F.6.1 D-AREA OIL SEEPAGE BASIN, BUILDING 631-G*

F.6.1.1 Assessment of No Action (No Removal of Waste, and No Remedial or Closure Actions)

Description of Action

TE | Under no action, the D-Area oil seepage basin would remain in its current state. Groundwater would continue to be monitored on a quarterly basis for
TC | 1 year and then annually for 29 years. Site maintenance, which includes mowing the grounds, would be continued for the entire 30-year period.

Comparison of Expected Environmental Releases with Applicable Standards

Tetrachloroethylene was the only constituent modeled at the D-Area Oil Basin. Tetrachloroethylene (estimated disposal mass - 0.35 kilogram) was selected because of elevated groundwater samples taken from the D-Area oil basin wells. PATHRAE predicts that the peak concentration of tetrachloroethylene at the 1-meter and 100-meter wells occurred in 1977 and 1978, respectively. These concentrations (0.02 milligram per liter at the 1-meter well, and 0.017 milligram per liter at the 100-meter well) exceed the health-based standard for tetrachloroethylene of 0.0007 milligram per liter. Groundwater monitoring shows elevated total organic carbon (TOC) levels (12.26 milligrams per liter) in downgradient well DOB 1. These elevated concentrations are probably due to the oil that was disposed of in the basin and not tetrachloroethylene. Total organic halogen (TOH) levels in the downgradient wells are not significantly different from the background concentrations.

Surface-water quality would not be affected significantly by the addition of potential contaminants from the groundwater pathway, because the resulting concentration of tetrachloroethylene in the Savannah River (2.0×10^{-10} milligram per liter) is projected to be below its health-based standard.

Tetrachloroethylene release to the atmosphere was modeled to estimate carcinogenic risk for each action. For release to the atmosphere,
TC | carcinogenic risk to the maximally exposed individual from tetrachloroethylene was calculated to be 2.13×10^{-19} for year 1, the peak year. There is no evidence that noncarcinogens or radioactive contaminants were released to the D-Area Oil Seepage Basin; therefore, these risks were not calculated.

Potential Impacts (Other Than Releases)

Aquatic Resources

A possible pathway for aquatic resources to be affected by no action is through the outcropping of contaminated groundwater to site streams. PATHRAE modeling was performed for tetrachloroethylene. The results indicated that no degradation of Savannah River water quality should occur as a result of

*The reference source for the information in this section is Huber, Johnson, and Bledsoe, 1987.

contaminated groundwater entering the river. In addition, levels of groundwater contamination are not significant ecologically; therefore, impacts to aquatic organisms would not occur for any closure. Table F-26 lists the non-PATHRAE-modeled materials found in the groundwater that are above freshwater aquatic life criteria. These materials should not create or enhance existing impacts on the aquatic biota of the Savannah River. This conclusion was based on the estimated dilution factors calculated by dividing the groundwater flux by the flow rate of the receiving stream. The dilution factor indicates that these wastes would be so diluted they would not affect the present water quality of the outcropping stream. TE

Terrestrial Resources

No adverse impacts to terrestrial resources would be expected from the implementation of any of the closure actions. Soil concentrations of tetrachloroethylene are expected to be low due to the compound's volatility and mobility. In addition, the 2-meter depth of the buried constituent makes biointrusion unlikely. Because the level of tetrachloroethylene at the outcrop is biologically insignificant, no impacts to wildlife from consuming undiluted groundwater at the outcrop would be expected. TE

Endangered Species

Because no endangered species have been sighted within the vicinity of the D-Area oil seepage basin, and because suitable habitat does not exist within 200 meters of the site (Table F-26), these species would not be affected.

Wetlands

As indicated in Table F-26, the nearest wetlands to the site are about 50 meters distant. These are bottomland hardwoods which are located in shallow upland depressions. There are 5.4 acres of wetlands within 200 meters and a total of 16.8 acres within 1000 meters of the site. The latter total includes some open water and emergent marsh. Because no disturbance is planned for this closure action, no adverse effects on wetlands are expected.

F.6.1.2 Assessment of No Removal of Waste and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

Under the no-waste-removal-and-closure action, the D-Area oil seepage basin would remain in its current state (i.e., backfilled). Groundwater would be monitored quarterly for 1 year and then on an annual basis for 29 years. Site maintenance would continue for the full 30-year period. TE TC

Comparison of Expected Environmental Releases with Applicable Standards

Because PATHRAE modeling for this closure action is the same as no action, the material presented in Section F.6.1.1 is applicable.

Atmospheric releases for this closure action are the same as described in Section F.6.1.1. TC

Potential Impacts (Other Than Releases)

Because PATHRAE modeling for this closure action is the same as no action, the material presented in Section F.6.1.1 is applicable. TE

F.6.1.3 Assessment of Removal of Waste to the Extent Practicable, and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

Under the waste-removal-and-closure action, all waste would be removed from the D-Area oil seepage basin. Approximately 5742 cubic meters of soil would be excavated to a depth of 1 meter below the bottom of the basin and removed to the SRP sanitary landfill. The basin would then be backfilled and the site graded and seeded. Maintenance of the site, which includes mowing of the grounds, would be continued for the entire 30-year period. Groundwater would be monitored on a quarterly basis for 1 year and then on an annual basis for 29 years. TC

Comparison of Expected Environmental Releases with Applicable Standards

Because PATHRAE modeling for this closure action is the same as that for no action, the material in Section F.6.1.1 is applicable. TE

The analysis described in the air release portion of Section F.6.1.1 was also performed for this action. Releases would be due to earth-moving activities and volatilization of tetrachloroethylene. Carcinogenic risks to the maximally exposed individual would be 2.53×10^{-20} or less.

An analysis of the health risks to the average individual worker that would be attributable to occupational exposure to carcinogens was performed using the methodology presented in Appendix I. The risk to a worker due to nonradioactive carcinogens was calculated as 5.65×10^{-18}. TC

Potential Impacts (Other Than Releases)

Aquatic Resources

Aquatic resources should not be affected by this closure action, because the removal of wastes would eliminate the future influx of wastes to the groundwater. Contaminated groundwater would continue to travel to outcrops on the Savannah River; however, no impacts should occur (see Section F.6.1.1). TE

Terrestrial Resources

The removal of soil and the subsequent backfilling and grading of the waste site could lead to some disruption of terrestrial biota. Wildlife could be temporarily disturbed by noise and human presence. After the remedial actions had been completed and the area revegetated, wildlife use would increase, especially if the site were allowed to succeed beyond the grassland/herbaceous stage. The removal of wastes would further reduce potential effects from biointrusion.

Endangered Species

TE | No impacts on endangered species are expected to occur as a result of this closure action (see Section F.6.1.1).

Wetlands

Wetlands located near the site could be affected by erosion, depending on the local drainage pattern. To avoid sedimentation impacts, erosion control measures would be implemented.

F.7 ASSESSMENT OF ACTIONS AT ROAD A AREA WASTE SITE

This geographic area is that influenced by the Road A chemical basin. It is located approximately 400 meters southwest of Road A near its intersection with Road 6 (Figure F-11), and about 3 kilometers east of TNX- and D-Area facilities.

F.7.1 ROAD A CHEMICAL BASIN, BUILDING 904-111G*

The Road A chemical basin (Building 904-111G) is located approximately 400 meters southwest of the intersection of SRP Road A (S.C. Highway 125) and SRP Road 6. The history of waste disposal, evidence of contamination, and waste characteristics at the basin are presented in Appendix B, Section B.8.1.1.

F.7.1.1 Assessment of No Action (No Removal of Waste, and No Remedial or Closure Actions)

Description of Action

Under no action, the site would be left in its present condition. Groundwater monitoring with the existing wells would be continued quarterly for the first year, then annually for the next 29 years. Site maintenance would consist of maintaining groundwater monitoring wells and installing and maintaining a site identification sign for the entire 30-year period.

TC

Comparison of Expected Environmental Releases with Applicable Standards

The history of disposal and the nature and quantities of materials disposed of in the Road A chemical basin are not known. Wastes disposed of at the site may have included miscellaneous radioactive and chemical aqueous wastes. Disposal of waste materials ceased in 1973 when the basin was closed and backfilled. Groundwater monitoring at the site began in May 1983 when three monitoring wells were installed; a fourth well was installed in July 1984.

The PATHRAE simulations for the waste constituents at the Road A chemical basin were not based on actual data, because constituent inventories are not available for the site. The inventories were instead estimated from the existing concentrations of lead, and uranium in the groundwater. PATHRAE

*The reference source of the information in this section is Pickett, Muska, and Bledsoe, 1987.

projections indicate that the concentration of lead would remain within regulatory standards. Uranium-238, as simulated by PATHRAE, was predicted to exceed the applicable standard (24 picocuries per liter) at the 1-meter well in 2985. The source terms used in the PATHRAE model assume that uranium-238 is composed of both mobile and less mobile fractions. The less mobile fraction created the maximum 2985 peak reported at 270 picocuries per liter. Monitoring for uranium-238 in the groundwater was not conducted, but its presence would have been detected by the gross alpha screening.

Surface-water quality would not be significantly affected by the addition of potential contaminants from the groundwater pathway from this site; the resulting concentrations of constituents from this source in Four Mile Creek are projected to be below drinking-water standards.

TC | No public exposures or risks attributable to atmospheric releases of lead or uranium are expected, because the site is currently backfilled with soil.

Potential Impacts (Other Than Releases)

Aquatic Resources

Lead and uranium-238 were modeled using PATHRAE. The levels of groundwater outcrop contamination predicted by the model for lead exceed the EPA aquatic life criteria; however, dilution of the groundwater outcrop by Four Mile Creek yields concentrations that are not expected to affect the aquatic biota adversely. In view of the elevated groundwater outcrop concentration for
TE | lead, the potential exists under all closure actions for limited effects on the aquatic biota in the relatively unmixed waters of wetlands adjacent to the groundwater outcrop. The groundwater outcrop concentrations for lead and uranium-238 are below drinking-water standards, indicating that there is no potential for adverse effects on wildlife that consume the undiluted groundwater outcrop.

To estimate potential impacts of other wastes, data on water-quality parameters of downgradient wells were reviewed to identify constituents with parameters higher than the water-quality criteria for aquatic life. They included pH, cadmium, and copper (Table F-27). However, considering the dilution factor, concentrations in Four Mile Creek should not change significantly.

Terrestrial Resources

After closure and backfilling in 1973, the Road A chemical basin, as well as a
TE | considerably larger area surrounding it (a total area of 3.6 acres), were graded and vegetated with bush-clover. Under this closure action, no further disturbance would occur to the terrestrial ecology of the waste site. Vegetation regrowth has not indicated any adverse impacts. In the absence of soil monitoring data, a definitive assessment of potential terrestrial impacts is not possible. However, in view of the amounts of contaminants
TE | disposed of at the site, any terrestrial impacts should be minimal for all closure actions. Because of the depth of the buried waste (3 meters), any effects from the biointrusion pathway should be negligible.

Endangered Species

Since the site would not be disturbed, there would be no impacts on endangered species.

Wetlands

TC As indicated in Table F-27, there are no wetlands within 200 meters of the waste site. Within 1000 meters of the site there are 79.3 acres of wetland, all of which is bottomland hardwood forest. No direct impact to these wetlands would occur because no disturbance would take place.

As discussed above, contaminated groundwater can outcrop in the bottomland hardwood wetlands to the west of the site. While contaminants would be diluted as groundwater flowed from the site to the outcrop, levels could be elevated enough to affect the wetlands ecology.

F.7.1.2 Assessment of No Removal of Waste and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

TC Under the no-waste-removal and-closure action, a low-permeability cap would be placed on top of the existing landfill. The cap would be placed only on top of the basin site itself. The area of the cap would be approximately 1700 square meters. The low-permeability cap would be graded and seeded. The vegetation would be cut periodically to minimize intrusion of any deep-rooted species through the low permeability cap. Because the materials that were disposed of in the basin would be left in place in this option, groundwater monitoring would be continued quarterly for 1 year, and then annually for the next 29 years. Site maintenance would be continued for the entire 30-year period.

Comparison of Expected Environmental Releases with Applicable Standards

Groundwater

TE The no-waste-removal-and-closure action would result in the same PATHRAE-modeled releases as described in Section F.7.1.1 for no action. All monitored constituents are currently within MCLs, and uranium-238 is the only constituent projected by PATHRAE to exceed its MCL. However, any remedial action would not be considered until additional groundwater monitoring data were obtained and soil characterization studies were completed.

Air

TE No releases to the atmosphere are projected to occur for this action, since
TC the source is currently backfilled with soil and the constituents are not volatile.

Potential Impacts (Other Than Releases)

Aquatic Resources

Aquatic impacts to Four Mile Creek would be expected to be similar to those discussed in Section F.7.1.1. Placement of a low-permeability cap would reduce infiltration through the basin sediments, reducing groundwater contamination. However, groundwater contaminated at current levels would continue to flow to outcrops on Four Mile Creek.

Terrestrial Resources

The site would be revegetated with herbaceous species such as vetch and deep-rooted shrubs and trees eliminated through occasional mowing, which would reduce potential impacts from biointrusion. Noise and human disturbance could disturb wildlife during site operations; however, this disturbance would be temporary.

Endangered Species

As noted in Table F-27, three former colony sites for the endangered red-cockaded woodpecker have been reported within 1000 meters of the Road A chemical basin. No activity has been reported at these colony sites in recent surveys on the SRP. Because of the distance involved, remedial actions should not adversely affect the former woodpecker colony site. In addition, bald eagles have been sighted flying in the area of the site. Any impacts to this species, for example, from construction noise should not be significant; such noise would occur only for a short time. Other habitat in the immediate vicinity of the waste site are not suitable for other Federally endangered species reported on the SRP (Dukes, 1984; Du Pont, 1985). Thus, site actions should not have any effect on these endangered species. TE

Wetlands

Wetlands present in the general area of the Road A chemical basin are discussed in Section F.7.1.1. Because of the distance to the nearest wetland, it is unlikely that any direct impacts resulting from this closure option would occur. Appropriate erosion and sediment control measures would be implemented.

F.7.1.3 Assessment of Removal of Waste to the Extent Practicable, and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

Under the waste-removal-and-closure action, the existing backfill would be removed from the basin, and contaminated soil from the edges and bottom of the basin would be excavated. It is assumed that removal of 0.6 meter of soil from the bottom and the edge of the basin would be sufficient to remove the contaminants. The estimated volume of backfill to be removed and reemplaced is about 4500 cubic meters. The amount of contaminated soil to be excavated and removed is estimated to be 1000 cubic meters. The contaminated material would be transported in metal containers. Because the history of disposal TC

indicates that radioactive materials were disposed of in this basin, it is anticipated that the excavated materials would be removed to a waste
TC storage/disposal facility. The backfill would be reemplaced and a low-permeability cap would be installed. Groundwater monitoring would not be continued.

Comparison of Expected Environmental Releases with Applicable Standards

TE The waste removal and closure action would result in the same PATHRAE-modeled releases as described in Section F.7.1.1 for no action. Groundwater remedial action would not be considered for the reasons discussed in Section F.7.1.2.

Air

TE Releases to the atmosphere are projected to occur for this action, owing to excavation activities in 1986. No releases are expected in future years because the source is backfilled with soil and the constituents are non-
TC volatile. The EPA Hazard Index due to releases of noncarcinogens is less than 1.5×10^{-9}.

Environmental doses and risks to the maximally exposed individual due to radiological releases from the Road A chemical basin were calculated using the methodology summarized in the introduction to this appendix and presented in Appendix I. The calculated doses are less than 1.0×10^{-3} percent of the DOE limit of 25 millirem per year for each of the 3 years. The risks associated with these doses would be less than 7.0×10^{-12}.

An analysis of the average individual worker's health risks attributable to occupational exposure to carcinogens (both nonradioactive and radioactive) and noncarcinogens was performed using the methodology presented in Appendix I.
TC The EPA Hazard Index due to noncarcinogens would be approximately 2.3×10^{-3}. The total dose to the worker was calculated to be 0.6 millirem, which would produce an incremental risk of approximately 1.7×10^{-7}. The total dose to the worker transporting the waste was calculated as 0.11 millirem, producing an incremental risk of 3.1×10^{-8}.

Potential Impacts (Other Than Releases)

Aquatic impacts would be expected to be similar to those discussed in Section F.7.1.2. Removal of waste would further lessen groundwater contamination. However, contaminated groundwater would continue to flow to outcrops on Four Mile Creek.

F.8 ASSESSMENT OF ACTIONS AT K-AREA WASTE SITES

The approximate boundaries of the K-Area geographic grouping are Road B on the south and Road 6 on the northwest. This grouping is formed by waste sites associated with K-Reactor. Figure F-12 locates the waste sites in this grouping and shows the proximity to the Road A Area waste site.

Sections F.8.1 through F.8.4 contain or reference the section that contains a discussion of sites 8-1 through 8-4. Section F.8.5 discusses biological impacts that are generically applicable to the waste sites in this geographic grouping.

F.8.1 K-AREA BURNING/RUBBLE PIT, BUILDING 131K

This burning/rubble pit is discussed in conjunction with the other burning/rubble pits in Section F.1.6. The ecological effects of this site that relate to the K-Area geographic grouping are discussed in Section F.8.5.

F.8.2 K-AREA ACID/CAUSTIC BASIN, BUILDING 904-80G

This acid/caustic basin is discussed in conjunction with the other acid/caustic basins in Section F.2.1. The ecological effects of this site that relate to the K-Area geographic grouping are discussed in Section F.8.5.

F.8.3 K-AREA BINGHAM PUMP OUTAGE PIT, BUILDING 643-1G

TE Section F.3.4 describes the actions, releases, and other potential impacts for this outage pit in conjunction with the other Bingham pump outage pits. Section F.8.5 describes biological impacts that apply generically to the waste sites in this geographic grouping.

TE F.8.4 K-AREA REACTOR SEEPAGE BASIN, BUILDING 904-65G*

TE Purge water from K-Reactor was discharged to the K-Area basin. The nearest surface stream to K-Area reactor seepage basin is Indian Grave Branch. This basin has been inactive since 1960.

F.8.4.1 Assessment of No Action (No Removal of Waste, and No Remedial or Closure Actions)

Description of Action

TC The K-Area reactor seepage basin is no longer in service but is currently receiving minimal control and upkeep. Vegetative growth is controlled with herbicides, erosion is monitored, fences are maintained, and groundwater is monitored. Under no action, practices would be continued for this site. The corners of the basin would be marked with identification pylons. Groundwater

TC monitoring would be conducted quarterly for 1 year and then annually for the next 29 years. Site maintenance would be continued for the entire 30-year period.

Comparison of Expected Environmental Releases with Applicable Standards

TC The monitoring data show that low levels of tritium are in the groundwater around the basin. The distribution of activity indicates that the tritium may come from an upgradient source. In addition, the groundwater contains other radionuclides, including strontium-90 and yttrium-90.

*The reference source for the information in this section is Pekkala, et al., 1987b.

The regulatory standards and measured or estimated maximum concentrations of all constituents which are of concern from regulatory or health risk are presented in Table F-28. Most maximum concentration figures are based on modeling, because either no concentration measurements were available or the calculated concentration was greater than the measured concentration.

The maximum estimated concentrations presented in Table F-28 correspond to PATHRAE-calculated peaks. For tritium, these peaks are predicted to have occurred prior to 1985. TC

Table F-28 shows that tritium, strontium-90 and yttrium-90 concentrations exceed the standard for the 1-meter well. Tritium exceeds its standard at the 100-meter well. TE

Surface-water quality is not significantly affected by the addition of potential contaminants from the groundwater pathway from this site, as the resulting concentrations of constituents in Indian Grave Branch are projected to be below drinking-water standards.

The annual dose to an individual resulting from the atmospheric radionuclide releases for the No-action alternative at various times is presented below as a percentage of the DOE limit of 25 millirem per year:

Year	Percentage of DOE limit
1	5.6×10^{-4}
100	1.2×10^{-3}
1000	2.0×10^{-13}

Risks associated with radionuclide releases are no more than 8.5×10^{-11} for each of the three years considered.

Potential Impacts (Other Than Releases)

Section F.8.5.1 describes general impacts from no action to biological resources. Potential ecological concerns at the K-Area reactor seepage basin include contaminated groundwater transport to the surface water of Indian Grave Branch and biointrusion. PATHRAE modeling of wastes at this basin included tritium, cobalt-60, strontium-90, yttrium-90, cesium-137, promethium-147, and plutonium-239. The groundwater outcrops and resulting stream water concentrations of the modeled wastes were compared to EPA aquatic life criteria or equivalent numbers from the technical literature. Tritium at year 0 was found to exceed the comparison criterion under all closure actions; no other radiological contaminants exceed the criteria. The tritium concentration exceeded the criterion by a factor of 2.5, but did not alter the existing stream water concentration, which itself exceeds the criterion for tritium. Studies of the biological effects of concentrations of tritium in the groundwater outcrop and diluted stream water were well below the no-effect concentration for developing fish embryos. Therefore, no adverse impacts to the aquatic biota of Indian Grave Branch and adjacent wetlands attributable to the transport of radiological contaminants from the K-Area basin are expected under any of the closure actions. TC TE TE

Although the tritium concentration in the groundwater outcrop at year 0 slightly exceeds the EPA drinking-water standard, no adverse impacts to wildlife that consume undiluted groundwater are expected, due to the conservative nature of the criterion when applied to wildlife and the low probability of wildlife consistently drinking from the area of the groundwater outcrop.

Based on available data, limited terrestrial impacts are expected at the K-Area basin under no action via the biointrusion pathway. Soil concentration for cobalt-60, strontium-90, and cesium-137 exceeded the soil criteria by factors ranging from 10.4 to 46.4. Any impacts to terrestrial vegetation would be limited to the general area occupied by the basin, which is less than 1000 square meters.

F.8.4.2 Assessment of No Removal of Waste and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

Under the no-waste-removal-and-closure action, no contaminated soil would be removed, but the basin would be allowed to dry, backfilled, and fitted with an infiltration barrier to reduce the likelihood of the contamination becoming exposed and migrating from the basin. The barrier would consist of an artificial membrane, compacted clay, sand, and gravel and is assumed to be 99-percent effective in preventing passage of infiltrating water. Finally, the basin would be covered with topsoil, graded, and seeded for erosion control. The corners of the basin would be marked with identification pylons. Groundwater monitoring would be conducted quarterly for 1 year and then annually for the next 29 years. Site maintenance would be continued for the entire 30-year period. TE TC

Comparison of Expected Environmental Releases with Applicable Standards

The implementation of this closure action is predicted to reduce all environmental releases except tritium to below MCLs (see Table F-28).

Surface-water quality would not be significantly affected by the addition of potential contaminants from the groundwater pathway from this site, as the resulting concentrations of constituents in Indian Grave Branch are projected to be below drinking-water standards.

No radionuclides would be released to the atmosphere.

Potential Impacts (Other Than Releases)

Sections F.8.4.1 and F.8.5.2 describe impacts on biological resources. Terrestrial impacts would be mitigated substantially, due to backfilling and capping.

F.8.4.3 Assessment of Removal of Waste to the Extent Practicable, and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

TE Under the waste-removal-and-closure action, the K-Area seepage basin would be allowed to dry by natural seepage and evaporation. Approximately 260 cubic meters of contaminated soil would then be excavated from the floor of the basin. The excavation is projected to reduce the contamination remaining at the basin to the residual concentrations shown in Table F-29.

Table F-29. Proposed Excavation for Cleanup of K-Reactor Seepage Basin in the Waste Removal Action

	Maximum concentration picocuries per gram (pCi/g)				Maximum residual contamination picocuries per gram (pCi/g)		
Basin No.	Cs-137	Sr-90	Co-60	Proposed excavation depth (m)	Cs-137	Sr-90	Co-60
904-65G	510	140	30	0.30	45	95	<1

Except for cobalt-60, the maximum soil contamination level remaining after excavation is expected to be above the soil guidelines used for selecting radioactive contaminants for inclusion in the risk assessment of closure options. Because elevated levels of contamination could remain after excavation, an infiltration barrier would be installed over the basin to reduce the likelihood of the contamination's becoming exposed and/or migrating from the waste site.

TC The excavated contaminated soil would be placed in metal containers or bagged as necessary and trucked to a waste storage/disposal facility at the SRP.

TC After excavation, the basin would be backfilled with about 1,600 cubic meters of clean soil and be fitted with a low-permeability cap. The barrier would consist of an artificial membrane, compacted clay, sand, and gravel and is assumed to be 99-percent effective in preventing passage of infiltrating water. Finally, the basin would be covered with topsoil, graded, and seeded for erosion control.

TC The corners of the closed basin would be marked with identification pylons. Groundwater monitoring would be conducted quarterly for 1 year and then annually for the next 29 years. Site maintenance would be continued for the entire 30-year period.

Comparison of Expected Environmental Releases with Applicable Standards

Expected releases for waste removal are predicted to be the same as those described in Section F.8.4.2 for no waste removal.

The annual dose resulting from atmospheric radionuclide releases for the first year would be 4.0×10^{-6} percent of the DOE limit of 25 millirem per year. The associated risk is 2.9×10^{-13}. There would be no atmospheric radionuclide releases during years 100 and 1000.

An analysis of the health risks to the average individual worker that would be attributable to occupational exposure to radioactive contaminants was performed using the methodology presented in Appendix I. The risk to the average worker is 1.54×10^{-7}, resulting from a total dose of 0.55 millirem. The risk to a worker transporting the waste is 7.84×10^{-8}, resulting from a dose of 0.28 millirem. TC

Potential Impacts (Other Than Releases)

Impacts on biological resources resulting from this closure action are similar to those described in Sections F.8.4.1 and F.8.5.3. Terrestrial impacts from the biointrusion pathway should be negligible under waste removal and closure due to the removal of contaminated soil, backfilling, and the installation of an infiltration barrier. TE

F.8.5 POTENTIAL IMPACTS ON BIOLOGICAL RESOURCES IN K-AREA

This section addresses those general impacts in this geographic grouping that are related to aquatic and terrestrial ecology, endangered species, and wetlands for each closure and remedial action. Discussions of site-specific data are given in the appropriate section above. TE

The K-Area burning/rubble pit and K-Area Bingham pump outage pit are backfilled and covered with soil. The K-Area acid/caustic basin and reactor seepage basin are inactive but act as wet-weather ponds. TE

F.8.5.1 Assessment of No Action (No Removal of Waste and No Remedial or Closure Action)

Aquatic Resources

Potential aquatic impacts could result from wastes entering groundwater and subsequently flowing to outcrops on nearby streams. Table F-30 presents data from groundwater monitoring wells for waste sites in K-Area; no data are available for the K-Area Bingham pump outage pit. The table lists wastes known to exceed EPA water-quality criteria for freshwater aquatic life that were not modeled using PATHRAE. In all cases, these contaminants are predicted to be diluted to concentrations below the EPA criteria.

Terrestrial Resources

The K-Area burning/rubble pit is inactive and has been covered with soil to grade level. Natural brush and grass have begun to grow over the site. The K-Area Bingham pump outage pit is also inactive and in a similar condition. Because no action is planned, no impacts on terrestrial ecosystems have been identified at either site. Potential impacts could occur if vegetation growing at these sites accumulated contaminants through root penetration of the waste, as discussed above.

Endangered Species

Previous surveys indicate little potential for endangered species in the vicinity of K-Area. Therefore, no impacts to these species should occur.

Wetlands

Data on wetlands located near the K-Area waste sites are presented in Table F-30. With the exception of 0.1 acre found within 200 meters of the K-Area seepage basin, no wetland areas are closer than 550 meters from any of the K-Area sites. No action would cause no additional impacts on wetlands over those that may be occurring now.

F.8.5.2 Assessment of No Removal of Waste and Implementation of Cost-Effective Remedial and Closure Actions as Required

Aquatic Resources

The types of impacts on aquatic ecosystems resulting from this closure action would be similar to those described in Section F.8.5.1 for the sites already backfilled. Erosion control measures would be used to prevent potential aquatic impacts from sedimentation due to the remedial actions planned. TE

Terrestrial Resources

Temporary impacts on terrestrial ecosystems might result from site disturbance and noise. Closure and occasional mowing would reduce the potential for waste uptake by vegetation.

Endangered Species

No impacts to endangered species are expected. Endangered species are sufficiently distant from the sites to prevent disturbance as a result of human activities.

Wetlands

Because of their distance from the sites, wetland habitats should not be affected by backfill and remedial activities planned under this closure action. Sedimentation and erosion control procedures would prevent potential wetland disturbance. TE

F.8.5.3 Assessment of Removal of Waste to the Extent Practicable and Implementation of Cost-Effective Remedial and Closure Actions as Required

Aquatic Resources

No impacts on aquatic ecosystems are expected from action. Waste removal would reduce releases to groundwater, although contaminants already leached into the groundwater would continue to flow to outcrops on surface streams. Erosion control and sedimentation measures would be used during waste excavation and closure. TE

Terrestrial Resources, Endangered Species, and Wetlands

TE | Due to the similarity of this action and no waste removal and closure, the discussion presented in Section F.8.5.2 is also applicable here. Waste removal would reduce potential impacts from biological accumulation.

F.9 ASSESSMENT OF ACTIONS AT L-AREA WASTE SITES

This geographic grouping is formed by waste sites near L-Reactor. This grouping is approximately 4 kilometers east of K-Reactor, just north of Road B. Figure F-13 shows the locations of the waste sites in the L-Area grouping.

Sections F.9.1 through F.9.12 contain, or reference the section that contains, a discussion of sites 9-1 through 9-12. Section F.9.13 discusses biological impacts that are generically applicable to the waste sites in this geographic grouping.

F.9.1 L-AREA BURNING/RUBBLE PIT, BUILDING 131-L

This burning/rubble pit is discussed in conjunction with the other burning/rubble pits in Section F.1.6. The ecological effects of this site that relate to the L-Area geographic grouping are discussed in Section F.9.13.

F.9.2 L-AREA ACID/CAUSTIC BASIN, BUILDING 904-79G

This acid/caustic basin is discussed in conjunction with the other acid/caustic basins in Section F.2.1. The ecological effects of this site that relate to the L-Area geographic grouping are discussed in Section F.9.13.

F.9.3 CMP PITS*

TE | The CMP pits consist of seven adjacent waste sites (Buildings 080-17G, 080-17.1G, 080-18G, 080-18.1G, 080-18.2G, 080-18.3G, and 080-19G). The seven sites were assumed to be a single operating unit for purposes of modeling migration in groundwater and surface water. Also, the actions described in this section would be applicable to each of the CMP pits. For atmospheric transport risks, each of the seven CMP pits was considered separately. However, the effects of these releases will be discussed cumulatively in this section. The history of waste disposal, evidence of contamination, and waste characteristics at these pits are presented in Appendix B, Section B.10.1.

F.9.3.1 Assessment of No Action (No Removal of Waste and No Remedial or Closure Actions)

Description of Action

No action would involve the quarterly monitoring of well clusters 8, 9, 10, 11, 12, and 13 for about 5 years. If at the end of 5 years there were no increase in contaminant levels, the frequency would be reduced to once or

*The reference source of the information in this section is Scott, Kolb, Price, and Bledsoe, 1987.

twice per year for an additional 30-year period. Site maintenance, including upkeep of access roads, monitoring wells, and identification signs, would continue for 30 years.

Comparison of Expected Environmental Releases with Applicable Standards

The chemical constituents selected for consideration of risks associated with the CMP pits are benzene, chloroethylene, 2,4-D, dichloromethane, endrin, Freon, chromium, lead, zinc, silvex, tetrachloroethylene, toxaphene, and trichloroethylene. Each of these compounds was selected because it was found in groundwater at levels higher than the threshold selection criteria, or was expected to be found in the soil as a result of a review of an inventory of materials that were disposed of at this site (Looney et al., 1987). TC

Table F-31 lists the predicted maximum concentrations of the selected constituents and the year of peak occurrence after 1985, based on groundwater modeling for this site. The table also lists health-based standards for comparison purposes and the model estimates concentrations of several constituents in excess of applicable standards at the 1- and 100-meter wells. Table F-31 indicates that the predicted peak concentration of endrin is not anticipated in the groundwater at the 1- and 100-meter wells for more than 700 years. This is the result of endrin's natural resistance to movement through the unsaturated soil zone between the remaining waste and the aquifer.

Surface-water quality would not be significantly affected by the addition of potential contaminants from the groundwater pathway from this site, as the resulting concentrations of constituents from this source in Pen Branch are projected to be below drinking-water standards.

Cumulative environmental risks due to atmospheric chemical releases from the CMP pits are estimated to be low and not significant. Risks to the maximally exposed individual would be below 10^{-9} for carcinogenic risks. The EPA Hazard Index for a maximally exposed individual from noncarcinogens would be less than 10^{-8}. TC

The expected concentrations for erosion and the biointrusion pathways are zero for this option. The erosion rate is such that no waste erodes during the first 1000 years of the simulation, and the 4 meters of soil cover or exceed the root penetration assumed for the biointrusion pathway.

Potential Impacts (Other Than Releases)

Section F.9.13.1 describes the ecological impacts of no action. PATHRAE modeling was performed on benzene, chloroethylene, 2,4-D, dichloromethane, endrin, Freon, chromium, lead, zinc, silvex, tetrachloroethylene, toxaphene, and trichloroethylene, which were identified as having potential impacts on the aquatic system. PATHRAE-generated groundwater outcrop concentrations for no action indicate that only toxaphene occurs at levels of ecological concern. The maximum groundwater outcrop concentration of toxaphene, which might indicate concentrations in wetland habitats bordering Pen Branch in the vicinity of the outcrop, was approximately four orders of magnitude above the EPA water-quality criteria for the protection of aquatic life, indicating the potential for impacts to the biota of these habitats. TC

The estimated (incremental) concentration of toxaphene in Pen Branch attributable to the CMP pits exceeded the EPA aquatic criteria by a factor of approximately seven, indicating a potential, but less serious, problem than in the wetlands. Concentrations of toxaphene in the Savannah River attributable to the CMP pits yielded quotients of less than 0.01 when compared to the EPA aquatic criteria indicating no problem for the biota in the river.

More specific aquatic life criteria, representing levels of toxaphene known to be toxic to aquatic biota representative of the SRP ecosystem in chronic tests, range from 0.09 to 0.20 micrograms per liter. Acute toxicity levels of toxaphene for representative taxa generally range from 1 to 30 micrograms per liter. A comparison of the calculated maximum chronic (undiluted) concentration of toxaphene in Pen Branch backwaters (2.3 micrograms per liter) to these toxicity criteria indicate the potential for significant impacts to biotic communities inhabiting these areas. However, the 10- to 20-fold exceedance indicates that, with any significant amount of dilution, the criteria will not be exceeded and any impacts should be restricted to a relatively small area. Maximum concentrations of toxaphene in Pen Branch attributable to the CMP Pits were two orders of magnitude below the criteria, indicating that there might be no adverse effects due to toxaphene in Pen Branch itself, regardless of the exceedance of the stringent EPA criteria.

No impacts on terrestrial resources, wetlands, or endangered species are expected under this closure action. In addition, there are no significant differences among the closure actions as far as ecological impacts are concerned. TE

F.9.3.2 Assessment of No Removal of Waste and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

The no-waste-removal-and-closure action would involve monitoring groundwater at the existing wells. Decreased availability of contaminants should result in the decline of observed concentrations, except perhaps at CMP-9. If trends were not downward after 1 year, a decision would be made on whether or not to continue further monitoring, activate the leach field, or install a vacuum recovery system. Site maintenance, including upkeep of access roads, monitoring wells, and identification signs, would continue for 30 years. TE

Additional corrective actions, such as groundwater extraction and treatment, might be used to reduce the levels of all of the contaminants in the groundwater, except endrin and silvex, to below applicable standards. Endrin, in particular, is an extremely slow-moving contaminant that is not anticipated to reach its peak concentration in the aquifer for several hundred years. Thus, efforts to extract it from the groundwater in the near future would be ineffective, because it remains either within the remaining bodies of waste or somewhere along the depth of the unsaturated zone.

Comparison of Expected Environmental Releases with Applicable Standards

The chemical constituents of concern are the same as for no action (see Section F.9.3.1). Table F-31 lists the predicted maximum concentrations of the chemical constituents based on results of groundwater modeling. TE

TE | Cumulative estimated environmental risks due to atmospheric chemical releases from the CMP pits for this option are identical to no action (Section F.9.3.1).

TE | The predicted concentrations for the erosion, reclaimed farmland, and the bio-intrusion pathways are again zero for no action.

Potential Impacts (Other Than Releases)

Sections F.9.3.1 and F.9.13.2 describe the ecological impacts of no waste removal and closure. Proposed remedial action for the CMP pits, consisting of activated leach fields and/or installation of a vacuum recovery system, should reduce the potential for continuing contamination of the groundwater. However, contaminated groundwater would continue to flow to outcrops on Pen Branch with a potential to produce adverse impacts on adjacent wetlands.

F.9.3.3 Assessment of Removal of Waste to the Extent Practicable, and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

Currently, 99.5 percent of all hazardous material has been removed from the seven CMP areas. Further action could be taken to lower residual concentrations to background levels. Among the possible actions are:

- Grouting and abandoning four wells totaling approximately 170 meters (CMP-9B, 9C, 16B, 16C).
- Excavating nearly 4000 cubic meters of compacted fill and crushed stone, together with the HDPE liner previously placed in the pit areas.
- Excavating an additional 1500 cubic meters of earth at depths of up to 27 meters below grade. Approximately 370 cubic meters of this material would contain an average concentration of organics of about 15 ppm.

TC

- Incinerating the earth moved.
- Refilling the excavated area to grade with clean soil and seeding for erosion control. The soil excavated and incinerated to remove the organics could be used for fill.
- Continuing groundwater monitoring at surrounding wells quarterly for 1 year, then annually for 29 years.
- Continuing site maintenance for the entire 30-year period.

TE | Additional corrective actions, such as groundwater extraction and treatment, could be used in conjunction with this closure action to reduce the present level of contaminants in the groundwater. The selection of actions would be based on site-specific studies and interactions with cognizant regulatory agencies. Removal of the remaining waste, as defined by the original waste boundaries, would not be sufficient to ensure removal of all remaining constituents, particularly endrin. Further investigation would be required to locate the extent of the endrin plume, which is (and will be, for the entire

100-year institutional control period) resident in the unsaturated zone between the waste and the water table. Once the plume location is specified, further strategies could be devised (e.g., a combination of waste removal and remedial actions such as forcing the endrin into the water table, from which it could be pumped and removed) to ameliorate future instances in which endrin exceeds standards.

Comparison of Expected Environmental Releases with Applicable Standards

Table F-31 lists the predicted maximum concentrations of the chemical constituents based on results of groundwater modeling. These data indicate significant contamination of the groundwater in the vicinity of the pits. When the groundwater is discharged to Pen Branch, however, the concentrations are below applicable standards.

Estimated environmental risks due to atmospheric chemical releases from the CMP pits are very low and are considered not significant. Risks due to carcinogens are less than 10^{-11} and EPA Hazard Index values for noncarcinogens are less than 1.1×10^{-9}. TC

The expected concentrations for the erosion, reclaimed farmland, and biointrusion pathways are zero.

An analysis of the health risks to the average individual worker that would be attributable to occupational exposure to carcinogens and noncarcinogens was performed using the methodology presented in Appendix I.

The groundwater remediation system could be designed so that the contaminant levels in the groundwater would fulfill applicable standards. In addition, any release from the treatment system would meet applicable standards.

Potential Impacts (Other Than Releases)

The potential ecological impacts of waste removal and closure for the CMP pits are similar to those described in Sections F.9.3.1 and F.9.13.3.

F.9.4 CMP PIT, BUILDING 080-17.1G

This pit is discussed in conjunction with the other CMP pits in Section F.9.3.

Total risk due to release of carcinogenic contaminants is 7.2×10^{-8}. The total EPA Hazard Index value for noncarcinogens is 0.14. TC

F.9.5 CMP PIT, BUILDING 080-18G

This pit is discussed in conjunction with the other CMP pits in Section F.9.3.

F.9.6 CMP PIT, BUILDING 080-18.1G

This pit is discussed in conjunction with the other CMP pits in Section F.9.3.

F.9.7 CMP PIT, BUILDING 080-18.2G

This pit is discussed in conjunction with the other CMP pits in Section F.9.3.

F.9.8 CMP PIT, BUILDING 080-18.3G

This pit is discussed in conjunction with the other CMP pits in Section F.9.3.

F.9.9 CMP PIT, BUILDING 080-19G

This pit is discussed in conjunction with the other CMP pits in Section F.9.3.

F.9.10 L-AREA BINGHAM PUMP OUTAGE PIT, BUILDING 643-2G

TE | The actions, releases, and other potential impacts for this outage pit are discussed in conjunction with the other Bingham pump outage pits in Section F.3.4.

F.9.11 L-AREA BINGHAM PUMP OUTAGE PIT, BUILDING 643-3G

TE | The actions, releases, and other potential impacts for this outage pit are discussed in conjunction with the other Bingham pump outage pits in Section F.3.4.

F.9.12 L-AREA OIL AND CHEMICAL BASIN, BUILDING 904-83G*

F.9.12.1 Assessment of No Action (No Removal of Waste and No Remedial or Closure Actions)

Description of Action

Under no action, the site would be left in its present condition. Groundwater monitoring of existing wells would be continued quarterly for 1 year and then annually for 29 years. Site maintenance would be continued for 30 years.

Comparison of Expected Environmental Releases with Applicable Standards

The current groundwater monitoring data indicate that nickel and tetrachloroethylene exceed health-based standards based on the maximum single-well mean for each constituent. PATHRAE simulation indicates that concentrations of cadmium, chromium, lead, nickel, tetrachloroethylene, americium-241, strontium-90, tritium, uranium-238, yttrium-90, cobalt-60, and plutonium-238 either have recently exceeded or are expected to exceed MCLs in groundwater near the basin in the future (Table F-32).

Surface-water quality is not significantly affected by the addition of potential contaminants from the groundwater pathway from this site, as the resulting concentrations of constituents from this source in the Steel Creek/L Lake system are projected to be below drinking-water standards.

Environmental doses and risks to the maximally exposed individual due to radiological releases to the atmosphere from the L-Area oil and chemical basin were calculated using the methodology presented in the introduction to this appendix and in Appendix I. The calculated doses are less than 0.47 percent

*The reference source for the information in this section is Pekkala, Jewell, Price, and Bledsoe, 1987.

of the DOE limit of 25 millirem per year for each of the 3 years. The risks associated with these doses would be less than 3.3×10^{-8}. Environmental risks due to atmospheric chemical releases from the L-Area Oil and Chemical Basin are estimated to be low and not significant. Risks to the maximally exposed individual for no action for carcinogens are 3.7×10^{-8} or less. The EPA Hazard Index value for noncarcinogens is 1.8×10^{-5} or less. TC

Potential Impacts (Other Than Releases)

A general description of the ecological impacts of no action is provided in Section F.9.13.1. PATHRAE modeling was performed on cadmium, chromium, lead, mercury, nickel, tetrachloroethylene, tritium, cobalt-60, strontium-90, cesium-137, uranium-235 and -238, plutonium-238 and 239 and americium-241, which were identified as having potential impacts on the aquatic system. The results indicate that these materials would not alter the present water quality of Steel Creek. Lead and mercury in Steel Creek are presently above the aquatic biota criteria. Since the groundwater flow from the oil and chemical basin becomes part of the undrained uplands and swampy surface depressions of Steel Creek, full dilution of wastes is not likely to occur and some accumulation could occur in these wetland areas.

Because the basin sometimes contains standing water during periods of rainfall, this water could contain wastes from contaminated soils and pose a potential problem to wildlife, including waterfowl, and vegetation that come into contact with it. There is also the potential impact of surface runoff into nearby streams and wetlands during heavy rainstorms, if the runoff is not controlled. Wetlands in the vicinity of the oil and chemical basin consist of the bottomland hardwood communities along Steel Creek and the open-water wetland of L-Lake.

To assess the potential impacts associated with biointrusion under no action, maximum observed concentrations of nonradiological contaminants measured in the sediments were compared to phytotoxicological benchmarks. The metals assessed occur in concentrations toxic to vascular plants. All radionuclides exceed DOE Threshold Guidance Limits. Calculated plant uptake of nonradiological contaminants indicates that plant tissue concentrations would not approach levels considered toxic to herbivorous birds and mammals. Ecological benchmarks to assess similar effects for radiological contaminants are not available. The radiological contaminants are of concern because of their high concentrations in basin sediments. These results indicate the potential for significant effects on plant growth at the waste site itself and possible effects on wildlife using the habitat because of the elevated levels of radionuclides.

F.9.12.2 Assessment of No Removal of Waste and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

Under the no-waste-removal-and-closure action, the basin water would be removed, and the sediment at the bottom of the basin would be stabilized with concrete to support backfill loads. The concrete decontamination pad and associated piping would be bulldozed into the basin. The basin would then be backfilled with approximately 3000 cubic meters of borrow fill, with an TC

TC additional 900 cubic meters required for a low-permeability cap. Groundwater monitoring would be continued quarterly for 1 year, then annually for the next 29 years. Site maintenance would be continued for the entire 30-year period.

As shown in Table F-32, concentrations of tetrachloroethylene, americium-241, strontium-90, tritium, yttrium-90, and cobalt-60 in groundwater near the basin are predicted by PATHRAE to exceed MCLs. Potential remedial action (e.g., groundwater pumping and treatment) could be required to address these constituents. Any actions taken would be based on site-specific studies and interactions with regulatory agencies. For example, the number, size, location, pumping rate, and pumping duration of groundwater-withdrawal wells would be determined after the contaminant plume was defined and a quantitative flow analysis was performed. Appropriate treatment technologies would be employed to reduce the concentrations of the constituents to below regulatory limits. Before a groundwater remedial action program was initiated, additional monitoring would be needed to define the actual extent and concentration of the contaminant plume.

Comparison of Expected Environmental Releases with Applicable Standards

Regulations promulgated under the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) apply to closure and remedial actions. The regulations require that groundwater affected by the chemical basin be processed to achieve contaminant levels within MCLs established under the Safe Drinking Water Act.

The closure and potential groundwater remedial actions that may be used are expected to reduce the concentrations of tetrachloroethylene, americium-241, strontium-90, tritium, yttrium-90, and cobalt-60 to within MCLs. Surface-water quality would not be significantly affected by the addition of potential contaminants from the groundwater pathway from this site, as the resulting concentrations of constituents in the Steel Creek/L Lake system are projected to be below drinking-water standards. An analysis for radiological releases to the atmosphere described in Section F.9.12.1 was also performed. Risks due to atmospheric release of carcinogenic compounds are 5.85×10^{-26}. EPA Hazard Index values for noncarcinogens are 6.1×10^{-16} or less. No
TE radioactive releases are assumed to occur for this action, since the basin would be capped.

Potential Impacts (Other Than Releases)

Section F.9.13.2 describes the ecological impacts of no waste removal and
TE closure. Closure of the L-Area oil and chemical basin includes drainage of any existing standing water in the basin. However, because the contents of the basin would be released according to the NPDES permit requirements, impacts to the aquatic biota would not be significant. Solidifying the soils and capping the waste site with a low-permeability cap would retard the leaching of wastes into the groundwater; however, contaminations already in the groundwater would continue to flow to outcrops on Steel Creek. The area would be revegetated with shallow-rooted plants and mowed to prevent root penetration into the cap and potential impacts through the biointrusion pathway.

F.9.12.3 Assessment of Removal of Waste to the Extent Practicable and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

The waste-removal-and-closure action for the L-Area oil and chemical basin includes the removal of any basin water and sediments, backfilling and capping with a low-permeability cover, and continuation of groundwater monitoring.

Any residual rainwater in the basin would be removed to Waste Management Operations for disposal. Basin sediments to a depth of 0.9 meter below the bottom of the basin would be stabilized with concrete and excavated. The 675 cubic meters of friable mixture would be loaded into metal containers for transport to a waste storage/disposal facility. TE

The concrete pad next to the basin and its pipeline to the basin would be removed and sent to a waste storage/disposal facility. The basin would then be backfilled with 3500 cubic meters of borrow fill. The waste site would be covered with a low-permeability cap (900 cubic meters) compacted, and seeded to prevent settling and erosion. Groundwater monitoring would be continued quarterly for the first year, then annually for the next 29 years. Site maintenance would be continued for the entire 30-year period.

As shown in Table F-32, concentrations of tetrachloroethylene, strontium-90, tritium, yttrium-90, and cobalt-60 in groundwater near the basin are predicted by PATHRAE to exceed applicable MCLs. Potential remedial action needed to reduce these constituents to below regulatory standards is discussed in Section F.9.12.2.

Comparison of Expected Environmental Releases with Applicable Standards

Regulations promulgated through RCRA and CERCLA apply to closure and remedial actions. The regulations require that groundwater affected by the chemical basin be processed to achieve contaminant levels within MCLs established under the Safe Drinking Water Act.

The potential groundwater remedial actions described in Section F.9.12.2 are expected to reduce the concentrations of tetrachloroethylene, strontium-90, tritium, yttrium-90, and cobalt-60 to within applicable MCLs. Surface-water quality would not be significantly affected by the addition of potential contaminants from the groundwater pathway from this site, as the resulting concentrations of constituents in the Steel Creek/L Lake system are projected to be below drinking-water standards. TC

The analysis of releases to the atmosphere described in Section F.9.12.1 was also performed for this option. Risks due to atmospheric release of carcinogenic compounds are 1.9×10^{-12} or less. EPA Hazard Index values for noncarcinogens are 9.2×10^{-9} or less. Radioactive releases would be due to excavation activities in 1986 but would be zero thereafter, since the basin would be capped. The dose to the maximally exposed individual was calculated as being less than 3.1×10^{-4} percent of the DOE limit of 25 millirem per year. The risk associated with this dose would be less than 2.2×10^{-11}. TC

TC An analysis of the health risks to the average individual worker attributable to occupational exposure to carcinogens and noncarcinogens for protected workers was performed using the methodology presented in Appendix H. The risks due to carcinogen releases to the average worker were calculated as being less than 2.0×10^{-9}. The EPA Hazard Index value for noncarcinogenic releases to the average worker was 8.7×10^{-4}. The total dose to the worker was calculated to be 24 millirem, which would produce an incremental risk of 6.7×10^{-6}. The total dose to the worker transporting the waste was calculated as 12 millirem, producing an incremental risk of 3.4×10^{-6}.

Potential Impacts (Other Than Releases)

TE Potential ecological impacts from this closure action would be similar to those described in Sections F.9.12.2 and F.9.13.3. Removal of the basin sediments would reduce the potential for further leaching of wastes to the groundwater and would eliminate the biointrusion pathway.

F.9.13 POTENTIAL IMPACTS ON BIOLOGICAL RESOURCES IN L-AREA

TE This section addresses those general impacts related to aquatic and terrestrial ecology, endangered species, and wetlands for each closure and remedial action. Discussion of site-specific data are presented in the appropriate section above.

There are 12 waste sites in L-Area. The L-Area burning/rubble pit is presently covered with soil and vegetation. Other waste sites within this geographic grouping include the seven CMP pits, which have been excavated and capped; the two L-Area Bingham pump outage pits, which contained low-level radioactive waste and are presently backfilled and covered with vegetation; the L-Area acid/caustic basin, which is dry except for an occasional impoundment of rainwater; and the L-Area oil and chemical basin, which is presently dry except for an occasional impoundment of rainwater. All waste sites within this geographic grouping are either abandoned or inactive.

F.9.13.1 Assessment of No Action (No Removal of Waste and No Remedial or Closure Actions)

Aquatic Ecology

TE No action for the waste sites of L-Area could indirectly cause contamination of surface-water bodies via the outcropping of groundwater from the various waste sites of L-Area. Table F-33 lists those groundwater wastes not modeled by PATHRAE that are known to exceed the freshwater EPA aquatic life criteria for each of the waste sites. Available data can determine that materials not modeled using PATHRAE analysis (see Table F-33) would not be expected to create or enhance impacts on the aquatic biota of nearby streams. This conclusion is based on the estimated dilution factor, which was calculated by dividing the groundwater flux by the flow rate of the receiving stream. This factor indicates that levels of waste materials would be so diluted as to not affect the water quality of the receiving stream.

Terrestrial Ecology

Potential terrestrial impacts of no action for the waste sites of L-Area include the exposure of wildlife and/or vegetation to standing contaminated surface waters and contaminated soils. The terrestrial impacts of those waste sites with standing surface waters are addressed individually, as are impacts from biointrusion, as appropriate.

Endangered Species

No endangered species have been identified in the immediate vicinity of the waste sites of L-Area from previous surveys at the SRP (see Table F-33). The habitats in the immediate vicinity of these waste sites are not considered suitable for any Federally endangered species previously reported on the SRP. There have been sightings of the bald eagle in the vicinity of L-Area (Mayer, Hoppe, and Kennamer, 1986), but no nests have been seen in this area. Also, the American alligator has been observed in the former L-Reactor cooling water discharge canal. No action for the waste sites of L-Area is not expected to have any effect on endangered species.

Wetlands

Wetlands of the L-Area include bottomland hardwood and scrub/shrub communities that occur along Steel Creek and the upper reaches of Pen Branch, and the open water wetland of L-Lake. Table F-33 provides the distances between the waste sites and the wetlands of L-Area. Potential impacts on these wetlands are addressed individually where appropriate. Impacts would be unlikely where wetlands are located some distance from a waste site.

F.9.13.2 Assessment of No Removal of Waste and Implementation of Cost-Effective Remedial and Closure Actions as Required

Aquatic Ecology

No waste removal and closure for the waste sites of L-Area could contribute directly and indirectly in the short term to the contamination of surface-water bodies during closure activities. Waste sites that contain standing water are addressed individually. Indirect contamination of surface-water body via groundwater is described in Section F.9.13.1 and for each waste site, as appropriate. According to the possible closure and remedial actions for the various L-Area waste sites, the level of impacts on the aquatic biota should be lower than that of no action.

Terrestrial Ecology

The potential terrestrial impacts of no waste removal and closure for the waste sites of L-Area include toxicity to vegetation via contaminated soils and temporary disturbance of the wildlife due to noise and habitat loss during closure operations.

Endangered Species

TE | Potential impacts on endangered species would be similar to those addressed in Section F.9.13.1. Noise generated by this closure action could have a temporary impact on the bald eagle.

Wetlands

Section F.9.13.1 describes the wetlands that exist within the vicinity of L-Area. Because closure operations might induce soil erosion, remedial action should include erosion and surface runoff control to protect the wetlands.

F.9.13.3 Assessment of Removal of Waste to the Extent Practicable and Implementation of Cost-Effective Remedial and Closure Actions as Required

Aquatic Ecology

Aquatic impacts of waste removal and closure for the waste sites of L-Area could include direct and indirect contamination of surface-water bodies. However, closure also involves the removal of wastes and contaminated soils from these waste sites. This closure action would further reduce the potential for wastes entering groundwater.

Terrestrial Ecology

The potential terrestrial impacts of waste removal and closure for the waste sites of L-Area would include temporary disturbance of the wildlife due to noise and habitat loss during closure operations. The removal of wastes and contaminated soils should prevent the uptake of wastes by vegetation.

Threatened or Endangered Species

TE | Potential impacts on endangered species would be similar to those addressed in Section F.9.13.1. Noise generated by this closure action may have a temporary impact on the bald eagle.

Wetlands

Section F.9.13.1 describes the wetlands that exist within the vicinity of L-Area. Because closure operations could induce soil erosion, remedial actions should include erosion and surface runoff control to protect the wetlands.

F.10 ASSESSMENT OF ACTIONS AT P-AREA WASTE SITES

This geographic grouping is formed by waste sites associated with P-Reactor, which is approximately 4 kilometers northeast of L-Reactor. Figure F-14 shows the boundaries of this geographic grouping and the locations of the waste sites within it.

Sections F.10.1 through F.10.3 contain or reference the section that contains a discussion of sites 10-1 through 10-3. Section F.10.4 discusses biological impacts that are generically applicable to the waste sites in this geographic grouping.

F.10.1 P-AREA BURNING/RUBBLE PIT, BUILDING 131-P

This burning/rubble pit is discussed in conjunction with the other burning/rubble pits in Section F.1.6. The ecological effects of this site that relate to the P-Area geographic grouping are discussed in Section F.10.4.

F.10.2 P-AREA ACID/CAUSTIC BASIN, BUILDING 904-78G

This acid/caustic basin is discussed in conjunction with the other acid/caustic basins in Section F.2.1. The ecological effects of this site that relate to the P-Area geographic grouping are discussed in Section F.10.4.

F.10.3 P-AREA BINGHAM PUMP OUTAGE PIT, BUILDING 643-4G

TE Section F.3.4 describes the actions, releases, and potential impacts for this outage pit. Section F.10.4 describes the ecological effects of this site that relate to the P-Area geographic grouping.

F.10.4 POTENTIAL IMPACTS TO BIOLOGICAL RESOURCES IN P-AREA

TE This section addresses those general impacts related to aquatic and terrestrial ecology, as well as endangered species and wetlands, for each closure and remedial action. Discussions of site-specific data are presented in the appropriate sections above.

The P-Area burning/rubble pit and the P-Area Bingham pump outage pit have been abandoned and are backfilled and covered with soil. The P-Area acid/caustic basin is inactive and is a wet-weather pond.

F.10.4.1 Assessment of No Action (No Removal of Waste and No Remedial or Closure Action)

Aquatic Resources

Aquatic impacts could result from the contamination of groundwater and its subsequent outcrop into nearby streams. Table F-34 presents data from groundwater monitoring wells for the P-Area waste sites. This table lists waste materials not modeled by PATHRAE analysis that are known to exceed EPA water-quality criteria for freshwater aquatic life. The contaminants listed would be below the EPA criteria after being diluted, based on the estimated dilution factor.

Terrestrial Resources

The P-Area burning/rubble pit is inactive and has been covered with soil to grade level. Natural brush and grass have begun to grow over the site. The P-Area Bingham pump outage pit is also inactive and in similar condition. Because no action is planned under this closure option, no impacts on terrestrial ecosystems have been identified at either site. Impacts could occur at

all sites, however, if vegetation growing at the sites accumulated contaminants through root penetration of the waste. Continued maintenance (occasional mowing) might be necessary to prevent the growth of deep-rooted plant species and subsequent bioaccumulation in plants and animals.

Endangered Species

Previous endangered species and habitat surveys indicate little potential for endangered species in the vicinity of P-Area.

Wetlands

An area of wetland vegetation was identified approximately 365 meters from the P-Area burning/rubble pit. Total wetland acreages and the specific wetland vegetation types present are unknown for this site and/or for the P-Area acid/caustic basin. Wetland data for all sites are presented in Table F-34. Because no disturbance is planned under this action, no adverse effects to wetlands are expected.

TE

F.10.4.2 Assessment of No Removal of Waste and Implementation of Cost-Effective Remedial and Closure Actions as Required

Aquatic Resources

The impacts to aquatic ecosystems resulting from this action would be the same as those of No action for the sites already backfilled. Sedimentation and erosion control measures would prevent impacts to aquatic ecosystems from actions proposed.

TE

Terrestrial Resources

Impacts to terrestrial ecosystems could result from site disturbance and noise associated with any corrective action measures undertaken. These impacts would be minimized by proper engineering design and careful operation. For example, the operation of machinery only in defined work areas would prevent disturbance to nearby habitats.

Endangered Species

No impacts to endangered species are expected from this action. Endangered species are sufficiently distant from the sites to prevent their being disturbed by human activities.

TE

Wetlands

Because of the distances from the sites, wetland habitats should not be affected by backfill and the remedial activities planned under this closure action. Sedimentation and erosion control procedures would prevent potential disturbance to wetlands.

TE

F.10.4.3 Assessment of Removal of Waste to the Extent Practicable and Implementation of Cost-Effective Remedial and Closure Actions as Required

Aquatic Resources

No impacts to aquatic ecosystems are expected from this action. Waste removal would reduce additional contaminant releases to the groundwater. Erosion control and sedimentation measures would be required during closure activities. TE

Terrestrial Resources

Because of the similarity of this action and no waste removal and closure, the discussion presented in Section F.10.4.2 is applicable here. Waste removal would reduce any impacts of biological accumulation. TE

Endangered Species

No impacts to endangered species are expected from this action. Endangered species are sufficiently distant from the sites to prevent their being disturbed by human activities. TE

Wetlands

Because of the distances from the sites, wetland habitats should not be affected by closure activities. Sedimentation and erosion control procedures would prevent potential disturbance to wetlands.

F.11 ASSESSMENT OF ACTIONS AT MISCELLANEOUS AREA WASTE SITES

This section assesses two waste sites, the SRL oil test site and the gunsite 720 rubble pit, which are not within the boundaries of the 10 geographic groupings described in the previous sections. The SRL oil test site is south of Road 3, a short distance from CS-Area (see Figure F-8). The gunsite 720 rubble pit is west of Road A, about 10 kilometers south of A-Area and 5 kilometers north of D-Area.

F.11.1 SRL OIL TEST SITE, BUILDING 080-16G*

F.11.1.1 Assessment of No Action (No Removal of Waste and No Remedial or Closure Actions)

Description of Action

Under no action, the site would be left as it is, but four groundwater monitoring wells would be installed (one upgradient and three downgradient). The wells would be monitored quarterly for 1 year and then annually for the next 29 years. Well identification and site identification markers would be TE

*The reference source for the information in this section is Johnson, Pickett, and Bledsoe, 1987.

TE | installed and maintained. Otherwise, the site would be allowed to return to its natural state. Site maintenance would be continued for the entire 30-year period.

Comparison of Expected Environmental Releases with Applicable Standards

Estimates of the environmental impact and health risks associated with the SRL oil test site were not determined because chemical constituents at the site did not exceed the selection criteria.

Potential Impacts (Other Than Releases)

Aquatic Resources

Although groundwater monitoring has not been conducted (Table F-35), impacts of no action to the aquatic ecosystem are not likely to occur as a result of groundwater outcropping to a stream, since vertical migration of oil through the soil was found to be minimal. Because vegetative growth on the site is sparse, small quantities of oil could reach a nearby branch of Four Mile Creek due to erosion; however, it is unlikely that any significant impacts to the stream would occur. PATHRAE modeling was not conducted for the SRP oil test site.

Terrestrial Resources

TC | Currently, the site is sparsely covered with grasses and weeds. It is likely that vegetative cover would remain sparse under no action. The total uptake of wastes by vegetation is possible.

Endangered Species

TE | As noted in Table F-35, no endangered species have been sighted in the vicinity of the oil test site, and habitats in the vicinity are not suitable for such species. Therefore, impacts to endangered species are unlikely for this action.

Wetlands

Depending upon local topography, erosion could carry waste materials to wetlands during storms; however, considering the distances involved (see Table F-35), impacts would not likely be significant.

F.11.1.2 Assessment of No Removal of Waste and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

TE | Under the no-waste-removal-and-closure action, the contaminated soils would not be removed; however, a low-permeability cap would be installed. It is assumed that the area of the cap would cover only the SRL oil test plots, about 6400 square meters. Four groundwater monitoring wells would be installed (one upgradient and three downgradient). The wells would be sampled and analyzed quarterly for 1 year, then annually for the next 29 years. Site and well identification markers would be installed and maintained. Vegetation

on top of the cap would be cut periodically to prevent the establishment of any deep-rooted species. Site maintenance would be continued for the entire 30-year period.

Comparison of Expected Environmental Releases with Applicable Standards

As stated before, chemical constituents were not identified for this waste site, and expected environmental releases could not be estimated. However, the installation of a low-permeability cap would reduce the possibility of environmental releases.

Potential Impacts (Other Than Releases)

Aquatic Resources

Impacts on aquatic ecosystems should not occur, because hydrocarbon vertical migration is minimal and a cap and revegetation would prevent transport of wastes to nearby surface waters by erosion. During placement of the cap, appropriate erosion control measures should be used to minimize possible sedimentation of surface waters.

Terrestrial Resources

TC Impacts on terrestrial ecosystems would be beneficial, because the placement of a cap and mowing of vegetation would prevent the uptake of wastes by plants. This action could result in certain short-term adverse impacts such as displacement of wildlife due to noise and other human disturbances.

Endangered Species

Endangered species should not be affected by no waste removal and closure (see Section F.11.1.1).

Wetlands

Wetlands should not be affected. The wastes would be buried under a cap, the revegetation of which would reduce the transport of wastes due to erosion. During placement of the cap, appropriate erosion control measures would have to be implemented to prevent sedimentation.

F.11.1.3 Assessment of Removal of Waste to the Extent Practicable, and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

TE Under the waste removal and closure action, contaminated soil would be excavated and removed to the SRP sanitary landfill. The soil volume to be excavated would be approximately 140 cubic meters (3.7 meters x 10.7 meters x 0.30 meter deep x 12 plots). The depth of soil excavation was chosen to be 0.3 meter because no hydrocarbon contamination was detected below that depth.

TC The site would be backfilled, graded, seeded to prevent erosion, and then allowed to return to its natural state. A low-permeability cap would not be installed. No signs or upkeep would be required. No groundwater monitoring

wells would be installed, because the soil characterization testing indicated no movement of any materials at soil depths below 0.3 meters. TC

Comparison of Expected Environmental Releases with Applicable Standards

As for the other actions, no chemical constituents of concern were identified for this waste site and no environmental releases were estimated. However, removal of the wastes and contaminated soils could reduce the possibility of future environmental releases.

Potential Impacts (Other Than Releases)

Aquatic Resources

Since wastes would be removed, long-term impacts on aquatic ecosystems would not occur. Temporary construction-related impacts and mitigation measures would be similar to those discussed in Section F.11.1.2.

Terrestrial Resources

Since wastes would be removed and a cap would not be installed, vegetation could be allowed to return to its natural state. This would permit a wider variety of wildlife to inhabit the site than under no waste removal and closure and prevent the possible contamination that would occur under no action. Temporary disturbances from waste removal, backfilling, and grading activities would be similar to those discussed in Section F.11.1.2.

Endangered Species and Wetlands

Endangered species and wetlands should not be affected by this action. TE

F.11.2 GUNSITE 720 RUBBLE PIT, BUILDING N80,000, E27.350*

F.11.2.1 Assessment of No Action (No Removal of Waste and No Remedial or Closure Actions)

Description of Action

Under no action, the drums would remain in their present location. Four groundwater monitoring wells would be installed and monitored quarterly for 1 year then annually for the next 29 years. Site maintenance would be continued for the entire 30-year period. TC

Comparison of Expected Environmental Releases with Applicable Standards

Estimates of the environmental releases associated with the gunsite 720 rubble pit were not determined because chemical constituents at the site did not exceed the selection criteria.

*The reference source of the information in this section is Huber and Bledsoe, 1987b.

Potential Impacts (Other Than Releases)

Aquatic Resources

Aquatic impacts, if they were to occur, would involve Upper Three Runs Creek, since this stream receives both groundwater and surface-water flow from the site. However, there is no indication of aquatic impacts, based on data at the site.

Terrestrial Resources

Terrestrial effects associated with no action for the Gun Site 720 rubble pit include a potential for uptake of contaminants in the drums by the vegetation growing at or near the waste site. Also, wildlife could come into contact with wastes.

Endangered Species

As noted in Table F-35, no endangered species or critical habitats have been identified in the vicinity of the waste site. However, American alligators have been reported in Upper Three Runs Creek, approximately 600 meters south of the site, and bald eagles have been sighted flying over the general site area. Because of the distances involved, it is unlikely that alligators would be adversely affected by no action.

Wetlands

Wetland communities found within 200 and 1000 meters of the gunsite 720 rubble pit are given in Table F-35. The only wetland type present within this radius is bottomland hardwood forest. No adverse impacts are expected, based on available information.

F.11.2.2 Assessment of No Removal of Waste and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

TC
TE

Under the no-waste-removal-and-closure action, remaining liquids in the drums would be stabilized with cement, bentonite, or another appropriate substance, and the drums would be buried. The excavated area would then be backfilled to grade and seeded. Four groundwater monitoring wells would be installed and monitored quarterly for 1 year, then annually for the next 29 years. Site maintenance would be continued for the entire 30-year period.

Comparison of Expected Environmental Releases with Applicable Standards

Chemical constituents have not been identified for this waste site, and environmental releases have not been established. Additional studies are needed to determine whether stabilization of the drummed waste would eliminate possible future environmental releases.

Potential Impacts (Other Than Releases)

Aquatic Resources

As noted in Section F.11.2.1, no aquatic impacts are expected, based on data at the site. Stabilization of the contents of the drums and their subsequent burial would eliminate the surface transport of wastes to Upper Three Runs Creek and lessen groundwater transport.

Terrestrial Resources

This action should eliminate the potential for direct contact of wildlife with the wastes at the site. During burial, refilling, and grading of the stabilized waste drums, noise and construction activities could cause temporary displacement of wildlife. TE

Endangered Species and Wetlands

The discussion in Section F.11.2.1 is generally applicable to this closure action. Closure activities could temporarily discourage eagles from flying over the area. TE

F.11.2.3 Assessment of Removal of Waste to the Extent Practicable, and Implementation of Cost-Effective Remedial and Closure Actions as Required

Description of Action

Under the waste removal and closure action, any drums found during excavation would be removed and transported to a waste storage/disposal facility. Approximately 35 cubic meters of soil located around the buried drums would also be excavated and taken to the same facility. Soil cores would be collected from the bottom of the excavation to determine if any contaminants are present. If no contamination is detected, no groundwater monitoring wells would be installed, and the site would be backfilled to grade and seeded. If contaminants are detected, four groundwater monitoring wells would be installed and monitored quarterly for the first year, then annually for the next 29 years. Site maintenance would be continued for the entire 30-year period. TC

Comparison of Expected Environmental Releases with Applicable Standards

As in the other actions, no chemical constituents of concern were identified for this waste site; therefore, no environmental releases were estimated. However, removal of the waste and backfilling the basin could reduce the possibility of environmental releases.

Potential Impacts (Other Than Releases)

Aquatic Resources

This action would offer the best protection against contamination for Upper Three Runs Creek. TE

Terrestrial Resources

Removal of waste drums and soil followed by regrading and revegetation of the site would reduce the potential for contaminant exposure to terrestrial species. Noise and construction activities would cause temporary disturbance to wildlife.

Endangered Species

The discussion presented in Section F.11.2.1 is applicable to this section as well.

Wetlands

Removal of drums and contaminated soil would prevent any possible contamination to wetlands. Operations associated with cleanup of the site would be conducted to minimize erosion and sedimentation.