3.5, Geology and Soils (also refer to Table 6-4): The ROI for geologic and soil resources encompasses all of Hanford, including the proposed *TC & WM EIS* action areas and any ongoing or future actions across Hanford that may require excavation of geologic and soil resources from Borrow Area C and additional materials from Gravel Pit No. 30. As indicated in Table 6–4, projected demands for other DOE and non-DOE activities would approach the 57.9 million cubic meters (75.7 million cubic yards) of established geologic and soil reserves from Borrow Area C and Gravel Pit No. 30 without the additional contribution from the *TC & WM EIS* alternative combinations. Section 6.3.8.3, American Indian Interests: Onsite DOE projects and activities that may be visible include excavation and use of geologic materials from borrow

NEPA Consideration	Source	General discussion	Specific Discussion
			pits, transport of materials on the borrow site haul road from Route 240 through Borrow Area C,…
Mitigation Measures – Cultural Resources	HSW EIS, Chapter 5, Section 5.18.2, p 5.307	Mitigation for cultural resources on the Hanford Site is addressed in general in the Hanford Cultural Resources Management Plan. An MOA was finalized in April 2009 for use of approximately 11 acres of Borrow Area C for materials to be used for a CERCLA barrier. NEPA values were addressed for that activity in DOE/RL-2003-24, Revision 0, *Proposed Plan for the 200-UW-1 Operable Unit* http://www5.hanford.gov/arpir/?content=findpage&AKey=DA007725. A final draft amended MOA (an expansion of the April 2009 MOA) is included in this revised EA.	In the HCP EIS (DOE 1999), the Central Plateau was designated for Industrial-Exclusive use and Area C was designated for Conservation (mining). The activities described in this HSW EIS would be consistent with those designations. To avoid loss of cultural resources during construction of solid waste management facilities on the Hanford Site, cultural resources surveys have been and would continue to be made of the areas of interest. If any cultural resources were discovered during construction, construction would be halted. The appropriate authorities would be notified so the find could be evaluated to determine its appropriate management or its effect on continuation of activities. Because Area C is within the viewshed from Rattlesnake Mountain, operation of the borrow pit there might have an indirect effect on the characteristics that contribute to the cultural and religious significance of Rattlesnake Mountain to local tribes. However, at the end of borrow pit operations, the area would be restored to natural contours and revegetated (see HSW EIS, Volume II, Appendix D). Additional information on aesthetic and scenic impacts of these activities is presented in HSW EIS, Section 5.12. Given the possibility for buried cultural resources, some methodology would likely be needed to observe the subsurface. Ground-penetrating radar, shovel testing, or backhoe testing might be appropriate, as would monitoring for cultural resources during construction. Depending on conditions of the area, the

NEPA Consideration	Source	General discussion	Specific Discussion
			frequency of monitoring may range from continuous to intermittent to periodic.
Mitigation Measures-Ecological Resources	HSW EIS, Chapter 5, Section 5.18.3, p 5.307		In the HCP EIS (DOE 1999) the Central Plateau was designated for Industrial-Exclusive use and Area C was designated for Conservation (mining)…Some other habitats and species found in the burned area (24 Command Fire) would be subject to mitigation under existing biological conditions and current mitigation guidelines. These are the element occurrences and purple mat (*Nama densum* var. *parviflorum*) found in Area C.
Mitigation Measures-Traffic and Transportation	HSW EIS, Chapter 5, Section 5.18.7, p 5.309		Transport of LLBG capping materials from the borrow pit in Area C across State Route 240 to the 200 Areas was determined to have the potential for traffic congestion and accident hazards. As a consequence, an underground conveyor system could be used to move the materials to a staging area east of State Route 240 and to minimize crossings of trucks and other equipment. Further, additional safety measures would be expected to take the form of dust control; restrictions on crossings to off-shift-change hours; signs and warning lights along State Route 240 to the north, south, and well in advance of the crossing; and a traffic control light at the crossing itself.
Mitigation Measures-Area and Resource Management and Mitigation Plans	HSW EIS, Chapter 5, Section 5.18.8, p 5.310		All of the following plans would be expected to be available as DOE guidance by the time the activities described in the HSW EIS would be underway and for which special management or mitigation might be appropriate. • *Hanford Cultural Resources Management Plan* • *Hanford Site Biological Resources Management Plan* • *Hanford Bald Eagle Management Plan*

NEPA Consideration	Source	General discussion	Specific Discussion
			• *Aesthetic and Visual Resources Management Plan* • *Facility and Infrastructure Assessment and Strategy* • *Mineral Resources Management Plan* (that is, soils, sand, gravel, and basalt) • *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions* • *Hanford Site Biological Resources Mitigation Strategy*.
Mitigation	TC&WM EIS, Chapter 7	Mitigation measures associated with Borrow Area C have been incorporated into the alternatives proposed in the TC&WM EIS to prevent or reduce the short- and long-term environmental impacts.	Table 7-1: addressing mitigation of geology and soils: the analysis in the TC & WM EIS assumes all borrow material would come from Borrow Area C, and no excavation spoils from waste management disposal facility or new facility construction would be used. To mitigate this impact, the extraction and management of geologic materials would be executed in a manner consistent with the policies and resource management plans as described in the *Hanford Comprehensive Land-Use Plan EIS* (DOE 1999a), the subsequent *Hanford Comprehensive Land-Use Plan EIS SA* (DOE 2008), and their associated RODs (64 FR 61615 and 73 FR 55824). Page 7-8 (Land Resources): Restoration of Borrow Area C, including regrading, contouring the landscape, revegetation to match the natural landscape, and adherence to best management practices for soil erosion and sediment control in accordance with appropriate resource management plans such as a final adopted version of the *Draft Industrial Mineral Resources Management Plan.*. Page 7-9 (Noise and Vibration): Noise impacts would be the greatest for wildlife near Borrow Area C.

NEPA Consideration	Source	General discussion	Specific Discussion
			Activities in Borrow Area C could be limited to daylight hours. Pages 7-11, -12 (Geology and Soils): For analysis purposes, it was assumed that all required geologic resources for the *TC & WM EIS* alternatives would come only from Borrow Area C and would potentially involve disturbance of up to 730 hectares (1,800 acres) of land excavated to a depth of approximately 4.6 meters (15 feet) deep. The greatest impact on Borrow Area C would occur for the alternative combination involving Tank Closure Alternative 6A, Option Case; FFTF Decommissioning Alternative 3; and Waste Management Alternative 2, Disposal Group 3. The following mitigating factors could possibly reduce the overall impact of mining operations from Borrow Area C: Extraction and management of geologic materials would be executed in a manner consistent with the policies and resource management plans described in the *Hanford Comprehensive Land-Use Plan EIS* (DOE 1999a), the subsequent *Hanford Comprehensive Land-Use Plan EIS SA* (DOE 2008), and their associated RODs (64 FR 61615 and 73 FR 55824). Borrow Area C would be restored, including regrading, contouring the landscape, revegetation to match the natural landscape, and adherence to best management practices for soil erosion and sediment control in accordance with appropriate resource management plans such as a final adopted version of the *Draft Industrial Mineral Resources Management Plan* (Reidel, Hathaway, and Gano 2001). Regardless of the use of borrow materials sources other

NEPA Consideration	Source	General discussion	Specific Discussion
			than Borrow Area C, geologic resources would still be required in large quantities under some alternatives and the long-term impacts of mining these materials would be realized. Page 7-13 (Water Resources): Portions of the probable maximum flood zone associated with Cold Creek lie within the confines of Borrow Area C. Mining of geologic materials to support tank closure and waste management activities would include consideration of impacts on the watercourse and associated floodplain. Any changes in the extent and nature of predicted mining that could impact the floodplain would be evaluated, and a floodplain assessment would be prepared as required by Executive Order 11988, *Floodplain Management*, and other Federal regulations (10 CFR 1022). Pages 7-17, -18 (Ecological Resources): The extent of ecological impacts on Borrow Area C would depend on the amount of geologic materials that would need to be mined to support backfilling needs, construction of new facilities, and construction of engineered surface barriers. The maximum impacts would occur under the Tank Closure alternatives that involve clean closure of the tanks, cribs, and trenches, and under Disposal Groups 2 and 3 for the Waste Management action alternatives (where one or two IDFs and the RPPDF would be sized for the largest capacities). Vegetation communities located within Borrow Area C include cheatgrass/bluegrass and needle-and-thread grass/Indian ricegrass. The latter represents an unusual and relatively pristine community type at Hanford and is more highly valued. In addition to Piper's daisy, stalked-pod milkvetch, and crouching milkvetch, which are also found in the Central Plateau as discussed

NEPA Consideration	Source	General discussion	Specific Discussion
			above, the long-billed curlew (state monitor) has been identified in Borrow Area C. Biological surveys of areas potentially affected under the action alternatives have been completed (Sackschewsky 2003a, 2003b). While current biological conditions and mitigation guidelines are appropriate for determining mitigation requirements for near-term impacts, they are not suitable for judging long-term mitigation requirements because habitats and species assemblages may change over time. Consequently, actual mitigation requirements for later activities that would occur under the alternatives considered would depend on the results of field surveys conducted just prior to initiating ground-disturbing activities and the mitigation guidelines in effect at Hanford at that time. In addition to preparing a comprehensive mitigation action plan to address the impacts on Level III resources (Piper's daisy, black-tailed jackrabbit, loggerhead shrike, and sage sparrow) and sagebrush habitat, the following mitigation measures could also be implemented to minimize short-term impacts on terrestrial resources and threatened and endangered species: • Conduct proper maintenance of heavy equipment and clearly mark construction zones to prevent intrusion into sensitive areas or outside work areas. • Implement noise reduction measures, as discussed in Section 7.1.3. • Implement spill prevention and control plans, as discussed in Section 7.1.6.

NEPA Consideration	Source	General discussion	Specific Discussion
			• Avoid, to the maximum extent possible, disturbance of the needle-and-thread grass/Indian ricegrass communities in Borrow Area C. • Perform land-disturbing activities at times that avoid animal breeding and nesting periods.
Land Use Determination	TC&WM EIS, Section 3.2.1.1.4		Prior to April 1999, McGee Ranch (in the northwest corner of Hanford north of Route 24 and south of the Columbia River) was identified as the primary suitable source of silt, loam, and basalt rock borrow material. Based on public and tribal input received by DOE during the *Hanford Comprehensive Land-Use Plan EIS* process and as recorded in its RODs (64 FR 61615, 73 FR 55824), DOE decided to protect a wildlife corridor through the McGee Ranch and consolidate the many planned borrow areas at Hanford into one location, identified as Borrow Area C, to keep a primary source of geological materials available for Hanford Site remediation activities.