

1 **5.5 Ecological Resources**

2
3 Potential impacts on ecological resources as a result of implementing Alternative Groups A, B, C, D₁,
4 D₂, D₃, E₁, E₂, and E₃, and the No Action Alternative are discussed in the following sections. Additional
5 information is provided in Appendix I.
6

7 Near-term impacts on ecological resources relate primarily to surface disturbance associated with
8 LLBGs and a proposed Hanford solid waste (HSW) near the PUREX Plant, borrow sites from which
9 capping materials are obtained, and construction sites for new facilities. Consideration of long-term
10 impacts is associated with eventual migration of radionuclides and other hazardous chemicals through the
11 vadose zone to groundwater and on to the Columbia River, as well as their potential impacts on aquatic
12 and riparian organisms.
13

14 The 24 Command Fire, a range fire that burned over parts of the Hanford Site in late June–early
15 July 2000, removed large amounts of vegetation in areas of interest, particularly in the western half of the
16 200 West Area and westward and southward from that area (DOE-RL 2000b). The 24 Command Fire did
17 not reach the 200 West LLBGs or the 200 East Area. The lack of vegetation has resulted in considerable
18 movement of soil by wind since the fire. In the absence of similar fires in the future, ecological resources
19 might begin to restore themselves naturally prior to initiation of some project activities. In the near term,
20 nuisance species such as Russian thistle (*Salsola kali*) and cheatgrass (*Bromus tectorum*) are likely to be
21 particularly abundant.
22

23 Impacts on ecological resources are sufficiently similar among the alternative groups that they would
24 not be expected to be an important discriminator in the selection process. Conclusions regarding potential
25 impacts to terrestrial biota were based on spring/summer field surveys conducted from 1998 to 2002.
26 Conclusions regarding potential impacts to Columbia River aquatic and riparian biota were based on an
27 ecological risk assessment of future contaminant releases.
28

29 **5.5.1 Alternative Group A**

30
31 **LLBGs**
32

33 Currently, the 200 East Area LLBGs contain about 106 ha (262 ac) of land, most of which has been
34 surface disturbed. Approximately 64 ha (158 ac) of this area already have been used for disposal of solid
35 waste. In Alternative Group A, the disposal area would be expanded from about 64 ha to about 66 ha
36 (163 ac) for the Hanford Only and Lower Bound waste volumes and to about 70 ha (173 ac) for the Upper
37 Bound waste volume.
38

39 Cheatgrass and Sandberg's bluegrass (*Poa sandbergii*) dominate approximately two-thirds of the
40 200 East Area LLBGs. The planted perennial, crested wheatgrass (*Agropyron cristatum*), dominates the
41 other one-third. The 200 East Area LLBGs receive regular herbicide applications and thus have
42 essentially no habitat value for native species. Consequently, continued use of these LLBGs, or new
43 disturbance of the extant plant communities within them via expansion of the disposal area, would not
44 result in the loss of any State of Washington-designated priority habitat.

1 Several plant species of concern have been noted within the 200 East Area LLBGs. The most notable
2 of these is Piper's daisy (*Erigeron piperianus*), listed by Washington State as a Sensitive species (a taxon
3 that is vulnerable or declining and could become endangered or threatened in Washington without active
4 management or removal of threats). This species was noted on the 218-E-10 and 218-E-12B LLBGs
5 during spring 1999 but not in spring 2000, 2001, or 2002. Piper's daisy populations on these LLBGs
6 have been reduced or eliminated, likely as a result of regular herbicide applications. If herbicide spraying
7 were to cease, these populations could regenerate from buried seed and be disturbed by waste manage-
8 ment activities. However, herbicide applications are expected to continue.

9
10 The other plant species of concern observed within the 218-E-10 and 218-E-12B LLBGs is crouching
11 milkvetch (*Astragalus succumbens*), a Washington State Watch List species (plant taxon that is of
12 concern but is considered to be more abundant and/or less threatened in Washington than previously
13 assumed). This species was observed in spring 2000, 2001, and 2002 within Trench 94 in the
14 218-E-12B LLBG and on the northeast side of the 218-E-10 LLBG. Because crouching milkvetch is
15 relatively common on the Central Plateau, disturbance of those individuals on the 218-E-12B and
16 218-E-10 LLBGs would likely not adversely affect the overall local population.

17
18 The 200 West Area LLBGs contain about 319 ha (788 ac), most of which has been surface disturbed.
19 About 67 ha (166 ac) already have been used for burial of solid waste. In Alternative Group A, the
20 disposal area would be expanded from about 67 ha to about 70 ha (173 ac) for the Hanford Only waste
21 volume, to 71 ha (175 ac) for the Lower Bound waste volume, and to 76 ha (188 ac) for the Upper Bound
22 waste volume.

23
24 Virtually all the 200 West Area LLBGs are sparsely colonized by cheatgrass, Russian thistle, and
25 crested wheatgrass. These also receive regular herbicide applications and thus have essentially no habitat
26 value for native species. Consequently, continued use of these LLBGs, or new disturbance of the extant
27 plant communities within them via expansion of the disposal area, would not result in the loss of any
28 Washington State-designated priority habitat.

29
30 The undeveloped southeastern portion of the 218-W-4C LLBG in the 200 West Area is dominated by
31 mature sagebrush (*Artemisia tridentata*) steppe, considered a Washington State priority habitat. However
32 because the 5 ha (12 ac) that are currently being used would not be expanded, no impacts to sagebrush
33 steppe are expected.

34
35 One plant species of concern has been observed within some of the 200 West LLBGs—stalked-pod
36 milkvetch (*Astragalus sclerocarpus*), a Washington State Watch List species. Stalked-pod milkvetch was
37 observed in spring 1998, 1999, 2000, 2001, and 2002 at the extreme western edge of the 218-W-5 LLBG
38 and within the undeveloped portion of the 218-W-4C LLBG. Because stalked-pod milkvetch is relatively
39 common on the Central Plateau, disturbance of those individuals on the 218-W-5 and 218-W-4C LLBGs
40 would likely not adversely affect the overall local population.

41
42 Wildlife that could be affected by disturbance of the 200 East and 200 West LLBGs includes the mule
43 deer (*Odocoileus hemionus*), Great Basin pocket mouse (*Perognathus parvus*), side-blotched lizard (*Uta*
44 *stansburiana*), and several migratory bird species. Ground-nesting birds that have been observed and that

1 may nest within the 200 East and 200 West LLBGs include the horned lark (*Eremophila alpestris*),
2 killdeer (*Charadrius vociferous*), long-billed curlew (*Numenius americanus*), and Western meadowlark
3 (*Sturnella neglecta*). Ground disturbance during the nesting season, generally March through July, could
4 destroy eggs and young and temporarily displace nesting individuals into other areas of the Hanford Site.
5

6 **HSW disposal facility Near PUREX in 200 East Area**

7

8 Currently, the proposed HSW disposal facility near the PUREX Plant contains about 41 ha (101 ac),
9 of which none has been cleared or used for burial of solid waste. The overstory in this area is dominated
10 by sagebrush; the understory is dominated by cheatgrass and Sandberg's bluegrass. Development of the
11 new HSW disposal facility for ILAW near the PUREX Plant would result in the loss of 32 ha (79 ac [all
12 waste volumes]) of sagebrush steppe. No plant species of concern were observed on the disposal area
13 near the PUREX Plant during the summer field survey of 2002.
14

15 Wildlife that could be affected by disturbance of the new HSW disposal facility near the PUREX
16 Plant includes the black-tailed jackrabbit (*Lepus californicus*), mule deer, coyote (*Canis latrans*), and
17 Northern pocket gopher (*Thomomys talpoides*), as well as several migratory bird species. Shrub- and
18 ground-nesting birds that have been observed and that likely nest within the disposal area near the
19 PUREX Plant include the sage sparrow (*Amphispiza belli*) and Western meadowlark, respectively.
20 Ground disturbance, if it were to occur during the nesting season, generally March through July, could
21 destroy eggs and young and temporarily displace nesting individuals into other areas of the Hanford Site.
22

23 The black-tailed jackrabbit and sage sparrow are considered Washington State Candidate species
24 (species that the Washington Department of Fish and Wildlife will review for possible listing as state-
25 endangered, -threatened, or -sensitive). The distribution of the black-tailed jackrabbit and sage sparrow
26 within Washington is limited mostly to the Columbia Basin. Both species have a strong affinity for
27 sagebrush habitat. Consequently, removal of sagebrush within the new HSW disposal facility near the
28 PUREX Plant would likely have a small impact on populations of these species within the Columbia
29 Basin.
30

31 **Facilities**

32

33 The CWC and WRAP lie in an industrialized area of about 90 ha (222 ac). No new impacts are
34 expected to result from continued operation of these facilities.
35

36 The T Plant Complex, which covers about 8 ha (20 ac), also lies within an industrial area and
37 provides habitat only for those birds that use the exterior of these buildings. Because modifications of the
38 T Plant Complex would be carried out within the T Plant, no new impacts are expected.
39

40 The ETF and LERF lie in an industrialized area of about 65 ha (161 ac). No new impacts are
41 expected to result from continued operation of these facilities.
42

1 **Borrow Pit**
2

3 Basalt, gravel, and silt/loam for use in capping the disposal facilities would be obtained from borrow
4 pits in Area C, an area of about 926 ha (2288 ac). This area also was burned in the 24 Command Fire;
5 however, some of the pre-fire shrub and understory vegetation survived, so the underlying soil surface has
6 not been as severely affected by wind erosion. The associated stockpile area east of SR 240 and the area
7 designated for the conveyance roads to the 200 Areas were burned severely in the 24 Command Fire,
8 removing all the vegetation.
9

10 Excavation of borrow materials would require about 69 ha (170 ac), 70 ha (173 ac), and 73 ha
11 (180 ac) for the Hanford Only, Lower Bound, and Upper Bound waste volumes, respectively. Impacts to
12 habitats and species would depend largely on the locations of borrow pits within Area C. The locations of
13 these areas of disturbance have not yet been determined.
14

15 Three habitats of concern within Area C may be affected by the excavation of borrow materials,
16 depending on the location of the borrow pits. These three habitats are designated element occurrences of
17 plant community types by the State of Washington Natural Heritage Program (NHP). An element
18 occurrence of a plant community type is one that meets the minimum standards set by NHP for ecological
19 condition, size, and the surrounding landscape. Element occurrences are generally considered to be of
20 substantial conservation value from a state and/or regional perspective. The largest of these is a
21 cheatgrass/ needle-and-thread grass/Indian ricegrass community, an element occurrence of the
22 bitterbrush/ Indian ricegrass sand dune complex community type, consisting of 97 ha (241 ac). The other
23 two communities are much smaller. The needle-and-thread grass/cheatgrass community, an element
24 occurrence of the sagebrush/needle-and-thread grass community type, consists of 5 ha (12 ac). The
25 Sandberg's bluegrass/cheatgrass community, an element occurrence of the big sagebrush/bluebunch
26 wheatgrass community type, consists of 1.5 ha (4 ac). These and other habitats that may be impacted by
27 excavation of borrow materials within Area C are discussed in detail in Appendix I.
28

29 The only plant species of concern observed in Area C during the summer 2000 field survey were
30 purple mat (*Nama densum* var. *parviflorum*), crouching milkvetch, and stalked-pod milkvetch. Purple
31 mat is a Washington State Review 1 species (plant taxon of potential concern that is in need of additional
32 field work before a status can be assigned). Purple mat occurs occasionally throughout central Hanford,
33 and crouching milkvetch and stalked-pod milkvetch are relatively common on the Central Plateau.
34 Consequently, disturbance of the individual plants located in Area C would likely not adversely affect the
35 overall local populations of these species.
36

37 Wildlife that could be impacted by disturbance of Area C includes badger (*Taxidea taxus*), coyote, elk
38 (*Cervus elaphus*), mule deer, northern pocket gopher, and several migratory birds. No wildlife species of
39 concern were observed in Area C. However, a herd of approximately 660 elk currently uses the ALE
40 Reserve and surrounding private lands. Elk have been observed using Area C for foraging and loafing.
41 Calving generally occurs at the upper elevations of Rattlesnake Mountain. Blasting and use of heavy
42 equipment to remove borrow materials from Area C, particularly if conducted during the winter months,
43 undoubtedly would disturb elk and displace some animals into adjacent areas. However, because Area C

1 comprises only a small portion of their overall range and is not known to be particularly important for
2 either overwintering or calving, the effect on the population is likely to be minimal.

3
4 The stockpile and conveyance road area currently supports Russian thistle, cheatgrass, and dune
5 scurfpea (*Psoralea lanceolata*). The only plant species of concern observed in this area during the
6 summer 2000 field survey was stalked-pod milkvetch. Because stalked-pod milkvetch is relatively
7 common on the Central Plateau, disturbance of the individual plants in the stockpile and conveyance road
8 area would not likely adversely affect the overall local population of this species.

9
10 The black-tailed jackrabbit is the only wildlife species of concern observed within the stockpile and
11 conveyance road area. Some jackrabbit mortalities may result from increased vehicular traffic in the area.
12 However, because disturbance of this area would not remove sagebrush, it would likely have no impact
13 on black-tailed jackrabbit populations within the Columbia Basin.

14
15 Ground-nesting birds that that have been observed and that may nest in Area C and within the
16 stockpile and conveyance road area include the horned lark and Western meadowlark. Ground
17 disturbance during the nesting season, generally March through July, could destroy eggs and young and
18 temporarily displace nesting individuals into other areas of the Hanford Site.

19 20 **5.5.2 Alternative Group B**

21 22 **LLBGs**

23
24 The impacts on ecological resources in the 200 East and 200 West LLBGs in Alternative Group B
25 would be essentially the same as for Alternative Group A, although the scale of disturbance would be
26 somewhat larger. The area occupied by LLW and MLLW in Alternative Group B would increase by
27 about 15 to 30 percent, depending on waste volume, over that specified in Alternative Group A. Because
28 this expanded area still would be within the boundaries of the existing 200 East and 200 West LLBGs,
29 which have little to no habitat value for native species due to regular herbicide applications, any
30 additional impacts on ecological resources are expected to be minimal.

31 32 **Facilities**

33
34 Impacts from the continued operation of the CWC, WRAP, ETF, T Plant Complex, and LERF would
35 be essentially the same as those described for Alternative Group A.

36
37 The New Waste Processing Facility would be located just west of WRAP. Constructing this facility
38 would disturb about 4 ha (10 ac) of habitat. This area was burned severely in the 24 Command Fire and
39 continues to be severely eroded by wind. The dominant plant species in the area is bur ragweed
40 (*Ambrosia acanthacarpa*), a native annual. The only wildlife observed in this area was the coyote. No
41 plant or wildlife species of concern occur in the area, except crouching milkvetch. Because crouching
42 milkvetch is relatively common on the Central Plateau, disturbance of individual plants in this area would
43 not likely adversely affect the overall local population of this species.

1 The CWC expansion area is located north of 16th Street and west of Dayton Avenue to the north-
2 south line of CWC. This area was burned in the 24 Command Fire and continues to be severely eroded
3 by wind. Disposal of ILAW would disturb about 26 ha (64 ac) of habitat in this area. The dominant plant
4 species in the CWC expansion area is Russian thistle. Stalked-pod milkvetch and purple mat were the
5 only plant species of concern observed in the CWC expansion area. Because purple mat occurs
6 occasionally throughout central Hanford and stalked-pod milkvetch is relatively common on the Central
7 Plateau, disturbance of the individual plants of these two species located in the CWC expansion area
8 would likely not adversely affect the overall local populations.
9

10 Only the coyote was observed in the CWC expansion area. Ground-nesting birds that were observed
11 and may nest within the CWC expansion area include the horned lark and Western meadowlark. Ground
12 disturbance during the nesting season, generally March through July, could destroy eggs and young and
13 temporarily displace nesting individuals into other areas of the Hanford Site. No wildlife species of
14 concern were observed in the CWC expansion area.
15

16 Although there are no plans at present to use the 218-W-5 Expansion Area, it could be used in the
17 future. The dominant plant species in the W-5 Expansion Area are Sandberg's bluegrass, cheatgrass,
18 Indian ricegrass, and Russian thistle. The only plant species of concern observed in the W-5 Expansion
19 Area were crouching milkvetch, stalked-pod milkvetch, and purple mat. Because purple mat occurs
20 occasionally throughout central Hanford, and crouching milkvetch and stalked-pod milkvetch are
21 relatively common on the Central Plateau, disturbance of the individual plants of these three species
22 located in the W-5 Expansion Area would likely not adversely affect the overall local populations.
23

24 Mammals that could be impacted by disturbance of the W-5 Expansion Area include badger, coyote,
25 Great Basin pocket mouse, and mule deer. Ground-nesting birds that were observed and may nest within
26 the W-5 Expansion Area include the horned lark and Western meadowlark. Ground disturbance during
27 the nesting season, generally March through July, could destroy eggs and young and temporarily displace
28 nesting individuals into other areas of the Hanford Site. No wildlife species of concern were observed in
29 the W-5 Expansion Area.
30

31 **Borrow Pit**

32

33 Impacts associated with use of Area C in Alternative Group B would be slightly greater compared
34 with those of Alternative Group A because the scale of disturbance would be somewhat larger. The area
35 to be excavated in Alternative Group B would be about 10 to 20 percent greater, depending on waste
36 volume, over that specified in Alternative Group A. The area of the associated stockpile and conveyance
37 road would remain the same in Alternative Group B as in Alternative Group A.
38

1 **5.5.3 Alternative Group C**

2
3 **LLBGs**

4
5 The impacts on ecological resources in Alternative Group C would be the same as those for
6 Alternative Group A because the areas occupied by LLW and MLLW in Alternative Group C would be
7 the same as those in Alternative Group A.
8

9 **HSW Disposal Facility Near PUREX in 200 East Area**

10
11 The impacts on ecological resources in Alternative Group C would be substantially smaller compared
12 with those of Alternative Group A; the scale of disturbance would be reduced by about 55 percent for all
13 waste volumes because of the reduced area required for ILAW disposal.
14

15 **Facilities**

16
17 Impacts from the continued operation of the CWC, WRAP, ETF, LERF, and the T Plant Complex
18 would be essentially the same as those described for Alternative Group A.
19

20 **Borrow Pit**

21
22 Impacts associated with use of Area C in Alternative Group C would be slightly smaller compared
23 with those of Alternative Group A because the scale of disturbance would be somewhat smaller. The area
24 to be excavated in Alternative Group C would be about 10 percent less for all waste volumes than that
25 specified in Alternative Group A. The area of the associated stockpile and conveyance road would
26 remain the same in Alternative Group C as in Alternative Group A.
27

28 **5.5.4 Alternative Group D₁**

29
30 **LLBGs**

31
32 Because the 200 East and 200 West LLBGs have little to no habitat value for native species due to
33 regular herbicide applications, the impacts on ecological resources in Alternative Group D₁ would be
34 essentially the same as for Alternative Group A, although the scale of disturbance would be somewhat
35 smaller. The LLW and MLLW for all waste volumes in Alternative Group D₁ would use only the areas
36 that already have been used for disposal of solid waste (64 ha [158 ac] in the 200 East LLBGs and 67 ha
37 [166 ac] in the 200 West LLBGs), representing about 5 to 15 percent less area disturbed, depending on
38 waste volume, than Alternative Group A.
39

40 **HSW Disposal Facility Near PUREX in 200 East Area**

41
42 The impacts on ecological resources in Alternative Group D₁ would be smaller than those of
43 Alternative Group A. The scale of disturbance in Alternative Group D₁ would be smaller than that of
44 Alternative Group A by about 25 percent for the Upper Bound waste volume but by about 40 percent for

1 the Hanford Only and Lower Bound waste volumes because of the reduced area required for ILAW
2 disposal.

3 4 **Facilities**

5
6 Impacts from the continued operation of the CWC, WRAP, ETF, LERF, and the T Plant Complex
7 would be essentially the same as those described for Alternative Group A.

8 9 **Borrow Pit**

10
11 Impacts associated with use of Area C in Alternative Group D₁ would be slightly smaller than those
12 for Alternative Group A because the scale of disturbance would be somewhat smaller. The area to be
13 excavated in Alternative Group D₁ would be about 10 percent less for all waste volumes than that
14 specified in Alternative Group A. The area of the associated stockpile and conveyance road would
15 remain the same in Alternative Group D₁ as in Alternative Group A.

16 17 **5.5.5 Alternative Group D₂**

18 19 **LLBGs**

20
21 Because the 200 West LLBGs have little to no habitat value for native species due to regular
22 herbicide applications, the impacts on ecological resources in Alternative Group D₂ would be essentially
23 the same as those for Alternative Group A, although the scale of disturbance would be somewhat smaller.
24 The LLW and MLLW for all waste volumes in Alternative Group D₂ would use only the areas that
25 already have been used for disposal of solid waste (67 ha [166 ac]), representing about 5 to 10 percent
26 less area of disturbance, depending on waste volume, from Alternative Group A.

27
28 The impacts on ecological resources in the 200 East LLBGs in Alternative Group D₂ would be
29 essentially the same as those for Alternative Group A, although the scale of disturbance would be
30 somewhat larger due to ILAW disposal. The area occupied by LLW, MLLW, and ILAW in
31 Alternative Group D₂ would be about 25 percent less for all waste volumes over that specified for LLW
32 and MLLW in Alternative Group A. Because this expanded area still would be within the boundaries of
33 the existing 200 East LLBGs, which have little to no habitat value for native species due to regular
34 herbicide applications, any additional impacts on ecological resources are expected to be minimal.

35 36 **Facilities**

37
38 Impacts from the continued operation of the CWC, WRAP, ETF, LERF, and the T Plant Complex
39 would be essentially the same as those described for Alternative Group A.

40 41 **Borrow Pit**

42
43 Impacts associated with use of Area C in Alternative Group D₂ would be slightly less than those for
44 Alternative Group A because the scale of disturbance would be somewhat smaller. The area to be

1 excavated in Alternative Group D₂ would be about 10 percent less for all waste volumes than that
2 specified in Alternative Group A. The area of the associated stockpile and conveyance road would
3 remain the same in Alternative Group D₂ as in Alternative Group A.
4

5 **5.5.6 Alternative Group D₃**

6 **LLBGs**

7
8
9 Because the 200 East and 200 West LLBGs have little to no habitat value for native species due to
10 regular herbicide applications, the impacts on ecological resources in Alternative Group D₃ would be
11 essentially the same as those for Alternative Group A, although the scale of disturbance would be
12 somewhat smaller. The LLW and MLLW for all waste volumes in Alternative Group D₃ would use only
13 the areas that already have been used for disposal of solid waste (64 ha [158 ac] in the 200 East LLBGs
14 and 67 ha [166 ac] in the 200 West LLBGs), representing about 5 to 15 percent less area disturbed,
15 depending on waste volume, from Alternative Group A.
16

17 **ERDF**

18
19 About 19 to 20 ha (47 to 49 ac) (Hanford Only and Lower Bound waste volumes) to 25 ha (62 ac)
20 (Upper Bound waste volume) at ERDF will be cleared for disposal of ILAW. Some of the area near
21 ERDF was burned in the 24 Command Fire. Based on a partial field survey of the ERDF site conducted
22 outside the growing season and prior to the fire, the overstory in this area was dominated by sagebrush,
23 and the understory consisted of cheatgrass, Sandberg's bluegrass, and needle-and-thread grass. The only
24 plant species of concern known to have occurred on the ERDF site prior to the 24 Command Fire was
25 stalked-pod milkvetch. The only evidence of wildlife species of concern observed within the ERDF site
26 were inactive nests of the loggerhead shrike (*Lanius ludovicianus*), a Washington state candidate species
27 and a federal species of concern (species whose conservation standing is of concern to the U.S. Fish and
28 Wildlife Service but for which status information still is needed). Consequently, a spring (April–May
29 2003) field survey is required to completely characterize the current habitat associations and plant species
30 on the ERDF site and wildlife use of the area prior to evaluating impacts.
31

32 **Facilities**

33
34 Impacts from the continued operation of the CWC, WRAP, ETF, LERF, and the T Plant Complex
35 would be essentially the same as those described for Alternative Group A.
36

37 **Borrow Pit**

38
39 Impacts associated with use of Area C in Alternative Group D₃ would be slightly less than those of
40 Alternative Group A because the scale of disturbance would be somewhat smaller. The area to be
41 excavated in Alternative Group D₃ would be about 10 percent less for all waste volumes than that
42 specified in Alternative Group A. The area of the associated stockpile and conveyance road would
43 remain the same in Alternative Group D₃ as in Alternative Group A.
44

1 **5.5.7 Alternative Group E₁**

2
3 **LLBGs**

4
5 Because the 200 West LLBGs have little to no habitat value for native species due to regular
6 herbicide applications, the impacts on ecological resources in Alternative Group E₁ would be essentially
7 the same as for Alternative Group A, although the scale of disturbance would be somewhat smaller. The
8 LLW and MLLW for all waste volumes in Alternative Group E₁ would use only the areas that already
9 have been used for disposal of solid waste (67 ha [166 ac]), representing about a 5- to 10-percent
10 reduction in the area of disturbance, depending on waste volume, from Alternative Group A.
11

12 Because the 200 East LLBGs have little to no habitat value for native species due to regular herbicide
13 applications, the impacts on ecological resources in Alternative Group E₁ would be essentially the same
14 as for Alternative Group A, although the scale of disturbance would be somewhat larger. The area
15 occupied by LLW and MLLW for all waste volumes in Alternative Group E₁ would be about 5 percent
16 more than that specified in Alternative Group A.
17

18 **ERDF**

19
20 The impacts on ecological resources in Alternative Group E₁ would be smaller than those of
21 Alternative Group D₃. The scale of disturbance in Alternative Group E₁ would be less than that of
22 Alternative Group D₃ by about 30 percent for the Hanford Only and Lower Bound waste volumes but by
23 about 45 percent for the Upper Bound waste volume because of the smaller area required for ILAW
24 disposal. No additional field surveys beyond those described in Alternative Group D₃ would be required
25 under Alternative Group E₁.
26

27 **Facilities**

28
29 Impacts from the continued operation of the CWC, WRAP, ETF, LERF, and the T Plant Complex
30 would be essentially the same as those described for Alternative Group A.
31

32 **Borrow Pit**

33
34 Impacts associated with use of Area C in Alternative Group E₁ would be less than those of
35 Alternative Group A because the scale of disturbance would be somewhat smaller. The area to be
36 excavated in Alternative Group E₁ would be about 10 percent less for all waste volumes from that
37 specified in Alternative Group A. The area of the associated stockpile and conveyance road would
38 remain the same in Alternative Group E₁ as in Alternative Group A.
39

1 **5.5.8 Alternative Group E₂**

2
3 **LLBGs**

4
5 Because the 200 East and 200 West LLBGs have little to no habitat value for native species due to
6 regular herbicide applications, the impacts on ecological resources in Alternative Group E₂ would be
7 essentially the same as those for Alternative Group A, although the scale of disturbance would be
8 somewhat smaller. The LLW and MLLW for all waste volumes in Alternative Group E₂ would use only
9 the areas that already have been used for disposal of solid waste (64 ha [158 ac] in the 200 East LLBGs
10 and 67 ha [166 ac] in the 200 West LLBGs), representing about a 5- to 15-percent reduction in the area of
11 disturbance, depending on waste volume, from Alternative Group A.
12

13 **ERDF**

14
15 The impacts on ecological resources in Alternative Group E₂ would be smaller than those of
16 Alternative Group D₃. The scale of disturbance in Alternative Group E₁ would be less than that of
17 Alternative Group D₃ by about 30 percent for the Hanford Only and Lower Bound waste volumes but by
18 about 45 percent for the Upper Bound waste volume because of the smaller area required for ILAW
19 disposal. No additional field surveys beyond those described in Alternative Group D₃ would be required
20 under Alternative Group E₂.
21

22 **HSW Disposal Facility Near PUREX in 200 East Area**

23
24 The impacts on ecological resources in Alternative Group E₂ would be much smaller compared with
25 those for Alternative Group A; the scale of disturbance would be about 65 percent less for the Upper
26 Bound waste volume and about 85 percent less for the Hanford Only and Lower Bound waste volumes
27 because of the smaller area required for ILAW disposal.
28

29 **Facilities**

30
31 Impacts from the continued operation of the CWC, WRAP, ETF, LERF, and the T Plant Complex
32 would be essentially the same as those described for Alternative Group A.
33

34 **Borrow Pit**

35
36 Impacts associated with use of Area C in Alternative Group E₂ would be slightly smaller than those of
37 Alternative Group A because the scale of disturbance would be somewhat smaller. The area to be
38 excavated in Alternative Group E₂ would be about 10 percent less for all waste volumes than that
39 specified in Alternative Group A. The area of the associated stockpile and conveyance road would
40 remain the same in Alternative Group E₂ as in Alternative Group A.
41

1 **5.5.9 Alternative Group E₃**

2
3 **LLBGs**

4
5 Because the 200 East and 200 West LLBGs have little to no habitat value for native species due to
6 regular herbicide applications, the impacts on ecological resources in Alternative Group E₃ would be
7 essentially the same as those for Alternative Group A, although the scale of disturbance would be
8 somewhat smaller. The LLW and MLLW for all waste volumes in Alternative Group E₃ would use only
9 the areas that already have been used for disposal of solid waste (64 ha [158 ac] in the 200 East LLBGs
10 and 67 ha [166 ac] in the 200 West LLBGs), representing about 5 to 15 percent less area disturbed,
11 depending on waste volume, than Alternative Group A.
12

13 **ERDF**

14
15 The impacts on ecological resources in Alternative Group E₃ would be much smaller compared with
16 those of Alternative Group A because the scale of disturbance would be about 60 percent less for the
17 Upper Bound waste volume and about 75 percent less for the Hanford Only and Lower Bound waste
18 volumes. No additional field surveys beyond those described for Alternative Group D₃ would be required
19 under Alternative Group E₃.
20

21 **HSW Disposal Facility Near PUREX in 200 East Area**

22
23 The impacts on ecological resources in Alternative Group E₃ would be substantially smaller
24 compared with those of Alternative Group A; the scale of disturbance would be about 55 percent less for
25 all waste volumes because of the smaller area required for ILAW disposal.
26

27 **Facilities**

28
29 Impacts from the continued operation of the CWC, WRAP, ETF, LERF, and the T Plant Complex
30 would be essentially the same as those described for Alternative Group A.
31

32 **Borrow Pit**

33
34 Impacts associated with use of Area C in Alternative Group E₃ would be slightly smaller than those of
35 Alternative Group A because the scale of disturbance would be somewhat smaller. The area to be
36 excavated in Alternative Group E₃ would be about 10 percent less for all waste volumes from that
37 specified in Alternative Group A. The area of the associated stockpile and conveyance road would
38 remain the same in Alternative Group E₃ as in Alternative Group A.
39

1 **5.5.10 No Action Alternative**

2
3 **LLBGs**

4
5 The impacts on ecological resources in the 200 West LLBGs in the No Action Alternative would be
6 essentially the same as those for Alternative Group A, although the scale of disturbance would be
7 somewhat larger. The area occupied by LLW and MLLW in the No Action Alternative would be about
8 13 percent larger for both the Hanford Only and Lower Bound waste volumes over that specified in
9 Alternative Group A. Because this expanded area still would be within the boundaries of the existing
10 200 West LLBGs, which have little to no habitat value for native species due to regular herbicide
11 applications, any additional impacts on ecological resources are expected to be minimal.
12

13 Because the 200 East LLBGs have little to no habitat value for native species due to regular herbicide
14 applications, the impacts on ecological resources in the No Action Alternative would be essentially the
15 same as those for Alternative Group A, although the scale of disturbance would be somewhat larger. The
16 area occupied by LLW and MLLW for the Hanford Only and Lower Bound waste volumes in the No
17 Action Alternative would be about 3 percent larger than that specified in Alternative Group A.
18

19 **HSW Disposal Facility Near PUREX in 200 East Area**

20
21 The impacts on ecological resources in the No Action Alternative would be much smaller compared
22 with those of Alternative Group A. The scale of disturbance would be about 70 percent less for both the
23 Hanford Only and Lower Bound waste volumes because of the smaller area required for ILAW disposal.
24

25 **Facilities**

26
27 Impacts from the continued operation of the CWC, WRAP, T Plant Complex, ETF, and LERF would
28 be essentially the same as those described for Alternative Group A.
29

30 The CWC expansion in the No Action Alternative is intended for the purpose of facilities
31 construction, whereas the CWC expansion in Alternative Group B is intended for the purpose of ILAW
32 disposal. These two CWC expansion areas occur at different but nearby locations. Both locations were
33 burned in the 24 Command Fire, and the ecological resources at both sites are essentially the same.
34

35 Consequently, the impacts on ecological resources in the CWC expansion area for the Hanford Only
36 waste volume of the No Action Alternative would be essentially the same as those in
37 Alternative Group B, although the scale of disturbance would be about 10 percent smaller.
38

39 Likewise, the impacts on ecological resources in the CWC expansion area for the Lower Bound waste
40 volume of the No Action Alternative would be essentially the same as those in Alternative Group B,
41 although the scale of disturbance would be about 15 percent larger.
42

1 **Borrow Pit**
2

3 Impacts associated with use of Area C in the No Action Alternative would be very small compared
4 with those in Alternative Group A because the scale of disturbance would be about 80 percent less for
5 both the Hanford Only and Lower Bound waste volumes. The area of the associated stockpile and
6 conveyance road would remain the same in the No Action Alternative as in Alternative Group A.
7

8 **5.5.11 Microbiotic Crusts**
9

10 Disruption of microbiotic crusts (cryptogams) may result in decreased diversity of microbiota, soil
11 nutrients, and organic matter (Belnap and Harper 1995; Belnap et al. 2001). The 24 Command Fire
12 during summer 2000 intensely burned the soil surface in areas (outside the LLBGs) that would be
13 disturbed by new construction as described in the HSW EIS (i.e., Area C and the associated stockpile and
14 conveyance road area, the two CWC expansion areas identified for facilities construction and ILAW
15 disposal, and the area identified for the New Waste Processing Facility). This undoubtedly resulted in the
16 destruction of soil microbiota, facilitating the severe wind erosion experienced in these areas (Becker and
17 Sackschewsky 2001a, 2001b; Sackschewsky and Becker 2001). Recovery of microbiotic crusts following
18 disturbance is generally a slow process. For example, in burned areas on the ALE Reserve, soil algae
19 recovery took place during the winter months of the second year following the fire of 1984 (Johansen
20 et al. 1993). The recovery time required by soil microbiota following construction is no exception.
21

22 Although microbiotic crusts may tolerate shallow burial, deep burial such as would result from
23 construction described in the HSW EIS will kill crusts (Shields et al. 1957). Recolonization of Area C
24 and the associated stockpile and conveyance road area, the two CWC expansion areas identified for
25 facilities construction and ILAW disposal, and the area identified for the New Waste Processing Facility
26 undoubtedly would require several years following construction, the speed of which may depend largely
27 on the availability of nearby sources of cryptogams (Belnap 1993). Consequently, a temporary loss of
28 benefits derived from microbiotic crusts would ensue.
29

30 **5.5.12 Threatened or Endangered Species**
31

32 In November 1998, DOE initiated consultation with the National Marine Fisheries Service (NMFS)
33 and the U.S. Fish and Wildlife Service (FWS) regarding the LLBGs. At that time, DOE requested a
34 listing of federally protected species that might occur in these and other areas potentially disturbed by
35 waste management activities. The FWS response (FWS 1998), which identified species protected under
36 the Endangered Species Act (ESA), contained no species known to occur in the LLBGs and other project
37 areas covered under the 1998 consultation. In addition, these same areas have been surveyed annually
38 under the DOE Ecological Compliance Assessment Project (DOE-RL 1995), and no federally protected
39 species have been documented (Appendix I).
40

41 However, the footprint of potential surface disturbance since has expanded beyond that of 1998
42 (e.g., addition of Area C). Consequently, DOE re-initiated consultation with the NMFS and FWS in
43 March 2002 (Appendix I, Attachment B), again requesting a listing of federally protected species that
44 could occur in all areas potentially disturbed by waste management activities. The NMFS responded by

1 telephone on April 26, 2002, providing a web site ([http://www.nwr.noaa.gov/1habcon/habweb/](http://www.nwr.noaa.gov/1habcon/habweb/listnwr.htm)
2 [listnwr.htm](http://www.nwr.noaa.gov/1habcon/habweb/listnwr.htm)) containing currently listed threatened and endangered species in the Pacific Northwest
3 (Appendix I, Attachment B). The FWS responded in April 2002 by letter containing currently listed
4 threatened and endangered species that may be present near the proposed project site in Benton County
5 (Appendix I, Attachment B). The NMFS- and FWS-listed threatened and endangered species known to
6 occur on the Hanford Site are provided in Section 4.6.4.

7
8 In February 2003, DOE again requested from the FWS a listing of federally protected species that
9 could occur in all areas potentially disturbed by waste management activities (Appendix I, Attachment B).
10 DOE revisited the NMFS web site noted above in March 2003. The FWS responded by letter in February
11 2003 (Appendix I, Attachment B). The result of revisiting the NMFS web site also is also provided in
12 Attachment B of Appendix I.

13
14 The terrestrial habitats that potentially could be disturbed have been surveyed previously, and no
15 federally-listed threatened or endangered species were observed (Appendix I). The aquatic endangered
16 species that potentially could be affected are the upper Columbia River spring-run evolutionarily
17 substantial unit of Chinook salmon (*Oncorhynchus tshawytscha*), and the upper Columbia River
18 evolutionarily substantial unit of steelhead (*Oncorhynchus mykiss*). No threatened aquatic species are
19 known to occur in the affected area. The risk of future adverse effects to these two species posed by
20 contaminants migrating through the vadose zone and into groundwater, and ultimately entering the
21 Columbia River, is negligible (Appendix I). The threatened bull trout (*Salvelinus confluentus*) spends
22 the majority of its life-cycle in Columbia River tributaries, of which the Hanford Reach has none. The
23 bull trout has been observed only a very few times in the Hanford Reach within the last 30 years.
24 Consequently, the probability that this species could be adversely affected by contaminants reaching the
25 Columbia River is virtually non-existent. Critical habitat for the bull trout is proposed for the mainstem
26 Columbia River, including the Hanford Reach. No actions that would physically modify proposed critical
27 habitat for this species would occur under any of the alternative groups of the HSW EIS. Further, because
28 the species occurs so rarely in the Hanford Reach, contaminants reaching the Columbia River would not
29 be expected to affect its use of proposed critical habitat.

30 31 **5.5.13 Impacts on Columbia River Aquatic and Riparian Biota in the Long Term**

32
33 Leaching of radionuclides and other hazardous chemicals from the waste via infiltrating precipitation
34 would result eventually in small quantities of long-lived mobile radionuclides reaching the Columbia
35 River. The following is a general discussion of the risk of future adverse impacts to Columbia River
36 aquatic and riparian biota posed by these contaminant releases within 10,000 years of 2046, and of risk as
37 a discriminator among the alternative groups.

38
39 Risk of radiological impacts is not an important discriminator among the alternative groups within
40 0 to 2500 years following 2046 (see Appendix I, Section I.3.4). However, in the time period 2500 to
41 10,000 years following 2046, risks of radiological impacts are slightly higher in the No Action
42 Alternative and somewhat higher in Alternative Group B than in the other alternative groups (see
43 Appendix I, Section I.3.4). These higher risks are the result of larger quantities of uranium reaching the
44 river environment in the latter time period under the conditions inherent in these two alternative groups.

1 Further, the risks of uranium chemical toxicological impacts to terrestrial and aquatic animal receptors are
2 slightly higher for the No Action Alternative and somewhat higher for Alternative Group B than for the
3 other alternative groups during the time period extending from 2500 to 10,000 years after 2046 (see
4 Appendix I, Section I.3.5). These relative risks are described below in absolute terms.
5

6 The risk of radiological impacts to aquatic and terrestrial animals and plants from future contaminant
7 releases is very small. The risk of chronic uranium chemical toxicological impacts to terrestrial animal
8 receptors is also very small. The risk of chronic uranium chemical toxicological impacts to Woodhouse's
9 toad (*Bufo woodhousei*) tadpole is inconclusive due to the variability and questionable applicability of the
10 available data upon which the risk calculations were based (see Appendix I, Section I.3.5). The risk of
11 chronic uranium chemical toxicological impacts to carp (*Cyprinus carpio*), largescale/mountain sucker
12 (*Catostomus macrocheilus/C. platyrhynchus*), and smallmouth bass (*Micropterus dolomieu*) is
13 negligible, except in Alternative Group B, which may pose a slight risk to these fish species (see
14 Appendix I, Section I.3.5). However, this is unlikely considering (1) the conservatism in the groundwater
15 modeling (see Appendix G) that produced the uranium concentrations used in the risk assessment and
16 (2) the simultaneous exposure to maximum contaminant concentrations, which do not always occur
17 concurrently in time and space, assumed for this risk assessment. The risk of uranium chemical
18 toxicological impacts to all other aquatic animal species evaluated is minimal. Uranium chemical
19 toxicological impacts, if any, would not occur until approximately 10,000 years following 2046.
20