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APPENDIX K

NATURAL RESOURCES ISSUES ASSOCIATED WITH 300-FF-1 REMEDIAL ALTERNATIVE SELECTION

K.1 INTRODUCTION

The purpose of this appendix is to present a qualitative overview of natural resource issues associated with remedial action alternatives for the 300-FF-1 Operable Unit. The discussion will qualitatively identify risk issues for certain resources--and, in some cases, the services they provide to humans or to other natural resources--associated with alternative response actions. The discussion will also suggest a general mitigation approach for certain potentially affected resources.

K.1.1 Background

Pursuant to the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), Executive Order 12580, and the National Oil and Hazardous Substances Contingency Plan (NCP), the U.S. Department of Energy (DOE) has roles as both a CERCLA lead response agency and a Natural Resource Trustee for certain trust resources on, over, or under lands managed by DOE. To the extent that the information presented here is integrated as risk management input into the eventual implementation of response actions at the Hanford Site, this analysis will promote environmental remedial decisions based on a more complete analysis of short- and long-term environmental risks and liabilities.

K.2 RESOURCE CATEGORIES

This section identifies the natural resources associated with the 300-FF-1 Operable Unit. The 300-FF-1 Operable Unit is adjacent to the Columbia River in the northeast corner of the 300 Area. It covers an area of approximately 47.4 hectares (117 acres) and contains many of the major past and present liquid waste disposal facilities for the entire 300 Area (Stenner et al. 1988).

The general categories of natural resources that were considered in this appendix are as follows:

- Air (i.e., air quality)
- Surface waters (e.g., rivers, streams, wetlands)
- Groundwater
- Soils
- Vegetation and plant communities
- Wildlife populations, including resident and migratory species
- Wildlife habitats (e.g., shrub-steppe, riparian zones, wetlands, raptor nest sites)
- Fish populations, including resident and anadromous species.

A detailed description of 300-FF-1 Operable Unit ecological resources is given in Section 2.2.7 of this FS.

K.2.1 Air Resources

Air quality on the Hanford Site is generally considered good. Actions that could result in generation of contaminated dust or dust emissions will tend to increase the exposure of air resources

to contaminants. The ability to reduce such exposure potential will be a factor to consider when comparing the remedial alternatives for 300-FF-1 Operable Unit.

K.2.2 Surface Water

Although contamination from the 300-FF-1 Operable Unit is known to have migrated from the units onsite via groundwater to the Columbia River, all water-borne contamination and related remedial issues for the 300 Area will be addressed in the 300-FF-5 Operable Unit. A more complete discussion of potential surface water impacts will, therefore, be included in the documents for that operable unit. However, a preliminary comparison of the remedial alternatives for 300-FF-1 will be made with regard to their respective potential effects on the surface water resource.

K.2.3 Groundwater

All water-borne contamination and related remedial issues for the 300 Area will be addressed in the 300-FF-5 Operable Unit. A more complete discussion of potential groundwater impacts will, therefore, be included in the 300-FF-5 document. However, a preliminary comparison of the remedial alternatives for 300-FF-1 will be made with regard to their respective potential effects on the associated groundwater resource.

K.2.4 Soils

Properties of the affected soils and the ability of the soil to support plant life are important natural resource considerations. Most of the soil in the 300 Area has been physically disturbed by construction and operation of the process waste units and burial grounds, and it could be difficult to distinguish the effects of disturbance from the effects of hazardous substance releases on the soil's ability to support plant and animal life. Much of the site is dominated by introduced cheatgrass and other plants characteristic of disturbed areas. The presence of plant cover could, however, be used to infer that the properties of most soil on the site have not been changed enough to reduce its ability to perform the natural resource services of providing plant, microbe, and invertebrate habitat.

K.2.5 Vegetation/Plant Communities

The principal vegetative communities of the 300 Area are shown in Figure K-1 (see Table K-1 for key to plant species) along with locations of waste areas. The outline of the operable unit is shown in black along with nearby buildings comprising other operable units. Much of the site is dominated by introduced cheatgrass and other plants characteristic of disturbed areas. The bitterbrush-Sandberg's bluegrass community (Putr/Posa) located in the northwestern corner of the operable unit has minimal disturbance. This community is primarily composed of native plant species. Other vegetative communities within the operable unit are shown in Figure K-1. Table K-1 lists the species in each vegetative community. Other mapped communities are listed by species and occurrence within each plant community in Table K-1.

K.2.6 Wildlife Populations

The terrestrial resources that are considered to be edible by humans include deer and gamebirds, which occasionally visit the site. Existing biological surveys indicate that no threatened or endangered species have been reported using the area. Section 2.2.7 of this FS discusses the ecology of the operable unit.

K.2.7 Wildlife Habitats

The following types of habitat have been identified within or near the operable unit: (1) terrestrial habitat that consists primarily of grasses, occupies most of the open land area, and relies on annual precipitation and (2) riparian habitat that occurs along the shoreline of the Columbia River, relying on root zone wetting by river water or spring seeps.

The relationship of the 300-FF-1 operable unit to site vegetation to the north, south, and west is shown in Figure K-2 (key to plant community abbreviations is given in Table K-1). The site is separated from recovering shrub-steppe to the west by Stevens Road. The site is connected to shrub-steppe habitat to the north and south. The eastern border of the 300 Area is a riparian zone occurring as a narrow strip near the Columbia River and near the water line of the sanitary trenches and process trenches.

The riparian zone of the Columbia River supports a variety of both terrestrial and riparian wildlife and maintains the highest biological diversity of the site. It serves as both feeding and breeding grounds for many species of wildlife. In addition, riparian vegetation provides both a source of food and shelter for several biological species and is a key source of nutrients for the Columbia River.

K.2.7.1 Habitat Evaluation Based on Existing Information. A qualitative evaluation of the vegetation/habitat present in the 300-FF-1 operable unit was conducted. It was then evaluated and rated based on a scale of high, medium, and low to identify the quality of existing vegetation/habitat. The evaluation system ranges from low quality to medium quality to exceptional or high quality. The ratings identify the adequacy of the current site vegetation/habitat and its ability to support a diversity of wildlife. For example, disturbed terrestrial habitat would be rated low while riparian habitat would be rated of high quality. The evaluation also considered the potentially affected vegetation/habitat surrounding the 300-FF-1 operable unit.

Based on existing information, the 300-FF-1 operable unit vegetation/habitat consists of terrestrial and riparian habitat. Figures K-1 and K-2 indicate that the terrestrial vegetation/habitat qualifies for a rating of low. It consists mainly of disturbed area vegetation. The riparian habitat rated as high. Potential ecological risk to the riparian zone is a key factor in the evaluation of remedial action alternatives in close proximity to the riparian zone and is an important exposure, and therefore risk, factor for the biota utilizing riparian habitat.

K.2.8 Fish Populations

Fish populations, including resident and anadromous species and other aquatic organisms in the Columbia River, will be addressed in the 300-FF-5 operable unit documents.

K.3 REVIEW OF REMEDIAL ALTERNATIVES: NATURAL RESOURCE ANALYSIS BASED ON NCP REMEDY SELECTION FACTORS

This section reviews the nine remedial alternatives and provides a qualitative analysis of potential risks or impacts on natural resources from implementation of a remedial alternative. This analysis includes (1) protection of the environment; (2) long-term effectiveness and permanence; (3) reduction of toxicity, mobility, and volume through treatment; (4) short-term effectiveness; (5) implementability; and (6) additional costs of restoration/mitigation.

Two groups of alternatives are considered for the 300-FF-1 operable unit. The first group is for process waste units (designated P), and the second group is for burial grounds (designated B). The following alternatives are considered in the FS for remediation of the process waste units:

- P-1 No Action
- P-2a Soil Cover
- P-2b Consolidation and Soil Cover
- P-3 Selective Excavation and Disposal
- P-4 Excavation, Soil Washing, and Fines Disposal.

The following alternatives are considered in the FS for remediation of the burial grounds:

- B-1 No Action
- B-2 Institutional Controls
- B-3 Consolidation and Soil Cover
- B-4 Excavation and Disposal.

K.3.1 Protection of the Environment

K.3.1.1 Alternatives P-1, B-1 (No Action), and B-2 (Institutional Control). The "no-action" option will not create any additional risks to the environment, but it also does not reduce or eliminate current site potential ecological risks to the pocket mouse. From the ecological risk assessment contained in Appendix C, it is unlikely that contaminant concentrations found in the operable unit would pose a risk to key ecological receptors, even if no remedial actions were undertaken. While the risk assessment determined that the no-action alternative would pose a risk to the pocket mouse, this operable unit is not critical habitat for the pocket mouse and does not pose a significant ecological effect. While these alternatives result in contaminants remaining onsite, the potential for migration of contaminants to the groundwater or the Columbia River is considered minimal.

K.3.1.2 Alternative P-2a (Soil Cover). This alternative eliminates the potential for external exposure and further reduces the potential for groundwater contamination by placing a silty soil cover

over the process units. This alternative contains contaminants in place and limits the infiltration of water into the waste units thereby limiting movement of contaminants through the soil to groundwater. The waste units will be graded for proper drainage and vegetated over disturbed areas thereby increasing evapotranspiration. This alternative will require implementing and maintaining institutional controls with a commitment to long-term monitoring. Soil cover will reduce risk to groundwater and subsequent impacts to the Columbia River. Since it will not be necessary to transport soil for disposal elsewhere, additional impacts to vegetation and wildlife through transportation will not occur. The soil cover should protect natural resources provided that monitoring is used to evaluate effectiveness.

K.3.1.3 Alternative P-2b (Consolidation and Soil Cover). This alternative uses onsite consolidation of contaminated soils above PRGs with excavation, placement, and compaction into two process ponds. The two ponds will be covered with a soil cover. This alternative will require implementing and maintaining institutional controls and long-term monitoring.

Achievement of PRGs should reduce or eliminate ecological risks to all receptors. However, excavation, transport, and placement of all contaminated soils in the north and south process ponds involve a risk of releases to the environment during remediation, thereby creating a short-term potential for exposure to wildlife.

Assurance that the consolidated waste does not result in any risks would require long-term institutional control; environmental monitoring will be required to detect migration of contaminants from the process ponds.

K.3.1.4 Alternative P-3 (Selective Excavation and Disposal). Alternative P-3 presents the same technical issues as Alternative P-2b except for the transportation of some soil from the 300-FF-1 operable unit to ERDF for disposal. Disposal at the ERDF should reduce potential for ecological risk and also reduce the need for institutional control for the process ponds identified in P-2b, as well as the associated long-term environmental monitoring requirements.

K.3.1.5 Alternative P-4 (Excavation, Soil Washing, and Fines Disposal). The basic approach of this alternative is excavation of soil with contamination above remediation goals and treatment by soil washing. Contaminated soil fines will be transported to the ERDF. Clean soil will be used as backfill; soil below remediation goals will be left in place.

Institutional control and long-term monitoring are not required for this alternative. Ecological risks will be reduced since no contaminants will remain onsite above remediation goals. Compared to Alternative P-2b, less volume will be required at the ERDF site because smaller soil volumes would be generated. However, in addition to required excavation for P-2b and P-3 and transport of contaminated soil to the 200 Area for P-3, Alternative P-4 will require additional area for soil washing equipment and a source of water that will require treatment after use (100,000 gal). The effect of soil washing operations may be mitigated by locating the soil washing equipment within the disturbed area of the operable unit.

Soil washing operations involve a short-term risk of unintentional releases to the environment. Increased site activities also raise the risk of possible impacts to riparian vegetation. Site restoration may be necessary after excavation and soil washing.

K.3.1.6 Alternative B-3 (Consolidation and Soil Cover). This alternative provides for consolidation onsite of all burial ground waste within two burial grounds and construction of a soil cover along with institutional control and environmental monitoring.

Potential ecological risks and issues associated with this alternative are essentially the same as discussed for Alterative P-2a.

K.3.1.7 Alternative B-4 (Excavation and Disposal). This alternative will remove contaminated soil above remediation goals from burial grounds for disposal at the ERDF. Soil below remediation goals will remain in place. This alternative is the same (and warrants the same discussion) as Alternative P-3.

K.3.2 Long-Term Effectiveness and Permanence

The alternatives that provide the least relative long-term effectiveness and permanence are Alternatives P-1, P-2a/b, B-1, B-2, and B-3. Alternatives P-1 and B-1 are no-action alternatives and could result in the continued migration of contaminants from the process waste units and burial grounds onsite; however, the potential for migration from natural infiltration is considered small. Alternatives P-2a/b, B-2, and B-3 involve either institutional control/long-term monitoring or long-term monitoring.

Alternatives P-2a and B-3 (consolidation and soil cover) should result in a reduction of contaminant migration to ground and surface water; however, they involve leaving contamination in place and reliance on covers and institutional controls. If covers are not maintained, Alternatives P-2a/b and B-3 could result in an eventual resumption of contaminant migration and groundwater and surface water injury.

Alternatives P-4 (excavation, soil washing, and disposal) and B-4 (excavation and disposal) involve excavation and disposal of soil contaminant concentrations above remediation goals in the ERDF site. Disposal of contaminants at the ERDF will eliminate current and future risks at the operable unit due to the presence of the hazardous materials. Therefore, these two alternatives are equally likely to result in greater long-term effectiveness in preventing continued exposure of terrestrial and aquatic resources to the 300-FF-1 operable unit contaminants.

K.3.3 Reduction of Toxicity, Mobility, and Volume through Treatment

The alternatives that will not provide reduction in toxicity, mobility, and volume through treatment are Alternatives P-1, P-2a/b, B-1, B-2, and B-3. Alternatives P-1 and B-1 are no action and could result in the continued migration of contaminants from the process waste units and burial grounds onsite; however, the potential for migration from natural infiltration is considered small. Alternatives P-2a/b, B-2, and B-3 involve either institutional control/long-term monitoring or long-term monitoring. Alternatives P-2 and B-3 have soil covers and do support a reduction of contaminant mobility.

Alternatives P-3, P-4, and B-4 all involve excavation and disposal of soil with contaminant concentrations above remediation goals in the ERDF site. Disposal of contaminants to the ERDF will eliminate natural resource risks at the operable unit due to the presence of hazardous materials.

K.3.4 Short-Term Effectiveness

Alternatives P-4 and B-4 involve transport of contaminated soil from 300-FF-1 to the ERDF and will create the greatest short-term risk to natural resources. Since these activities will occur close

to the Columbia River, any wildlife breeding activity that coincides with onsite work may be disrupted due to noise and the close proximity of remedial workers. Since the site is highly disturbed, it is not expected that intrusion into special habitat will be a concern. Similarly, Alternatives P-2b and B-3, which involve consolidation and soil covers, may affect wildlife breeding occurring along the river.

Alternatives P-1, B-1, and B-2, which are no action or institutional controls, will not result in any physical disturbances to the environment. Alternative B-2 (institutional control) will require the addition of monitoring wells resulting in disturbance to the environment.

K.3.5 Implementability

Alternatives P-2a/b, P,3, P-4, B-3, and B-4 all have planned site grading for proper drainage and establishment of vegetative cover. In light of current site conditions (highly disturbed), the level of restoration will necessarily be limited. This would suggest restoration relying on shallow root system species, so as to reduce the potential for infiltration of contaminated soils. Restoration efforts may be more implementable for the excavation alternatives which will remove contaminants from the operable unit.

K.3.6 Restoration/Mitigation (i.e., Additional Response Cost Factor)

Alternatives P-1, B-1, and B-2 will not require additional costs to protect natural resources since these options are limited to no action or institutional control. All other alternatives may involve costs for the restoration or mitigation planning to protect natural resources during remedy implementation. Because most of the contaminants are located and most of the remedial actions will occur within previously disturbed areas, it is not likely that the cost of mitigation or restoration will be significant for any of the alternatives, with the possible exception of actions taken within and/or around the South Process Pond, landfill 1c, and landfill 1a and which are nearest the riparian area along the river and burial ground No. 4 which is within the relatively less disturbed habitat to the northwest of the main waste site area within the operable unit. Efforts to minimize the effects of remedial actions on natural resources will be most critical for these waste sites.

K.4 RESULTS OF THE ANALYSIS

The purpose of this section is to identify key natural resource issues associated with the 300-FF-1 operable unit and identify potential mitigation efforts. The natural resources of concern are principally the riparian/wetlands. In addition, there are cultural resource issues of concern in the areas nearest the river.

Remedial actions within the 300-FF-1 operable unit may affect two ecosystems: a disturbed terrestrial system contained within the operable unit, comprised mainly of grasses and a narrow riparian/wetland zone along the Columbia River, which is not part of the operable unit.

To the west of the site is Stevens Highway, and to the north and south is disturbed vegetation consisting mainly of grasses (Figure K-1), isolating the operable unit vegetation from areas of the site that currently support sagebrush and other native vegetation. This isolation limits restoration options for the site. Replanting of native vegetation is of questionable value without concurrent restoration of

lands to the north and south of the site. The nearby buildings, other facilities, and the potential for use as an industrial site would appear to limit restoration options.

Mitigation efforts directed toward minimizing impacts to the riparian habitat along the river would appear to hold the greatest possibility for long-term benefit. Examples of mitigation measures include seasonal restrictions on construction and other activities that could disturb breeding seasons of waterfowl and other wildlife. Based on the low rating assigned to the quality of current vegetation and the limited diversity of wildlife on the operable unit, special efforts to protect the biota of the terrestrial area would appear to offer less potential for long-term ecological benefit.

This appendix provides a qualitative evaluation of the potential impact to natural resources of implementing the remedial alternatives. Because the ecological risk assessment in Appendix C demonstrated there are no effects on ecological receptors except for the pocket mouse even without remedial action, removal of contaminated soil is unlikely to have a significant ecological benefit to terrestrial receptors. The information in Appendix G demonstrates that the groundwater pathway is not a significant risk driver for any of contaminants of concern. Therefore, remediation to reduce potential ecological risk is unlikely to produce a significant ecological benefit through groundwater and surface water pathways. Thus, most remedial options will provide overall protection of natural resources, and those options that provide more stringent cleanup levels will likely cause more short-term disturbances.

K.5 KEY CONSIDERATIONS FOR THE REMEDIAL DESIGN/REMEDIAL ACTIONS

There are several key considerations for the remedial design and remedial action implementation phases of this project:

1. Awareness that the site is culturally sensitive and will require a cultural resource plan. For more detail, refer to the Hanford Cultural Resources Management Plan, 1989.

2. Although the remedial actions are proposed to occur only within the waste sites that are located within previously disturbed areas, operations can affect sensitive riparian/wetland habitat. Ecological risks can be reduced through use of a buffer area to reduce the effects of construction disturbances and activity restrictions during certain times of the year.

3. Although the quality of terrestrial habitat associated with the 300-FF-1 operable unit is low, efforts taken to minimize the amount of surface disturbance throughout the site will provide a general benefit in terms of overall habitat preservation within the operable unit.

4. Because of the highly disturbed nature of the site, habitat improvement efforts should be consistent with final land use. For example, replanting of native vegetation in a potential industrial zone may have little or no benefit and may not be as cost effective as mitigation measures taken to improve habitat quality in areas where less-intensive uses are contemplated.

Figure K-1. Vegetation/Land Use in the 300-FF-1 Operable Unit

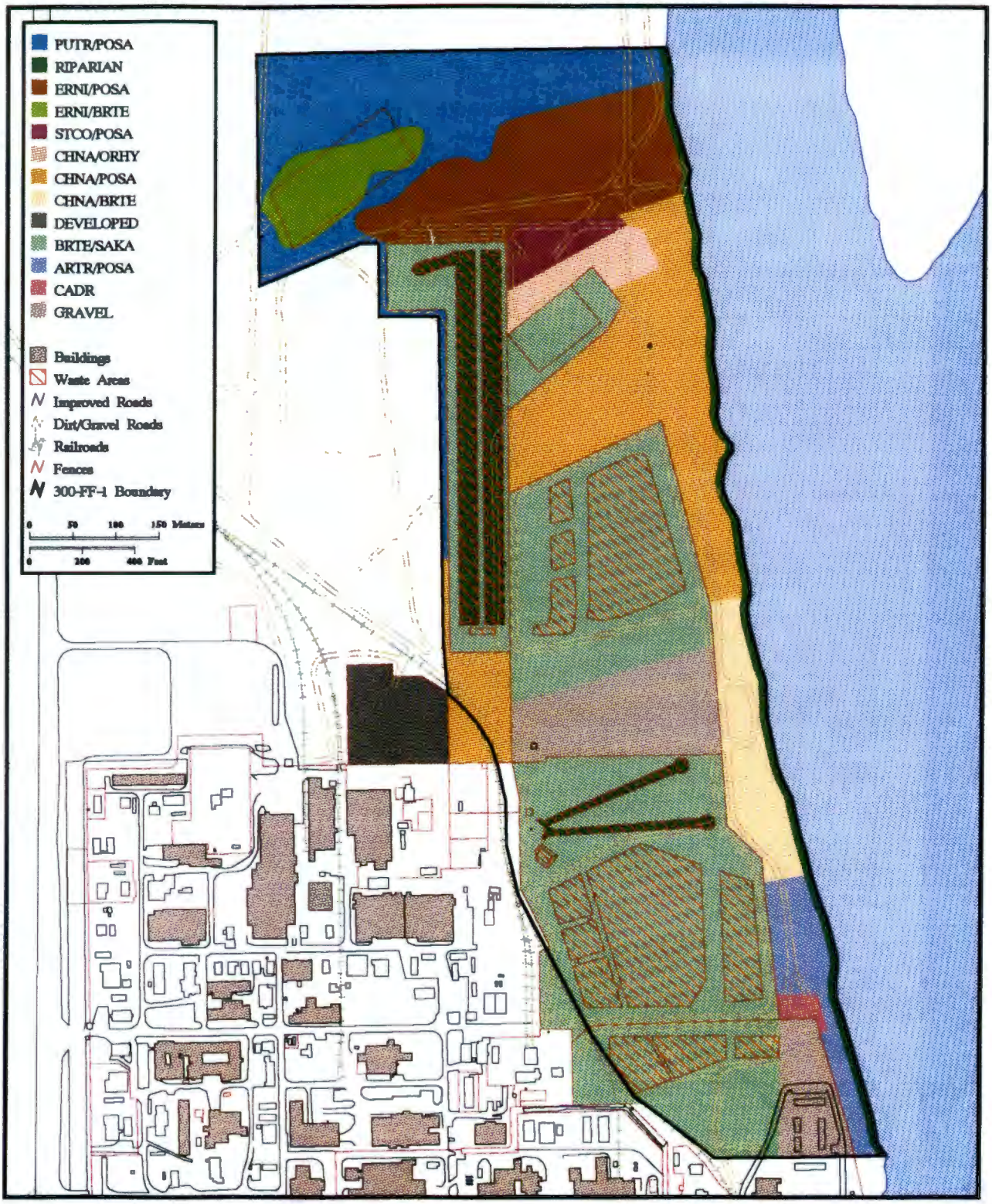

Figure K-2. Vegetation/Land Use Surrounding in the 300 Area

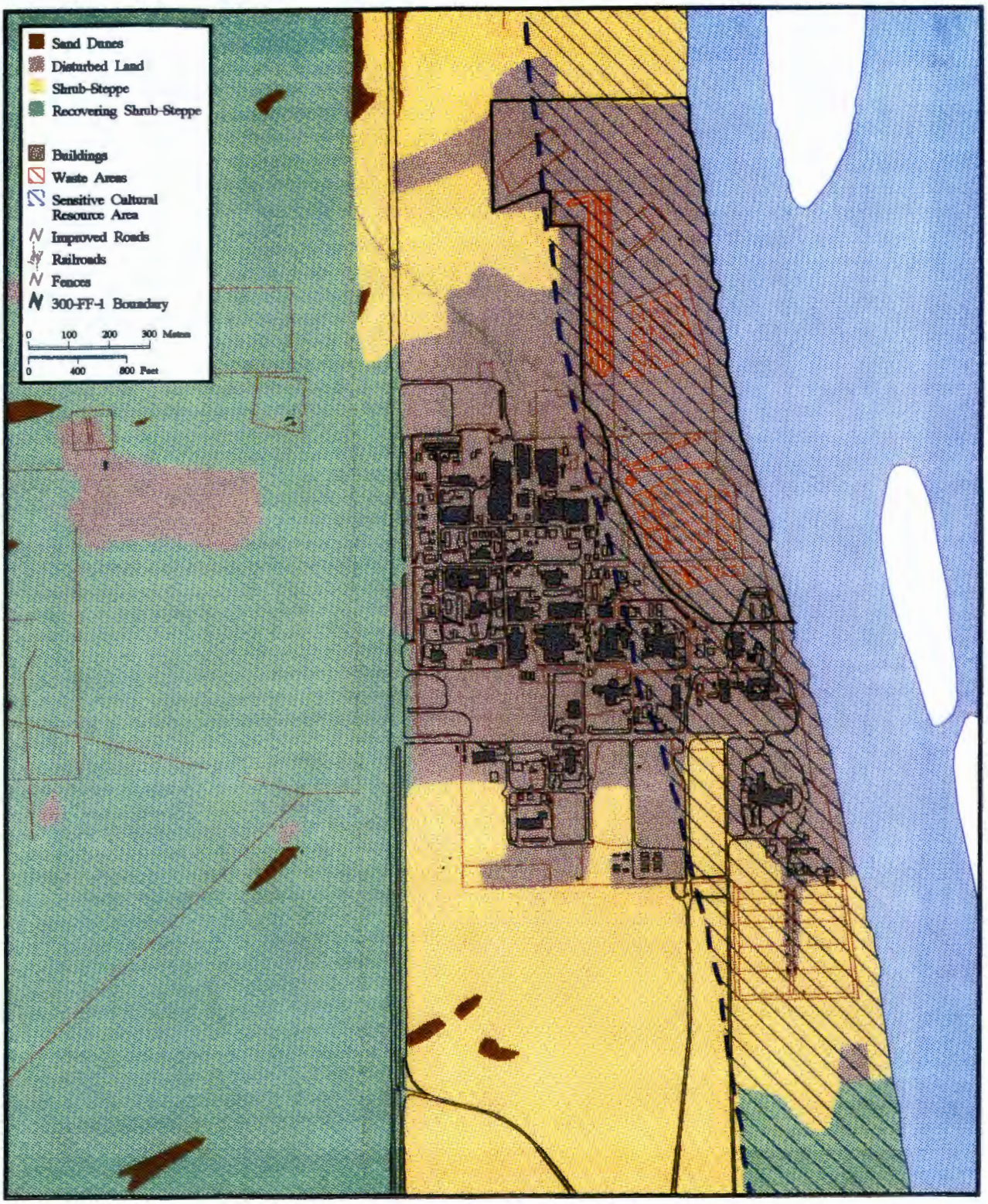

Table K-1. Plants and Plant Communities of the 300-FF-1 Operable Unit and Vegetation Key to Figure K-1. (sheet 1 of 2)

Community[a]	Species Common Name[b]	Latin Name
ERNI/BRTE	Grey rabbitbrush Cheatgrass Snow buckwheat	*Chrysothamnus nauseosus* *Bromus tectroum* *Eriogonum niveum*
BRTE/SAKA	Cheatgrass Russian thistle Grey rabbitbrush Tumble mustard Sandberg's bluegrass	 *Salsola kali* *Sisymbrium altissimum* *Poa sandbergii*
Burned	Cheatgrass Diffuse knapweed Yarrow Russian thistle Sandberg's bluegrass	 *Centaurea diffusa* *Achillea millefolium*
CHNA/POSA	Cheatgrass Sandberg's bluegrass Grey rabbitbrush Needle-and-thread grass Snow buckwheat	 *Stipa comata*
CHNA/BRTE	Cheatgrass Grey rabbitbrush Tumble mustard Russian thistle	
ARTR/POSA	Cheatgrass Sandberg's bluegrass Grey rabbitbrush Big sagebrush	
CADR	Whitetop Cheatgrass	*Cardaria draba*
CHNA/ORHY	Indian ricegrass Cheatgrass Grey rabbitbrush	*Oryzopsis hymenoides*
STCO/POSA	Needle-and-thread grass Sandberg's bluegrass Grey rabbitbrush	

Table K-1. Plants and Plant Communities of the 300-FF-1 Operable Unit and Vegetation Key to Figure K-1. (sheet 2 of 2)

Community[a]	Species Common Name[b]	Latin Name
ERNI/POSA	Sandberg's bluegrass Snow buckwheat Cheatgrass Grey rabbitbrush Bottlebrush squirreltail	 *Sitanion hystrix*
PUTR/POSA	Bitterbrush Sandberg's bluegrass Cheatgrass Grey rabbitbrush Snow buckwheat Needle-and-thread grass	*Purshia tridentata*
Riparian (River)	Sandberg's bluegrass Reed canary grass Perennial ryegrass Sandbar willow Russian knapweed Cheatgrass Wiregrass Mulberry Asparagus	*Poa sandbergii* *Phalaris arundinacea* *Elymus cinerius* *Salix exigua* *Centaurea repens* *Eleocharis palustris* *Morus alba* *Asparagus officinalis*
Riparian (Trenches)	Smartweed Bulrush Cattail	*Polygonum persicaria* *Scirpus americanus* *Typha latifolia*
Unimproved Roadways	Russian thistle Tumble mustard Lance-leaf scurf-pea Bur ragweed	 *Psoraleo lanceolata* *Ambrosia acanthicarpa*

[a]See Figure K-1 for locations.
[b]Species listed in order of abundance (cover.)