1218137

DOE/EA-1934
Draft

Environmental Assessment for Expansion of Borrow Areas on the Hanford Site

RECEIVED
DEC 06 2012
EDMC

United States
Department of Energy

DOE/EA-1934
Draft

Environmental Assessment for Expansion of Borrow Areas on the Hanford Site

December 2012

United States Department of Energy

P.O. Box 550, Richland, Washington 99352

TABLE OF CONTENTS

1.0 PURPOSE AND NEED FOR AGENCY ACTION 1-1

2.0 BACKGROUND 2-1

3.0 PROPOSED ACTION AND ALTERNATIVE ACTION 3-1

3.1 PROPOSED ACTION 3-1

3.2 ALTERNATIVES TO THE PROPOSED ACTION 3-4

3.2.1 No-Action Alternative 3-4

4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES ... 4-1

4.1 GENERAL HANFORD SITE ENVIRONMENT 4-1

4.2 SPECIFIC SITE ENVIRONMENT 4-2

4.2.1 100-F Area Proposed Action Location 4-3
4.2.2 100-H Area Proposed Action Location 4-3
4.2.3 100-N Area Proposed Action Location 4-4
4.2.4 Pit 6 Proposed Action Location 4-5
4.2.5 Pit 9 Proposed Action Location 4-6
4.2.6 Pit 18 Proposed Action Location 4-6
4.2.7 Pit 21 Proposed Action Location 4-7
4.2.8 Pit 23 Proposed Action Location 4-8
4.2.9 Pit 24 Proposed Action Location 4-9
4.2.10 Pit 30 Proposed Action Location 4-10
4.2.11 Pit 34 Proposed Action Location 4-11
4.2.12 Pit 36 Proposed Action Location 4-12

5.0 CUMULATIVE IMPACTS AND ENVIRONMENTAL CONSEQUENCES DISCUSSION 5-1

5.1 CUMULATIVE IMPACTS OF THE PROPOSED ACTION 5-1

5.1.1 Health and Safety 5-1
5.1.2 Air Quality 5-1
5.1.3 Water Quality 5-4
5.1.4 Land Use 5-4
5.1.5 Ecological Resources 5-4
5.1.6 Cultural Resources 5-5
5.1.7 Visual Resources 5-6
5.1.8 Transportation 5-18

5.1.9 Reasonably Foreseeable Accidents Considered and the Potential Effects 5-19
5.1.10 Socioeconomics and Environmental Justice 5-19
5.1.11 Conclusion of Cumulative Impacts and Environmental Consequences Discussion 5-21

5.2 IMPACTS FROM THE NO-ACTION ALTERNATIVE 5-21

6.0 PERMITS AND REGULATORY REQUIREMENTS 6-1

6.1 PARTICULATE EMISSIONS 6-1

6.2 HANFORD REACH NATIONAL MONUMENT 6-1

6.3 EXCAVATION PERMITS 6-1

6.4 MATERIALS PROCESSING AT PIT 30 6-2

7.0 CONSULTATION AND COORDINATION 7-1

8.0 REFERENCES 8-1

APPENDICES

A. PROPOSED BOUNDARIES OF EXPANDED BORROW PITS ..... A-i
B. EVALUATION OF AIR QUALITY IMPACTS ..... B-i

FIGURES

1-1. Hanford Site Map 1-2
2-1. Location of Proposed Action Borrow Sites. 2-2
5-1. Gable Mountain: Eastern summit of Gable Mountain, Looking Southwest Toward Borrow Pits 30 and 34 (Primarily American Indian Viewers). 5-8
5-2. Gable Mountain: Eastern Summit of Gable Mountain Southeast Toward Borrow Pits 6 and 9 (Primarily American Indian Viewers) 5-9
5-3. Gable Mountain: Top of Gable Mountain, Looking South Toward Borrow Pits 30 and 34 (Primarily American Indian Viewers) 5-9
5-4. Gable Mountain: Top of Gable Mountain, Looking Northwest Toward Proposed Borrow Pit 36 (Primarily American Indian Viewers) 5-10
5-5. Gable Mountain: Top of Gable Mountain, Looking North Toward Proposed Borrow Pit 23 and the 100-N Borrow Pit (Primarily American Indian Viewers). 5-10
5-6. Gable Mountain: Top of Gable Mountain, Looking North Toward Borrow Pit 21 (Primarily American Indian Viewers). 5-11
5-7. Gable Mountain: Top of Gable Mountain, Looking North Toward the 100-H Borrow Pit (Primarily American Indian Viewers) 5-11

5-8. Gable Mountain: Top of Gable Mountain, Looking East Toward the 100-F Borrow Pit and Borrow Pit 18 (Primarily American Indian Viewers) 5-12
5-9. Gable Mountain: Top of Gable Mountain, Looking West Toward the Borrow Pit 24 (Primarily American Indian Viewers). 5-12
5-10. White Bluffs Overlook: White Bluffs Interpretive Overlook, Looking Southwest Toward the Borrow Pits 6, 9, 30 and 34 (Primarily Recreational Viewers). 5-13
5-11. White Bluffs Overlook: White Bluffs Interpretive Overlook, Looking Northwest Toward the Borrow Pits 21, 23, 24, 36 and the 100-F, 100-H, and 100-N Borrow Pits (Primarily Recreational Viewers). 5-13
5-12. White Bluffs Boat Launch: White Bluffs Launch (east bank), Looking Southwest Toward the Borrow Pits 6, 9, 30 and 34 (Primarily Recreational Viewers). 5-14
5-13. White Bluffs Boat Launch: White Bluffs Boat Launch (east bank), Looking Northwest Toward the Borrow Pits 21, 23, 24, 36 and the 100-F, 100-H, and 100-N Borrow Pits (Primarily Recreational Viewers). 5-14
5-14. Rt 4 North Inside *Mooli Mooli*: Looking East Toward the 100-F and 100-H Borrow Pits (Primarily American Indian Viewers). 5-15
5-15. Rt 4 North Inside *Mooli Mooli*: Looking North Toward Borrow Pit 21 (Primarily American Indian Viewers). 5-15
5-16. Rt 4 North Inside *Mooli Mooli*: Looking West Toward Proposed Borrow Pit 36 (Primarily American Indian Viewers). 5-16
5-17. Rt 4 North Inside *Mooli Mooli*: Looking Northwest Toward the 100-N Borrow Pit (Primarily American Indian Viewers). 5-16
5-18. B Reactor: Looking West Toward the Borrow Pit 24 (Primarily Recreational Viewers). 5-17
5-19. Bruggerman Warehouse: Looking East, Overview of Hanford Site (Primary Recreational Viewers). 5-17
5-20. State Route 24 Umtanum Ridge Overlook: Umtanum Ridge Overlook Looking East, Overview of Hanford Site (Primarily Recreational Viewers). 5-18

TABLES

3-1. Proposed Expansion Areas. 3-2
3-2. Additional Miles Traveled for the No-Action Alternative. 3-5
5-1. Maximum Annual Criteria and Toxic Air Pollutant Emissions (tons/year). 5-2
5-2. Maximum Predicted Total Impacts Compared to NAAQS. 5-3
5-3. Ecological Resources Reviews for Borrow Areas. 5-5
5-4. Cultural Resources Reviews for Borrow Areas. 5-6

Table of Contents

ACRONYMS

bcm	bank cubic meters
BLM	U.S. Bureau of Land Management
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CO	carbon monoxide
CO_2e	equivalent carbon dioxide
DOE	U.S. Department of Energy
EA	Environmental Assessment
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
GIS	Geographical Information System
MAP	mitigation action plan
NAAQS	national ambient air quality standards
NEPA	National Environmental Policy Act
NHPA	*National Historic Preservation Act of 1966*
NO_x	oxides of nitrogen
PM	particulate matter
ROG	reactive organic gases
SO_x	oxides of sulfur
TCP	Traditional Cultural Property
USFWS	U.S. Fish and Wildlife Service
WAC	*Washington Administrative Code*
WTP	Waste Treatment Plant

1.0 PURPOSE AND NEED FOR AGENCY ACTION

Situated along the Columbia River in southeastern Washington, the U.S. Department of Energy's (DOE's) 1,517-km^2 (586-mi^2) Hanford Site is undergoing extensive efforts to clean up contamination resulting from past nuclear defense research and development activities dating back to World War II (Figure 1-1). Cleanup activities can result in large excavated areas needing to be backfilled and revegetated. The purpose of the proposed action in this environmental assessment (EA) is to meet DOE's need to secure raw aggregate sand and gravel material (approximately 10,714,000 bank cubic meters [bcm]) to support ongoing environmental cleanup restoration projects (e.g., backfill of remediated waste sites), as well as construction and maintenance activities across the Hanford Site. While final remedial action decisions have yet to be made for some cleanup work, the proposed action would support the projected needs for sand and gravel for a period of approximately 10 years.

Figure 1-1. Hanford Site Map.

2.0 BACKGROUND

Historically, sand, gravel, and basalt materials extracted on the Hanford Site have been used in the following ways:

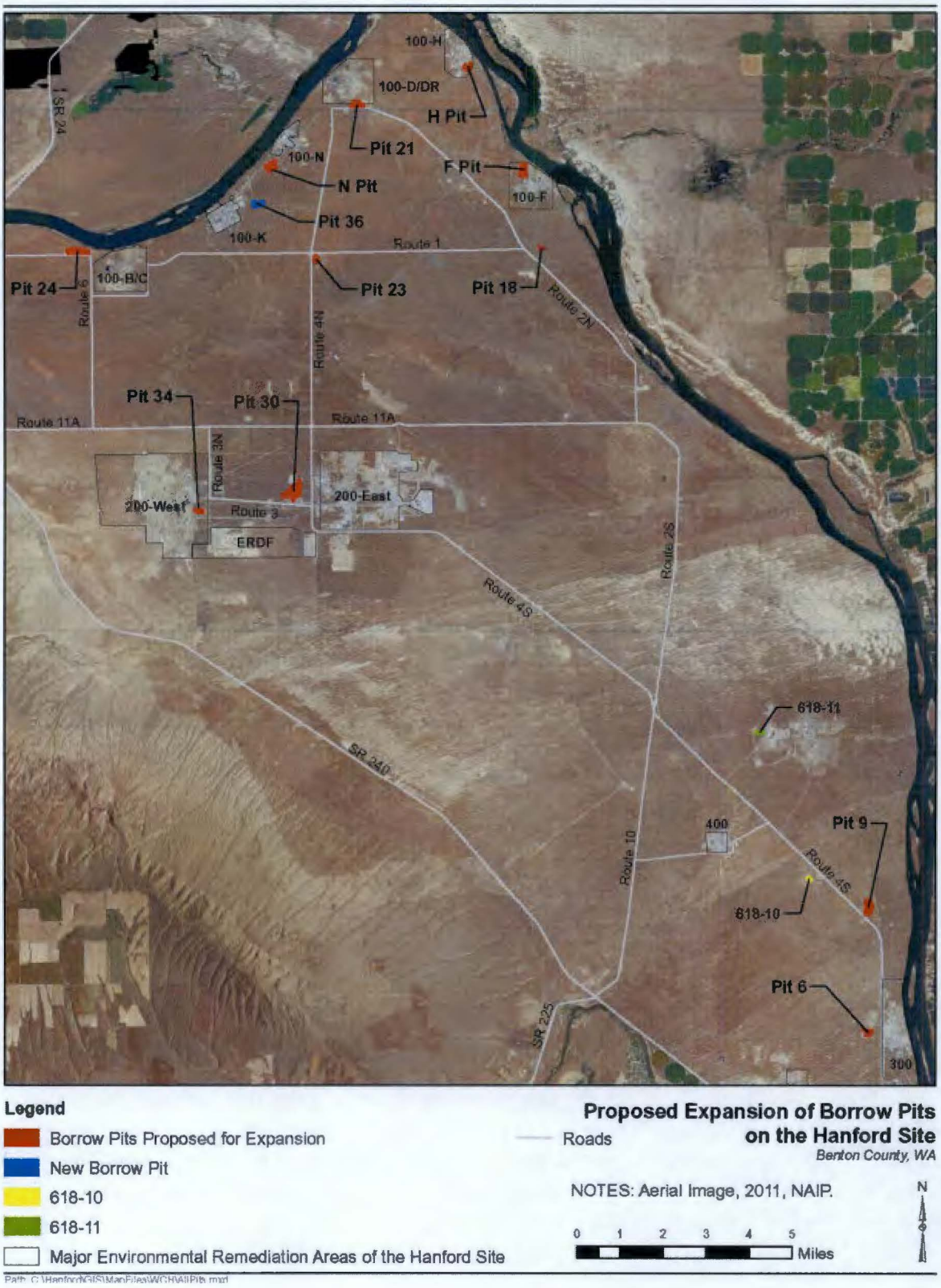
- As backfill for completing closure of waste sites
- As aggregate for concrete and roads
- As construction material for the Environmental Restoration Disposal (ERDF) landfill disposal cells (interim cap and drainage layer)
- As general construction aggregate.

The "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement" (64 FR 61615) provides overall guidance and direction for land management and land-use activities on the Hanford Site. Several preferred sources of borrow material on the Hanford Site are identified in Appendix D of the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS). Two subsequent *National Environmental Policy Act of 1969* (NEPA) EA analyses performed in 2001 and 2003 addressed the use of specific borrow areas (DOE/EA-1454, DOE/EA-1403). These two EAs and resultant Finding of No Significant Impact determinations provided for the use of 27 borrow pits and 2 rock quarries, and for the potential 10% expansion of disturbed surface area at each borrow pit beyond the identified needs at that time. Of the 27 borrow pits considered in the two EAs, only Pits F, H, N, 6, 9, 18, 21, 23, 24, 30, and 34 continue to provide fill material and construction and road aggregate.

Planning, operations, and closure/restoration of borrow pits is conducted in accordance with a series of resource management plans that were written to implement the HCP EIS. These plans include the *Hanford Site Biological Resources Management Plan* (BRMaP) (DOE/RL-96-32), the *Hanford Site Biological Resources Mitigation Strategy* (DOE/RL-96-87), and the *Hanford Cultural Resources Management Plan* (DOE/RL-98-10).

With the intent of identifying foreseeable needs for backfill of remediated waste sites, as well as for construction and maintenance activities across the Hanford Site, DOE has identified the need for approximately 10,714,000 bcm of sand and gravel materials. Eleven pits are being proposed for expansion or continued use in this EA to meet this need including Pits F, H, N, 6, 9, 18, 21, 23, 24, 30, and 34 (Figure 2-1), as well as a proposed new pit in the area between the 100-K and 100-N Reactor Areas (Pit 36). These pits have been identified with the goals of minimizing haul distances from borrow sources to remediation sites, minimizing greenhouse gas and other emissions, minimizing impacts to natural and cultural resources, and minimizing costs associated with excavating and transporting materials.

Figure 2-1. Location of Proposed Action Borrow Sites.



3.0 PROPOSED ACTION AND ALTERNATIVE ACTION

The proposed action and the alternative action are discussed in the following sections.

3.1 PROPOSED ACTION

The DOE proposes to expand 11 active borrow pits on the Hanford Site that were included in previous EAs (DOE/EA-1403, DOE/EA-1454), and to establish one new borrow source.

The borrow pits currently being proposed for expansion and development are for use in support of DOE missions for site cleanup under the Pre-existing, Nonconforming land-use policy as described in the HCP EIS (DOE/EIS-0222-F). The pits included in this EA are located within Industrial, Conservation, Low-intensity Recreation, or Preservation areas designated in the HCP EIS. The "Pre-existing, Nonconforming" policy allows for continuation of land uses that were established prior to HCP EIS land-use designation, such as remediation activities. Portions of the borrow areas proposed for expansion are located within 0.4 km (0.25 mi) of the Columbia River within the Hanford Reach National Monument.

Under the proposed action, DOE would expand nine existing borrow sites located near remedial action project areas (Pits H, N, 6, 9, 21, 23, 24, 30, and 34) and establish one new borrow area in the 100 Area. In addition, Pits F and 18 are included in this EA for the purpose of allowing them to remain active with no lateral expansion of the current disturbed area. Continued use could include removal of material to a greater depth, for example. These two pits were inadvertently expanded beyond the extent identified under the previous NEPA assessments. Inclusion of Pits F and 18 in this EA helps to ensure that future use would be managed within the authorized boundaries and that current borrow pit operational, mitigation, and closure requirements would be followed. The material would be used for backfill of remediated waste sites, as well as for construction and maintenance activities across the Hanford Site. Table 3-1 provides a description of the expected use of the material proposed to be removed from each pit. The borrow areas listed in Table 3-1 are being proposed for use based on their proximity to remediation activities. Expansion of the areas listed provides borrow material at the shortest distance from remediation areas and would reduce costs and impacts associated with transport of borrow materials to the greatest extent feasible.

The total volume of materials to be recovered over the duration of remedial actions in the areas supported by these borrow sites is estimated to be approximately 10,714,000 bcm. Excavation of material would be limited to the areas described in this EA. Appendix A contains maps showing the current area of surface disturbance at each pit and the proposed expansion considered in this EA. Table 3-1 lists the volumes used to estimate the allowed expansion areas for each borrow pit and the anticipated use. Needs exceeding the areas approved in this EA would be evaluated in a future NEPA analysis.

Table 3-1. Proposed Expansion Areas.

Borrow Pit Name	Estimated Quantity (bcm)	Expansion Area (acres)	Total Disturbed Area (acres)	Maximum Depth (evaluation in meters)	Anticipated Project Use [a]
F	60,000	0 [b]	39.9	116	100-F waste site remediation backfill
H	266,000	10.6	34.3	117	100-H waste site remediation backfill
N	500,000	12.8	53.0	121	100-N demolition and waste site remediation backfill
6	1,300,000	28.0	97.7	108	300 Area 300-FF-2 Operable Unit demolition and waste site remediation backfill
9	432,000	11.6	70.3	110	300 Area demolition; 300 Area, 618-10 and 618-11 waste site remediation backfill
18	10,000	0 [c]	8.2	116	Not applicable
21	1,297,000	35.0	64.2	121	100-D demolition and wastes site remediation backfill
23	1,557,000	13.0	71.7	124	100-N, 100-K, 100-D demolition and waste site remediation backfill
24	872,000	16.5	65.0	123	100-B/C demolition and remediation backfill
30	2,664,000	19.0	142.0	126	Potential additional ERDF disposal cell construction; WTP construction
34	444,000	10.9	28.0	135	Waste site remediation backfill, primarily for central plateau
36 (new proposed pit)	1,312,000	30.0	30.0	124	100-N and 100-K demolition and waste site remediation backfill

[a] Indicates the anticipated use of borrow material. The anticipated use indication is not intended to limit the use of borrow material to only those uses listed.

[b] Quantity and acreage for Pit F reflects the currently disturbed area, including area beyond the boundary identified in DOE/EA-1454. No lateral expansion is anticipated.

[c] Quantity and acreage for Pit 18 reflects the currently disturbed area, including area beyond the 4.9 ac identified in DOE/EA-1403. No lateral expansion is anticipated

ERDF = Environmental Restoration Disposal Facility
WTP = Waste Treatment Plant

The proposed action would involve the removal of topsoil and vegetation at each of the proposed expansion areas and one new borrow area in preparation for excavation and transport of aggregate material. In order to reduce environmental impacts, expansion of the pits would occur

from the previously excavated areas outward, rather than inward from the new boundary whenever feasible. Prior to any material being excavated for use as backfill, the top 30 cm (12 in.) of topsoil would be stockpiled for redistribution across the disturbed area to facilitate successful restoration. In order to ensure that borrow material is only removed from within the approved areas, pit boundaries would be marked in the field. Borrow material would be excavated on an as-needed basis to ensure only the area needed for material is disturbed. For the proposed activities at borrow pits 23, 100-N, and 36, borrow areas would be bermed around outside edges that would be visible from Traditional Cultural Properties to minimize any potential adverse impacts during pit operations.

After borrow materials are exhausted within a particular pit, slopes would be recontoured to blend stably and naturally with adjacent areas in a pattern that is both aesthetically pleasing and that would support healthy establishment of native communities. Closure of pits would include revegetation in accordance with applicable Hanford Site Management plans. A slope model of 4:1 was used to calculate borrow material quantities for each pit and would be utilized to provide stable slopes during excavations (WDNR 1997).

Groundwater elevations (hydraulic head) for the unconfined aquifer beneath each pit was obtained from available well-log data. These elevations were used to determine excavation limitations for each pit. Excavations would be limited to leave at least 2 m (6.6 ft) in depth from the bottom of the pit to the typical groundwater elevation. Due to variations in groundwater elevation, maximum pit depths were construed such that groundwater would not be present at surface level long enough to sustain vegetation that will only grow in a wet environment. Table 3-1 lists the elevation that would be recommended for use as a maximum depth at each pit. Other considerations for maximum depth could include safety, aesthetics, and restoration.

The proposed action would take place over a period of several years in support of DOE's environmental cleanup mission at the Hanford Site.

The proposed action also includes ensuring adequate access for the expanded borrow locations included in this EA. Existing haul roads could require upgrades, and two new roads would be constructed for the transportation of borrow material at Pits 6 and 36. Appropriate utilities would be provided and may include portable generators or extension of power lines for lighting, installation of trailers for personnel, and portable toilets. Conventional industrial equipment would be used to excavate the borrow material. Equipment used to transport borrow material may include both conventional and nonconventional trucks.

Ecological and cultural resources reviews have been performed for the proposed action borrow areas. Should the status of any of the borrow areas change, for example, a need for new roads or staging areas not otherwise identified in the EA, ecological and cultural resource impacts would be reevaluated. Ecological reviews and excavation permits would also be updated as required by the *Hanford Site Biological Resources Management Plan* (DOE/RL-96-32) and the *Hanford Site Excavating, Trenching, and Shoring Procedure* (DOE-0344), respectively.

Topsoil from the expansion areas of the borrow sites and surface materials from construction of roads would be stockpiled for future use in restoration when closing the sites. Topsoil would be stockpiled for future use in approved areas, which may be inside, outside, or adjacent to the pit boundary. Mitigation actions pertaining to establishment and closure of the borrow pits, such as revegetation of borrow sites and haul roads, would be consistent with resource management plans that have been developed for the Hanford Site including the following:

- *Bald Eagle Site Management Plan for the Hanford Site, South-Central Washington* (DOE/RL-94-150)
- *Hanford Site Biological Resources Mitigation Strategy* (DOE/RL-96-87)
- *Threatened and Endangered Species Management Plan: Salmon and Steelhead* (DOE/RL-2000-27)
- *Mitigation Action Plan for the 100 and 600 Areas of the Hanford Site* (DOE/RL-2001-22)
- *Hanford Site Biological Resources Management Plan* (DOE/RL-96-32)
- *Hanford Cultural Resources Management Plan* (DOE/RL-98-10).

3.2 ALTERNATIVES TO THE PROPOSED ACTION

Alternatives to the proposed action are described in the following subsection.

3.2.1 No-Action Alternative

Under the No-Action Alternative, excavation of borrow materials would continue only in borrow areas that have not already reached their maximum surface area disturbance, identified in DOE/EA-1403, *Environmental Assessment for Use of Existing Borrow Areas, Hanford Site, Richland, Washington,* and DOE/EA-1454, *Environmental Assessment for Reactivation and Use of Three Former Borrow Sites in the 100-F, 100-H, and 100-N Areas.* As such, borrow pits N, H, 9, and 23 would be used to supply backfill materials for remedial actions in the River Corridor. After Pits N and H were exhausted, contractors would begin using borrow material from Pit 23. Pits 30 and 34 would be used for Central Plateau activities until exhausted, at which time an offsite source would likely be accessed. Table 3-2 lists the additional projected miles that would be traveled by each remediation project in order to meet backfill needs under the No-Action Alternative. Figure 2-1 shows the relative locations of project areas to borrow areas.

At some time during remedial actions, the existing No-Action Alternative borrow areas would be exhausted prior to completion of demolition, remediation, backfill, and construction activities on the Hanford Site. For example, the N and H pits would be exhausted in 2014 and 2015, respectively, according to current remediation projections. Pit 6 would be entirely unavailable, as it is currently expanded to its maximum allowable extent.

Table 3-2. Additional Miles Traveled for the No-Action Alternative.

Project Area (Remediation and Demolition)	Proposed Alternative Borrow Pit	No-Action Alternative Borrow Pit	Additional Miles (One-Way)
100-B/C	Pit 24	Pit 23	4.8
100-K	Pit 36 (new)	Pit 23	2.3
100-N	N Pit (limited use)	Pit 23 (after Pit N is exhausted in 2014)	2.3
100-D	Pit 21	Pit 23	3.4
100-H	H Pit (limited use)	Pit 23 (after Pit H is exhausted in 2015)	7.1
300 Area	Pit 6	Pit 9	2.5

4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The following subsections describe the general Hanford Site environment, as well as the specific site environments for the locations of the proposed and alternative actions. Supplementary detail regarding the habitat and environs of the Hanford Site can be found in the *Hanford Site Environmental Report for Calendar Year 2011* (DOE/RL-2011-119) and *Hanford Site National Environmental Policy Act (NEPA) Characterization* (PNNL-6415).

4.1 GENERAL HANFORD SITE ENVIRONMENT

The Hanford Site lies within the Pasco Basin of the Columbia Plateau in southeastern Washington State. The site occupies an area of approximately 1,517 km^2 (586 mi) located north of the city of Richland and the confluence of the Yakima and Columbia Rivers (DOE/EIS-0222-F). The Columbia River surrounds the Hanford Site on three sides, flowing eastward to form the northwest and northeast boundaries before turning south to form the eastern boundary of the site. This large area has restricted public access and provides a buffer for the areas on the Hanford Site that historically were used for production of nuclear materials, waste storage, and waste disposal.

The Hanford Site has a semiarid climate averaging 15 to 18 cm (6 to 7 in.) of annual precipitation, most of which takes place during the winter months, although annual precipitation averages have varied from 7.6 cm (3 in.) in 1976 to 31.3 cm (12.3 in.) in 1995. Average daily maximum temperatures range from 2 °C (35 °F) in late December and early January to 36 °C (96 °F) in late July. Monthly average wind speeds are lowest during the winter months, averaging 10 to 11 km/h (6 to 7 mph), and highest during the summer, averaging 13 to 14 km/h (8 to 9 mph) (PNNL-6415), with infrequent periods of high winds of up to 128 km/h (80 mph). Tornadoes are extremely rare; no destructive tornadoes have occurred in the region surrounding the Hanford Site. The probability of a tornado hitting any given location on the Hanford Site is estimated at 1 chance in 100,000 during any given year. The region is categorized as one of low to moderate seismicity.

The vegetation on the Hanford Site is a shrub-steppe community of sagebrush and rabbitbrush with an understory consisting primarily of cheatgrass and Sandberg's bluegrass. As discussed in PNNL-6415, natural plant communities have been altered by Euro-American activities that have resulted in the proliferation of non-native species. Of the 590 species of vascular plants recorded for the Hanford Site, approximately 20% of all species are considered non-native. Biodiversity inventories conducted by The Nature Conservancy of Washington between 1994 and 1999 (TNC 1999) identified 85 additional taxa, establishing the actual number of plant taxa on the Hanford Site at 675. Cheatgrass is the dominant non-native species.

Several species of both plants and animals are under consideration for formal listing by the federal government and Washington State. Details are provided in PNNL-6415 and are

incorporated by reference in this EA. Relatively undisturbed areas of the mature shrub-steppe vegetation are high-quality habitat for many plants and animals and have been designated as "priority habitat" by Washington State.

Most mammals known to inhabit the Hanford Site are small, nocturnal species such as pocket mice and jackrabbits. Large mammals found on the Hanford Site consist of deer and elk, although the elk primarily reside on the Fitzner-Eberhardt Arid Lands Ecology Reserve. Coyotes and raptors are the primary predators. Several species of small birds nest in the steppe vegetation. Semiannual peaks in avian variety and abundance occur during migration seasons.

Threatened and endangered plants and animals identified on the Hanford Site, as listed by the federal government (*Endangered Species Act of 1973* and 50 *Code of Federal Regulations* [CFR] 402) and Washington State (*Washington Administrative Code* [WAC] 232-012-297 and Washington Natural Heritage Program 1997) are generally not found in the vicinity of the borrow sites. No plants or mammals on the federal list of threatened and endangered wildlife and plants are known to be on the Hanford Site. The bald eagle (*Haliaeetus leucocephalus*), however, is listed as State Sensitive and is a Federal Species of Concern. Additional details regarding the protection and enhancement of bald eagle habitats on the Hanford Site are provided in the *Bald Eagle Site Management Plan for the Hanford Site, South-Central Washington* (DOE/RL-94-150).

The Hanford Reach represents a unique ecosystem, stretching approximately 82 km (51 mi) from Priest Rapids Dam south to the start of Lake Wallula, north of Richland. Flow rates throughout the Hanford Reach are regulated by both the upstream Priest Rapids Dam and the downstream McNary Dam. Although daily fluctuations in flow occur in this stretch of the Columbia River, it is the only remaining free-flowing section of the Columbia River in the United States. The Columbia River provides valuable habitat for a variety of aquatic organisms. Of note, this section of river provides significant spawning habitat for stocks of upriver bright fall Chinook salmon and white sturgeon. The Upper Columbia River spring run Chinook salmon, Middle Columbia River steelhead, and Upper Columbia River steelhead have been placed under the protection of the *Endangered Species Act of 1973*. These fish spawn in, or migrate through, the Hanford Reach. Additional details regarding the protection and enhancement of stocks of spring Chinook salmon and steelhead within the Hanford Reach of the Columbia River are found in the *Threatened and Endangered Species Management Plan: Salmon and Steelhead* (DOE/RL-2000-27).

4.2 SPECIFIC SITE ENVIRONMENT

Site-specific ecological resource reviews, cultural reconnaissance surveys, and literature searches were conducted for each of the proposed action areas. Results of these surveys are detailed in the following subsections. None of the proposed pit expansions presented would be located within a 100-year floodplain or wetland.

4.2.1 100-F Area Proposed Action Location

The 100-F borrow area lies within the perimeter of the 100-F Reactor Area, northwest of the 105-F Reactor (Appendix A, Figure A-1). A portion of the proposed borrow site in the 100-F Area is located within 0.4 km (0.25 mi) of the Columbia River in the area designated as the Hanford Reach National Monument. While this borrow area is not proposed for lateral expansion beyond what was previously analyzed in DOE-EA-1454, it remains active, and as part of this proposed action would be subject to the proposed actions related to operational practices, mitigation, and closure. The 100-F borrow area depth would not exceed an approximate elevation of 116 m (381 ft), which is approximately 2 m (7 ft) above the water table elevation.

There are no known plant or animal species of concern in the area. The vegetation within and near the borrow area consists of a sparse stand of small-stature gray rabbitbrush (*Ericameria nauseosa*) and a variety of understory species including cheatgrass (*Bromus tectorum*) and Sandberg's bluegrass (*Poa sandbergii*). No adverse impacts to ecological resources are anticipated with the continued use of this borrow area. Based upon the BRMaP requirements, there would be no mitigation actions required for continued use of this borrow area.

The proposed 100-F borrow pit expansion location is not visible from key observation points such as the Columbia River, Traditional Cultural Properties identified through the *National Historical Preservation Act of 1966* (NHPA) Section 106 process, or regularly used viewpoints such as the White Bluffs[1] overlook or the Umtanum Ridge overlook located along State Route 24. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.

This area was reviewed and surveyed for cultural resources under "Cultural Resources Review to Activate and Expand Borrow Pits at 100-F, 100-H, and 100-N Areas (HCRC#2003-100-001)" (CCN 103599). No historic properties or cultural resources were identified during the survey.

4.2.2 100-H Area Proposed Action Location

The existing 100-H borrow area is located at the southeast corner of the 100-H Area, directly adjacent to H Avenue on the east side (Appendix A, Figure A-2). A portion of this borrow site is located within 0.4 km (0.25 mi) of the Columbia River in the area designated as the Hanford Reach National Monument). The proposed action is to expand the existing borrow area by 10.6 ac (from 23.7 ac to 34.3 ac) a 45% expansion. Borrow area depth would not exceed an approximate depth elevation of 117 m (384 ft), which is approximately 2 m [7 ft] above the water table elevation.

[1] *The White Bluffs Overlook is an interpretive site and scenic viewpoint within the Hanford Reach National Monument. Located across the Columbia River from the proposed borrow area expansion sites, the overlook affords sweeping views of the Columbia River and the Hanford Site reactor areas and uplands.*

The Washington State rare plant Geographical Information System (GIS) database identifies an occurrence of Piper's daisy (*Erigeron piperianus*), a Washington State sensitive species, in the area of the borrow pit. In addition, the BRMaP (DOE/RL-96-32) designates this species as a Level III resource. Prior to borrow area operations, an evaluation for this species would be conducted each spring/summer to assess its presence and ensure mitigation in accordance with applicable DOE management plans (e.g., BRMaP). Mitigation for impacts to this species is replacement on a 1:1 per plant basis. This requirement would be captured in the annually updated ecological reviews. All mitigation actions would be documented in a mitigation action plan (MAP) for this EA. The proposed expansion area is sparsely vegetated with an overstory of gray rabbitbrush and mature stands of big sagebrush (*Artemisia tridentata*). The understory consists of a Sandberg's bluegrass/cheatgrass community with occurrences of other grasses and forbs. The previously mined areas of the pit have been revegetated with a high success rate of shrub survival and recruitment.

Due to the relatively low habitat quality and small size of the expansion, adverse impacts to ecological resources are not anticipated. As described in the proposed action and as prescribed by the BRMaP, displaced native plants would be replaced through mitigation and/or borrow area closure and revegetation actions. In addition, it is anticipated that once borrow operations cease and closure activities are implemented in a given area, some wildlife species would return to the area naturally.

The proposed 100-H Borrow Pit expansion location is not visible from key observation points such as the Columbia River, Traditional Cultural Properties identified through the NHPA Section 106 process, or regularly used viewpoints such as the White Bluffs overlook or the Umtanum Ridge overlook located along State Route 24. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.

The 100-H borrow pit proposed action location was reviewed and surveyed for cultural resources under *No Historic Properties Affected (NHPA) Cultural Resources Review for the Expansion of the 100-H Borrow Pit in the 100-H Area of the Hanford Site, Benton County, Washington* (HCRC#2012-100-025). No historic properties or cultural resources were identified during the survey.

4.2.3 100-N Area Proposed Action Location

The proposed 100-N borrow pit is adjacent to and south of the Hanford Generating Plant (Appendix A, Figure A-3). A portion of the proposed borrow site in the 100-N Area is located within 0.4 km (0.25 mi) of the Columbia River in the area designated as the Hanford Reach National Monument. The proposed action is to expand the existing borrow area by 12.8 ac (from 40.2 ac to 53 ac), a 32% expansion. Within the previously mined area, vegetation is primarily devoid. The expansion area to the northwest contains mostly weedy species such as cheatgrass, tall tumblemustard (*Sisymbrium altissimum*), and Russian thistle (*Salsola kali*). Species of concern have not been identified within the previously excavated areas nor within the proposed expansion area.

The pit expansion would not exceed an approximate depth elevation of 121 m (397 ft) (approximately 2 m [7 ft] above the highest water table elevation). No adverse impacts to ecological resources are anticipated during the continued use of this site. Mitigation per BRMaP with respect to the use and expansion of this pit would not be required.

The proposed 100-N Borrow Pit expansion location is not visible from key observation points such as the Columbia River or regularly used viewpoints such as the White Bluffs overlook or the Umtanum Ridge overlook located along State Route 24. However, it is visible from the Traditional Cultural Property (TCP) known as the *Mooli Mooli*, as identified through the NHPA Section 106 process. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.

The 100-N borrow pit proposed action location was reviewed and surveyed for cultural resources under *No Potential to Cause Effects (NPCE) Cultural Resources Review for the Ten Percent Expansion of the Borrow Pit at the 100-N Area* (NPCE#2011-100-011). No historic properties or cultural resources were identified during the survey.

4.2.4 Pit 6 Proposed Action Location

Pit 6, located off Route 4S, less than 0.4 km (0.25 mi) west of the 300 Area, remains active at this time (Appendix A, Figure A-4). The proposed action is to expand the existing borrow area by 28 ac (from 69.7 ac to 97.7 ac), a 40% expansion. The pit expansion would not exceed an approximate depth elevation of 108 m (354 ft) (approximately 2 m [7 ft] above the water table elevation). An additional access road into the pit from Route 4S is also proposed as part of the proposed action.

Within the previously mined areas, vegetation is primarily devoid. The vegetation in the proposed expansion area primarily consists of antelope bitterbrush (*Purshia tridentate*), Indian ricegrass (*Oryzopsis humenoides*), needle-and-thread grass (*Hesperostipa comata*), and Sandberg's bluegrass plant communities. Other vegetation observed in this area includes snow buckwheat (*Eriogonum niveum*), hoary aster (*Machaeranthera canescens*), and gray rabbitbrush.

Despite the observed occurrences of several native vegetative species, adverse impacts to ecological resources are anticipated to be insignificant relative to the expansion and use of this site. As described in the proposed action and as prescribed by the BRMaP, displaced native plants would be replaced through mitigation and/or borrow area closure and revegetation actions. In addition, it is anticipated that once borrow operations cease and closure activities are implemented in a given area, some wildlife species would return to the area naturally.

The proposed Borrow Pit 6 expansion location is not visible from key observation points such as the Columbia River, Traditional Cultural Properties identified through the NHPA Section 106 process, or regularly used viewpoints such as the White Bluffs overlook or the Umtanum Ridge overlook located along State Route 24. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse

impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.

The Pit 6 proposed action location was reviewed and surveyed for cultural resources under *No Historic Properties Affected (NHPA) Cultural Resources Review for the Expansion of the 100-H Borrow Pit in the 100-H Area of the Hanford Site, Benton County, Washington* (HCRC#2012-600-032). One previously recorded historic archaeological site was identified through a literature review, but could not be relocated within the proposed action location during the field survey. No historic properties or cultural resources were identified during the survey.

4.2.5 Pit 9 Proposed Action Location

Pit 9 is located approximately 1 km (2 mi) north of the 300 Area and east of Route 4S (Appendix A, Figure A-5). The proposed action is to expand the existing borrow area by 11.6 ac (from 58.7 ac to 70.30 ac), a 20% expansion. The pit expansion would not exceed an approximate depth elevation of 110 m (361 ft) (approximately 2 m [7 ft] above the water table elevation).

Pit 9 remains active and no significant vegetative habitat exists within the active areas. The expansion area primarily consists of non-native species such as cheatgrass and tall tumblemustard. The southern portion of this borrow area will remain as an inert landfill and thus, no mining could occur. No adverse impacts to ecological resources would be anticipated during the expansion and use of this site.

The proposed Borrow Pit 9 expansion location is not visible from key observation points such as the Columbia River, Traditional Cultural Properties identified through the NHPA Section 106 process, or regularly used viewpoints such as the White Bluffs overlook or the Umtanum Ridge overlook located along State Route 24. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.

The Pit 9 proposed action location was reviewed and surveyed for cultural resources under *No Historic Properties Affected (NHPA) Cultural Resources Review for the Expansion of the Borrow Pit 9 in the 300 Area of the Hanford Site, Benton County, Washington* (HCRC#2012-300-010). No historic properties or cultural resources were identified during the survey.

4.2.6 Pit 18 Proposed Action Location

Pit 18 is located directly adjacent to the east side of F Avenue, approximately 0.4 km (0.25 mi) north of where F Avenue intersects Route 2N south of the 100-F Area (Appendix A, Figure A-6). No lateral expansion would be necessary under the proposed action in this EA; however, to achieve project goals, this pit would remain active. The pit depth would not exceed an approximate elevation of 116 m (381 ft) (approximately 2 m [7 ft] above the water table elevation).

No plant or animal species of concern were found to occur within the action location. The vegetation within the previously mined portion consists of a sparse stand of small-stature gray rabbitbrush and a variety of mostly weedy understory species. No adverse impacts to ecological resources would be anticipated during the use of this site.

Borrow pit 18 is not visible from key observation points in the Columbia River, Traditional Cultural Properties identified through the NHPA Section 106 process, or regularly used viewpoints such as the White Bluffs overlook or the Umtanum Ridge overlook located along State Route 24. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.

This area was reviewed for impacts to cultural resources under cultural resources review *100-IU-2 and 100-IU-6 Field Remediation: Use of Pit 18 to Develop and Maintain Haul Roads* (NPCE#2006-600-010). No impacts to historic properties or cultural resources were identified during the review.

4.2.7 Pit 21 Proposed Action Location

The Pit 21 proposed action location parallels Route 2N, directly south of the 100-D/DR Area (Appendix A, Figure A-7). The proposed action is to expand the existing borrow area by 35 ac (from 29.2 ac to 64.2 ac), a 120% expansion. The pit expansion would not exceed an approximate depth elevation of 121 m (397 ft) (approximately 2 m [7 ft] above the water table elevation).

The previously mined areas are primarily devoid of vegetation; however, the equipment staging area and trailer areas were revegetated in 2011. The expansion area to the south has a mix of overstory species containing some sparse, mature big sagebrush and green rabbitbrush (*Chrysothamnus viscidiflorus*). Many other species of vegetation occur here ranging from cheatgrass and Russian thistle to yarrow (*Achillea millefolium*) and pale evening primrose (*Oenothera pallida*). There are several occurrences of starvation pricklypear (*Opuntia polyacantha*) and Carey's balsamroot (*Balsamorhiza careyana*) within the expansion area as well. There is a broken island within the expansion area designated as a Level III resource under BRMaP (DOE/RL-96-32) and would require mitigation in accordance with applicable DOE management plans (e.g., BRMaP). Compensatory sagebrush mitigation would be required on a 3:1 basis, by area, for this 2.79-ac island. As described in the proposed action and as prescribed by the BRMaP, displaced native plants would be replaced through mitigation and/or borrow area closure and revegetation actions. In addition, it is anticipated that once borrow operations cease and closure activities are implemented in a given area, some wildlife species would return to the area naturally. All mitigation actions will be identified in the MAP for this EA.

The proposed Borrow Pit 21 expansion location is not visible from key observation points such as the Columbia River, Traditional Cultural Properties identified through the NHPA Section 106 process, or regularly used viewpoints such as the White Bluffs overlook or the Umtanum Ridge overlook located along State Route 24. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse

impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.
This area was reviewed and surveyed for cultural resources under *No Historic Properties Affected (NHPA) in the 100 Area of the Hanford Site, Benton County, Washington* (HCRC#2012-100-023). No historic properties or cultural resources were identified during the survey.

4.2.8 Pit 23 Proposed Action Location

Pit 23 is located directly southeast of the intersection of Route 1 and Route 4N, south of the 100 Area (Appendix A, Figure A-8). The proposed action is to expand the existing borrow area by 13 ac (from 58.7 to 71.7 ac), a 22% expansion. The pit expansion would not exceed an approximate depth elevation of 124 m (407 ft) (approximately 2 m [7 ft] above the water table elevation).

Vegetation within and surrounding the site consists of a variety of grasses, forbs, and shrubs. At the south end of the pit, both within and adjacent to the site, are mature stands of big sagebrush. Within the proposed expansion area to the east of the original pit boundary vegetation is primarily poor, characterized by a Sandberg's bluegrass/cheatgrass community with sparse occurrences of native species such as bottlebrush squirreltail (*Sitanion hystrix*) and sand dropseed (*Sporobolus cryptandrus*).

The presence of a high-quality native habitat is relatively low within this site. Adverse impacts to ecological resources are anticipated to be insignificant relative to the expansion and use of this site. As described in the proposed action and as prescribed by the BRMaP, displaced native plants would be replaced through mitigation and/or borrow area closure and revegetation actions. In addition, it is anticipated that once borrow operations cease and closure activities are implemented in a given area, some wildlife species would return to the area naturally.

The proposed Borrow Pit 23 expansion location is not visible from key observation points such as the Columbia River or regularly used viewpoints such as the White Bluffs overlook or the Umtanum Ridge overlook located along State Route 24. However, it is visible from the TCP known as Gable Mountain, as identified through the NHPA Section 106 process. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.

The Pit 23 proposed action location was reviewed and surveyed for cultural resources under *No Historic Properties Affected (NHPA) Cultural Resources Review for the Expansion of the Borrow Pit 23 in the 600 Area of the Hanford Site, Benton County, Washington* (HCRC#2012-600-034). No historic properties or cultural resources were identified during the survey.

4.2.9 Pit 24 Proposed Action Location

Pit 24 parallels Route 6 where it runs east/west about 0.8 km (0.5 mi) northwest of the 100-B/C Reactor Areas. Most of the borrow site is located within 0.4 km (0.25 mi) of the Columbia River, in the area designated as the Hanford Reach National Monument. The proposed action is to expand the existing borrow area by 16.5 ac (from 48.5 to 65 ac), a 34% expansion. The pit expansion would not exceed an approximate depth elevation of 123 m (404 ft) (approximately 2 m [7 ft] above the water table elevation).

The western active portion of the borrow pit is mostly nonvegetated gravel. The eastern (inactive) portion includes a wetted area of the pit that is dominated by willow, cattail, and invasive species including salt cedar (*Tamarix* sp.) and common reed (*Phragmites australis*). Following a previous pit expansion in the late-1990s, this area was identified for potential wetland habitat improvement in an otherwise non-vegetated borrow pit, since the bottom of the pit was at the groundwater table. Removal of additional material from the eastern, wetted portion is not analyzed in this EA. *Draft Guidance on Identifying Waters Protected by the Clean Water Act*, Section 7 (EPA 2012), identifies categories of water generally not "waters of the United States" and not subject to the Clean Water Act. These categories are described in the preambles to the Clean Water Act regulations (51 FR 41271 and 53 FR 20765), remain unchanged in the draft guidance, and include the following:

> "Water-filled depressions created in dry land incidental to construction activity and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel, unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of waters of the United States."

Based on this information, until Pit 24 is closed and thus abandoned, no portion of it meets the definition of "waters of the United States." Although there would be no impacts to the wetted portion of this site from the proposed action, the MAP for this EA will address the above-mentioned invasive species.

The area proposed for expansion is located west of the active borrow area and within an old farm field. The area is dominated by cheatgrass, sand dropseed, and slender sixweeks (*Festuca octoflora*) with sparse occurrences of mature spiny hopsage (*Grayia spinosa*). Other plant species occurrences observed during reconnaissance include Russian thistle and spring whitlowgrass (*Draba verna*).

Based upon low habitat quality and the relatively small expansion, no adverse impacts to ecological resources are anticipated during the expansion and use of this site.

The proposed Borrow Pit 24 expansion location is not visible from key observation points such as the Columbia River, Traditional Cultural Properties identified through the NHPA Section 106 process, or regularly used viewpoints such as the White Bluffs overlook or the Umtanum Ridge overlook located along State Route 24. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse

impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.

The Pit 24 proposed action location was reviewed and surveyed for cultural resources under *Cultural Resources Review for the Expansion of the Borrow Pit 24 in the 100 B/C Area of the Hanford Site, Benton County, Washington* (HCRC#2011-100-057). No new archaeological sites were identified during the survey. One previously identified pre-Hanford farmstead is located within the Pit 24 Proposed Action location. Mitigation has been completed for the impacts to the farmstead. The cultural resources review finding indicated that the proposed project activity would result in "no adverse effect" to historic properties as long as the following specific stipulations are upheld:

- A temporary boundary marker will be established to protect the remaining portions of the farmstead.
- Intermittent cultural resources monitoring will be conducted and will focus on the near-surface excavations.

The Pit 24 proposed action location was reviewed and surveyed for cultural resources under cultural resources review HCRC#2011-100-057. No historic properties or cultural resources were identified during the survey.

4.2.10 Pit 30 Proposed Action Location

Pit 30 is located to the west of the 200 East Area, directly northwest of where Route 3 and Route 4N intersect (Appendix A, Figure A-10). The proposed action is to expand the existing borrow area by 19 ac (from 123 to 142 ac), a 15% expansion. The pit expansion would not exceed an approximate depth elevation of 126 m (413 ft) (approximately 2 m [7 ft] above the water table elevation).

The vegetation for the requested expansion area and the east side of the borrow pit primarily consists of a big sagebrush/Sandberg's bluegrass and cheatgrass community. Other vegetation observed in the requested expansion area includes antelope bitterbrush and a variety of other forbs and grasses. Of note, Washington State's rare plant GIS plant database identifies an observance of Piper's daisy in the area of the borrow pit. The Washington State Natural Heritage Program identifies Piper's daisy as a state sensitive species. The BRMaP (DOE/RL-96-32) designates this species as a Level III resource. This species would need to be monitored each spring/summer in order to assess its presence and determine a mitigation plan in accordance with applicable DOE management plans (e.g., BRMaP). Compensatory sagebrush mitigation would be required on a 3:1 basis by area. As described in the proposed action and as prescribed by the BRMaP, displaced native plants would be replaced through mitigation and/or borrow area closure and revegetation actions. In addition, it is anticipated that once borrow operations cease and closure activities are implemented in a given area, some wildlife species would return to the area naturally. All mitigation actions will be captured in the MAP for this EA.

The proposed Borrow Pit 30 expansion location is not visible from key observation points such as the Columbia River, Traditional Cultural Properties identified through the NHPA Section 106 process, or regularly used viewpoints such as the White Bluffs overlook or the Umtanum Ridge overlook located along State Route 24. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.

The Pit 30 proposed action location was reviewed for cultural resources under *No Potential to Cause Effects (NPCE) Cultural Resources Review for the Expansion of Pit 30* (NPCE#2008-600-014). No historic properties or cultural resources were identified during the survey.

4.2.11 Pit 34 Proposed Action Location

Pit 34 is located on the east side of the 200 West Area, approximately a 0.4 km (0.25 mi) southwest of the Route 3 and Route 3N intersection (Appendix A, Figure A-11). The proposed action is to expand the existing borrow area by 10.9 ac (from 17.1 ac to 28 ac), a 64% expansion. The pit expansion would not exceed an approximate depth elevation of 135 m (443 ft) (approximately 2 m [7 ft] above the water table elevation).

The vegetation within the expansion area is primarily gray rabbitbrush, cheatgrass, and Sandberg's bluegrass. The present high-quality habitat of mature big sagebrush in the vicinity of Pit 34 would not be impacted by pit use in either the previously mined areas, nor the proposed expansion area. As described in the proposed action and as prescribed by the BRMaP, displaced native plants would be replaced through mitigation and/or borrow area closure and revegetation actions. In addition, it is anticipated that once borrow operations cease and closure activities are implemented in a given area, some wildlife species would return to the area naturally. No adverse impacts to ecological resources would be anticipated during the expansion and use of this site.

The proposed borrow pit 34 expansion location is not visible from key observation points such as the Columbia River, Traditional Cultural Properties identified through the NHPA Section 106 process, or regularly used viewpoints such as the White Bluffs overlook or the Umtanum Ridge overlook located along State Route 24. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.

The Pit 34 proposed action location was reviewed and surveyed for cultural resources under *No Historic Properties Affected (NHPA) Cultural Resources Review for a Borrow Pit 34 Expansion in the 200 Area of the Hanford Site* (HCRC#2011-200-054). No historic properties were identified during the survey.

4.2.12 Pit 36 Proposed Action Location

The new proposed Pit 36 borrow location and associated access roads are directly east of the 100-K Area, approximately 0.90 km (0.56 mi) south of the Columbia River (Appendix A, Figure A-12). The use of this proposed pit would not exceed an approximate depth elevation of 124 m (407 ft) (approximately 2 m [7 ft] above the water table elevation). When it was found that expansion of the existing N Pit to meet future borrow needs would not be feasible, this location was selected to provide borrow material for projects in the 100-K and 100-N Areas.

The proposed action location for Pit 36 is in an area that has previously received extensive disturbance. Besides sparse occurrences of gray rabbitbrush, the dominant vegetation is primarily cheatgrass and tall tumble mustard. Some scattered big sagebrush, mariposa lilly (*Calochortus macrocarpus*), yellow salsify (*Tragopogon dubius*), and shaggy fleabane (*Erigeron pumilus*) were observed.

Any displaced species with regards to use and expansion of Pit 34 would either be replaced through closure or return naturally; mitigation per BRMaP would not be required. No adverse impacts to ecological resources are anticipated during the use of this site.

The new Pit 36 borrow area identified under the proposed action was identified to support the 100-N and 100-K remediation projects. Material needed to support ongoing remediation will exceed the borrow material allowed under previous EAs for the existing Pit N. Location of a new borrow area to the west of 100-N is proposed in order to avoid physical impacts to the *Mooli Mooli* TCP. The proposed shape of Pit 36 is sinuous, in order to better blend with surrounding topography, and would be flanked to the east by stockpiled topsoil to create additional visual camouflage while the pit is active. Measures that would be taken in the future to address visual resources as part of the proposed action are described in Section 3.1 of this EA. The Pit 36 proposed action location was reviewed and surveyed for cultural resources under HCRC#2012-100-024. The proposed actions at the Pit 36 location is visible from the TCP known as *Mooli Mooli*, as identified through the Section 106 process. Actions that would minimize impacts to visual resources are part of the proposed action and are described in Section 3.1 of this EA. Significant adverse impacts to visual resources are not anticipated. Visual resources are discussed further in Section 5.1.7.

The Pit 36 borrow pit proposed action location was reviewed and surveyed for cultural resources under *Cultural Resources Review for the Design, Construction, and Continued Use of Borrow Pit 36 Located in the 100-K Area of the Hanford Site, Benton County, Washington* (HCRC#2012-100-024). No historic properties or cultural resources were identified during the survey. The Hanford Site TCP known as the *Mooli Mooli* is located within 0.50 km (0.31 mi) of the proposed action location.

5.0 CUMULATIVE IMPACTS AND ENVIRONMENTAL CONSEQUENCES DISCUSSION

5.1 CUMULATIVE IMPACTS OF THE PROPOSED ACTION

Section 4.0 of this EA discussed the specific environments that would be affected by the proposed action. This section discusses the cumulative impacts from expansion, development and continued routine operation of the borrow areas evaluated within this EA. Because the proposed action includes measures to avoid and/or minimize any potential adverse impacts, significant cumulative impacts are not anticipated under the proposed action. As noted in this summary, any expected impacts will be addressed in a MAP for this EA.

5.1.1 Health and Safety

No radiological or toxicological exposure to personnel or the general public would be expected to occur as a result of routine excavation operations, either loading or offloading activities, since borrow materials are obtained from uncontaminated areas. The materials would be handled in a manner consistent with commercial industrial quarry activities, along with dust suppression practices widely used on the Hanford Site. The use of appropriate personal protective clothing, specific training, and equipment safeguards would be adequate to ensure the safe recovery and handling of this material.

5.1.2 Air Quality

During the transfer of material from borrow areas, small quantities of gaseous and particulate pollutants would be generated at the borrow pits and during transportation of borrow pit materials. Air quality impacts from implementing the No-Action Alternative or the Proposed Action Alternative would be due principally to exhaust emissions from earth-moving equipment and vehicles (primarily haul trucks) and fugitive dust (particulate matter [PM]) emissions from excavation, loading, and transportation of borrow pit materials. Dust-suppression methods, such as application of water spray, would be implemented to control emissions of PM. Since the proposed expansion of borrow pits would result in continuation of an existing ongoing practice of removal and use of borrow pit material, no substantial increase in overall air emissions would be envisioned to result from the Proposed Action Alternative.

The primary air emission from vehicles is carbon dioxide, which is considered a greenhouse gas. Greenhouse gases are gaseous constituents of the atmosphere, both natural and resulting from or produced by human beings, that absorb and emit thermal infrared radiation (heat) emitted by the Earth's surface, the atmosphere itself, and clouds. Water vapor, carbon dioxide, nitrous oxide, methane, and ozone are the primary greenhouse gases in the Earth's atmosphere. Greenhouse gases trap heat between the Earth's surface and the lower part of the atmosphere; this phenomenon is called the greenhouse effect. The amount of greenhouse gases emitted during the Proposed Action Alternative has been estimated based on established emission factors and estimated fuel consumption by the haul trucks and excavators (Appendix B). Under the

Proposed Action Alternative, potential maximum emissions are estimated to be approximately 1,527 metric tons/year of equivalent carbon dioxide (CO_2e), which is expected to be comparable to previous years' emissions from the ongoing use of borrow pits on the Hanford Site. By way of comparison, the total greenhouse gas emissions from mobile sources (primarily fleet vehicles) on the Hanford Site in 2011 and 2010 was 43,617 metric tons/year CO_2e and 33,590 metric tons/year CO_2e, respectively (HNF-53104).

In addition to greenhouse gas emissions, the haul trucks and excavators would emit criteria and toxic air pollutants. Criteria pollutants include volatile organic compounds, also known as reactive organic gases (ROG), carbon monoxide (CO), oxides of nitrogen (NO_x), oxides of sulfur (SO_x), and PM. Particulate matter of concern, and thus regulated by state and federal regulations, are small-diameter components (i.e., PM_{10} [particles 10 micrometers in diameter or smaller] and $PM_{2.5}$ [particles smaller than 2.5 micrometers in diameter]). Emissions of SO_x would be small due to the use of ultra-low sulfur fuel. Potential emissions of criteria pollutants have been estimated along with emissions of toxic air pollutants associated vehicle operations for benzene, formaldehyde, acetaldyhyde, and 1,3-butadiene for the Proposed Action Alternative (Appendix B). Maximum annual emissions are summarized in Table 5-1. Since the proposed expansion of borrow pits would result in continuation of an existing ongoing practice of removal and use of borrow pit material, no substantial increase in overall air emissions would be envisioned to result from the Proposed Action Alternative.

Table 5-1. Maximum Annual Criteria and Toxic Air Pollutant Emissions (tons/year).

Criteria Pollutants						Toxic Air Pollutants			
NOx	CO	ROG	SOx	PM_{10}	$PM_{2.5}$	Benzene	Formalde-hyde	Acetalde-hyde	1,3 Butadiene
13.74	3.18	0.68	0.02	29.8	3.51	0.007	0.020	0.005	0.009

Emissions of dust (PM) would occur during excavation and loading of borrow pit materials and during transportation on unpaved roads. Water is used to control dust during excavation, loading and unloading, and transportation. Exhaust emissions of PM are also generated from the operation of the haul trucks and the excavators. The U.S. Environmental Protection Agency (EPA) has established standards for PM under the National Ambient Air Quality Standards (NAAQS). The EPA has established a 24-hour standard for PM_{10} and 24-hour and annual standards for $PM_{2.5}$. Three borrow pits (Pit 6, Pit 24, and Pit 36) were evaluated to estimate the potential impacts from PM_{10} and $PM_{2.5}$ from the Proposed Action Alternative. These three pits were deemed to represent reasonable worst-case scenarios based on material throughput, truck traffic on the borrow pit site and new unpaved roads, and distance to potential public receptors.

Air dispersion modeling via a screening-level analysis was conducted to demonstrate the projected PM emissions (Appendix B). The results of the modeling are presented in Table 5-2 along with the NAAQS. The results show that at a hypothetical maximum impact point (Columbia River for the 24-hour standard and Hanford Site boundary for the annual standard) potential maximum PM impacts in any given year would be below the NAAQS. As noted

previously, since the proposed expansion of borrow pits would result in continuation of an existing ongoing practice of removal and use of borrow pit material, no substantial increase in overall air emissions would be envisioned to result from the Proposed Action Alternative.

Table 5-2. Maximum Predicted Total Impacts Compared to NAAQS.

Site/ Contaminant	Averaging Time	Predicted Maximum Project Impact ($\mu g/m^3$)	Average Ambient Concentration ($\mu g/m^3$)[a]	Total Predicted Maximum Impact (Project + Ambient) ($\mu g/m^3$)[b]	NAAQS ($\mu g/m^3$)
Pit 6					
PM_{10}	24-hour	21.7	18	39.7	150
$PM_{2.5}$	24-hour	2.5	4.5	7.0	35
$PM_{2.5}$	Annual	0.054	4.5	4.6	15
Pit 24					
PM_{10}	24-hour	30.2	18	48.2	150
$PM_{2.5}$	24-hour	4.7	4.5	9.2	35
$PM_{2.5}$	Annual	0.0093	4.5	4.5	15
Pit 36					
PM_{10}	24-hour	36.6	18	54.6	150
$PM_{2.5}$	24-hour	4.1	4.5	8.6	35
$PM_{2.5}$	Annual	0.01	4.5	4.5	15

[a] Note: In 2006, EPA revoked the annual standard for PM_{10} because available evidence did not suggest a link between long-term PM_{10} exposure and health problems. However, WAC 173-470-100, "Ambient Air Quality Standards for Particulate Matter," maintains an annual standard for PM_{10} that is the same as the revoked federal standard, 50 micrograms per cubic meter ($\mu g/m^3$), annual arithmetic mean. Due to a variety of factors (including results of the 24-hour modeling analysis for PM_{10} and annual $PM_{2.5}$, limited number of days of operation per year, and the factor to convert maximum hourly to annual concentration for a volume source [0.03 versus 0.15 for a 24-hour]), it is concluded that the annual predicted concentration of PM_{10} would be well below the state standard of 50 μg/m3 and modeling this scenario would not be necessary.

[b] The ambient PM_{10} concentration (18 $\mu g/m^3$) is based on the annual average measured at the Benton Clean Air Authority monitoring station in Kennewick, Washington, in 2006 (the observed annual average PM_{10} concentration at the HMS was 13 $\mu g/m^3$, but this was only based on 149 days of observations). The annual average $PM_{2.5}$ concentration at the HMS during 2006 was 4.5 $\mu g/m^3$ (PNNL 2007).

EPA = U.S. Environmental Protection Agency
HMS = Hanford Meteorological Station
NAAQS= National Ambient Air Quality Standards
PM = particulate matter
WAC = *Washington Administrative Code*

5.1.3 Water Quality

Construction and operation activities at the borrow locations may include the use of clean water sprays for dust control and surface fixatives, as necessary. The source of water used for dust suppression is the existing Hanford Site water system, which meets groundwater quality criteria standards.

Additional water would be used in Pit 30 to process the borrow material to obtain the appropriate sized material to meet construction needs at ERDF and Waste Treatment Plant (WTP). However, the discharges at Pit 30 are not anticipated to impact the groundwater or Columbia River. Pit 30 is located in the 200 Area of the Hanford Site and the distance to groundwater is at least 100 m (330 ft) below the ground surface and the Columbia River is several miles away. In addition, requirements from state-wide Sand and Gravel General Permit issued by the Washington State Department of Ecology (Ecology) would be implemented. The permit identifies requirements to control discharges and minimize impacts to waters of the state (e.g., groundwater and the Columbia River). For all borrow area location evaluated in this EA there would be minimal infiltration to groundwater, and the proposed action is not anticipated to impact the groundwater or Columbia River.

5.1.4 Land Use

The borrow pits proposed for expansion under the proposed action are located within "Industrial," "Conservation," "Low-intensity Recreation," or "Preservation" areas designated in the HCP EIS (DOE/EIS-0222-F). The pits included in this EA are approved for use in support of DOE missions for site cleanup under the "Pre-existing, Nonconforming" land-use policy as described in the HCP EIS The "Pre-existing, Nonconforming" policy allows for continuation of land uses that were established prior to HCP EIS land-use designation, such as remediation activities. All or portions of borrow pits F, H, N, and 24 lie within 0.4 km (0.25 mi) of the Columbia River, an area known as the Hanford Reach National Monument. Consistent with DOE's authority to manage lands within the Monument as necessary to carry out the environmental cleanup mission, use of the proposed borrow sites would be allowable under the June 9, 2000, Presidential Proclamation.

5.1.5 Ecological Resources

As discussed in Section 4.2 of this EA, no significant impacts to plant or animals species would be anticipated under the proposed action for Pits F, N, 6, 9, 18, 23, 34, and 36. Mitigation for impacts to ecological resources would be expected at 4 of the 12 pits: Pits H, 21, 24, and 30.

For example, at Pit H, occurrence of Piper's daisy, a BRMaP Level III resource, has been reported. An evaluation for the presence of this species would be conducted prior to expansion. If present and impacted by expansion, mitigation would be conducted in accordance with applicable Hanford Site management plans and the MAP for this EA. Along with several native plant species, several species of wildlife were observed in the expansion area for Pits 21 and 30 under the proposed alternative. Impacts to ecological resources, including mature shrub habitat and sage-obligate species are expected as a consequence of expanding Pits 21 and 30.

Mitigation would be conducted in accordance with Hanford Site management plans and the MAP for this EA. The eastern (inactive) portion of Pit 24 includes a wetted area that supports growth of vegetation requiring a damp environment, including invasive species. Although there would be no borrow material obtained from the inactive wetted portion of this pit under the proposed action, there will be a mitigation for the presence of invasive species identified in the MAP for this EA.

Revegetation to restore impacted native species displaced by expansion under the proposed action would be conducted in accordance with applicable Hanford Site management plans. No disturbance to bald eagles would result under the proposed action because the proposed borrow areas are not located in proximity to eagle roosting/nesting areas. Table 5-3 lists the ecological resources reviews for the borrow pits that would be affected under the proposed action alternative.

Table 5-3. Ecological Resources Reviews for Borrow Areas.

Pit Location	Ecological Resource Review Number
100-F	06-ER-037b
100-H	11-ER-025c
100-N	07-ER-019e
Pit 6	10-ER-007c
	10-ER-007d
Pit 9	12-ER-010a
Pit 18	06-ER-012
Pit 21	12-ER-016
Pit 23	12-ER-003c
Pit 24	11-ER-015
Pit 30	08-ER-003b
Pit 34	ECR-2011-200-052
Pit 36	12-ER-018

5.1.6 Cultural Resources

In accordance with Section 106 of the NHPA, potential impacts to historic properties that would result from the proposed action were evaluated. As discussed in Section 4.2 of this EA, direct adverse impacts to historic properties and cultural resources are not expected for Pits F, H, and N, and for Pits, 6, 9, 18, 21, 23, 24, 30, 34, and 36. However, an indirect visual impact to the Hanford Site TCP known as the *Mooli Mooli* is anticipated from the proposed actions at Pit 36 and the N borrow pit. Additionally, an indirect visual impact to the Hanford Site TCP known as Gable Mountain is anticipated from the proposed action at Pit 23.

Visual impacts to the *Mooli Mooli* and Gable Mountain would be mitigated by shaping the borrow pits to the natural land contours, recontouring and revegetation with native plant species upon borrow pit closure in accordance with the proposed action in Section 3.1 of this EA. Additionally, Pit 36 would be bermed along the northern pit boundary to minimize the visual impact during use of the pit.

Table 5-4 lists the cultural resources reviews for the borrow pits that would be affected under the proposed action alternative.

Table 5-4. Cultural Resources Reviews for Borrow Areas.

Pit Location	Cultural Resource Review Number	Results and Stipulations
100-F[a]	HCRC#2003-100-001 (CCN 103599)	No Historic Properties Affected.
100-H	HCRC#2012-100-025	No Historic Properties Affected.
100-N	NPCE#2011-100-011	No Potential to Cause Effect.
Pit 6	HCRC#2012-600-004	No Historic Properties Affected.
	HCRC#2012-600-032	No Historic Properties Affected.
	HCRC#2012-600-037	No Historic Properties Effected.
Pit 9	HCRC#2012-300-010	No Historic Properties Affected.
Pit 18	NPCE#2006-600-010	No Potential to Cause Effect.
Pit 21	HCRC#2012-100-023	No Historic Properties Affected.
Pit 23	HCRC#2012-600-034	No Historic Properties Affected.
Pit 24	HCRC#2011-100-057 HCRC#98-600-005 HCRC#98-600-005a	No Adverse Effect to Historic Properties –With Stipulations. Adverse Effect to Historic Properties. The Washington State Department of Archaeology and Historic Preservation signed MOA dated August 24, 1998 (Griffith 1998); the Advisory Council on Historic Preservation signed a memorandum of agreement on September 30, 1998 (Crisler 1998).
Pit 30	NPCE#2008-600-014	No Historic Properties Affected.
Pit 34	HCRC#2011-200-052	No Historic Properties Affected.
Pit 36	HCRC#2012-100-024	Adverse Effect to Historic Properties.

[a] The cultural resource review conducted for Pit F in 2002 addressed the total disturbed area in Table 3-1.
[b] The cultural resource review conducted for Pit 18 in 2006 addressed the total disturbed area in Table 3-1.
HCRC = Hanford Cultural Resources Case
NPCE = No Potential to Cause Effects

5.1.7 Visual Resources

An evaluation of potential impacts to visual resources from the proposed action was performed. The study area for visual resources includes the existing borrow areas proposed for expansion, the proposed new borrow area, and surrounding lands from which the borrow areas could be seen. Seven different "viewpoints" were used to conduct the evaluation including Gable

Mountain, the White Bluffs Overlook, The White Bluffs Boat Launch, inside the *Mooli Mooli* hills near the 100-N Area, 105-B Reactor, the Bruggerman Warehouse, and the Umtanum Ridge Overlook. These viewpoints were selected to represent key locations from which Hanford Site areas affected by the proposed action could be observed. A general description of the visual resources in the proposed action area is provided in this section, along with photographs from each viewpoint evaluated.

The visual setting of the Hanford Site consists of expansive views of low-relief grass and shrub-steppe over the relatively level plateau of the Pasco Basin. These views are complemented by high-relief geologic features, including Umtanum and Yakima ridges to the west, Rattlesnake Mountain to the south, and the Columbia River and associated White Bluffs formation to the north. Gable Butte and Gable Mountain are prominent features within the otherwise level plateau study area. Development within the Hanford Site is primarily widely spaced industrial areas, including historic reactors located along the Columbia River and two designated industrial zones: the Central Plateau (also called the 200 Area), and the South 600 Area, located in the southeast portion of the Hanford Site. The Energy Northwest Columbia Generating Station nuclear power plant is located in the South 600 Area and its cooling towers and stream plumes can be seen from miles away. The Energy Northwest nuclear reactors and DOE facilities of the Central Plateau are brightly lit at night and are highly visible from many areas.

Transmission lines and structures are also a major visual component of the Hanford Site, with several 500-kV and 230-kV lines with steel-lattice towers and 115-kV lines with H-framed wood structures. Other built components that comprise the visual landscape at the Hanford Site include State Route 24 and State Route 240. The built features, while clearly evident, do not dominate the landscape and, within the context of the Hanford Site as a historic nuclear facility, would be considered an integral part of the Hanford landscape. Based on criteria developed by the U.S. Bureau of Land Management (BLM) to rate scenic quality (BLM 1986), overall scenic values of the Hanford Site are high because the area contains the following:

- High-vertical geographic features, such Gable Butte and Gable Mountain, Rattlesnake Mountain, set against expansive open space.

- The Hanford Reach of the Columbia River, which is in the Hanford Reach National Monument is eligible, but not currently proposed, for designation as a Wild and Scenic River (USFWS 2008).

- Historic cultural features, including the "B Reactor," located approximately 2.4 km (1.5 mi) south of Pit 24. The B Reactor is a National Historic Landmark that is also being proposed for designation as part of the Manhattan Project *National Historical Park* (NPS 2010).

Viewer groups within the study area include American Indians, public viewers from area highways, recreational viewers from the Columbia River Unit of the Hanford Reach National Monument, and Hanford site workers and visitors. The majority of the study area is closed to public access and, therefore, has relatively few public viewers. American Indians have access to portions of the Hanford Site that have cultural significance and American Indians are the

primary viewers using the Gable Butte and Gable Mountain area for traditional cultural uses. American Indians and recreational viewers from the Columbia River and adjacent bluffs are the viewer groups most sensitive to visual change.

Figures 5-1 through 5-20 are viewpoints selected as representative views for the visual quality analysis for this EA. Viewer groups likely to use each viewpoint are indicated for each figure.

Figure 5-1. Gable Mountain: Eastern summit of Gable Mountain, Looking Southwest Toward Borrow Pits 30 and 34 (Primarily American Indian Viewers).

Figure 5-2. Gable Mountain: Eastern Summit of Gable Mountain Southeast Toward Borrow Pits 6 and 9 (Primarily American Indian Viewers).

Figure 5-3. Gable Mountain: Top of Gable Mountain, Looking South Toward Borrow Pits 30 and 34 (Primarily American Indian Viewers).

Figure 5-4. Gable Mountain: Top of Gable Mountain, Looking Northwest Toward Proposed Borrow Pit 36 (Primarily American Indian Viewers).

Figure 5-5. Gable Mountain: Top of Gable Mountain, Looking North Toward Proposed Borrow Pit 23 and the 100-N Borrow Pit (Primarily American Indian Viewers).

Figure 5-6. Gable Mountain: Top of Gable Mountain, Looking North Toward Borrow Pit 21 (Primarily American Indian Viewers).

Figure 5-7. Gable Mountain: Top of Gable Mountain, Looking North Toward the 100-H Borrow Pit (Primarily American Indian Viewers).

Figure 5-8. Gable Mountain: Top of Gable Mountain, Looking East Toward the 100-F Borrow Pit and Borrow Pit 18 (Primarily American Indian Viewers).

Figure 5-9. Gable Mountain: Top of Gable Mountain, Looking West Toward the Borrow Pit 24 (Primarily American Indian Viewers).

Figure 5-10. White Bluffs Overlook: White Bluffs Interpretive Overlook, Looking Southwest Toward the Borrow Pits 6, 9, 30 and 34 (Primarily Recreational Viewers).

Figure 5-11. White Bluffs Overlook: White Bluffs Interpretive Overlook, Looking Northwest Toward the Borrow Pits 21, 23, 24, 36 and the 100-F, 100-H, and 100-N Borrow Pits (Primarily Recreational Viewers).

Figure 5-12. White Bluffs Boat Launch: White Bluffs Launch (east bank), Looking Southwest Toward the Borrow Pits 6, 9, 30 and 34 (Primarily Recreational Viewers).

Figure 5-13. White Bluffs Boat Launch: White Bluffs Boat Launch (east bank), Looking Northwest Toward the Borrow Pits 21, 23, 24, 36 and the 100-F, 100-H, and 100-N Borrow Pits (Primarily Recreational Viewers).

Figure 5-14. Rt 4 North Inside *Mooli Mooli*: Looking East Toward the 100-F and 100-H Borrow Pits (Primarily American Indian Viewers).

Figure 5-15. Rt 4 North Inside *Mooli Mooli*: Looking North Toward Borrow Pit 21 (Primarily American Indian Viewers).

Figure 5-16. Rt 4 North Inside *Mooli Mooli*: Looking West Toward Proposed Borrow Pit 36 (Primarily American Indian Viewers).

Figure 5-17. Rt 4 North Inside *Mooli Mooli*: Looking Northwest Toward the 100-N Borrow Pit (Primarily American Indian Viewers).

Figure 5-18. B Reactor: Looking West Toward the Borrow Pit 24 (Primarily Recreational Viewers).

Figure 5-19. Bruggerman Warehouse: Looking East, Overview of Hanford Site (Primary Recreational Viewers).

Figure 5-20. State Route 24 Umtanum Ridge Overlook: Umtanum Ridge Overlook Looking East, Overview of Hanford Site (Primarily Recreational Viewers).

The construction and operation of borrow sites and associated *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) remedial action area haul roads under the proposed action would minimize additional impacts to aesthetic and visual resources to the extent practical, since most borrow sites would be located away from high traffic areas and would not be visible to the general visiting population. Additionally, these areas would be revegetated to blend in with the surrounding terrain. Proposed borrow locations 100-F, 100-H, 6, 9, 18, 21, 24, 30, and 34 are not visible from the Columbia River or other TCPs defined by the American Indians. Pit 36 and the 100-N borrow pit are visible from the TCP known as the *Mooli Mooli*. Pit 23 is visible from the TCP known as Gable Mountain. To mitigate the visual impacts from these three borrow pits, the borrow pits would be bermed around the outside edges to minimize the visual impact and recontoured and revegetated upon closure of the borrow pits.

5.1.8 Transportation

Potential impacts of incident-free, intra-site truck transport of borrow materials have been considered. Typically, incident-free impacts are based on consideration of traffic congestion and pollutants emitted from the vehicles during normal transportation. Occasional interference with the local traffic flow would be mitigated by appropriate administrative controls (e.g., warning signs and traffic markers). The exclusive haul roads used for the proposed action would continue to minimize interference with normal traffic flows because they would not use or intersect any primary Hanford Site routes. Where use of primary Hanford Site routes are likely for transport of borrow material (e.g., use of Pit 23), availability of a number of other borrow sources close to project areas would minimize the impact to primary-route traffic.

Types of pollutants that could be present and might impact the public include sulfur oxides, particulates, nitrogen oxides, carbon monoxide, hydrocarbons, and photochemical oxidants.

The shorter driving distances afforded under the proposed action would minimize emissions from transport of borrow material. Because the proposed action would allow continuation of the current practice of borrow material transport, vehicle and fugitive dust emissions resulting from the proposed action are not anticipated to substantially impact the existing air quality on the Hanford Site. Pollution prevention policies and procedures have been established for the Hanford Site. Administrative controls such as vehicle maintenance and the use of ultra-low sulfur fuels would also minimize potential impacts. In addition, dust-control measures such as the use of water sprays would be used on the unpaved portion of the haul roads to minimize particulate air emissions during transportation of borrow materials.

5.1.9 Reasonably Foreseeable Accidents Considered and the Potential Effects

The reasonably foreseeable accidents under the proposed action for excavation and use of borrow areas and construction of haul roads within the CERCLA remedial action areas would be typical construction and transportation accidents. Public health and safety would not be affected because the area is closed to the general public. Typical construction hazards would exist; however, the risk of severe accidents would be low because haul roads would be restricted to operational use only. The risk of accidents would be reduced under the proposed action by making borrow source material available as close to project areas as possible.

5.1.10 Socioeconomics and Environmental Justice

Activities on the Hanford Site have played a substantial role in the socioeconomics of the Tri-Cities since the 1970s. DOE and its contractors operating and cleaning up the Hanford Site, Energy Northwest (Columbia Energy Generating Station), and the agricultural community comprise the major economic sectors of the Tri-Cities. In addition, tourism, technology-based businesses, and non-DOE contractors also contribute significantly to the region's economy.

The area within an 80-km (50-mi) radius of the Hanford Site encompasses parts of 10 counties in two states: Adams, Benton, Franklin, Grant, Kittitas, Klickitat, Walla Walla, and Yakima Counties in Washington; and Morrow and Umatilla Counties in Oregon. Based on the 2010 Census, the total population of these counties was 811,495 of which the total minority population was 215,445 or about 27%. 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).

The ethnic composition of the ten counties is roughly 73.5% White, 1.1% Black or African American, 2.3% American Indian or Alaska Native, 1.5% Asian or Pacific Islander, 0.1% Native Hawaiian/Pacific Islander, 18.1% some other race, and 3.4% two or more races. Hispanics and Latinos account for 32.8% of the total population and roughly 80% of the total minority population in the 10 counties. Approximately 80% of the minority population resides in Franklin, Benton, Yakima, and Grant Counties. American Indians reside primarily on the Yakama Reservation and

upstream of the Hanford Site near the town of Beverly, Washington. Low-income persons constitute approximately 16% of the total population in the 10 counties surrounding the Hanford Site.

Approximately 90% of DOE contractor employees working on the Hanford Site live in Benton and Franklin Counties. Of these employees, approximately 73% resided in Richland, Pasco, or Kennewick (roughly 37% in Richland, 11% in Pasco, and 25% in Kennewick). Residents of other areas of Benton and Franklin Counties including West Richland, Benton City, and Prosser, account for the remaining 17% of total DOE contractor employment (PNNL-6415). An estimated 175,177 people lived in Benton County and 78,163 lived in Franklin County during 2010, totaling 253,340, an increase of roughly 32% from the 2000 Census. This growth rate is faster than the state of Washington, which has grown 14.1% since the 2000 Census. During 2010, Benton and Franklin Counties accounted for 3.8% of Washington's population. The population demographics of Benton and Franklin Counties are similar to those found within Washington State.

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 the Hanford Site and continue to live adjacent to the site. They fish on the Columbia River and gather food resources near the Hanford Site. Some tribes are also recognized to have cultural and religious ties to the site.

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 (e.g., land, air, water, wildlife, vegetation) or in the human environment (e.g., employment, health, land use).

For purposes of this analysis, it was estimated that about 250,000 labor hours would be required to complete the proposed action. Since the proposed action is a continuation of project activities underway, the work is expected to be accomplished using a workforce similar to what is currently in place. Expansion and use of the borrow pits in the proposed action would be performed by a combination of on-site labor and off-site vendors. The existing borrow areas occupy a total of approximately 517 acres within the Hanford Site, and the proposed action would increase that total to 704 acres. While several Native American tribes have cultural and religious ties to the Hanford Site, the locations being considered for borrow area expansion do not impact known sensitive cultural resources. The location of the new Pit 36 was selected in order to avoid expansion of N Pit, which would have directly impacted a culturally sensitive area. Consequently, it is not expected that the proposed action in this EA would 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.

A greater number of labor hours would be expected with the No-Action Alternative, given the longer haul distances to fill the need for borrow material. In addition, the proportion of borrow material obtained from off-site vendors under the No-Action Alternative would be greater. However, because the use of borrow pits to support Hanford Site activities is an ongoing operation, impacts from the No-Action Alternative are not expected to have a significant socioeconomic impacts on the surrounding populations. In addition, impacts to cultural resources identified in the proposed alternative would be avoided.

5.1.11 Conclusion of Cumulative Impacts and Environmental Consequences Discussion

The evaluations in this section of the EA were performed in order to give consideration to potential cumulative impacts that would result from the proposed action. Most aspects of potential effects from the proposed action would be temporary, such as effects to transportation, air quality, water quality, health and safety, and socioeconomic and environmental justice aspects.

Land use for borrow pit use under the proposed action is consistent with allowances made by current land-use decisions. For any effects to resources that would not be considered temporary, impacts would be mitigated by measures outlined in a MAP for this EA. This applies to ecological, cultural, and visual resources. Because the proposed action includes measures to avoid and/or minimize any potential adverse impacts, significant cumulative impacts are not anticipated under the proposed action.

5.2 IMPACTS FROM THE NO-ACTION ALTERNATIVE

Generally, transport of borrow materials from a limited number of pits as allowed under the No-Action Alternative, compared to the availability of a greater number of expanded pits under the proposed action alternative, would increase impacts to air quality, transportation resources, and risks. This is a consequence of the greater transport distances required when a smaller number of borrow sources are available for the same number of active remediation and construction project areas. For example, the increase in distance to obtain borrow source material under the No-Action Alternative would result in greater greenhouse gas emissions.

A greater number of labor hours would be expected with the No-Action Alternative, given the longer haul distances to fill the need for borrow material. In addition, the proportion of borrow material obtained from off-site vendors under the No-Action Alternative would be greater. However, because the use of borrow pits to support Hanford Site activities is an ongoing operation, impacts from the No-Action Alternative are not expected to have a significant socioeconomic impacts on the surrounding populations. In addition, impacts to cultural resources identified in the proposed alternative would be avoided.

6.0 PERMITS AND REGULATORY REQUIREMENTS

6.1 PARTICULATE EMISSIONS

Particulate emissions are regulated by the Washington State Department of Ecology pursuant to WAC 173-400, "General Regulations for Air Pollution Sources." The general standards for maximum emissions contained in WAC 173-400-040 are applicable to borrow pit activities. These standards require reasonable precautions to be taken to (1) prevent the release of air contaminants associated with fugitive emissions resulting from materials handling, demolition, or other operations; and (2) prevent fugitive dust from becoming airborne from fugitive sources of emissions. Additionally, WAC 173-400-040 requires the use of reasonably available control technology. Dust control measures such as the use of water sprays would be used to control dust during the excavation, loading, and transportation of borrow materials.

6.2 HANFORD REACH NATIONAL MONUMENT

Federal and non-federal entities planning new activities within 0.4 km (0.25 mi) of the Columbia River shoreline of the section of river designated as the Hanford Reach must consult and coordinate with the U.S. Department of Interior in accordance with Section 2(A)(3) of the *Hanford Reach Study Act*. Portions of the borrow areas proposed for expansion are located within 0.4 km (0.25 mi) of the Columbia River in an area designated as the Hanford Reach National Monument (Pits 24, N, H, and F). Consistent with the DOE's authority to manage lands within the Monument as necessary to carry out the environmental cleanup mission, expansion and use of the proposed borrow sites would be allowable under the June 9, 2000, Presidential Proclamation (65 FR 37253). The U.S. Fish and Wildlife Service (USFWS) manages portions of the monument on behalf of the federal government, assuring protection of the resources identified in the proclamation. While DOE has the authority to use the land for continuation of cleanup actions, DOE coordinated with the USFWS concerning interactions with the Hanford Reach National Monument during preparation of this EA.

6.3 EXCAVATION PERMITS

For the purposes of promoting safe work practices and protecting natural and cultural resources, DOE has established Hanford Site excavation permit requirements and authorizations for working in and around excavations and trenches. Hanford Site excavation permits for the excavation of aggregate materials would be required to prevent unplanned disturbance or infiltration. Excavation permits would include results of evaluation of impacts to cultural resources and any mitigation actions resulting from this EA, in accordance with NEPA and Section 106 of the NHPA. Excavation permits would also include evaluation results for impacts to natural resources and mitigation actions resulting from this EA in accordance with NEPA and DOE management plans, which incorporate federal natural resource protection laws as well as other relevant and appropriate regulations (DOE/RL-96-32). The transportation of the borrow materials would comply with the applicable regulations, orders, and guidance promulgated by

the DOE, Occupational Safety and Health Administration, and U.S. Department of Transportation, as applicable. These agencies have developed comprehensive regulations covering the performance of shipping, packaging, vehicle safety, routing of shipments, and physical protection.

6.4 MATERIALS PROCESSING AT PIT 30

Pit 30 activities, unlike the operation of the other borrow pits, includes significant processing of the materials (e.g., crushing and screening) and additional use of water to obtain the appropriate size material for construction of the WTP and ERDF expansion cells. These activities are subject to the Sand and Gravel General Permit issued by Ecology that covers waste water discharges from specific types of facilities throughout Washington State. For those facilities that require coverage under the permit, a permit application for coverage form is submitted to Ecology. In addition, Ecology has issued air emissions requirements in the Hanford Site Air Operating Permit Number 00-05-006, for the operation of the WTP concrete batch plant that includes requirements for WTP associated borrow operations in Pit 30. Borrow operations in Pit 30 that support ERDF cell expansion are not subject to permitting as this work is being conducted under CERCLA; however, the substantive requirements would be met. In accordance with Section 121(e) of CERCLA, no federal, state, or local permits are required for any removal or remedial action carried out under CERCLA authority. Onsite CERCLA actions are, however, required to comply with substantive (but not administrative) requirements of other environmental laws and regulations.

7.0 CONSULTATION AND COORDINATION

The following agencies and organizations were provided advance letters of notification of DOE's intent to prepare this EA:

- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes and Bands of the Yakama Nation
- Nez Perce Tribe
- Wanapum
- U. S. Environmental Protection Agency
- U. S. Fish & Wildlife Service
- Washington State Department of Ecology
- Washington State Department of Fish and Wildlife
- Washington State Historic Preservation Officer
- Oregon Department of Energy
- Benton County
- Franklin County
- City of Richland
- Hanford Natural Resource Trustee Council
- Hanford Advisory Board
- Heart of America Northwest
- Washington Physicians for Social Responsibility.

Consultation meetings and briefings were held with Tribes and other organizations as requested. During the preparation of this EA, the USFWS was consulted concerning interactions with the Hanford Reach National Monument. A 30-day public comment period on the draft EA is being held from December 10, 2012, through January 13, 2013. The draft EA is available in the DOE reading room (Consolidated Information Center at Washington State University Tri-Cities), the Richland Public Library, and the Hanford Site website (http://www.hanford.gov/docs/ea/ea1454.html).

8.0 REFERENCES

50 CFR 402, "Interagency Cooperation - Endangered Species Act of 1973," *Code of Federal Regulations*, as amended.

64 FR 61615, 1999, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement," *Federal Register*, Vol. 64, pp. 61615, (November 12).

65 FR 37253, 2000, "Establishment of the Hanford Reach National Monument," *Federal Register*, Vol. 65, pp. 37253-37257 (June 9).

CCN 103599, 2002, "Cultural Resources Review to Activate and Expand Borrow Pits at 100-F, 100-H, and 100-N Areas (HCRC#2003-100-001)," CCN 103599 to M. A. Buckmaster from D. D. Teel, Bechtel Hanford Environmental Restoration Contractor., Richland Washington, November 4.

CCN 126702, 2006, "Ecological and Cultural Resources Review for Continued Use of Borrow Pit 18 (06-ER-012)," CCN 126702 to J. D. Laurenz from D. D. Teel, Washington Closure Hanford, Richland, Washington.

CCN 157745, 2011, "Ecological Resource Review for Continued Use of the 100-F Borrow Pit – Update (06-ER-037b)," CCN 157745 to G. E. Dixson from J. E. Thomson, Washington Closure Hanford, Richland, Washington.

CCN 167435, 2012, "Ecological and Cultural Resources Review for Continued Use of the 100-N Borrow Pit and Maintenance of Associated Haul Roads – Update – (07-ER-019e, HCRC# 95-100-037, and HCRC# 97-100-13A-F)," CCN 167435 to J. E. Jakubek from J. E. Thomson, Washington Closure Hanford, Richland, Washington.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601, et seq.

Crisler, J. M., 1998, "Memorandum of Agreement Regarding the Expansion of Gravel Pit 24, Hanford Site, WA," Letter on file at the U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/EA-1403, 2001, *Environmental Assessment for Use of Existing Borrow Areas, Hanford Site, Richland, Washington*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/EA-1454, 2003, *Environmental Assessment for Reactivation and Use of Three Former Borrow Sites in the 100-F, 100-H, and 100-N Areas*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/EIS-0222-F, 1999, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL-94-150, 1994, *Bald Eagle Site Management Plan for the Hanford Site, South-Central Washington*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

DOE/RL-96-87, 2003, *Hanford Site Biological Resources Mitigation Strategy*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-98-10, 2003, *Hanford Cultural Resources Management Plan*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2000-27, 2000, *Threatened and Endangered Species Management Plan: Salmon and Steelhead*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-22, 2001, *Mitigation Action Plan for the 100 and 600 Areas of the Hanford Site*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2011-119, 2012, *Hanford Site Environmental Report for Calendar Year 2011*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Endangered Species Act of 1973, 16 U.S.C. 1531, et seq.

EPA, 2011, *Draft Guidance on Identifying Waters Protected by the Clean Water Act*, U.S. Environmental Protection Agency, Washington, D.C.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, issued February 11, 1994.

Griffith, G., 1998 *Memorandum of Agreement for Mitigation of the Fry and Conforth Farm (HT-95-050), Hanford Site*, Letter to Mr. James E. Rasmussen on file at DOE-RL, Richland, Washington.

Hanford Reach Study Act of 1988, Public Law 100-605.

HCRC#98-600-005, 1997, *Gravel Pit 24 Expansion (HCRC#98-600-005)*. On file at Mission Support Alliance, Richland, Washington.

HCRC#98-600-005a, 2005, *Cultural Resources Review for the Borrow Pit 24 Expansion: Phase 2 (HCRC#98-600-005a)*, Bechtel Hanford, Inc., Richland, Washington

HCRC#2003-100-001, *Cultural Resources Review to Activate and Expand Borrow Pits at 100F, 100H, and 100N Areas of the Hanford Site, Benton County, Washington (HCRC#2003-100-001),* Environmental Restoration Contractor, Richland, Washington, on File at the U.S. department of Energy Cultural Resource GIS Database and Library managed by Mission Support Alliance.

HCRC#2011-200-052, 2012, *No Historic Properties Affected (NHPA) Cultural Resources Review for a Borrow Pit 34 Expansion in the 200 Area of the Hanford Site, Benton County, Washington (HCRC#2011-200-052)*, CH2M Hill, Richland, Washington. On file at the U.S. Department of Energy Cultural Resource GIS Database and Library managed by Mission Support Alliance, Richland, Washington.

HCRC#2011-600-057, *Cultural Resources Review for the Expansion of the Borrow Pit 24 in the 100 B/C Area of the Hanford Site, Benton County, Washington (HCRC#2011-600-057)*, Washington Closure Hanford, Richland, Washington. On file at the U.S. Department of Energy Cultural Resource GIS Database and Library managed by Mission Support Alliance, Richland, Washington.

HCRC#2012-100-023, 2012, *No Historic Properties Affected (NHPA) Cultural Resources Review for the Expansion of the Borrow Pit 21 in the 100 Area of the Hanford Site, Benton County, Washington (HCRC#2012-100-023)*, Washington Closure Hanford, Richland, Washington. On file at the U.S. Department of Energy Cultural Resource GIS Database and Library managed by Mission Support Alliance, Richland, Washington.

HCRC#2012-100-024, *Cultural Resources Review for the Design, Construction, and Continued Use of Borrow Pit 36 Located in the 100-K Area of the Hanford Site, Benton County, Washington (HCRC#2012-100-024),* Washington Closure Hanford, Richland, Washington. On file at the U.S. Department of Energy, Cultural Resource GIS Database and Library managed by Mission Support Alliance, Richland, Washington.

HCRC#2012-100-025, 2012, *No Historic Properties Affected (NHPA) Cultural Resources Review for the Expansion of the 100-H Borrow Pit in the 100-H Area of the Hanford Site, Benton County, Washington (HCRC#2012-100-025)*, Washington Closure Hanford, Richland, Washington. On file at the U.S. Department of Energy Cultural Resource GIS Database and Library managed by Mission Support Alliance, Richland, Washington.

Mendez, K. M., Sheldon, D, and R. B. DeMaris, 2012, *No Historic Properties Affected (NHPA) Cultural Resources Review for the Expansion of the Borrow Pit 6 in the 600 Area of the Hanford Site, Benton County, Washington (HCRC#2012-600-004)* , Washington Closure Hanford, Richland, Washington. On file at the U.S. Department of Energy Cultural Resource GIS Database and Library managed by Mission Support Alliance, Richland, Washington.

Purtzer, L.C., 2012, *No Historic Properties Affected (NHPA) Cultural Resources Review for the Expansion of the Borrow Pit 6 in the 600 Area of the Hanford Site, Benton County, Washington (HCRC#2012-600-032)*, Washington Closure Hanford, Richland,

Washington. On file at the U.S. Department of Energy Cultural Resource GIS Database and Library managed by Mission Support Alliance, Richland, Washington.

HCRC#2012-300-010, 2012, *No Historic Properties Affected (NHPA) Cultural Resources Review for the Expansion of the Borrow Pit 9 in the 300 Area of the Hanford Site, Benton County, Washington (HCRC#2012-300-010)*, Washington Closure Hanford, Richland, Washington. On file at the U.S. Department of Energy Cultural Resource GIS Database and Library managed by Mission Support Alliance, Richland, Washington.

HCRC#2012-600-034, 2012, *No Historic Properties Affected (NHPA) Cultural Resources Review for the Expansion of the Borrow Pit 23 in the 600 Area of the Hanford Site, Benton County, Washington (HCRC#2012-600-034),* Washington Closure Hanford, Richland, Washington. On file at the U.S. Department of Energy Cultural Resource GIS Database and Library managed by Mission Support Alliance, Richland, Washington.

HCRC#2012-600-037, 2012, *No Historic Properties Affected (NHPA) Cultural Resources Review for the Southern Expansion and Stockpiles for Borrow Pit 6 in the 600 Area of the Hanford Site, Benton County, Washington (HCRC#2012-600-037)*, Washington Closure Hanford, Richland, Washington. On file at the U.S. Department of Energy Cultural Resource GIS Database and Library managed by Mission Support Alliance, Richland, Washington.

NPCE#2006-600-010, *No Potential to Cause Effect (NPCE) Cultural Resources Review for the Use of Pit 18 in the 600 Area of the Hanford Site, Benton County, Washington (NPCE#2006-600-010),* Washington Closure Hanford, Richland, Washington. On file at the U.S. Department of Energy Cultural Resource GIS Database and Library managed by Mission Support Alliance, Richland, Washington.

NPCE#2008-600-014, 2008, *No Potential to Cause Effected (NPCE) Cultural Resources Review for the Expansion of Pit 30 (NPCE#2008-600-014)*, Washington Closure Hanford, Richland, Washington.

NPCE#2011-100-011, 2010, *No Potential to Cause Effected (NPCE) Cultural Resources Review for the a Ten Percent Expansion of the Borrow Pit at the 100-N Area (NPCE#2011-100-011),* Washington Closure Hanford, Richland, Washington.

National Environmental Policy Act of 1969, 42 U.S.C. 4321, et seq.

National Historic Preservation Act of 1966, 16 U.S.C. 470, et seq.

PNNL-6415, 2002, *Hanford Site National Environmental Policy Act (NEPA) Characterization*, Rev. 18, Pacific Northwest National Laboratory, Richland, Washington.

PNNL-20548, 2011, *Hanford Site Environmental Report for Calendar Year 2010,* Pacific Northwest National Laboratory, Richland, Washington.

TNC, 1999, *Biodiversity Inventory and Analysis of the Hanford Site, Final Report 1994-1999*, The Nature Conservancy of Washington, Seattle, Washington.

WAC 173-400, "General Regulations for Air Pollution Sources," *Washington Administrative Code*, as amended.

WAC 232-012-297, "Endangered, Threatened, and Sensitive Wildlife Species Classification," *Washington Administrative Code*, as amended.

Washington Natural Heritage Program, 1997, *Endangered, Threatened, and Sensitive Vascular Plants of Washington*, Washington Department of Natural Resources, Washington Natural Heritage Program, Olympia, Washington.

WDNR, 1997, *Best Management Practices for Reclaiming Surface Mines in Washington and Oregon,* Open file report 96-2, Washington State Department of Natural Resources, Washington Division of Geology and Earth Resources, Olympia, Washington.

APPENDIX A

PROPOSED BOUNDARIES OF EXPANDED BORROW PITS

APPENDIX A

PROPOSED BOUNDARIES OF EXPANDED BORROW PITS

Legend

F Pit (39.90 acres)

Roads

Total Disturbed Area: 39.90 acres

NOTES: Aerial Image, 2011, NAIP.

0 600 1,200 1,800 2,400 Feet

N

F Pit

Hanford Site, Benton County, WA

Path: C:\Hanford\GIS\MapFiles\WCHF PitExpansion.mxd

Legend

- H Pit Expansion Area (10.60 acres)
- H Pit (23.70 acres)
- Roads

Total Disturbed Area: 34.30 acres

NOTE: Aerial Image, 2011, NAIP.

0 600 1,200 1,800 2,400 Feet

N

H Pit Expansion
H Pit
Hanford Site, Benton County, WA

Path: C:\Hanford\GIS\MapFiles\WCH\HPitExpansion.mxd

Legend

- N Pit Expansion Area (12.80 acres)
- N Pit (40.20 acres)
- Roads

Total Disturbed Area: 53.00 acres

NOTES: Aerial Image, 2011, NAIP.

0 600 1,200 1,800 2,400 Feet

N

N Pit Expansion Area
Pit 23
Hanford Site, Benton County, WA

Path: C:\Hanford\GIS\MapFiles\WCH\NPitExpansion.mxd

Legend

- Pit 6 Expansion Area (28.00 acres)
- Pit 6 (69.66 acres)
- New Access Road

Total acres: 97.66 acres

NOTE: Aerial Image, 2011, NAIP.

0 500 1,000 1,500 Feet

N

Pit 6 Expansion Area
Pit 6
Hanford Site, Benton County, WA

Path: C:\Hanford\GIS\MapFiles\WCH\Pit6Expansion.mxd

Legend

- Pit 9 Expansion Area (11.60 acres)
- Pit 9 (58.70 acres)
- Roads

Total Disturbed Area: 70.30 acres

NOTE: Aerial Image, 2011, NAIP.

0 600 1,200 1,800 2,400 Feet

N

Pit 9 Expansion Area
Pit 9
Hanford Site, Benton County, WA

Path: C:\Hanford\315\MapFiles\WCH\HL_RC2012-300-007_Pit9.mxd

Legend

Pit 18 (8.20 acres)

Roads

Total Disturbed Area: 8.20 acres

NOTE: Aerial Image, 2011, NAIP.

0 600 1,200 1,800 2,400 Feet

N

Pit 18

Hanford Site, Benton County, WA

Path: C:\HanfordGIS\MapFiles\WCH\Pit18.mxd

Legend

- Pit 21 Expansion Area (35.00 acres)
- Pit 21 (29.20 acres)
- Roads

Total Disturbed Area: 64.20 acres

NOTE: Aerial Image, 2011, NAIP.

0 600 1,200 1,800 2,400 Feet

N

Pit 21 Expansion Area
Pit 21
Hanford Site, Benton County, WA

Path: C:\Hanford\GIS\MapFiles\WCH\Pit21Expansion.mxd

Legend

- Pit 23 Expansion Area (13.00 acres)
- Pit 23 (58.70 acres)
- Roads

Total Disturbed Area: 71.70 acres

NOTES: Aerial Image, 2011, NAIP.

0 600 1,200 1,800 2,400 Feet

N

Pit 23 Expansion Area
Pit 23
Hanford Site, Benton County, WA

Path: C:\Hanford\GIS\MapFiles\WCH\Pit23.mxd

Legend

- Pit 24 Expansion Area (16.50 acres)
- Pit 24 (48.50 acres)
- Roads

Total Disturbed Area: 65.00 acres

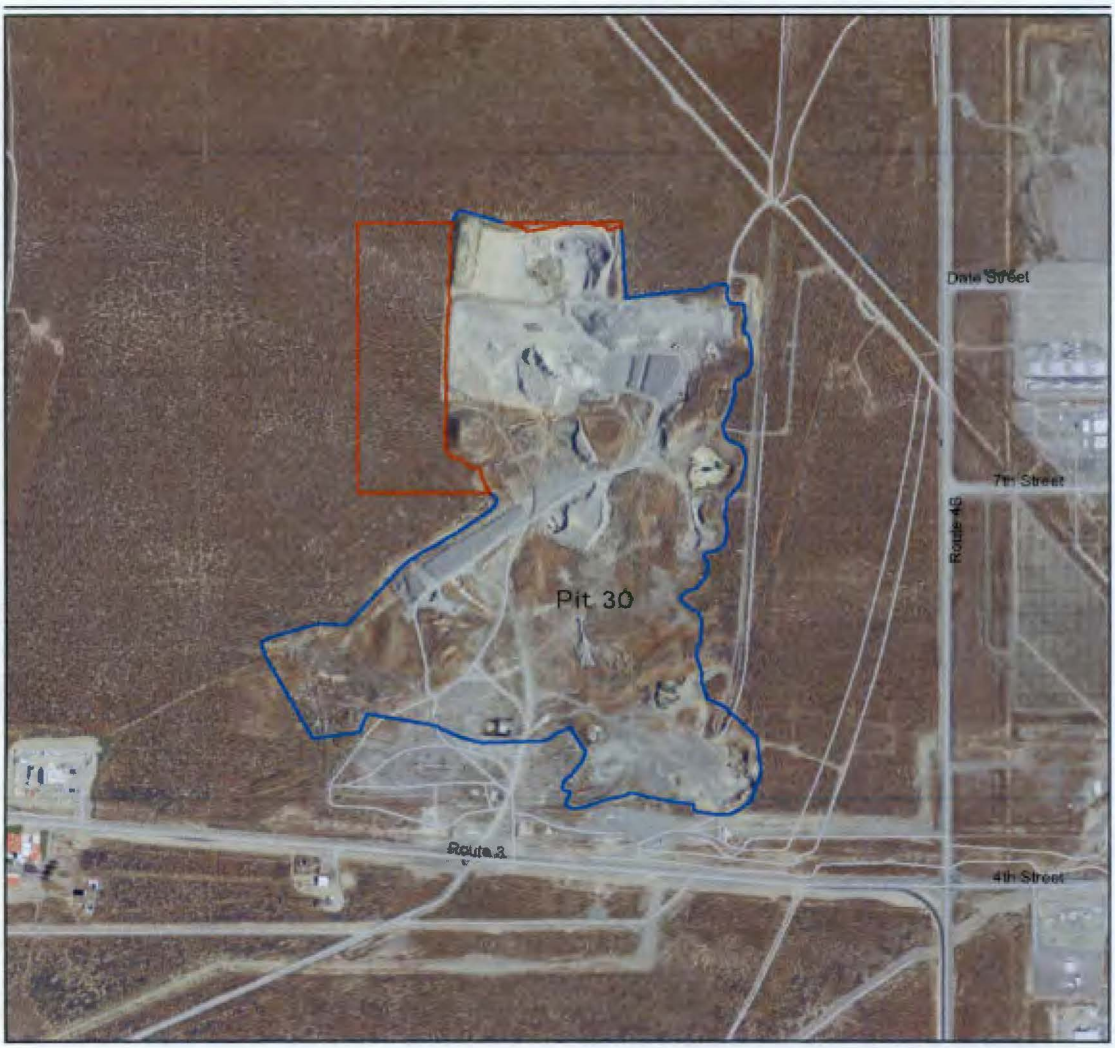
NOTES: Aerial Image, 2011, NAIP.

0 600 1,200 1,800 2,400 Feet

N

Pit 24 Expansion Area
Pit 24
Hanford Site, Benton County, WA

Path: C:\Hanford\GIS\MapFiles\WCH\Pit24.mxd



Legend

- Pit 30 Expansion Area (19.00 acres)
- Pit 30 (123.00 acres)
- Roads

Total Disturbed Area: 142.00 acres

NOTE: Aerial Image, 2011, NAIP.

0 600 1,200 1,800 2,400 Feet

N

Pit 30 Expansion Area
Pit 30
Hanford Site, Benton County, WA

Path: C:\Hanford\GIS\MapFiles\WCH\Pit30.mxd

Legend

- Pit 34 Expansion Area (10.90 acres)
- Pit 34 (17.10 acres)
- Roads

Total Disturbed Area: 28.00 acres

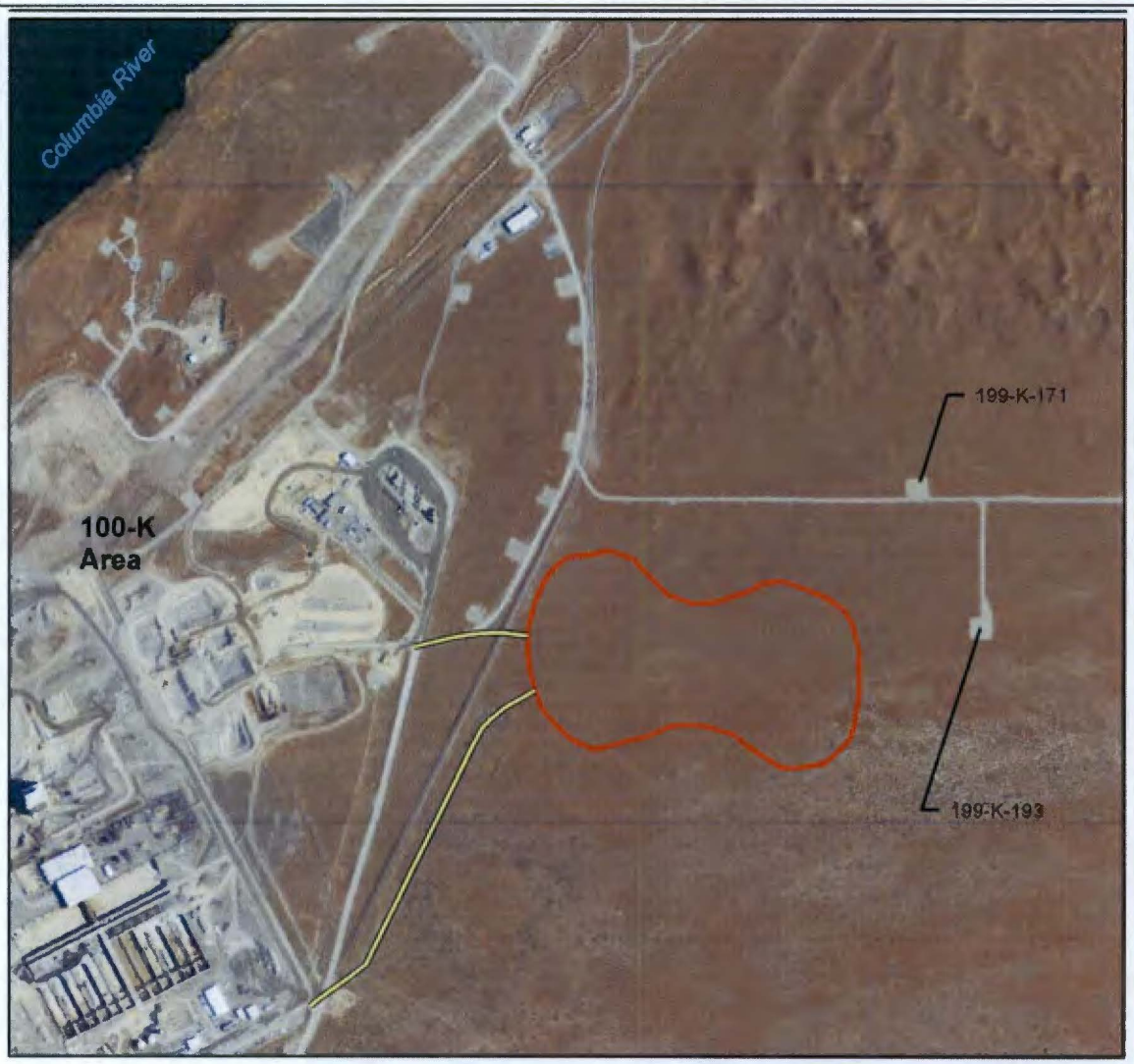
NOTE: Aerial Image, 2011, NAIP.

0 600 1,200 1,800 2,400 Feet

N

Pit 34 Expansion Area
Pit 34
Hanford Site, Benton County, WA

Path: C:\Hanford\GIS\MapFiles\WCH\Pit34.mxd



Legend

Pit 36 (30 acres)

New Access Roads

NOTE: Aerial Image, 2011, NAIP.
Access road portions of APE are 40 feet wide.

0 600 1,200 1,800 2,400 Feet

N

Pit 36

Hanford Site, Benton County, WA

Path: C:\Hanford\GIS\MapFiles\WCH\HCRC2012-100-024_NPitExpansion.mxd

APPENDIX B

EVALUATION OF AIR QUALITY IMPACTS

APPENDIX B

EVALUATION OF AIR QUALITY IMPACTS

During the transfer of material from borrow areas, small quantities of gaseous and particulate pollutants would be generated at the borrow pits and during transportation of borrow materials. Air quality impacts from implementing the No-Action Alternative or the proposed action alternative would be due principally to exhaust emissions from earth-moving equipment and vehicles (primarily haul trucks), and fugitive dust (particulate matter [PM]) emissions from excavation, loading, and transportation of borrow pit materials. Dust-suppression methods (e.g., application of water spray) would be implemented to control emissions of PM. Since the proposed expansion of borrow pits would result in a continuation of an existing ongoing practice of removal and use of borrow pit material, no substantial increase in overall air emissions would be envisioned to result from the proposed action alternative. The No-Action Alternative emissions are expected to be greater than the proposed action alternative due to the additional vehicle miles traveled between the borrow pits and backfill locations. Under the No-Action Alternative, only a limited number of borrow pits are available and they are located farther from the areas that require borrow pit material for backfill.

The following sections discuss the exhaust and dust emissions from the excavation, loading, and transportation of borrow materials under the proposed action alternative.

B.1.0 GREENHOUSE GAS EMISSIONS AND CRITERIA AIR POLLUTANT EMISSIONS

Total annual greenhouse gas (GHG) emissions from vehicles and other fuel-burning equipment used to support borrow operations is addressed in Section B.1.1. Total annual criteria air pollutant emissions are addressed in Section B.1.2. The complete calculations that support both sections are contained in the "Annual Air Emissions for Expansion Borrow Pits" (0000X-CA-V0022).

B.1.1 Green House Gas Emissions from Vehicles and Construction Equipment

The primary air emission from vehicles is carbon dioxide, which is considered a GHG. Greenhouse gases are gaseous constituents of the atmosphere, both natural and resulting from or produced by human beings, that absorb and emit thermal infrared radiation (heat) emitted by the Earth's surface, the atmosphere itself, and clouds. Water vapor, carbon dioxide, nitrous oxide, methane, and ozone are the primary GHGs in the Earth's atmosphere. Greenhouse gases trap heat between the Earth's surface and the lower part of the atmosphere; this phenomenon is called the greenhouse effect. The amount of GHGs emitted during the Proposed Action Alternative has been estimated based on established emission factors and estimated fuel consumption by the haul trucks and excavators. Under the Proposed Action Alternative, potential maximum emissions are estimated to be approximately 1,527 metric tons/yr of CO_2e, which is expected to be

comparable to previous years' emissions from the ongoing use of borrow pits on the Hanford Site. By way of comparison, the total GHG emissions from mobile sources (primarily fleet vehicles) on the Hanford Site in 2011 and 2010 was 43,617 metric tons CO_2e and 33,590 metric tons CO_2e, respectively.

The GHG emissions were calculated from truck exhaust and construction equipment (excavator) exhaust. Truck exhaust emissions were calculated based on truck running and idling emissions, and annual vehicle miles traveled in transporting material. Emission factors (EFs) were based on the California Air Resources Board emissions model for on-road vehicles (CARB 2011) for heavy heavy-duty diesel trucks. Emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) were calculated. The CO_2, CH_4, and N_2O emissions were multiplied by their global warming potentials (GWP); 1, 21, and 310, respectively, and all were summed to estimate the total annual GHG as "CO_2 equivalent" (CO_2e).

Construction equipment emissions were calculated based on their estimated fuel consumption and EFs from (Appendix D) of *the Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document* (CEQ 2010) for CO_2, CH_4, and N_2O. These were converted to CO_2e values and summed.

The following provides the basis for estimating the annual GHG emissions from the vehicles used to implement borrow pit operation activities under the proposed action. Emissions under the No-Action Alternative would be greater due to the increased number of miles the haul trucks would need to travel to obtain borrow materials. The haul trucks and excavation equipment emissions are calculated separately from each other and summed to come up with a total GHG emissions rate of 1,527 metric tons/yr CO_2e.

Haul Trucks.

The following provides the estimate for maximum annual GHG emissions from the haul trucks under the proposed action:

- 501,064 mi/yr traveled by the haul trucks from all borrow pits
- 1,727.9 g/vehicle miles traveled (VMT) running EF for CO_2, 0.0051 g/VMT CH_4, 0.0048 g/VMT N_2O
- Apply GWP factors for CO_2, CH_4, N_2O; 1, 21, and 310
- Idling emissions of CO_2 are 2,395.4 g/truck/day (no data on CH_4 or N_2O during idling, however, as can be concluded from the running EFs, their contribution is insignificant)
- Assume the equivalent of 10 trucks operating full time (208 days/year).

The total GHG emissions from the haul trucks from operation and idling was calculated as 872.2 metric tons CO_2e /year (867.2 metric tons and 5.0 metric tons CO_2e /year for operations and idle, respectively).

In-Pit Excavators

The following provides the estimate for GHG emissions from the excavating equipment used in the borrow pits:

- 63,908 gal of fuel/year used by the in-pit excavators
- 10,206.5 g/gal EF for CO_2, 0.414 g/gal CH_4, 0.083 g/gal N_2O
- Apply GWP factors for CO_2, CH_4, N_2O; 1, 21, and 310, respectively.

The total GHG emission associated with in-pit excavators was calculated to be 654.9 metric tons CO_2e.

The total GHG emissions from haul trucks and excavators are equal to 1,527 metric tons CO_{2e}/year (872.2 metric tons CO_2e from haul trucks and 654.9 metric tons CO_2e from excavators).

B.1.2 Criteria Air Pollutant Emissions from Vehicles and Construction Equipment

In addition to GHG emissions, the haul trucks and excavators would emit criteria air pollutants. Criteria air pollutants include volatile organic compounds, also known as reactive organic gases (ROG), carbon monoxide (CO), oxides of nitrogen (NO_x), oxides of sulfur (SO_x), and PM. Particulate matter of concern, and thus regulated by state and federal regulations, are small diameter components (PM_{10} [particles 10 micrometers in diameter or smaller] and $PM_{2.5}$ [particles smaller than 2.5 micrometers in diameter]). Emissions of SO_x would be small due to the use of ultra-low sulfur fuel.

Estimated maximum annual emissions are summarized in Table B-1. Since the proposed expansion of borrow pits would result in continuation of an existing ongoing practice of removal and use of borrow pit material, no substantial increase in overall air emissions would be envisioned to result from the Proposed Action Alternative.

Table B-1. Maximum Annual Criteria Pollutants (tpy).

Criteria Pollutants					
NOx	**CO**	**ROG**	**SOx**	**PM_{10}**	**$PM_{2.5}$**
13.74	3.18	0.68	0.02	29.8	3.51

Criteria pollutants are generated from material handling and transport activities at each borrow pit in four ways:

1. Exhaust emissions from diesel haul trucks

2. Exhaust emissions from diesel excavators

3. Fugitive dust emissions from excavator loading borrow material into diesel haul trucks and haul truck dumping at the receiving location

4. Fugitive dust emissions from haul traffic on unpaved roads.

Details for each of the component contributions are discussed below.

B.1.2.1 Exhaust Emissions from Diesel Haul Trucks

Exhaust emissions from diesel haul trucks have two components: running emissions and idling emissions. Emissions of each criteria pollutant were calculated using the following equation for maximum annual operations:

Emissions = $EF_{running}$ x VMT + EF_{idling} x Vehicle Operating Days

Data for on-road truck EFs for criteria pollutants were obtained from the California Air Resources Board (ARB) emissions model (CARB 2011) (http://www.arb.ca.gov/msei/msei.htm [CARB 2012]). The EFs are based on the California statewide fleet for in-use "Heavy Heavy Duty Diesel Tractor Trucks" (GVWR>33,000 lb) operating during 2011, considering all model years and speeds. The PM_{10} and $PM_{2.5}$ EFs include contribution from tire wear and break wear. A total of 501,064 truck miles is estimated for the maximum operating year. The equivalent of ten trucks operating full time (208 days/year) was assumed in calculating idle emissions. Truck running and idling emissions during the maximum operating year are presented in Tables B-2 and B-3.

Table B-2. Maximum Annual Truck Running Emission Rates (tpy).

NOx	CO	ROG	SOx	PM_{10}	$PM_{2.5}$
7.68	1.98	0.44	0.01	0.37	0.31

Table B-3. Maximum Annual Truck Idling Emission Rates (tpy).

NOx	CO	ROG	SOx	PM_{10}	$PM_{2.5}$
0.07	0.03	0.01	0.0001	0.0010	0.0010

B.1.2.2 Exhaust Emissions from Diesel Excavators. Emissions of each criteria air pollutant from excavators were calculated using the following equation for maximum annual operations:

Emissions = EF x Power rating x Load Factor x Hours of Operation

Excavator EFs were obtained from the U.S. Environmental Protection Agency's (EPA's) *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling – Compression-Ignition*" (EPA 2010). Excavators were assumed to have a 380 hp rating. A load factor (fraction of overall power consumed over the course of a day) of 0.53 applies to excavators (EPA 2002, 2010). Excavators were estimated to be operating for 6,225 hours during the maximum

operating year. Maximum annual emission rates for excavator operation are presented in Table B-4.

Table B-4 Maximum Annual Excavator Emission Rates (tpy).

NOx	CO	ROG	SOx	PM_{10}	$PM_{2.5}$
6.00	1.17	0.23	0.00690	0.18	0.18

B.1.2.3 Fugitive Dust Emissions from Excavator Loading Borrow Material into Diesel Haul Trucks

Fugitive dust (PM) emissions are generated when excavators load material into haul trucks. The standard equation in EPA (2012) for calculating these emissions is:

$$EF = k \times (0.0032) \times \frac{(U/5)^{1.3}}{(M/2)^{1.4}} \times (1\text{-control efficiency}) \quad [\text{lb/ton}]$$

where:

PM_{10} Factor, k = 0.35
$PM_{2.5}$ Factor, k = 0.053
U (wind speed) = 7.61 mph
M (moisture content) = 2.8%
Control efficiency = 0% due to water spraying
ton = tons of throughput of material being dumped.

The average annual wind speed was obtained from PNNL-19455, *Hanford Site Environmental Report for Calendar Year 2009* (PNNL-20548). Moisture content was obtained from the Washington Closure Hanford Environmental Restoration database. Control efficiency due to applying water spray during loading was obtained from a *Compilation of Air Pollutant Emission Factors* (EPA 2012). The controlled EFs for PM_{10} and $PM_{2.5}$ are 0.000362 lb/ton and 0.000055 lb/ton, respectively.

Based on the estimated throughput of 5,044,864 tons during the maximum year, excavator load-in emissions of PM_{10} are estimated to be 1.83 tpy and emissions of $PM_{2.5}$ are estimated at 0.28 tpy.

B.1.2.4 Fugitive Dust Emissions from Haul Traffic on Unpaved Roads

Fugitive dust emissions from haul traffic on unpaved roads is calculated using the standard equation in EPA (2012) for travel on unpaved industrial roads:

$EF = k \times (s/12)^a (W/3)^b \times (365-P)/365$ [lb/VMT]

where:

s = 14.7 surface material silt content (percent) (WHC 1991)
W = 27 tons (mean vehicle weight; assume average of loaded truck weight and empty truck weight).

The constants are:

Constant	PM_{10}	$PM_{2.5}$
k	1.5	0.15
a	0.9	0.9
b	0.45	0.45

The resulting uncontrolled EFs are PM_{10}= 3.65 lb/VMT and $PM_{2.5}$ = 0.36 lb/VMT.

Assuming frequent watering throughout the day would provide 90% control and assuming the percentage of total truck distance traveled onsite that is on unpaved roads is 30%, with 501,064 total onsite miles traveled during the maximum operating year, PM_{10} emissions are estimated to be 27.4 tpy and $PM_{2.5}$ emissions are estimated at 2.74 tpy.

B.2.0 TOXIC AIR POLLUTANT EMISSIONS

Potential emissions of toxic air pollutants associated with vehicle and construction equipment operations have been estimated for benzene, formaldehyde, acetaldyhyde, and1,3-butadiene (0000X-CA-V0022), and are summarized here. Toxic air emissions are estimated using *Emissions of Criteria Pollutants, Toxic Air Pollutants, and Greenhouse Gases, from the Use of Alternative Transportation Modes and Fuels* (Delucchi et al. 2006), which allows for estimating gaseous emissions of toxic air pollutants as a fraction of ROG emissions, for diesel-powered vehicles. These fractions are presented in Table B-5.

Table B-5. Fraction of ROG from Diesel-Powered Vehicles.

Benzene	Formaldehyde	Acetaldehyde	1,3 Butadiene
0.011	0.029	0.008	0.014

Applying these fractions to the estimated quantity of ROG emissions for the proposed project, 0.68 tpy (see Table C-1), maximum annual air toxics from the proposed project can be calculated. The results are presented in Table B-6.

Table B-6. Toxic Air Pollutant Emission Rates from Diesel-Powered On-Road Trucks And Construction Equipment (tpy).

Benzene	Formaldehyde	Acetaldehyde	1,3 Butadiene
0.007	0.020	0.005	0.009

B.3.0 PARTICULATE MATTER EMISSIONS MODELING

Emissions of dust (PM) could occur during excavation and loading of borrow pit materials and during transportation on unpaved roads. Water is used to control dust during excavation and transportation. Exhaust emissions of PM are also generated from the operation of the haul trucks and excavators. The EPA has established standards for PM under the National Ambient Air Quality Standards (NAAQS) at 40 *Code of Federal Regulations* (CFR) 50, "National Primary and Secondary Ambient Air Quality Standards." The EPA has established 24-hour standards for PM_{10} and 24-hour and annual standards for $PM_{2.5}$.

Three borrow pits were evaluated to estimate the potential impacts from PM_{10} and $PM_{2.5}$. Air dispersion modeling via a screening-level analysis was conducted to estimate maximum offsite impacts from project-generated particulate emissions. This is a conservative health-protective approach that uses worst-case meteorology to determine the maximum potential air quality impact. The details of the modeling are documented in the "Air Dispersion Modeling Analysis for Expansion Borrow Pits 6, 24, and 36" (0000X-CA-V0023) and are summarized below.

The modeling was performed using the EPA's SCREEN3 Model Version 96043 to predict maximum 1-hour ground-level concentrations from a single source. The PM_{10} and $PM_{2.5}$ emissions from the four sources discussed in Section B.1.2 were considered for all activities on the pit site plus truck-generated exhaust PM and fugitive dust PM emissions from the pit site to the nearest paved road. The sum of PM_{10} and $PM_{2.5}$ emissions were assumed to be emitted from a single volume source located in the borrow pit site.

The screen modeling was executed using regulatory default settings and rural dispersion coefficients. A full meteorological array of wind speeds and atmospheric stability classes was evaluated in the dispersion analysis. The analysis used the simple terrain feature because

receptors were not determined to be above the effective stack heights of the release. The modeling was done separately for three locations (Pit 36, Pit 24, and Pit 6) for the Proposed Action Alternative. These three pits were deemed to represent reasonable worst-case scenarios based on material throughput, truck traffic on the borrow pit site and new unpaved roads, and distance to potential public receptors.

Two modeling scenarios were constructed. In the first "maximum 24-hour" scenario, maximum daily emissions were modeled to predict a maximum one-hour concentration that was then converted using an appropriate factor for volume sources to predict a maximum expected 24-hour concentration at the closest point on the Columbia River riverbank. In the second "maximum annual" scenario, maximum annual emissions were modeled to predict a maximum 1-hour concentration that was then converted using an appropriate factor for volume sources to predict a maximum expected annual concentration at the closest point off the Hanford Site.

Maximum predicted 1-hour concentrations modeled to the "maximum 24-hour" scenario were multiplied by a factor of 0.15 to convert to a maximum predicted 24-hour average concentration, in accordance with the Colorado Department of Health and Environment's "SCREEN3 Stationary Source Modeling Guidance" (CDPHE/APCD 2005) for volume sources (EPA SCREEN3 guidelines only [EPA 1995] address factors appropriate for point sources, not area or volume sources). Similarly, SCREEN3 modeled maximum1-hour concentrations in the "maximum annual" scenarios were multiplied by 0.03 to convert to maximum annual concentrations (CDPHE/APCD 2005).

The No-Action Alternative was not modeled. Under the No-Action Alternative, impacts associated with Pit 6 would increase as additional material would be excavated. Under the No-Action Alternative, Pit 24 would only be available for a limited period of time, after which most of the material for the 100 Area would be obtained from Pit 23, which is located much further from the Columbia River (the hypothetical maximum impact point) then Pit 24. Under the No-Action Alternative Pit 36 would not be established as a new borrow pit.

The results of the modeling are presented in Table B-7. Ambient air concentrations of PM_{10} and $PM_{2.5}$ are added to predicted project impacts and the sums are compared to the NAAQS. In all scenarios, the results are below the NAAQS. Areas that meet ambient air quality standards are said to be "in attainment" by the EPA. Benton County and the Hanford Site are "in attainment" for all federal and state ambient air quality standards.

Table B-7. Maximum Predicted Total Impacts Compared to NAAQS. (2 Pages)

Site/ Contaminant	Averaging Time	Predicted Maximum Project Impact (μg/m³)	Average Ambient Concentration (μg/m³)	Total Predicted Maximum Impact (Project + Ambient) (μg/m³)[a]	NAAQS (μg/m³)
Pit 6					
PM_{10}[a]	24-hour	21.7	18[b]	39.7	150
$PM_{2.5}$	24-hour	2.5	4.5	7.0	35
$PM_{2.5}$	Annual	0.054	4.5	4.6	15

Table B-7. Maximum Predicted Total Impacts Compared to NAAQS. (2 Pages)

Site/ Contaminant	Averaging Time	Predicted Maximum Project Impact ($\mu g/m^3$)	Average Ambient Concentration ($\mu g/m^3$)	Total Predicted Maximum Impact (Project + Ambient) ($\mu g/m^3$)[a]	NAAQS ($\mu g/m^3$)
Pit 24					
PM_{10}[a]	24-hour	30.2	18	48.2	150
$PM_{2.5}$	24-hour	4.7	4.5	9.2	35
$PM_{2.5}$	Annual	0.009	4.5	4.5	15
Pit 36					
PM_{10}[a]	24-hour	36.6	18	54.6	150
$PM_{2.5}$	24-hour	4.1	4.5	8.6	35
$PM_{2.5}$	Annual	0.01	4.5	4.5	15

[a] Note: In 2006, EPA revoked the annual standard for PM_{10} because available evidence did not suggest a link between long-term PM_{10} exposure and health problems. However, WAC 173-470-100, "Ambient Air Quality Standards for Particulate Matter," maintains an annual standard for PM_{10} which is the same as the revoked federal standard, 50 micrograms per cubic meter ($\mu g/m^3$), annual arithmetic mean. Due to a variety of factors (including results of the 24-hour modeling analysis for PM_{10} and annual $PM_{2.5}$, limited number of days of operation per year, and the factor to convert maximum hourly to annual concentration for a volume source (0.03 versus 0.15 for a 24-hour), it is concluded that the annual predicted concentration of PM_{10} would be well below the state standard of 50 $\mu g/m^3$ and modeling this scenario would not be necessary.

[b] The ambient PM_{10} concentration (18 $\mu g/m^3$) is based on the annual average measured at the Benton Clean Air Authority monitoring station in Kennewick in 2006 (the observed annual average PM_{10} concentration at the HMS was 13 $\mu g/m^3$, but this was only based on 149 days of observations). The annual average $PM_{2.5}$concentration at the HMS during 2006 was 4.5 $\mu g/m^3$ (PNNL 2007).

EPA = U.S. Environmental Protection Agency
HMS = Hanford Meteorology Station
NAAQS = National Ambient Air Quality Standards
PM = particulate matter
WAC = *Washington Administrative Code*

As noted previously, the potential future emissions from the Proposed Action Alternative are believed to be comparable to past emissions and will not result in a significant increase in emissions.

B.4.0 REFERENCES

0000X-CA-V0022, 2012, "Annual Air Emissions for Expansion Borrow Pits," Rev. 0, Washington Closure Hanford, Richland Washington.

0000X-CA-V0023, 2012, "Air Dispersion Modeling Analysis for Expansion Borrow Pit 6, 24, and 36," Rev. 0, Washington Closure Hanford, Richland Washington.

40 CFR 50, "National Primary and Secondary Ambient Air Quality Standards," *Code of Federal Regulations,* as amended.

CARB, 2011, *EMFAC2011 Overview*, California Environmental Protection Agency, Air Resources Board, Sacramento, California.

CARB, 2012, California Environmental Protection Agency Air Resources Board. Electronic document, ,http://www.arb.ca.gov/msei/msei.htm, accessed October 2012.

CDPHE/APCD, 2005, "SCREEN3 Stationary Source Modeling Guidance," *CDPHE/APCD Technical Guidance Series: Air Quality Modeling,* Colorado Department of Public Health and Environment, December 28.

CEQ, 2010, *Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document*, White House Council on Environmental Quality, Washington, D.C.

Delucchi, M., Q. Wang, and R. Ceerla, 2006, *Emissions of Criteria Pollutants, Toxic Air Pollutants, and Greenhouse Gases, from the Use of Alternative Transportation Modes and Fuels*, UCD-ITS-RR-96-12, Institute of Transportation Studies, University of California, Davis, California.

EPA, 1995, *SCREEN3 Model User's Guide,* EPA-454/B-95-004, U.S. Environmental Protection Agency. Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

EPA, 2002, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, EPA 420-R-41-016, NR-005b, U.S. Environmental Protection Agency, Office of Transportation and Air Quality, Washington, D.C.

EPA, 2010, *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling – Compression-Ignition*, EPA 420-R-10-018, NR-009d, U.S. Environmental Protection Agency, Office of Transportation and Air Quality, Washington, D.C.

EPA, 2011, Technology Transfer Network Clearinghouse for Inventories & Emissions Factors. Electronic document. http://www.epa.gov/ttn/chief/ap42/index.html, accessed October 2012.

PNNL, 2010, *Hanford Site Environmental Report for Calendar Year 2009*, PNNL-19455, Pacific Northwest National Laboratory, Richland, Washington.

WHC, 1991, *Physical Treatment of Hanford Waste Sites Engineering Study*, WHC-SD-EN-ES-006, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WAC 173-470, "Ambient Air Quality Standards for Particulate Matter," *Washington Administrative Code*, as amended.

DISTRIBUTION

U.S. Department of Energy
Richland Operations Office

Name	X0-00

Washington Closure Hanford

Name	X0-00

Document Control	H4-11
DOE-RL Public Reading Room	H2-53
Hanford Technical Library	P8-55