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WA7890008967, Part IV, Corrective Action Unit 1
100-NR-1 Operable Unit

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CHAPTER 5.0
COMPARATIVE ANALYSIS OF ALTERNATIVES

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COMPARATIVE ANALYSIS OF ALTERNATIVES

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1 **5.0 COMPARATIVE ANALYSIS OF ALTERNATIVES**

2 **5.1 Compliance With ARARS**

3 The ARARs are standards, requirements, criteria, or limitations promulgated under Federal or state
4 environmental laws that must be met or waived for actions conducted under CERCLA. Only the
5 substantive provisions of requirements that are ARARs must be met (or waived) for actions conducted
6 entirely onsite (CERCLA, Section 121 [d][2]). Such onsite actions are exempted from obtaining Federal,
7 state, and local permits (CERCLA, Section 121 [e][1]). Also, to be considered requirements are
8 nonpromulgated standards, including DOE orders, proposed regulations, and regulatory guidance that
9 may be referenced to the extent necessary for the response action to be adequately protective.

10 Because no action is being taken, Alternative 1 would not meet ARARs for cleanup. All other
11 alternatives would meet ARARs requiring protection of human health and the environment. Key ARARs
12 for the other alternatives include waste management standards, air emission control standards, radiation
13 control standards, and standards for protection of cultural and ecological resources. Proposed
14 environmental cleanup standards for remediation of the 100-N Area soil (proposed soil cleanup standards
15 of 15 mrem/yr above background and MTCA Method B) are addressed in the 100-NR-1 and 100-NR-2
16 CMS; therefore, they are not discussed in this document. Other standards to be met by the response
17 action include various DOE, Federal, and state worker safety standards.

18 **5.1.1 Columbia River Protection Standards**

19 [40 CFR 122](#) addresses technology-based limitations and standards, control of toxic pollutants, and
20 monitoring for discharges to United States waters, including storm water. Public Law 100-605, *Study of*
21 *the Hanford Reach of the Columbia River*, requires new activities near the Columbia River to minimize
22 direct and adverse effects on the values being studied for the Columbia River.

23 No wastewater discharges to the Columbia River are planned under any of the alternatives. Erosion and
24 storm water controls would be used as necessary for alternatives involving demolition.

25 **5.1.2 Cultural and Ecological Resource Protection Standards**

26 The *National Historic Preservation Act of 1966* (implemented via [36 CFR 800](#)) requires Federal agencies
27 to evaluate and mitigate adverse effects of Federal activities on any site eligible for inclusion on the
28 National Register of Historic Places. The PA for the maintenance, deactivation, alteration, and
29 demolition of the built environment allows RL to prepare a treatment plan that provides for the mitigation
30 of historic structures at 100-N Area. The PA requires that all mitigation activities identified in the
31 treatment plan must be completed prior to any demolition, alteration or removal of artifacts from the
32 100-N facilities.

33 The cultural resource protection requirements apply because of the presence of potentially significant
34 archaeological sites or artifacts in the 100-N Area, and the potential historical significance of facilities in
35 the area. The cultural significance of the 100-N Area facilities has been evaluated and mitigation has
36 been established under the PA. It is unlikely that archaeological sites would be impacted by demolition
37 activities.

38 The *Native American Graves Protection and Repatriation Act* ([43 CFR 10](#)) requires agencies to consult
39 and notify culturally affiliated Tribes when Native American human remains are inadvertently discovered
40 during project activities. The 100-N restoration activities could inadvertently uncover previously
41 disturbed or intact graves associated with archaeological sites.

42 The President's Executive Order 1300.7 requires agencies to consider impacts of actions on sacred sites.
43 An area at 100-N called *Mooli Mooli* may be a sacred site that will require consultations with affected
44 Tribes.

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1 The *National Archaeological and Historical Preservation Act of 1974* requires action to recover and
2 preserve artifacts in areas where activity may cause irreparable harm, loss, or destruction of significant
3 artifacts. The *Endangered Species Act of 1973* (implemented via [50 CFR 402](#)) and [WAC 232-012-297](#))
4 prohibit activities that threaten the continued existence of listed species or destroy critical habitat. The
5 *Migratory Bird Treaty Act* makes it illegal to remove, capture, or kill any migratory bird, or any part of
6 nests or the eggs of any such birds.

7 Threatened and endangered species are known to be present in the 100 Area, but no adverse impacts on
8 protected species or critical habitat resulting from implementation of any of the alternatives is anticipated.
9 Facility-specific ecological reviews would be conducted to identify potentially adverse impacts prior to
10 the performance of any demolition work.

11 **5.1.3 Waste Management Standards**

12 The RCRA regulates management and disposal of hazardous (dangerous) waste. Authority for much of
13 RCRA has been delegated to the State of Washington. Implementing state regulations contained in
14 [WAC 173-303](#) requires identification and appropriate management of dangerous wastes and dangerous
15 components of mixed wastes, and identifies standards for treatment and disposal of these wastes. These
16 requirements are applicable to any existing wastes or any wastes that are generated during D&D of the
17 ancillary facilities that are designated, in accordance with [WAC 173-303](#), as a dangerous or mixed waste.
18 Similarly, [WAC 173-304](#) requires identification and appropriate management of solid wastes. It is
19 applicable to any solid waste generated during D&D of the ancillary facilities. Except for Alternative 1,
20 each of the alternatives would generate waste that would be subject to [WAC-173-303](#), [-304](#), and [-460](#).

21 Performance objectives for land disposal of low-level radioactive waste are provided in [10 CFR 61](#),
22 Subpart C. Although not applicable to DOE facilities, these standards are relevant and appropriate to any
23 disposal facility for low-level and mixed waste generated during D&D of the ancillary facilities.

24 All alternatives, except for Alternative 1, would generate solid, dangerous, low-level, and/or mixed waste.
25 For each of these alternatives, actions proposed to manage such waste would satisfy the waste
26 management ARARs and all wastes would be evaluated and managed in compliance with the appropriate
27 requirements. Prior to disposal, dangerous, low-level, or mixed wastes would be managed in a manner
28 that prevents releases or inadvertent exposure to workers, and is protective of the environment. The
29 ERDF is engineered to meet RCRA minimum technological requirements for landfills, including
30 standards for a double liner, a leachate collection system, leak detection, and final cover. The ERDF also
31 meets the appropriate performance standards under [10 CFR 61](#) for disposal of low-level waste (LLW) and
32 mixed waste. Treatment requirements including land disposal restriction requirements, if any, necessary
33 to dispose of wastes in the ERDF would be identified to meet the ERDF waste acceptance criteria.
34 Treatment may include stabilization, dewatering, encapsulation, or other readily available treatment
35 methods. Packaging and transportation requirements for waste generated during D&D of the ancillary
36 facilities would be identified and implemented prior to movement of any wastes. Any offsite facility
37 receiving dangerous wastes would meet all RCRA administrative and substantive requirements. Any
38 offsite shipment of waste would comply with appropriate U.S. Department of Transportation
39 requirements ([49 CFR 171-173](#)).

40 At this time, no listed dangerous wastes are expected to be generated as a result of implementing any of
41 the alternatives. Wastes designated as characteristic may be generated and would be subject to the
42 dangerous waste management standards in [WAC 173-303](#).

43 **5.1.4 Air Emission Standards**

44 The *Clean Air Act* regulates both toxic and radioactive airborne emissions. Under implementing
45 regulations found in [40 CFR 61](#), Subpart H, and [WAC 246-247](#), radionuclide airborne emissions from all
46 combined operations at the Hanford Site may not exceed 10 mrem/year effective dose equivalents to the
47 hypothetical offsite maximally exposed individual. [WAC 246-247](#) requires verification of compliance,

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1 typically through periodic confirmatory air sampling. [WAC 173-400](#) establishes requirements for the
2 control and/or prevention of the emission of air contaminants, including dust.

3 The radionuclide emission standards would apply to any fugitive, diffuse, and point-source air emissions
4 of radionuclides generated during activities associated with any of the D&D alternatives. If there is a
5 potential for a non-zero radioactive emission, best available radionuclide control technology would be
6 required. If the action would increase emission of toxic air pollutants to the atmosphere above the small
7 quantity emission rates, implementation of best available control technology for toxics would be required.
8 Alternatives 3 and 4 propose using decontamination of surfaces to control radiological contaminants and
9 standard construction techniques to provide dust control during demolition.

10 Standard construction techniques are used at the ERDF to control fugitive emissions during placement of
11 wastes. The in situ burial operations would also use standard construction techniques to control fugitive
12 emissions during placement of wastes. These methods should adequately control fugitive radionuclide
13 emissions and toxic air pollutants. Therefore, standard construction techniques would be considered the
14 best available radionuclide control technology and the best available control technology for toxics for any
15 of the proposed activities as demonstrated during the 100-N Area treatability study (DOE-RL 1996a).

16 **5.1.5 Radiation Protection Standards**

17 *Occupational Radiation Protection* ([10 CFR 835](#)) establishes radiation protection standards, limits, and
18 program requirements for protecting individuals from ionizing radiation resulting from the conduct of
19 DOE activities. It also requires that measures be taken to maintain radiation exposure as low as
20 reasonably achievable (ALARA). This regulation is applicable to activities considered under each of the
21 four alternatives.

22 A combination of personal protective equipment, personnel training, physical design features (e.g.,
23 confinement, remote handling, shielded containers), and administrative controls (e.g., limiting time in
24 radiation zones) would be used to ensure that the requirements for worker and visitor protection are met
25 by all alternatives. Alternatives 3 and 4 would also meet the requirements to maintain exposure ALARA
26 by decontaminating surfaces prior to demolition and by providing personal protective equipment, training,
27 and administrative controls. For all alternatives, individual monitoring would be performed as necessary
28 to verify compliance with the requirements.

29 **5.1.6 Polychlorinated Biphenyls**

30 The *Toxic Substance Control Act of 1976* (TSCA) and [WAC 173-303](#) regulates the management and
31 disposal of PCBs and PCB waste. The implementing regulations in [40 CFR 761](#) contain requirements for
32 the management of spills and remediation of materials suspected to contain PCB waste. The ERDF is
33 authorized to accept certain PCB waste for disposal. All waste suspected to contain PCBs would be
34 evaluated to determine whether the waste meets the ERDF waste acceptance criteria. Any PCB waste
35 that does not meet the ERDF waste acceptance criteria would be sent to an onsite PCB storage area
36 meeting the substantive requirements for TSCA storage, and would be transported for disposal at a
37 TSCA-approved disposal facility.

38 **5.1.7 Asbestos**

39 Removal and disposal of asbestos and ACM are regulated under the *Clean Air Act* ([40 CFR 61](#),
40 Subpart M) and Occupational Safety and Health Administration (OSHA) ([29 CFR 1910.1101](#) and
41 [WAC 296-62](#)). These regulations provide for special precautions to prevent environmental releases or
42 exposure to workers of airborne emissions of asbestos fibers during removal actions. [40 CFR 61.52](#)
43 identifies packaging requirements. Alternative 1 would not remove asbestos. If ACM was encountered
44 during routine S&M, as would be conducted under Alternative 2, it would be removed and disposed in
45 accordance with applicable regulations. Alternatives 3 and 4, since they involve decontamination, would

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1 be expected to include actions that would encounter and disturb ACM. These alternatives shall comply
2 with the requirements for management and disposal of asbestos or ACM.

3 **5.1.8 Environment, Safety, Quality, and Health Requirements**

4 Worker protection standards are described in OSHA regulations, national consensus standards, and DOE
5 orders (e.g., [29 CFR 1910](#), [29 CFR 1926](#), National Fire Protection Association [NFPA] 1990,
6 [WAC 296-62](#), and DOE Order 5400.5 [DOE 1993b]). Exposure limits, personnel protection
7 requirements, and decontamination methods for hazardous chemicals are established by [29 CFR 1910](#).
8 Additionally, [29 CFR 1910](#) requires identification and mitigation of physical hazards to workers posed by
9 a facility, including but not limited to, confined spaces, falling hazards, fire, and electrical shock. The [29](#)
10 [CFR 1926](#) reference provides requirements for worker safety during construction activities.

11 The DOE orders establish requirements relating to safety, health, and environmental protection. The
12 substantive requirements of these orders would be met for any S&M or D&D activities. Known and
13 suspected inventories in each building will be screened during the design phase against the criteria in
14 DOE Standard 1027 (DOE 1992a) to determine the appropriate DOE environmental safety and health
15 order requirements. Site- and activity-specific requirements and controls would be identified in final
16 design and work plan documents, including contingency plans and emergency response plans. In
17 addition, the following DOE order requirements have been determined to contain requirements that are to
18 be considered for one or more of the alternatives:

- 19 • The requirements in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*
20 (DOE 1993b), and limiting exposure of the public to radioactive releases, are relevant and
21 appropriate to all alternatives.
- 22 • The requirement in DOE O 451.1, *National Environmental Policy Act Compliance Program*
23 (DOE 1995), to address *National Environmental Policy Act of 1969* values are relevant and
24 appropriate to all alternatives.
- 25 • The requirement in DOE Order 5480.3, *Safety Requirements for the Packaging and*
26 *Transportation of Hazardous Materials, Hazardous Substances and Hazardous Waste* (DOE
27 1985), to comply with U.S. Department of Transportation or equivalent packaging standards is
28 relevant and appropriate to each alternative that generates waste for disposal. The requirements
29 of the order for special handling of plutonium-bearing wastes could be relevant and appropriate
30 for Alternatives 3 and 4 if facilities contain plutonium-bearing wastes (which are not likely).
- 31 • The requirements in DOE Order 5820.2A, *Radioactive Waste Management* (DOE 1988), for
32 management of LLW are relevant and appropriate to all alternatives except Alternative 1. The
33 requirements for the management of TRU waste would be relevant and appropriate to the
34 demolition alternative if activities to implement the alternative generated one or more packages of
35 waste that contain greater than 100 nCi/g of TRU constituents at the time of assay (although it is
36 not expected that TRU waste will be generated).
- 37 • The requirements in DOE Order 5480.20A, *Personnel Selection, Qualification, and Training*
38 (DOE 1994), are relevant and appropriate for all alternatives except Alternative 1 for facilities
39 that are classified as nuclear by the preliminary hazard classification analysis.
- 40 • The requirements in DOE Order 5480.23, *Nuclear Safety Analysis Reports* (DOE 1992b), to
41 identify hazards, analyze hazards and accidents, and identify controls and mitigation measures to
42 safely manage the hazards are relevant and appropriate to all alternatives for facilities that are
43 classified as nuclear by the preliminary hazard classification analysis.
- 44 • The requirements in DOE Order 5480.28, *Natural Phenomena Hazards Mitigation* (DOE 1993a),
45 to analyze potential hazards from natural phenomena and identify appropriate mitigation
46 measures are relevant and appropriate to all alternatives for facilities that are classified as nuclear
47 by the preliminary hazard classification analysis.

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1 **5.1.9 Draft Radiological Criteria for Decommissioning**

2 Two agencies (U.S. Nuclear Regulatory Commission [NRC] and EPA) have proposed standards to
3 establish acceptable levels of residual radioactivity for environmental remediation. These are
4 nonpromulgated standards and are to be considered.

5 The draft NRC *Radiological Criteria for Decommissioning* ([10 CFR 20](#), proposed revision) provides a
6 regulatory basis to determine the extent to which lands and structures must be remediated before a site
7 can be considered decommissioned.

8 The draft EPA *Radiation Site Cleanup Regulation* (40 CFR 196, Draft) will set the standards for
9 remediation of soils, groundwater, surface water, and structures at Federal facilities. These proposed
10 standards would not apply to Alternatives 1 and 2, because these alternatives do not decommission or
11 demolish any facilities. Alternatives 3 and 4 would comply with these proposed standards.

12 **5.2 OTHER CONSIDERATIONS**

13 In accordance with DOE Order 451.1 (DOE 1995) and NEPA policy, DOE CERCLA documents are
14 required to incorporate NEPA values such as analysis of cumulative, offsite, ecological, and
15 socioeconomic impacts to the extent practicable.

16 Cumulative impacts may occur in both the short term and long term because of interrelationships among
17 other activities occurring in the 100 Area. Other activities in the 100 Area include the following:

- 18 • Remediation of waste sites and groundwater in the reactor areas
- 19 • Safe storage activities for the 105-C Reactor (to be followed by safe storage activities for the
20 other reactors)
- 21 • Storage and removal of spent fuel contained in basins at the 100-K Area
- 22 • Removal of ancillary facilities in the other reactor areas.

23 Each of these activities contributes to the goals of 100 Area remediation including protection of the
24 Columbia River. However, due to the increasing scarcity of resources to accomplish the work, each of
25 these activities also competes with the others for priority allocation of funding.

26 Near-term decontamination and demolition of the facilities addressed in this EE/CA would require
27 significantly greater commitment of budget resources (including disposal costs, workers, equipment and
28 supplies) during the time necessary to accomplish the removal action than would be required to continue
29 S&M. Therefore, in the near term, Alternatives 3 and 4 would impose a greater cumulative burden in
30 terms of additional competition for remediation dollars and work force resources than either
31 Alternatives 1 or 2.

32 In the long term, the overall cumulative effect of the 100 Area activities is to enhance the protection of
33 workers, the public, and the environment, which is consistent with the values expressed by the regulators,
34 stakeholders, affected tribes, and the public. Long-term S&M will not provide a permanent remedy
35 consistent with these cumulative benefits. In the long term, completion of either Alternatives 3 or 4
36 would be consistent with and supportive of the overall cumulative benefits that will be derived from the
37 remedial activities in the 100 Area.

38 Offsite impacts include affects on the public or the environment due to release of contaminants resulting
39 from an activity. Alternatives 1 and 2 are not expected to result in negative offsite impacts in the near
40 term. Continued confinement of hazardous substances in the facilities would become more difficult with
41 time, increasing the potential for offsite impacts. Alternatives 3 and 4 would potentially result in airborne
42 emissions of hazardous substances, but significant or long-term impacts are not expected.

43 None of the alternatives are expected to affect existing natural resource conditions. Although bald eagles
44 frequent the Columbia River during the winter, there are no identified roosts near the 100-N Area.

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1 Surveys indicate that all proposed activities are unlikely to disturb sensitive plant or animal species. Prior
 2 to initiation of any specific field activity, an ecological review of the facility and surrounding area would
 3 be conducted to ensure there would be no impacts to natural resources (e.g., migratory birds).

4 There would be no unmitigated impacts to cultural resources with implementation of any of the
 5 alternatives.

6 Socioeconomic impacts from any of the alternatives would be minimal. The work force required for
 7 current S&M activities is small. Personnel required to accomplish either Alternative 3 or Alternative 4
 8 would be selected from the existing S&M and remediation work force at the Hanford Site or would be
 9 made available to subcontractors.

10 In evaluating Alternatives 3 and 4, consideration should be given to potential future land-use planning
 11 needs and values expressed by the regulators, stakeholders, public, and the Tribes, with regard to the
 12 preferred future use of the 100-N Area.

13 **Table 5.1. Summary of Estimated Costs for Alternatives^a**

Description	Summary Cost Estimates^a
Alternative 2 - Long Term Surveillance and Maintenance	
Remedial Unit 1	\$15,140
Remedial Unit 2	\$57,040
Remedial Unit 3	\$40,000
Remedial Unit 4	\$31,920
Remedial Unit 5	\$324,030
Other Facilities	\$141,000
Total (annual costs)	\$609,130
Alternative 3 - D&D with Disposal at ERDF and Other Landfills	
Remedial Unit 1	\$5,541,000
Remedial Unit 2	\$2,574,000
Remedial Unit 3	\$2,172,000
Remedial Unit 4	\$5,553,000
Remedial Unit 5	\$12,308,000
Other Facilities	\$27,813,000
Total	\$55,961,000
Alternative 4 - D&D, ERDF Disposal and In Situ Burial	
Remedial Unit 1	\$5,332,000
Remedial Unit 2	\$2,115,000
Remedial Unit 3	\$1,814,000
Remedial Unit 4	\$5,359,000
Remedial Unit 5	\$6,210,000
Other Facilities	\$20,759,000
Total	\$41,589,000

^aThese estimates do not account for escalation or contingency.

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