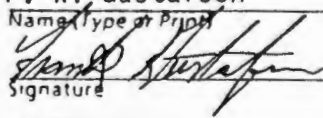


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7. Abstract

This engineering plan is an evaluation of alternatives identified for the removal or interim stabilization of radiological surface contamination discovered during implementation of the 300-FF-1 remedial investigation. Also included is the program management plan for implementing the preferred alternative.

The results conclude that two alternatives will be implemented due to the large number of contaminated sites and the diverse characteristics associated with these sites. The chosen alternatives call for the stabilization of two large areas using clean fill as the stabilizing medium and, for the removal of the remaining contaminated areas, using a high-efficiency particulate air filtered vacuum system.

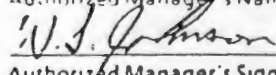


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1.0 INTRODUCTION

1.1 BACKGROUND

A surface radiation survey was conducted in the 300-FF-1 operable unit which is located in the southeast portion of the Hanford Site, just north of the 300 Area. The survey was completed as part of the remedial investigation (RI) being conducted via the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 process. The radiation survey identified 77 areas that exhibited surface radiological contamination. Seven of these areas were successfully removed when identified.

The results of this survey were presented to the U.S. Environmental Protection Agency (EPA), the lead regulatory agency for the 300-FF-1 operable unit as defined by the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989), the Washington Department of Ecology (Ecology), and the U.S. Department of Energy (DOE). It was requested by these agencies that the Westinghouse Hanford Company (Westinghouse Hanford) take interim measures to remove/stabilize these radiological areas in an attempt to minimize and control the spread of the contamination until a final remediation method is determined.

This engineering plan documents the process used in selecting alternatives to be taken in removing/stabilizing the radiologically contaminated areas located in the 300-FF-1 operable unit. The implementation process and project management plan for performing the removal/stabilization activities were also developed and are included in this engineering plan. This plan requires concurrence by the EPA, DOE, and Ecology.

1.2 PURPOSE

The purpose of this plan is to describe alternatives that can be used to eliminate, reduce, or control risks to human health and the environment posed by the radiological surface contamination located outside of facility boundaries in the 300-FF-1 operable unit.

1.3 SCOPE

This engineering plan addresses alternatives for removing/interim stabilization of radiological surface contamination areas identified during implementation of Phase I RI activities in the 300-FF-1 operable unit. A total of 77 of these areas were identified, with the contaminated material present ranging from soils to laboratory waste. Additional surface contamination was identified during a separate radiation survey south of the process ponds. The source of this additional contamination was from swallows dropping mud from the process trenches they were using to build nests in various locations in the 300 Area. Screens have since been installed over the process trenches to minimize access to the contaminants by the swallows.

Four alternatives were considered for implementation as part of this activity. These alternatives include: (1) the "no-action" alternative, which is taking no action to mitigate the risk associated with the radiological contamination until the final remedial action is implemented; (2) barricading or installing barriers to control access to the areas containing surface contamination; (3) small scale removal of the contamination from the ground surface; and, (4) use of agents for interim stabilization to prevent the migration of the contamination to other areas.

Large scale removal alternatives, e.g., front-end loaders and haul trucks, were not considered because of the large volumes of contaminated material associated with some of the areas, such as the scrapings disposal area. Disposal of this material would not be prudent as the final remedial actions may allow for much more economical methods of treating the material. This treatment may include a soil washing system capable of concentrating the contaminants, thereby reducing the volume of material requiring disposal.

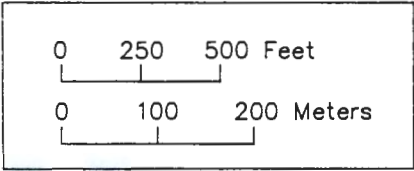
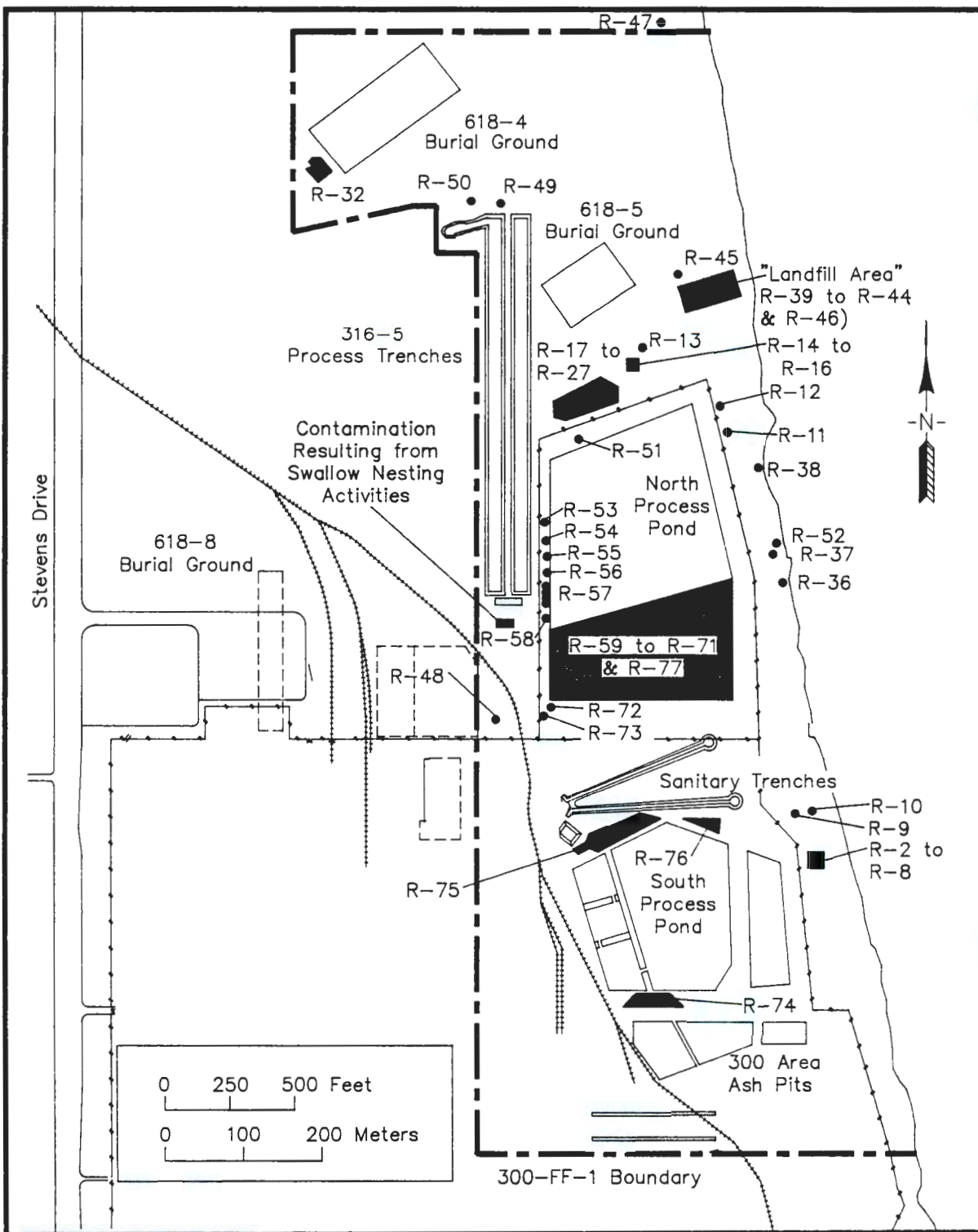
All activities are to be conducted in a manner that will not impede or adversely impact, to the extent possible, activities currently scheduled in the *Remedial Investigation/Feasibility Study Work Plan for the 300-FF-1 Operable Unit, Hanford Site, Richland Washington* (DOE-RL 1990), which was approved by the EPA in June of 1990. The interim action chosen for implementation shall also compliment (to the extent possible) the expected final remedial action to be implemented at the operable unit.

2.0 DESCRIPTIONS OF RADIOLOGICAL SURFACE CONTAMINATION AREAS

A surface radiation survey was conducted as part of the RI for the 300-FF-1 operable unit. The radiological surveys were conducted primarily using portable Geiger-Muller, beta/gamma detectors. Areas within existing facility boundaries, such as burial grounds routinely surveyed, were not surveyed as part of this task. This survey located 77 areas exhibiting radiation levels above a statistically calculated background of 100 counts per minute beta/gamma (EMO 1990).

Figure 2-1 shows the areas surveyed and locations of areas exhibiting elevated radiation levels. Seven of the areas (R-1, R-29, R-30, R-31, R-33, R-34, and R-35) were successfully removed using shovels at the time they were identified. The remaining 70 surface contamination areas considered by this engineering plan were assigned to groups according to their proximity to waste disposal facilities located in the operable unit. If there was no apparent association to a facility, the contaminated areas were assigned to a "non-facility associated" group. Table 2-1 summarizes results of this assignment process. A description of the contaminated areas associated with each of the facilities is provided. Specific information on each area is included as Appendix A. Descriptions were obtained from *Final Report: Surface Radiation Survey for the Phase I Remedial Investigation of the 300-FF-1 Operable Unit on the Hanford Site* (EMO 1990).

Figure 2-1. Areas Exhibiting Radiological Surface Contamination.



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Table 2-1. Grouping of Contaminated Areas.

Facility Name	No. of Associated Contamination Areas	Contamination Media
Burial Ground #4 (618-4)	1	Soil
North Process Pond	44	Soil
South Process Pond	12	Soil
"Landfill Area"	8	Ceramic Disks, Glass, Metal, Pipe, Soil, and Tumbleweed
Nonfacility Associated	5	Feces, Metal and Soil

The radiological contamination discovered was primarily associated with soil; however, some contaminated metal and other materials were also found. Analyses of samples from selected locations showed that the radiation levels were caused predominately by uranium. Some of the soil samples also contained elevated concentrations of copper. There does not appear to be a linear relationship between the concentrations of copper and uranium. Results of this sampling effort are contained in Table 2-2.

2.1 BURIAL GROUND #4

Seven locations above background were found near Burial Ground #4, six near the entrance and one outside the north fence. The radiological contamination at six of these sites was metal pieces (no soil contamination was noted). The metal pieces were picked up and placed in a "lard can" (similar to a paint can) and stored within the fenced area of Burial Ground #4. The contaminated metal pieces are thought to be the aluminum end plugs or other material from uranium fuel cladding operations.

The soil-contaminated area, R-32, exhibited the highest level of radiation at 50,000 counts per minute beta/gamma. Other surface debris not exhibiting radiological contamination was located in the vicinity of R-32. A geophysical survey conducted over the burial ground indicates that although the boundaries of the burial ground are located within the fenced boundaries, it is possible that additional disposal activities may have occurred outside the marked burial grounds.

Table 2-2. Analytical Results from Samples Collected During Surface Radiation Survey Activities.

Location Sampled	Sample Type	²³⁸ U, pCi/g	²³⁴ U, pCi/g	Copper, p/m	Selenium, p/m	Lead, p/m	Arsenic, p/m	Uranium, p/m	⁹⁰ Sr, pCi/g
R-1	Soil	22.8	<3	180.6 ± 9.7	0.90 ± 0.43	19.5 ± 1.6	4.30 ± 0.74	680 ± 48	732 ± 74
R-2	Soil	102.0	4.93	85.0 ± 5.0	<0.95	31.2 ± 2.5	7.2 ± 1.2	517 ± 36	0.23 ± 0.06
R-6	Soil	153.0	6.54	123.6 ± 6.8	<0.94	37.9 ± 2.6	5.9 ± 1.1	706 ± 50	0.39 ± 0.7
R-8	Soil	112.0	4.23	114.8 ± 6.4	<0.93	33.5 ± 2.4	5.7 ± 1.1	502 ± 35	0.27 ± 0.0
R-9	Soil	101.0	6.34	1,005 ± 51	<0.91	25.9 ± 2.1	5.2 ± 1.1	492 ± 35	0.27 ± 0.06
R-10	Soil	165.0	13.10	5,650 ± 280	<1.0	79.3 ± 4.6	2.8 ± 1.4	674 ± 47	0.39 ± 0.06
R-11	Soil	197.0	7.99	110.0 ± 6.1	<0.04	16.4 ± 1.6	3.16 ± 0.81	486 ± 34	<0.06
R-12	Soil	63.1	3.50	73.3 ± 4.3	<0.80	15.5 ± 1.6	1.63 ± 0.76	185 ± 13	0.14 ± 0.06
R-13	Soil	21.5	<3	34.0 ± 2.4	<0.81	16.1 ± 1.6	2.20 ± 0.75	169 ± 12	<0.06
R-14	Soil	77.2	4.12	43.0 ± 2.9	<0.82	24.3 ± 1.9	1.64 ± 0.84	226 ± 16	0.20 ± 0.06
R-15	Soil	75.8	3.49	34.9 ± 2.5	<0.79	23.9 ± 1.8	1.80 ± 0.78	155 ± 11	0.14 ± 0.06
R-16	Soil	119.0	6.10	28.9 ± 2.2	<0.83	21.4 ± 1.8	1.60 ± 0.79	153 ± 11	0.54 ± 0.09
R-17	Soil	61.8	3.20	29.3 ± 2.3	<0.84	18.8 ± 1.7	2.97 ± 0.85	147 ± 10	<0.05
R-19	Soil	61.4	<3	39.5 ± 2.8	<0.79	24.4 ± 1.9	3.04 ± 0.86	182 ± 13	0.12 ± 0.04
R-20	Soil	60.4	3.20	35.5 ± 2.8	<0.83	22.3 ± 1.8	2.28 ± 0.85	140 ± 10	<0.05
R-23	Soil	289.0	18.20	4,420 ± 220	<1.0	76.2 ± 4.4	<2.4	1,115 ± 78	0.23 ± 0.06
R-26	Soil	46.5	2.68	144.2 ± 7.9	<0.87	26.9 ± 2.1	4.19 ± 0.94	219 ± 16	0.14 ± 0.05
R-27	Soil	45.1	2.52	60.9 ± 3.7	<0.84	21.0 ± 1.8	3.45 ± 0.86	171 ± 12	<0.07
R-28	Metal	18,800.0	843.00	N/A	N/A	N/A	N/A	N/A	N/A
R-32	Soil	4,410.0	23.80	38.9 ± 2.8	<0.99	58.9 ± 3.5	2.3 ± 1.1	18,500 ± 1,300	N/A
R-38	Soil	90.9	5.33	77.7 ± 4.7	<0.91	78.5 ± 4.5	2.9 ± 1.2	1,322 ± 93	N/A

N/A = Not analyzed for.

2.2 NORTH PROCESS POND

Forty-four areas exhibiting surface soil contamination above background radiation levels were found near the North Process Pond. Most of the areas were only moderately above background with activity levels measuring between 200 and 400 counts per minute beta/gamma. Exceptions include R-11 (200 to 1,000 counts per minute), R-12 (200 to 900 counts per minute), R-38 (14,000 counts per minute), R-51 (800 to 1,000 counts per minute), R-57 (800 counts per minute maximum), and a very small portion of R-77 (a mud dauber nest; 1,500 to 3,000 counts per minute). The mud dauber nest is located under some old plywood a few feet north of R68.

The largest of the areas, R-77, includes the "scrapings disposal area" which received material dredged from the North Process Pond and then covered with coal flyash. The area was posted in two distinctive sections: The western one-third was posted as a "Radiation Zone" and the remaining two-thirds was posted as an "Underground Radiation Zone". The area defined by the signs was not surveyed entirely since it was suspected to be contaminated by the scrapings. Instead, just the perimeter and several longitudinal transects were made across the area to verify and define the boundary of the area. Locations R-59 to R-71 are found on or adjacent to the south perimeter road around the pond. These areas are located within the area posted as R-77.

2.3 SOUTH PROCESS POND

The radiation survey identified 13 areas exhibiting surface soil contamination in the vicinity of the South Process Pond. The source of this contamination may have come from a pond overflow and dike failure, both of which occurred in the 1940's.

Location R-1 was the only place where the soil contamination was removed. Locations R-2 through R-9 underwent preliminary investigations by Westinghouse Hanford Inactive Facilities Surveillance and Maintenance personnel to determine whether the contamination at these locations could be easily removed. The contamination was found to extend greater than 6 in. beneath the ground surface. No further efforts were made to remove the contaminated soil. The contaminated material removed during the excavations were placed in lard cans and are being stored inside the fenced area of Burial Ground #4.

Location R-75 is located over a roadway leading to the west side of the pond. The contamination is from the decontamination activities associated with heavy equipment used in the excavation of trenches located in the pond bottom.

2.4 LANDFILL AREA

The contamination identified at locations R-39 through R-46 appears to be associated with wastes buried in an undesignated landfill area. (Aerial photos from 1948 to present show what appears to be excavated trenches used at various times in this area.) Some of the wastes appear to have originated from a laboratory. Among the nonradioactive material visible on the ground

surface are empty acid and mercury bottles, ceramics, glassware, metal, and a partially buried drum.

Materials exhibiting radiological contamination include soil, tumbleweed, pipes, ceramics, glass, and small amounts of a yellow material that resembles "yellow cake" (a complex uranium compound, produced by chemically refining natural uranium). Location R-40, which ranged from 350 to 25,000 counts per minute, had the highest reading of these areas.

Location R-45, which lies slightly northwest of where the landfill trenches are believed to be, is a small mound with debris on top. The contaminated material includes soils and ceramics. It is suspected that other solid wastes may be located within the mound.

Figures 2-2, 2-3, and 2-4 show examples of areas of radiological surface contamination associated with the burial trenches and the proximity of the Columbia River.

2.5 NONFACILITY ASSOCIATED CONTAMINATION

The radiological survey identified four areas (R-47 through R-50) of contamination with no apparent association to any of the waste disposal facilities in the 300-FF-1 operable unit. Location R-47, in the center of a dirt road, is located approximately 80 ft north of the northern boundary of the operable unit. A potential source of this contamination could not be determined. The potential source of the contamination at R-48 could include windblown material from Burial Grounds #2 and #3 (located due west of the contaminated area) or mud droppings associated with swallow nesting activities.

An additional surface contamination area caused by the swallow nesting activities was found south of the process trenches during a separate radiological survey. Swallows were using contaminated sediments from the 316-5 Process Trenches in their nest building activities. The use of these sediments was minimized by the installation of screens over the trenches in 1990. An expedited response action is planned for early 1991 in which the contaminated material located in these trenches will be excavated and placed in either inactive portions of the trenches or in the North Process Pond, further minimizing the problems associated with swallow nesting activities.

Figure 2-2. Undesignated Landfill Area Containing Noncontaminated Surface Debris.





Figure 2-3. Undesignated Landfill Area Containing Radiological Surface Contamination.

Figure 2-4. Undesignated Landfill Area Containing Radiological Surface Contamination Zone.



3.0 DESCRIPTION OF ALTERNATIVES

Four categories of alternatives have been considered as part of this activity. They include the no-action alternative, barricading/posting of the contaminated areas, contaminant removal, and stabilization activities. It is not within the scope of this engineering plan to establish final cleanup standards, only to mitigate the environmental hazards due to the radiological surface contamination until such time as normal RI/FS activities develop and implement the final cleanup strategy.

The following requirements must be met before implementing any of the alternatives with the exception of the no-action alternative.

- A Hazardous Waste Operations Permit (HWOP) shall be completed to address potential radioactive and hazardous material exposures and provide guidance for the mitigation of these hazards. The permit will also address the specific health and safety concerns associated with each of the alternatives to be implemented.
- A radiation work permit (RWP) shall be completed to address personnel exposure monitoring and protective clothing requirements for entry into radiation areas.
- A decommissioning work plan (DWP) will be prepared which provides the specific alternative implementation guidance.
- A safety assessment of the possible hazards associated with the proposed activities will be conducted.

Additional alternative-specific requirements are identified in the following sections that provide detailed information on each of the alternatives.

3.1 NO-ACTION

The no-action alternative would require no additional effort in attempting to immobilize the contaminants in the environment. Activities at the surface contamination areas would be deferred until final remediation, as chosen by the RI/FS process, is implemented. Implementation of the final remediation will most likely not occur within the next 5 years. It is possible that the contamination presently identified will have migrated to clean areas and possibly offsite before the initiation of final remediation.

3.2 BARRICADING/POSTING OF CONTAMINATED AREAS

Each of the surface contamination areas are presently chained off and posted in accordance with established Westinghouse Hanford procedures (WHC 1988a, Section 7). The surface contamination areas are located within a controlled access area with appropriate barricading and posting located at the entrance points. Additional posting along the Columbia River designates the area as a hazardous waste investigation site and restricts people from entering.

It is believed that any additional barricading and posting at each of the sites would not provide a measurable benefit and be a waste of resources. Persons entering the area as it presently exists would have to ignore multiple warning signs and cross through the chain barricades to reach the radiological surface contamination areas. Inadvertent entry into these areas is therefore highly unlikely.

The only exception would be in the vicinity of the landfill area described in Section 2.4. The installation of a 7-ft, chain-link fence around the landfill area trenches would be prudent because of the potential hazards associated with the possible subsidence of the ground surface and exposure of buried objects contained in the trenches. Prior to installation of the fence, the boundaries of the trenches must be identified to ensure the entire area is contained by the fence. This will be accomplished through the use of accepted geophysical methods (e.g., ground-penetrating radar). If the geophysical methods indicate that this area has been used as a landfill, it must be accurately and permanently marked with concrete posts and be added to the Westinghouse Hanford Waste Information Data System.

An excavation permit must be obtained prior to installing the fence. A cultural resource review of the area must be completed to obtain this permit. If the review determines that the landfill area is archaeologically significant, additional requirements may be necessary. Specific details on estimated costs are provided in Appendix B.

3.3 SMALL-SCALE REMOVAL

The removal alternative would eliminate the migration of radiological surface contamination. If the contaminated material can be removed, the area may again be freely accessible to personnel, possibly eliminating the need for surface radiological contamination posting. The areas where the contaminants have been removed will remain marked with identification posts as further investigations in these areas may be required by RI/FS activities. Removal of the contaminants will eliminate the possibility of the contamination spreading to other noncontaminated areas. Since the contamination has been removed from the site, no future maintenance activities will be necessary.

No adverse impacts to the final remediation activities within the 300-FF-1 operable unit are anticipated due to the limited scale of the removal activities proposed. In most cases, these removal activities will be limited to contamination found no deeper than 12 in. If it becomes apparent that the extent of contamination is greater than anticipated or beyond removal capabilities, work will be halted pending further evaluation. The removal activity at an area will be considered complete when radiation levels no longer exceed the 100 counts per minute background reading for the area using a portable Geiger-Muller beta/gamma radiation detector equipped with a model P-11 probe (P-11 is a trade name of the Eberline Instrument Corporation, Santa Fe, New Mexico). This instrumentation was used to locate the surface contamination areas in the original survey. Information obtained from the removal activities, including copies of the field logbooks and waste designation results, will be made available as supplemental information to the ongoing 300-FF-1 RI/FS.

Contaminated material that is removed will be handled in accordance with established Westinghouse Hanford procedures. Based on the results of the initial radiation survey and analytical results, the contaminated materials are considered to be low-level radioactive waste and will be appropriately containerized and temporarily stored in one of the 300-FF-1 burial grounds. The waste will then be designated in accordance with the environmental investigations instruction (EII) 4.2 "Interim Control of Unknown, Suspected Hazardous and Mixed Waste" (WHC 1988b). This will determine if hazardous materials are present in excess of their respective minimum concentration limits. Upon being designated, the waste will be disposed of in accordance with *Hanford Site Radioactive Solid Waste Acceptance Criteria* (WHC 1990).

Performing these removal activities will require obtaining an RWP, an HWOP, and an excavation permit with associated cultural resource review. The excavation permit is only applicable to excavations over 12 in. in depth, but will be obtained for those instances where removal could possibly exceed the 12-in. depth.

3.3.1 Manual Removal

Manual removal of low-level radiological surface contamination has been accomplished in the past using small-scale excavation equipment. Hand tools, including shovels and pick axes, are used to remove the contamination, placing it in certified U.S. Department of Transportation waste drums. Small amounts of fugitive dusts are typically generated during these removal activities. For this reason, the contaminated material may be wetted with a portable hand sprayer after being located by a Health Physics Technician (HPT). When performed within its capabilities, manual removal of radiological surface contamination has proven to be very effective.

The manual removal alternative is capable of removing all the types of materials expected to be encountered. This includes the laboratory and construction debris located on the surface of the "landfill area". Manual removals such as this are best suited to small areas of surface contamination, typically areas less than 50 ft² and to a depth of 12 in.

Manpower requirements for performing the manual removal alternative are dependent on how quickly the activity is completed. Each contaminated area undergoing removal will require two workers from the Decontamination and Decommissioning (D&D) Function to perform the actual removal activities and one HPT to identify the radiological contaminants and verify their removal. The HPT will also monitor the removal process to ensure that only contaminated material is placed into the drum. This is necessary to minimize the amount of wastes generated. A driver will be needed to transport the drums of material that are removed to the chosen onsite storage location. A field team leader (FTL) and a site safety officer (SSO) will also be required to supervise the removal activities and ensure worker safety. If necessary, the FTL and SSO would be able to supervise multiple removal activities in the instance where an expedited schedule is necessary. Specific details on cost estimates are provided in Appendix B.

3.3.2 Vacuum Removal

Contaminated surface soils can be removed using a high efficiency particulate air (HEPA)-filtered vacuum cleaner. The system described here is one that is used by Hanford Restoration Operations personnel for their radiological surface contamination sites. When operated within its capabilities, the system has proven to be very effective. Since the soils picked up are collected directly into a disposal vessel and the exhaust is HEPA filtered, containment is very good and the short term impacts are minimal.

The system consists of a vacuum hose and nozzle connected to a collection drum (55 gal), which is in turn connected to a prefilter/HEPA filter canister (≈ 10 gal), followed by an air-driven (venturi) vacuum unit mounted on another 55-gal drum. The vacuum and collection drums are currently carried in the back of a pickup truck, but can easily be moved to another vehicle. The air to operate the vacuum is provided by a separate compressor which is placed near the location of removal activities or mounted on a trailer and towed behind the pickup truck if movement is required.

The vacuum system will pick up loose, fine to coarse soils with a small amount of rock not larger than a marble. Removal of powdery type material may require frequent cleaning of the prefilter. This system is very good at removing small particles from around larger cobble, such as blow sand. If the contaminated soil is not loose, it can be broken up with hand tools beforehand. The vacuum hose is 1.5 in. in diameter and, while capable of picking up small leaves and seeds, may clog if twigs are picked up.

This system is best suited to relatively small areas, usually $< 500 \text{ ft}^3$. This is also dependent on the depth of the contamination. The vacuum will remove soil as deep as needed; however, large or deep areas will consume larger amounts of manpower.

The distribution of the contamination may favor use of the vacuum in some large areas. If the contamination is present as discrete specks or spots, the vacuum works well at removal and keeps the waste volumes at a minimum. Once set up, soils can be picked up within 15 to 25 ft of the vacuum. The limiting factor is the dropoff in suction associated with the longer hose lengths. The use of shorter length hoses will result in more efficient operation of the system.

The collection drums are normally only filled $2/3$ to $3/4$ full. Above this amount, material will be entrained in the filter canister and result in more frequent cleaning of the prefilter. The pickup truck-mounted configuration can only carry two loaded (650 lb) collection drums; a larger bed truck with pallet-mounted collection drums would facilitate waste handling and storage for the 300-FF-1 operation. Either vehicle will require firm ground for movement.

Manpower requirements for operating the system will depend on which vehicle the system is mounted on and the manner in which the waste drums are handled. In either case, a driver is required to haul the compressor to the work area. Normally, the vacuum operators will tow the compressor within the cleanup site. If the vacuum is mounted on a larger truck, a driver may be required full time to drive that vehicle and to operate the forklift for pallets of loaded drums. With one worker operating the compressor and one

worker operating the nozzle, the vacuuming is performed more efficiently. An HPT must also be in attendance. Personnel operating the compressor or the vacuum should wear hearing protection because of the noise.

An air permit is currently being prepared for using the HEPA-filtered vacuum system on a site-wide basis. Once this permit is obtained, an offsite dose assessment must be performed to ensure that the activity will not result in an offsite exposure of more than 0.1 mrem. It is anticipated (based on the levels exhibited at the surface-contaminated areas) that the offsite exposure will not exceed this 0.1 mrem requirement. If the dose assessment determines that the offsite exposure would exceed 0.1-mrem, further air permitting requirements may have to be met. In either case, notification must be made to the Washington Department of the Interior Park Services of the intention to perform the activity. Specific details on cost estimates are provided in Appendix B.

3.4 SURFACE STABILIZATION

The goal of surface stabilization activities is to reduce or eliminate the potential for the contaminants to migrate. This is accomplished by establishing a physical barrier over the contaminants making them less susceptible to migration.

The stabilization alternatives have the potential to impact future restoration activities within the 300-FF-1 operable unit. The stabilization alternatives are not restricted to areas with contamination extending below the 12-in. level as are the removal alternatives being considered. No sampling activities are necessary for implementing these alternatives and, therefore, no additional site characterization information will be available to the 300-FF-1 RI/FS. However, a copy of the field logbooks documenting the stabilization activities will be provided to the RI coordinator.

Normally, these alternatives do not require the handling of hazardous wastes. However, the removal of contaminated objects and other debris, such as that associated with the "landfill area" trenches, would be prudent. Performing these stabilization alternatives will require obtaining an RWP, an HWOP to identify the necessary health and safety requirements, and a DWP to provide specific implementation information.

3.4.1 Clean Fill

The clean-fill stabilization alternative utilizes clean fill material, obtained from a borrow area or a gravel quarry located on the Hanford Site, to hold contaminants in place by covering them with approximately 12 to 18 in. of noncontaminated material. The clean-fill stabilization alternative has been implemented and proven to be effective on many occasions at the Hanford Site.

The material is brought to the site via haul trucks and dumped on the edge of the area to be stabilized. A dozer, equipped with a push blade, then spreads the material over the contaminated area. Care is taken to ensure that the dozer and haul trucks do not come into direct contact with the contaminated surface. This activity will continue until the surface of the contaminated area is covered to the desired depth.

A nuclear process operator or D&D worker and an HPT must also be available to provide assistance as required (such as removal of the surface debris). After completion of the clean fill stabilization activity, the area is re-posted as an underground radiation area, eliminating the requirements necessary for entering surface radiation zones. This will allow for easier access to the areas by the personnel performing RI/FS activities. Specific details on cost estimates are provided in Appendix B.

3.4.2 Fixative

This alternative provides interim stabilization of the surface contamination using the application of a nonhazardous, natural substance to act as a fixative. A fixative, for the purpose of this description, is a substance that is applied as a liquid and then hardens to act as a protective shell, preventing the erosion and migration of the contaminated material.

There are numerous types of fixatives currently used by industry. Two of these have seen routine use in the state of Washington and are considered herein for their potential use for stabilization of the radiological contaminants. Both of these fixatives are a byproduct of the timber industry and are considered to be equivalent in their ability to fix the contamination.

Lignosite, a product manufactured by the Georgia-Pacific Corporation in Bellingham, Washington, is composed primarily of calcium lignosulfonate which is derived from the lignin that binds cellulose fibers into rigid woody structures associate with trees and higher plants (Appendix C). Lignosite has been used successfully in stabilizing gravel roadways, tailings piles, and as a floatation agent in processing pears.

Enduraseal, a similar type of product manufactured by Entac of Langley British Columbia, is made from naturally occurring resins found in trees (sap), has seen widespread use outside of the Hanford Site for fugitive dust control on road and pathways, the sealing of coal and ash stockpiles, and soil stabilization (Appendix C).

The proper application of these surface fixatives has proven to be effective for confining light soils and dust. The fixative agent acts as a protective barrier, preventing the lateral and vertical movement of surface soils under normal weather conditions. The fixative is applied directly to the surface in a liquid state to ensure uniform application. The thickness of the fixative coating and depth of penetration into the soil is controlled by diluting the fixative with water and varying the volume of liquid applied per unit of surface area. The type of soil influences the amount of liquid required to reach the desired penetration.

The areas to be stabilized are presently classified as radiation areas and will remain as such after stabilization. A valid RWP shall dictate the requirements for entry and exit of the contaminated areas during stabilization activities. Personnel exposure to radiological hazards is anticipated to be low based on the results of the detailed radiation area surveys. No new surface vegetation growth is expected while the fixative is in place.

Prior to application of the fixative, each location must be cleared of debris. All surface materials other than soils, small rocks, and vegetation

must be removed to ensure an even distribution of material directly to the soil surface. The concentrated fixative is diluted with water to formulate a mixture that will ensure adequate penetration into the soil.

For the initial application, the fixative would be diluted to a 1:1 (concentrate and water) mixture and applied directly to the surface at an approximate rate of 0.75 gal/yd². It is estimated that the initial application will penetrate 1 to 2 in. into the soil. Within 24 hr after the initial application, a second application of fixative, diluted to a 1:2 ratio (concentrate and water), would be applied directly to the surface at an approximate rate of 0.5 gal/yd². This second application will result in creating a seal over the penetrated material, providing for thorough stabilization of the surface soils. The application and dilution guidelines may be altered if determined necessary by the FTL.

Westinghouse Hanford equipment can be used to apply the fixative. All hardware necessary to transport and apply the fixative are available onsite. There are currently two tank trucks, each with a 2,200-gal capacity, available to transport the mixture in the field. For the small surface areas (<25 ft²), hand-held, pressurized sprayers can be used to apply the material. The tank trucks will be outfitted with a pump to distribute the material over larger areas.

Westinghouse Hanford personnel will be used to perform the site preparation and application of the fixative material. The collection and removal of surface debris will be performed by two D&D workers and the operation of the tank trucks and spraying equipment will be accomplished by two drivers. Health Physics shall provide an HPT for personnel and equipment surveys during work within the radiation areas. An SSO will provide safety and health monitoring. All personnel will be managed by the FTL, supplied by the Environmental Field Services Group.

All secondary waste (debris) collected prior to the application of the fixative shall be contained in drums by the D&D worker per established Westinghouse Hanford waste handling procedures.

The materials available to be used as a fixative are manufactured from natural materials found in tree resins. The products have been tested and found to contain no hazardous components and are considered to be environmentally safe (see Appendix C for copies of the Material Safety Data Sheets supplied by the manufacturers). Therefore, there are no immediate industrial safety and health concerns from potential exposures from the use of these products.

Under normal weather conditions, the initial application can last for 6 to 10 months and subsequent applications for up to 1 year, depending on traffic over the area. Monthly inspections are recommended during the first year to determine the performance of the fixative material. Inspections after the first year will occur at routine intervals based on the results of the materials performance over the first year. The application of additional material shall be performed by the Operations Support Services drivers from the Solid Waste Handling Unit.

All the surface areas stabilized with fixatives would continue to be classified as surface contamination areas. Existing barriers will provide a

limited access condition for personnel and vehicular traffic. With the absence of surface traffic, the fixative material is expected to perform effectively over a longer period of time.

If the periodic inspections determine that additional application are necessary, the material will be applied in the same manner as the second application in the initial process (e.g., diluted mixture, 1 gal concentrate to 2 gal water, applied at a rate of approximately 0.5 gal/yd²).

Both of the products will degrade with time. Although this means that routine inspections of the stabilized areas and additional applications may be necessary, it also means that the use of these products should have no major impact on the final remedial activities that are chosen for the operable unit. Currently, soil washing alternatives are being considered for implementation as part of the final remedial actions. If this alternative is utilized, a hot water or steam rinsing cycle may be required in the process to effectively degrade the fixatives so the contaminants can be removed.

Since the use of fixatives would be new to the Hanford Site, a procedure governing its use would be required. This procedure will include details for mixing the concentrated material with water, transportation and storage requirements, and on the use of the equipment necessary for proper application of the material. The procedure will also contain the steps for conducting the routine inspections of the stabilized areas.

Specific details on cost estimates are provided in Appendix B.

4.0 EVALUATION METHODOLOGY

4.1 EVALUATION PROCESS

In selecting the alternative to be implemented at each of the radiologically contaminated sites, a two-phase evaluation process was used. This was necessary because not all of the alternatives considered would be implementable at each of the contaminated sites due to the diversity of the site-specific characteristics (primarily the areal extent and expected depths of contamination). For this reason, an initial screening (phase I) was performed which established which alternatives could be effectively implemented at each radiologically contaminated site.

The no-action alternative was eliminated from the evaluation process because it does not control contaminant migration offsite. The risks posed by site contaminants to the public and environment would not be reduced or eliminated. Therefore, selection of the no-action alternative was unacceptable and was not retained for further evaluation.

No further evaluation was conducted for the barricading/posting alternative described in Section 3.2. The installation of barriers in excess of those required would be a waste of resources as well as a hindrance to implementation of RI/FS activities in the area. However, it would be prudent to install a fence around the "landfill area" trenches, as this area may pose

a dangerous situation if substantial subsidence or exposure of the buried material was to occur.

The initially screening considered the implementing constraints associated with areal size and depth of contamination established for each of the alternatives. Table 4-1 summarizes each of these constraints. Alternatives were then assigned to applicable contaminated sites in accordance with these constraints.

Table 4-1. Initial Screening Alternative Selection Constraints.

Limiting Constraints- Alternative!	Areal Size Limitations	Depth
Manual Removal	< 50 ft ²	< 1 ft
HEPA-Filtered Vacuum System	< 500 ft ²	< 1 ft
Stabilization	None	None

The second phase of the evaluation used a set of evaluation criteria to select a preferred alternative for each site. Each criterion was assigned a weighting factor to reflect its relative importance compared to the other criteria. The higher the weighting factor assigned to a given criterion, the more relevant that specific criterion was considered to be. Table 4-2 lists the evaluation criterion chosen and its associated weighing factor.

Table 4-2. Alternative Evaluation Criteria.

EVALUATION CRITERIA	WEIGHTING FACTOR
Effectiveness	3
Protection of Human Health and the Environment	2
Cost	1
Impact on Final ROD	2
Implementability	1

Once the evaluation requirements for each criterion were established, a series of scores was assigned to each alternative in the matrix. The better the alternative performed (when compared with the other alternatives), the higher the score that was assigned. The score assigned to an alternative for a given criterion was then multiplied by the weighting factor, establishing a weighted score. The weighted scores assigned to the alternative were then totaled. This was completed for each alternative. The alternative was then chosen based on these scores. The higher the total score, the better the

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alternative. An alternative was then chosen for each of the contaminated sites based on the combined results of the phased screening process. The alternative that had the highest overall score and was considered to be implementable at a site screening was considered to be the preferred alternative for implementation at that particular contaminated site.

4.2 EVALUATION CRITERIA

This section establishes the criteria used as the basis for determining which of the alternatives (considered to be applicable at a given site) would be implemented at each of the surface-contaminated sites. The evaluation criterion were based on the nine evaluation criteria provided by EPA (EPA 1988, Figure 4-8, pg. 4-25). Due to the interim nature of this activity, the primary concerns for performing the evaluation were effectiveness of the alternative, protection of human health and the environment, cost of performing the alternative, the impact the alternative will have on final remedial action to be taken at the site, and the ease of implementing the alternative. A description of each criterion used to compare the alternatives is provided below.

4.2.1 Effectiveness

This criterion evaluated the effectiveness of the alternative with consideration given to both the short and long terms. Effectiveness compares the potential for reduction in the mobility of the radiological contaminants offered by each of the alternatives. The nature and extent of any future "maintenance" requirements associated with each alternative was also considered. The more effective the alternative would be in reducing the mobility of the contamination, the higher the score it received in comparison with the other alternatives.

4.2.2 Protection of Human Health and the Environment

Each alternative was evaluated for how well it protects human health from adverse impacts during the implementation phase. This includes possible exposure of the radiological contaminants to employees that are implementing the alternative in question as well as the public and surrounding environment. This only considered impacts to the environment from implementing the alternative and is not a measure of the effectiveness of the alternative in immobilizing the radiological contaminants.

4.2.3 Cost

The cost of implementing each alternative in $\$/\text{ft}^2$ of area "treated" was estimated and is provided in Appendix B. These estimates allowed for comparing each of the alternatives on a cost-only basis. The evaluation score assigned to each alternative was determined by allocating a score of 0 to the most costly alternative, a score of 4 to the least costly, and proportional scores for the remaining two, based on the slope of the line formed when the most and least costly alternatives were plotted on an x-y coordinate system.

4.2.4 Impact on RI/FS Final Remedial Action

Interim actions taken to mitigate environmental hazards on a CERCLA site should conform with, to the extent possible, the anticipated final remedial actions to be implemented as part of the RI/FS process. Impacts that each of the alternatives may have on the final remedial actions taken in the 300-FF-1 operable unit must therefore be included in the evaluation process. The evaluation was based on potential response actions identified in the *Remedial Investigation/Feasibility Study Work Plan for the 300-FF-1 Operable Unit, Hanford Site, Richland, Washington* (DOE/RL 1990, Table 42) and from discussions with the 300-FF-1 operable unit RI/FS technical coordinator. The lower the anticipated impact to the final remedial action, the higher the score assigned to the alternative.

4.2.5 Implementability

Various levels of effort must be exerted to properly implement each of the alternatives (without regards to the no-action alternative). This criterion evaluates the implementing requirements for each alternative. The easier the alternative is to implement while meeting these requirements, the higher the score assigned to it.

5.0 ALTERNATIVE EVALUATION

5.1 INITIAL ALTERNATIVE SCREENING PHASE

Following the evaluation methodology established in the preceding section, the initial screening was performed, assigning the alternative applicable for implementation at each of the radiologically contaminated sites. Table 5-1 provides the results of the initial screening phase.

5.2 SECOND ALTERNATIVE SCREENING PHASE

The second phase of the evaluation process was then implemented, assigning scores to each of the alternatives based on the evaluation criteria. The following section provides the basis for assigning these scores with respect to the evaluation criteria.

5.2.1 Effectiveness

The removal alternatives rated the highest among all of the proposed actions in terms of effectiveness. While implementation of the stabilization alternatives will reduce the potential for the contaminants to migrate off-site, the removal alternatives eliminate this risk completely.

Table 5-1. Initial Screening Phase Results.

Location	Surface Area, ft ²	Applicable Alternatives Identified	Location	Surface Area, ft ²	Applicable Alternatives Identified	Location	Surface Area, ft ²	Applicable Alternatives Identified
North Process Pond								
R-51	0.79	A, B, C, D	R-58	16	A, B, C, D	R-53	0.79	A, B, C, D
R-54	50	B, C, D	R-55	0.79	A, B, C, D	R-56	0.79	A, B, C, D
R-57	0.79	C, D	R-62	15	C, D	R-63	0.196	C, D
R-65	0.196	C, D	R-68	224	C, D	R-69	15	C, D
R-59	4,800	C, D	R-60	24	C, D	R-61	0.196	C, D
R-64	0.196	C, D	R-66	0.196	C, D	R-67	0.196	C, D
R-70	6	C, D	R-71	100	C, D	R-77	130,000	C, D
R-72	3.14	A, B, C, D	R-73	3.14	A, B, C, D	R-17	0.2	A, B, C, D
R-18	0.2	A, B, C, D	R-19	3.14	A, B, C, D	R-19	3.14	A, B, C, D
R-20	80	B, C, D	R-21	3.14 ^a	A, B, C, D	R-22	1,963.5 ^a	C, D
R-23	100 ^a	B, C, D	R-24	^a	A, B, C, D	R-24	^a	A, B, C, D
R-26	^a	A, B, C, D	R-27	^a	A, B, C, D	R-13	7.1	A, B, C, D
R-14	0.196	A, B, C, D	R-15	12.6	A, B, C, D	R-16	0.2	A, B, C, D
R-11	3.14	A, B, C, D	R-12	16	A, B, C, D	R-36	9	A, B, C, D
R-37	9	A, B, C, D	R-38	0.196	A, B, C, D	R-52	3.14	A, B, C, D
South Process Pond								
R-2	12.6	A, B, C, D	R-3	12.6	A, B, C, D,	R-4	0.196	A, B, C, D
R-5	0.196	A, B, C, D	R-6	60	B, C, D	R-7	0.5	A, B, C, D
R-8	0.5	A, B, C, D	R-9	54	B, C, D	R-10	0.79	B, C, D
R-74	5,520	C, D	R-75	9,000	C, D	R-76	620	B, C, D
Landfill Area								
R-39	44	C, D	R-40	814	C, D	R-41	252	C, D
R-42	54	C, D	R-43	0.196 ^a	C, D	R-44	0.196	C, D
R-45	192	B, C, D	R-46		C, D			
Nonfacility Associated								
R-47	0.196 ^a	A, B, C, D	R-48	12.5	A, B, C, D	R-49	^a	A, B, C, D
R-50	^a	A, B, C, D	SN	15	A, B, C, D			
Burial Ground #4								
R-32	19.6	A, B, C, D						

^aConsidered to point sources.

A = manual removal

B = HEPA-filtered vacuum removal

C = fixative stabilization

D = clean-fill stabilization

SC = contaminated area associated with swallow nesting activities.

The use of fixatives is new to the Hanford Site, but has seen extensive use in the state of Washington (and the United States) for controlling dusts and stabilizing road surfaces. Clean-fill stabilization, on the other hand, has been implemented at Hanford for controlling the migration of radiological surface contaminants, such as those being considered herein. Routine inspections of the stabilized areas are necessary to properly maintain the radiologically contaminated sites. An attempt will be made to remove surface debris (e.g., trash) prior to the application of the stabilizing medium.

Since the use of clean fill in stabilizing contamination has been proven to be effective at the Hanford Site and provides a more substantial barrier over the contaminants than does the use of fixatives, it is preferred over the fixative stabilization alternative. The results of the effectiveness evaluation are shown in Table 5-2.

Table 5-2. Effectiveness Evaluation Scoring Results

Alternative ▶	Manual Removal	HEPA-Filtered Vacuum Removal	Clean-Fill Stabilization	Fixative Stabilization
Raw Score ▶	4	4	2	1

5.2.2 Protection of Human Health and the Environment

Each alternative, excluding application of fixative materials, has been performed on a routine basis at the Hanford Site. Detailed implementation procedures are followed to ensure that the spread of contaminants is appropriately controlled and are considered to be environmentally acceptable and prudent. Since the application of fixatives would not involve the movement of contaminants, the potential impact to the surrounding environment and offsite receptors is minimal. Consequently, the possible exposure to employees of contaminants is considered to be the most significant impact from implementation of this activity. Impact to the surrounding environment is therefore a secondary consideration by this criterion.

The manual removal alternative would provide for the largest exposure of contaminants to the employees implementing the alternative since the contaminants would be handled by the employees performing the task. The HEPA-filtered vacuum alternative would provide for the next highest exposure to the radiological contaminants. While the vacuum system is used to pick up and handle the bulk of the contaminants, the workers would still be required to pick up much of the contaminated surface debris and, in some cases, loosen the contaminants before removal by the vacuum system. The radiological exposures to employees by the stabilization alternatives are considered to be equal, as neither alternative requires that the contaminants (other than the limited amount of surface debris) be handled by those performing the activity.

Of the alternatives considered, the clean-fill stabilization alternative may generate the largest amount of airborne dust during the excavation and spreading of the clean fill material. The fixative alternative will generate airborne particulates during the application process, but the impact will be

minimal in comparison with the clean-fill stabilization alternative as much better control is possible.

Based on the above information, the fixative stabilization alternative scored the highest with respect to the environmental impact evaluation criterion, followed by the clean-fill stabilization alternative. The removal alternatives scored lower than the stabilization alternatives because of the personnel exposures. Of the two removal alternatives, the HEPA-filtered vacuum activity is preferred because it offers lower personnel exposure levels than does the manual removal alternative. The results of the protection of human health and the environment evaluation are shown in Table 5-3.

Table 5-3. Protection of Human Health and the Environment Evaluation Scoring Results

Alternative ▶	Manual Removal	HEPA-Filtered Vacuum Removal	Clean-Fill Stabilization	Fixative Stabilization
Raw Score ▶	1	2	3	4

5.2.3 Cost

Cost comparisons for the alternatives were made on a \$/ft²-of-area-treated basis. The removal alternatives were by far the most expensive to implement because of the waste designation requirements for disposal of waste. The HEPA-filtered vacuum alternative (\$94/ft²) was the least expensive of the removal alternatives due primarily to the faster removal rates that are possible with the system. The slower removal rates associated with the manual removal alternative are a result of the need to handle waste drums within the radiation areas. This increases the time necessary to set up the operation and to remove the equipment from the zone. The HEPA-filtered vacuum removal alternative does not require that the drums enter the site, leaving them on the truck which also allows for quick transport of the drums between sites and to the burial ground at which the drums will be stored.

The manual removal alternative was given an evaluation score of 0, indicating it is the most expensive alternative (\$99/ft²) to implement. The clean-fill stabilization alternative was assigned a score of 4, indicating it is the least expensive alternative to implement (\$0.50/ft²). The scores assigned to the remaining two alternatives (vacuum removal at \$94/ft² and fixative stabilization at \$0.80/ft²) are proportional to the costs for the most and least expensive alternatives. The results of the cost evaluation are shown in Table 5-4.

Table 5-4. Cost Evaluation Scoring Results.

Alternative ▶	Manual Removal	HEPA-Filtered Vacuum Removal	Clean-Fill Stabilization	Fixative Stabilization
Score ▶	0	0.2	4	3.99

5.2.4 Impact on RI/FS Final Remedial Action

The removal alternatives will not have an adverse impact on the final remedial alternatives since the contaminated material has been removed and will not have to undergo further remediation. Both of the stabilization alternatives have the potential to impact the final remedial action, however.

The clean-fill stabilization alternative will inhibit access to the buried contaminants and the fill material may have to be treated because of its contact with the radiological contaminants. The fixative stabilization alternative will fix the contaminants to noncontaminated materials forming a crust on the surface which will also have to be treated.

A soil washing process is considered to be one of the most promising remedial technologies for implementation in the 300-FF-1 operable unit at this time. The goal of the soil washing process is to separate the contaminants in the soils from the noncontaminated portion. While the clean-fill stabilization alternative will increase the volume of material to be treated, this volume is considered to be an insignificant increase compared with the overall volume to be treated. Currently, an estimated 2,200,000 yd³ of material in the 300 Area may undergo soil washing. The clean-fill stabilization process will only add an approximate 3,000 yd³ of material that may require treatment. This represents an increase of <1% in the total volume of material requiring treatment by soil washing or other remedial alternative. While the fixative alternative will not increase the overall volume to be treated, an additional hot water or steam process may be necessary in conjunction with the soil washing processes to degrade the fixative material and release contaminants from the noncontaminated portion.

Based on this information, the removal alternatives were considered to be the preferred remedial actions. Clean-fill stabilization was the next preferred alternative followed by fixative stabilization. The results of the impact on final record of decision evaluation are shown in Table 5-5.

Table 5-5. Impact on Final Record of Decision Evaluation Scoring Results

Alternative ▶	Manual Removal	HEPA-Filtered Vacuum Removal	Clean-Fill Stabilization	Fixative Stabilization
Raw Score ▶	4	4	3	1

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5.2.5 Implementability

The manual removal alternative will be the easiest to perform of those considered. The most time-consuming portion of this task will be the waste designation process, which is a task that must be completed as part of all the alternatives. The HEPA-filtered vacuum removal alternative will be the next easiest task to implement. This alternative will require an offsite exposure modeling effort prior to implementation to ensure that the total offsite dose does not exceed the 0.1 mrem level, which would require additional air permitting requirements. It is not anticipated, but if the offsite exposure as determined by the modeling task does exceed this level, further evaluation should be conducted to ensure that implementing this alternative is still prudent.

Implementing the clean-fill stabilization alternative will require a substantial amount of upfront planning but is still considered to be more implementable in comparison with the fixative stabilization alternative because it has been a routine activity on the Hanford Site. The fixative stabilization alternative will require the development of application procedures which must be approved prior to performing the activity. The results of the implementability evaluation are provided in Table 5-6.

Table 5-6. Implementability Evaluation Scoring Results

Alternative ▶	Manual Removal	HEPA-Filtered Vacuum Removal	Clean-Fill Stabilization	Fixative Stabilization
Raw Score ▶	4	3	2	1

5.3 PREFERRED ALTERNATIVE SELECTION

After assigning the alternative evaluation scores in each matrix, the scores were summed. The completed evaluation matrix is provided in Table 5-7.

Next, the preferred alternative for each site was chosen. The alternative assigned to each of the sites in the phase I evaluation that exhibited the highest total score in the evaluation matrix was considered to be the preferred alternative for that site based on the generic information about each of the sites. The results of the preferred alternative selection process are presented in Table 5-8. Figure 5-1 shows the location of each of the contaminated sites and the alternative to be implemented at that location.

Generally, the radiologically contaminated sites which cover more than 500 ft² and/or the expected depth of contamination extends more than 1 ft will be stabilized, with the remainder of the sites being cleaned up via the HEPA-filtered vacuum removal alternative. Several exceptions to this generality occurred primarily due to the location of the contaminants. These areas, and the reasons for performing removal versus stabilization are identified in the following paragraphs.

Table 5-7. Alternative Evaluation Results.

Alternative ▶ Evaluation Criteria ▼	Manual Removal		HEPA Filtered Vacuum Removal		Clean-Fill Stabilization		Fixative Stabilization	
	R.S.	W.S.	R.S.	W.S.	R.S.	W.S.	R.S.	W.S.
Effectiveness (WF = 3)	4	12	4	12	2	6	1	3
Protection of Human Health and the Environment (WF = 2)	1	2	2	4	3	6	4	8
Cost (WF = 1)	0	0	0.2	0.2	4	4	3.99	3.99
Impact on Final ROD (WF = 2)	4	8	4	8	3	6	1	2
Implementability (WR = 1)	4	4	3	3	2	2	1	1
TOTAL	26		27.2		24		17.99	

* R.S. → Raw Score

W.S. → Weighted Score

Two areas, R-75 and R-74, are located on roadways, restricting access to the western side of the South Process Pond and to the inlet portion of the sanitary trenches. For this reason, an attempt to remove the contaminants from these areas will be made utilizing the HEPA-filtered vacuum system. At a minimum, one of these roadways must be opened for unrestricted access. If neither of the areas can be successfully removed, additional measures such as regrading the roadway, pushing the contaminated materials to the side, and then stabilizing the contaminants as necessary with clean fill will be attempted.

An attempt will be made to remove the contaminants from R-57 since this area is also located over a roadway that extends around the perimeter of the North Process Pond. While access through this area is not critical, the removal equipment will be in the vicinity, since other areas selected for removal are located nearby. The removal of R-22 will be attempted as it is contained within the same established radiation area as R-17 through R-21 and R-23 through R-27 which are all candidate sites for performing the contamination removal alternative.

It is recommended that the stabilization activities in the vicinity of the "undesigned burial trenches" treat the entire area above the two northern trenches. This area includes R-39 through R-44 and R-46. It appears that the buried material in these trenches is becoming exposed. Placing clean fill over these trenches will minimize the possibility of contaminated material becoming exposed, prior to implementing the final remedial actions chosen for the operable unit via the CERCLA process.

Only the portion of R-77 that is identified as a surface radiation area will be stabilized (this area is approximately 44,000 ft²). This area includes the contaminated areas R-59 through R-71. This will result in the entire area being posted as an underground radiation zone.

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Table 5-8. Alternatives Selected for Implementation at Each of the Radiological Contamination Sites.

Location	Alternative Selected	Location	Alternative Selected
R-77	D ^a	R-36	B
R-59	D	R-37	B
R-61	D	R-38	B
R-66	D	R-52	B
R-70	D	R-32	B
R-60	D	R-73	B
R-64	D	R-17	B
R-67	D	R-47	B
R-71	D	R-19	B
R-69	D	R-2	B
R-68	D	R-21	B
R-69	D	R-3	B
R-63	D	R-23	B
R-62	D	R-4	B
R-40	D	R-25	B
R-39	D	R-5	B
R-44	D	R-27	B
R-42	D	R-6	B
R-43	D	R-51	B
R-41	D	R-7	B
R-46	D	R-15	B
R-56	B	R-8	B
R-57	B	R-48	B
R-58	B	R-12	B
R-16	B	R-9	B
R-55	B	R-72	B
R-20	B	R-10	B
R-53	B	R-18	B
R-49	B	R-45	B
R-54	B	R-26	B
R-75	B	R-14	B
R-74	B	R-76	B
R-22	B	R-11	B
SN	B	R-50	B
R-13	B	R-24	B

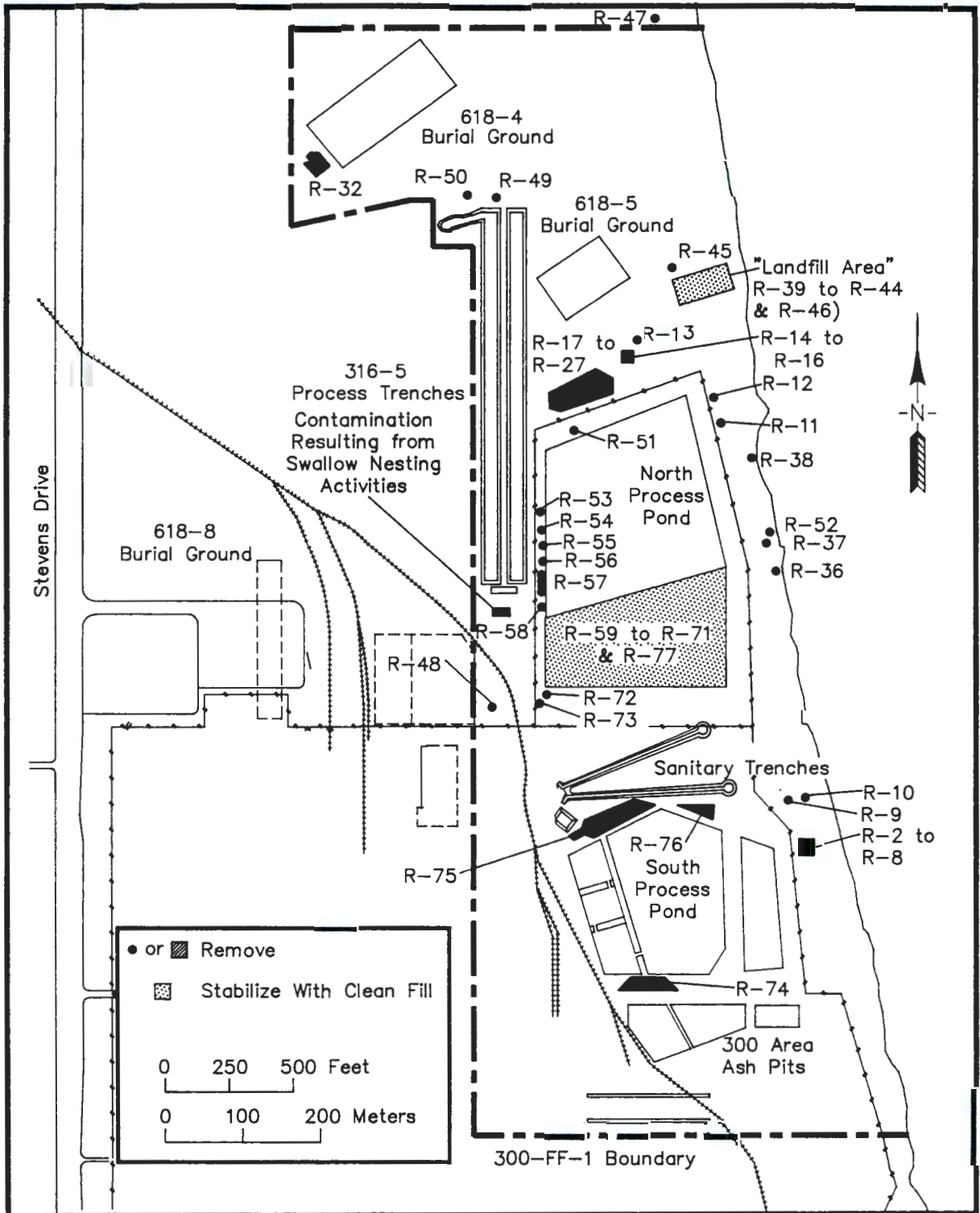
^aOnly western 1/3 requires stabilization.

B = HEPA-filtered vacuum removal

D = clean-fill stabilization

SN = contaminated area associated with swallow nesting.

Figure 5-1. Location of Contaminated Sites and Alternative Selected for Each.



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6.0 ALTERNATIVE IMPLEMENTATION

Based on the results of the alternative evaluation, approximately 19,400 ft² of radiological surface contamination will be removed via the HEPA-filtered vacuum removal alternative. Roughly 74,000 ft² will be stabilized using clean fill. If the extent of contamination is greater than anticipated in areas undergoing removal activities and it is determined to be beyond the capabilities of the HEPA-filtered vacuum removal system, the actions taken at the site should be reconsidered. It may be prudent to stabilize these areas with clean fill.

A routine monitoring program will be required to ensure that the contamination contained in the stabilized areas remains that way. This program could possibly be coordinated with other routine surveys currently conducted at the burial grounds located in the operable unit.

Implementation of the activities will begin by preparing the necessary permits for performing the activities. These include a DWP, RWP, excavation permit, and an HWOP. Air permitting requirements associated with the HEPA-filtered vacuum system must also be accomplished. A safety analysis will be conducted to ensure that all possible accident scenarios are addressed.

The removal activities will take approximately 2 wk to complete. This timeframe includes any safety meetings or project meetings necessary prior to performing the activity. The stabilization activities will also take approximately 2 wk to conduct. It is suggested that the removal activities occur prior to performing stabilization as to identify (if any) the sites which initially underwent removal, but due to the extent of the contamination will also undergo stabilization. This will also help to minimize the amount of traffic and personnel in the site at one time. It may be possible to coordinate the stabilization activities with similar activities being scheduled for the summer of 1991 as part of the 300 Area Process Trench expedited response action.

Waste designation and disposal will require the longest period of time. This task includes sampling the drummed material, analyzing the samples, designating the waste by Solid Waste Engineering, and finally, disposing of the contaminated material.

A logbook on all field activities will be kept to ensure that all pertinent information concerning the activity is documented. The logbook will be kept by the site supervisor or their appointed designee. Information kept will include documenting the location from which contaminated material is removed and the drum number (or other appropriate container) where it is placed. This will ensure that analytical results from waste designation activities can be correlated to the appropriate location from which the material was removed. This will be valuable information to the ongoing RI.

The project management plan (Appendix D) describes the performing organizations identified to support these activities and their respective tasks. The Environmental Engineering Group will retain overall control for the project with the field mobilization and implementation activities to be completed by Hanford Restoration Operations. The plan also contains a proposed schedule for completing the tasks. This schedule is contingent on the availability of resources.

7.0 REFERENCES

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- EMO, 1990. *Final Report: Surface Radiation Survey for the Phase I Remedial Investigation of the 300-FF-1 Operable Unit on the Hanford Site*, EMO-1008, Environmental Management Operations, Richland, Washington.
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- WHC, 1988a. *Radiation Protection Manual*. WHC-CM-4-10, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1988b. *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1990. *Hanford Site Radioactive Solid Waste Acceptance Criteria*, WHC-EP-0063-2, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A

SPECIFIC INFORMATION ON CONTAMINATED AREAS

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Location	Surface Area, ft ²	Contamination Level Exhibited, counts/min	Appearance
North Process Pond			
R-51	0.79	800 to 1,000	
R-58	16	250	
R-53	0.79	200 to 250	Light gray sandy mud, lighter than surrounding soil
R-54	50	400	Light gray sandy mud, lighter than surrounding soil
R-55	0.79	400	Light gray sandy mud, lighter than surrounding soil
R-56	0.79	300	Light gray sandy mud, lighter than surrounding soil
R-57	1,584	800	Light gray sandy mud, lighter than surrounding soil
R-62	15	200	Light gray sandy mud, lighter than surrounding soil
R-63	0.196	200	Light gray sandy mud, lighter than surrounding soil
R-65	0.196	200	Light gray sandy mud, lighter than surrounding soil
R-68	224	500	light gray sandy mud, lighter than surrounding soil
R-69	15	300	light gray sandy mud, lighter than surrounding soil
R-59	4,800	450	
R-60	24	300	
R-61	0.196	200	
R-64	0.196	200	
R-66	0.196	500	
R-67	0.196	400	
R-70	6	300	
R-71	100	650	
R-77	130,000	1,500 to 3,000	
R-72	3.14	400	
R-73	3.14	400	
R-17	0.2	750	
R-18	0.2	500	
R-19	3.14	400	
R-20	80	250	
R-21	3.14	250	
R-22	1,963.5	150	
R-23	100	350	
R-24	a	250	
R-25	a	250	
R-26	a	250	
R-27	a	250	
R-13	7.1	250 to 400	
R-14	0.196	500	
R-15	12.6	500	
R-16	0.2	500	
R-11	3.14	200 to 1,000	
R-12	16	200 to 900	
R-36	9	200 to 600	
R-37	9	200 to 600	
R-38	0.196	14,000	
R-52	3.14	250	
South Process Pond			
R-2	12.6	250 to 300	Absence of vegetation, bleached appearance
R-3	12.6	250 to 300	Absence of vegetation, bleached appearance
R-4	0.196	250 to 300	Absence of vegetation, bleached appearance
R-5	0.196	250 to 300	Absence of vegetation, bleached appearance
R-6	60	250 to 300	Absence of vegetation, bleached appearance
R-7	0.5	250 to 300	Absence of vegetation, bleached appearance
R-8	0.5	250 to 300	Absence of vegetation, bleached appearance
R-9	54	500 to 1,500	
R-10	0.79	600 to 700	
R-74	5,520	300	

Location	Surface Area, ft ²	Contamination Level Exhibited, counts/min	Appearance
South Process Pond (cont)			
R-75	9,000	800 to 2,000	
R-76	620	100 to 200	
Landfill Area			
R-39	44	7,500	
R-40	814	350 to 15,000	
R-41	252	850 to 1,000	Also contains nonrad, empty Hg bottle, metal, and ceramics
R-42	54	800	
R-43	0.196	200	Also contains nonrad, broken glass, and ceramics
R-44	0.196	150	Disks exhibit a rusty-red color
R-45	192 ^a	150 to 350	Small mound with debris on top
R-46		150 to 350	
Nonfacility Associated			
R-47	0.196	2,500	
R-48	12.5 ^a	250	Rusty-red color
R-49		2,000	
R-50	a	300	
Burial Ground #4			
R-32	19.6	50,000	

^aConsidered to be point sources.

APPENDIX B

ALTERNATIVE COST ESTIMATES

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Barricading Contaminated Area

General Assumptions:

- It will take 10 man-days to complete the ground-penetrating radar survey of the landfill area trenches (two people for 2 days to conduct survey and two people for 3 days to analyze the data).
- 990 ft of fence will be needed to contain the area. (Kaiser Engineers Hanford will install the fence, a price of \$10/ft was quoted.)

10 man-days @ \$35/h	\$ 2,800.00
990 linear feet of fence @ \$10/ft	9,900.00
10% contingency	1,270.00
Total	\$13,970.00

Small-Scale Removal

General Assumptions:

- In attempt to approximate the disposal costs associated with the removal alternatives, 43 contaminated sites, each with an areal extent of 30 ft², were assumed.
- The volume of contaminated material removed from each site is assumed to be 10 ft³. This is based on only 1/3 of the material, to a total depth of 1 ft, being contaminated. This is a conservative estimate based on the use of good waste minimization practices.
- Waste drums will only be filled 2/3 full. The cost of a single drum is \$80.00. A total of 87 drums will be required to contain the wastes, at a total cost of \$7,000.
- Waste designation samples will be composited at a rate of one sample per three drums of waste. The cost for performing the sampling and analysis tasks is \$2,000 per sample. A total of 29 samples will be taken and analyzed, resulting in a total cost of approximately \$58,000.
- All of the waste removed is assumed to be low level. The current cost for disposing of low level waste is \$54/ft³ (7.48 ft³ per drum). Total cost for waste disposal is \$35,141.
- Two drivers will be required for one full day to transport the waste material to the disposal site. This will cost \$400.

Manual Removal

Assumption: Removal from 43 sites (30 ft² each) will occur over 11 days (88 hours); an average of four sites per day.

<u>Personnel</u>	<u>Classification</u>	<u>Rate, \$/h</u>	<u>Estimated Cost, \$</u>
1	HPT	25	\$ 2,200
2	D&D	25	4,400
1	Driver	25	2,200
1	SSO	35	3,080
1	FTL	35	3,080
			<u>\$ 14,960</u>

Total cost for manual removal (includes costs for waste designation and disposal, \$1,000 for miscellaneous materials, and a 10% contingency)..... \$128,151

Cost per ft² = \$98.58

HEPA-Filtered Vacuum Removal

Assumption: Removal from 43 sites (30 ft² each) will occur over 6 days; an average of eight sites per day.

<u>Personnel</u>	<u>Classification</u>	<u>Rate, \$/h</u>	<u>Estimated Cost, \$</u>
1	HPT	25	\$ 1,200
2	D&D	25	2,400
1	Driver	25	1,200
1	SSO	35	1,680
1	FTL	35	1,680
Total			<u>\$ 8,160</u>

Total cost for HEPA-filtered vacuum removal (including costs for waste designation and disposal, \$2,000 for miscellaneous materials, and a 10% contingency)..... \$121,771

Cost per ft² = \$93.67

Surface Stabilization

Clean Fill

Assumptions:

- Clean fill will be obtained from quarry pit #6.
- Material will be transported with 10- to 12-yd³ dump trucks loaded to 80% capacity to minimize amount of spillage as trucks enter and exit Route #4. Truck cycle time, including loading, unloading, and round trip to quarry is estimated at 9 min. At this rate, approximately 50 loads can be completed per day.
- An approximate 3,000 yd³ of material will be spread over 74,000 ft² of contaminated areas with a D-6 dozer.
- A 4,000-gal capacity water truck will apply water to control dust in the contaminated areas.
- A safety workwer will be required to perform traffic control as the haul trucks enter and exit Route #4.
- The project will be completed in a 10-day period, including mobilization-demobilization times.

<u>Personnel</u>	<u>Classification</u>	<u>Rate, \$/h</u>	<u>Estimated Cost, \$</u>
1	HPT	25	\$ 2,000
1	D&D	25	2,000
3	Truck Driver	30	7,200
1	Dozer Operator	30	2,400
1	Loader Operator	30	2,400
1	Grader Operator ^a	30	1,800
1	Sweeper Operator ^a	30	600
1	Water Truck Operator	30	2,400
1.3	Site Supervisor	40	4,200
Total			\$25,000

(^aThe grader operator will only be required 75% time and the sweeper operator only 25% time.)

Total cost of clean-fill stabilization (including \$1,000 for mobilization-demobilization, \$5,000 for fuel and equipment maintenance, and a 10% contingency \$34,100

Cost per ft² = \$0.46

Fixative

Assumptions:

- Initial site preparation and application is expected to be completed within 5 working days.
- Additional applications are expected to be completed within 2 working days and could be required annually to maintain the stabilized surface. Annual operating cost is projected from 12 monthly inspections and one additional to maintain stabilized areas.
- Labor estimates were calculated from a base of \$35/h for exempt and \$25/h for bargaining unit.
- Secondary waste removal is estimated at one drum of mixed waste and two drums of low level radioactive waste. Costs are based on \$245/ft³ for mixed and \$54/ft³ for low level wastes.
- Total area considered in each cost estimate is 175,000 ft² (the total radiological surface contamination area).
- Miscellaneous materials, e.g., hoses, spray bars or containers, etc., are available from onsite stores. Costs for these articles are included in the vehicle operating costs.

Initial Application:

<u>Classification</u>	<u>Personnel/unit</u>	<u>Cost, \$K</u>
FTL	1	1.4
SSO	1	1.4
D&D	2	0.8
Waste Disposal	3 (drums)	2.7
Drivers	2	2.0
Vehicle Operation	1 (tank truck)	0.5
Fixative material	10,600 (gal)	21.2 ^a
Health Physics Support	1	1.0
	Total	31.0

Total cost for initial application of fixative (includes 10% contingency) 34.1

Cost per ft² = \$0.195

^aIncludes shipping cost.

Additional Applications

<u>Classification</u>	<u>Personnel/Unit</u>	<u>Cost, \$K</u>
FTL	1	0.6
SSO	1	0.6
Drivers	2	0.8
Vehicle Operation	1 (tank truck)	0.2
Fixative Material	3,500 (gal)	7.2 ^a
HPT	1	0.4
	Total	9.6

Total cost for additional application of fixative (includes 10% contingency) 10.6

Cost per ft² = \$0.061

^aIncludes shipping cost.

Annual Operating Cost of Additional Applications

<u>Function</u>	<u>Personnel/Unit</u>	<u>Cost, \$K</u>
Fixative application	1	10.6
Drivers	2 (inspections)	2.5 ^a
		13.1

Total annual cost for additional application of fixative (includes 10% contingency) 14.4

Cost per ft² = \$0.082

^aIncludes monthly inspection.

Total cost of fixative stabilization:

- \$0.30/ft² for first year
- \$0.10/ft² for subsequent years

Assuming final response action will not occur until 1997, total implementation costs are approximately \$0.80/ft².

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APPENDIX C

FIXATIVE MATERIAL SAFETY DATA SHEETS

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MATERIAL SAFETY DATA SHEET

MANUFACTURER

INTERNATIONAL DUST CONTROL PRODUCTS INC.
(formerly ENTAC WETERN INDUSTRIES INC.)
20501 LOGAN AVENUE
LANGLEY, B.C., CANADA V3A 4L8
TEL (604) 533-5152 FAX (604) 533-5116

ENDURASEAL

MANUFACTURING INFORMATION

T.D.G. CLASSIFICATIONNONE AVAILABLE
CHEMICAL NAME.....MIXTURE OF TREESAP,
SURFACTANTS & WATER
CHEMICAL FORMULA.....NON APPLICABLE
MOLECULAR WEIGHT.....NON APPLICABLE
CHEMICAL FAMILY.....NON APPLICABLE
MATERIAL USE.....FUGITIVE DUST CONTROL

HAZARDOUS INGREDIENTS

NONE (ENDURASEAL aka Entac) 100% ORGANIC EMULSION PRODUCED FROM NATURALLY OCCURRING RESINS OR TREESAP.

PHYSICAL DATA

PHYSICAL STATE.....LIQUID
ODOR/APPEARANCE.....BROWN EMULSION W/ BLAND ODOR
ODOR THRESHOLD.....NOT ESTABLISHED
VAPOR PRESSURE.....NON APPLICABLE
VAPOR DENSITY (AIR=1).....NON APPLICABLE
EVAPORATION RATE (BUTYL ACETATE=1.0)
BOILING POINT.....100 ° C
FREEZING POINT.....0 ° C
ph.....8.5
SPECIFIC GRAVITY.....> .998 @ 25 ° C
SOLUBILITY IN WATER.....DILUTABLE
COEFFICIENT WATER/OIL DIST.....NON APPLICABLE
EFFECTS OR CHRONIC EXPOSURE.....NONE ESTABLISHED
LD 50 OF MATERIAL, SPECIES & ROUTE.....SEE ATTACHED LETTERS
LC 50 OF MATERIAL, SPECIES & ROUTE....." " "
EXPOSURE LIMIT OF MATERIAL.....NONE ESTABLISHED
IRRITANCY OF MATERIAL.....NONE ESTABLISHED
SENSITIZING CAPABILITY OF MATERIAL.....NONE ESTABLISHED
CARCINOGENICITY OF MATERIAL.....NONE ESTABLISHED
REPRODUCTIVE EFFECTS.....NONE ESTABLISHED
SYNERGISTIC MATERIALS.....NONE ESTABLISHED

PREVENTIVE MEASURES

PROTECTIVE EQUIPMENT

GLOVES/TYPE.....RUBBER
 RESPIRATORY/TYPE.....LOCAL EXHAUST
 EYE/TYPE.....SAFETY GOGGLES
 FOOTWEAR/TYPE.....NON APPLICABLE
 CLOTHING/TYPE.....REGULAR
 OTHER/TYPE.....NONE

ENGINEERING CONTROLS.....VENTILATE ADEQUATELY
 CLEAN UP PROCEDURES.....SMALL SPILLS WIPE UP AND
 CLEAN WITH WATER.

LEAK/SPILL.....DIKE AND CONTAIN SPILL.
 COVER WITH THIN LAYER OF
 DIRT OR SAND AND REMOVE WITH
 SUITABLE TOOL. TRANSFER TO
 SUITABLE CONTAINER.

WASTE DISPOSAL, METHOD AND
 EQUIPMENT.....IN ACCORDANCE WITH MUNICIPAL,
 COUNTY, STATE & FEDERAL
 REGULATIONS.

HANDLING PROCEDURES AND
 EQUIPMENT.....HANDLE WITH PROTECTIVE GLOVES
 AND STORE AT TEMPERATURES
 ABOVE FREEZING. MATERIAL IS
 STABLE UPON STORAGE.

STORAGE NEEDS.....STORE AT ABOVE FREEZING
 SPECIAL SHIPPING INSTRUCTIONS.....NONE

FIRE AND EXPLOSION DATA

FLAMMABILITY.....NO
 IF YES, UNDER WHICH CONDITIONS?.....NON APPLICABLE
 MEANS OF EXTINCTION.....NON APPLICABLE
 SPECIAL PROCEDURES.....NON APPLICABLE
 FLASH POINT (C), METHOD.....COC 288° C (550° F)
 AUTO IGNITION TEMPERATURE.....NON APPLICABLE
 T.D.G. FLAM. CLASS.....NON APPLICABLE
 UPPER EXPLOSION LIMIT.....NON APPLICABLE
 LOWER EXPLOSION LIMIT.....NON APPLICABLE
 HAZARDOUS COMBUSTION PRODUCTS.....NON APPLICABLE

EXPLOSION DATA

SENSITIVITY TO STATIC.....NONE
 DISCHARGE.....NONE
 SENSITIVITY TO IMPACT.....NONE

REACTIVITY DATA

CHEMICAL STABILITY

YES/NO.....YES
IF NO, WHICH CONDITIONS.....NON APPLICABLE
INCOMPATIBILITY WITH OTHER SUBSTANCES.....NO
IF YES, WHICH ONES.....NON APPLICABLE
REACTIVITY, UNDER WHAT CONDITIONS.....NON APPLICABLE
HAZARDOUS PRODUCTS OF
DECOMPOSITION.....NONE

TOXICOLOGICAL PROPERTIES

ROUTE OF ENTRY:

SKIN CONTACT.....YES
SKIN ABSORPTION.....NO
EYE CONTACT.....YES
INHALATION.....YES
INGESTION.....YES

EFFECTS OF ACUTE EXPOSURE

INHALATION.....NONE ESTABLISHED
EYE CONTACT.....SLIGHT OR NO IRRITATION
SKIN CONTACT.....NONE
INGESTION.....NONE ESTABLISHED

FIRST AID MEASURES

SKIN.....WASH THOROUGHLY WITH SOAP
AND WATER FOR 10 MINUTES
EYES.....FLUSH WITH COLD WATER FOR
10 MINUTES. SEEK PHYSICIAN
IF IRRITATION CONTINUES.
INHALATION.....MOVE VICTIM TO VENTILATED
AREA
INGESTION.....RINSE MOUTH WITH WATER AND
HAVE VICTIM DRINK WATER TO
DILUTE MATERIAL IN STOMACH.
OBTAIN MEDICAL ATTENTION
IMMEDIATELY.

PREPARATION DATE OF MSDS

SOURCES.....HAZARDS IN THE CHEMICAL LAB,
4TH ED., ROYAL SOCIETY OF
CHEMISTRY, 1986
DISCLAIMER.....THE INFORMATION HEREIN IS
GIVEN IN GOOD FAITH, BUT NO
WARRANTY, EXPRESS OR IMPLIED,
IS MADE. PRODUCT USERS SHOULD
MAKE INDEPENDENT JUDGEMENTS OF
THE SUITABILITY OF THIS
INFORMATION TO ENSURE PROPER
USE AND TO PROTECT THE HEALTH
AND SAFETY OF EMPLOYEES.

PREPARED BY MANAGEMENT
OCTOBER 1, 1990

Georgia-Pacific



MATERIAL SAFETY DATA SHEET

LIGNOSITE® Road Binder liquid

SECTION I - PRODUCT IDENTIFICATIONProduct Name and Synonyms: LIGNOSITE Road Binder 50%; Calcium Lignosulfonate.CAS Name and No: Fermented Spent Sulfite Liquor; CAS# 68131-32-8.Chemical Family: Lignin.Chemical Formula: $[\text{CH}_2\text{OHCHCH}(\text{OH})_{0.5}(\text{SO}_3)_{0.5}\text{C}_6\text{H}_3\text{O}(\text{CH}_3\text{O})]_n$ calcium salt (typical repeating monomer) plus inorganic salts, oxidized sugars, pentose sugars and other carbohydrates.Manufacturer's Name and Address:

GEORGIA-PACIFIC CORPORATION
 300 Laurel Street (98225)
 P. O. Box 1236
 Bellingham, WA 98227

Telephone: 206-733-4410

Emergency Telephone Number: 1-800-424-9300 CHEMTRECSECTION II - HAZARDOUS INGREDIENTS

<u>COMPONENT</u>	<u>% (WT OR VOL)</u>	<u>ACGIH TWA UNITS</u>	<u>ACGIH STEL UNITS</u>	<u>OSHA PEL UNITS</u>
None	---	---	---	---

SECTION III - PHYSICAL PROPERTIESAppearance and Odor: Dark brown viscous liquid with slight odor.Molecular Weight: 24,000 (wt. avg.); 700 (no. avg.).Boiling Point (Degrees Fahrenheit): Around 212.Melting Point (Degrees Fahrenheit): Around 32.Vapor Pressure (MM of Mercury): Water (approx. 7-8).Specific Gravity (Water = 1): Approx. 1.25.Vapor Density (Air = 1): Not known.Percent Volatile (By Weight): Approx. 50% (water).

pH: Approx. 5.5-7.

Solubility in Water: Soluble.

Evaporation Rate (Butyl Acetate = 1): Not known.

SECTION IV - FIRE AND EXPLOSION DATA

Flash Point: None.

Fire Extinguishing Media: Water or CO₂.

Flammable Limits (Percent by Volume): LOWER UPPER
Not applicable

Special Fire Fighting Procedures & Equipment: Normal.

Unusual Fire and Explosion Hazards: None.

SECTION V - REACTIVITY DATA

Stability: UNSTABLE STABLE

Conditions to Avoid: None known.

Incompatibility (Materials to Avoid):

Caution necessary with strong oxidizing agents.

Hazardous Decomposition Products: Sulfur dioxide (SO₂) possible.

Hazardous Polymerization: WILL OCCUR WILL NOT OCCUR

Conditions to Avoid: None known.

SECTION VI - HEALTH HAZARD INFORMATION

Effects from Routine Use: None known.

Effects of Overexposure: None known.

Probable Routes of Exposure: Skin, eyes.

Emergency and First Aid Procedures:

Eye Contact: Rinse immediately with water. Remove contact lenses; flush eyes with water. Consult a physician if necessary.

Skin Contact: Wash skin with soap and water. Seek medical attention if irritation persists. Launder contaminated clothing before re-use.

Inhalation: Move to fresh air.

Ingestion: Rinse mouth. Immediately dilute by drinking large quantities of water. After dilution, induce vomiting. Seek immediate medical attention. Never give anything by mouth to an unconscious person.

SECTION VII - TOXICITY DATA

Oral: This material is not toxic when administered orally to rats under the Federal Hazardous Substances Act (FHSA) criteria.

Dermal: This material is not an irritant when applied as a moist powder to the skin of rabbits under the FHSA criteria.

Inhalation: Four-hour exposure of rats to 198 mg/m³ of dust has resulted in neither mortality nor observable signs of toxicity.

Carcinogenicity: Not listed as a carcinogen by IARC, NTP, OSHA or ACGIH.

Other Pertinent Data: This material is not an eye irritant when applied (in a 40% solution) to the eyes of rabbits under the FHSA criteria.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Personal Protective Equipment

Protective Gloves: Rubber gloves recommended.

Eye Protection: Goggles recommended.

Respiratory Protection (Specify Type):

NIOSH-approved sulfur dioxide respirator recommended for hot vapors of solution.

Other Protective Equipment: As appropriate to prevent contact with body.

Ventilation:

Local Exhaust: Not normally required.

Mechanical (General): Not normally required.

Special: None.

Other: None.

SECTION IX - SPILL, LEAK, AND DISPOSAL PROCEDURES

Steps to be Taken in Case Material is Released or Spilled:

Wash area with water. Spills or releases of this material do not currently trigger the emergency release reporting requirements under the federal Superfund Amendments and Reauthorization Act of 1986 (SARA). State and local laws may differ from federal law. Consult counsel for further guidance on your responsibilities under these laws.

Waste Disposal Methods:

Customary plant procedures for industrial waste treatment.

Clean Water Act Requirements: None known.

Resource Conservation and Recovery Act (RCRA) Requirements: None known.

SECTION X - REGULATORY INFORMATION

FDA: Calcium lignin sulfonate is regulated under 21 CFR 175.105 as a substance for use as component of adhesives. Under 21 CFR 176.170, it may be safely used as a component of the uncoated or coated food-contact surface of paper and paperboard intended for use in producing, manufacturing, packaging, processing, preparing, treating, packing, transporting, or holding of aqueous and fatty foods. Under 21 CFR 176.210, it is also permitted for use in the formulation of defoaming agents used in the manufacture of paper and paperboard intended for use in packaging, transporting, or holding food. Under 21 CFR 573.600, lignin sulfonates are approved for use in animal feeds, either in liquid or powder form, up to 4% of finished feed.

USDA: USDA self-certified (9 CFR 317.20); is FDA approved.

CPSC: Not applicable.

TSCA: CAS# 68131-32-8, Fermented Spent Sulfite Liquor.

WHMIS: LIGNOSITE Road Binder is not a controlled product under the Canadian Workplace Hazardous Materials Information System.

DOT: Non-regulated.

Proper Shipping Name: Lignin Liquor.

Hazard Class: None.

Label Required: None.

Identification No: None.

Other Pertinent Information: None.

EPA: Superfund Amendments and Reauthorization Act (SARA) Title III: Section 313, Supplier Notification.

Not applicable.

SECTION XI - SPECIAL PRECAUTIONS AND COMMENTS

Precautions to be Taken in Handling and Storing:

This material is biodegradable. Use caution when opening unvented containers of water solutions. Microbial activity may cause pressure accumulation.

Other Precautions: None known.

Registrations/Certifications: None.

Effective Date: 5/18/90.

Supersedes: 9/21/89.

IMPORTANT:

The information and data herein are believed to be accurate and have been compiled from sources believed to be reliable. It is offered for your consideration, investigation and verification. Buyer assumes all risk of use, storage and handling of the product in compliance with applicable federal, state and local laws and regulations. GEORGIA-PACIFIC MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, CONCERNING THE ACCURACY OR COMPLETENESS OF THE INFORMATION AND DATA HEREIN. THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE SPECIFICALLY EXCLUDED. Georgia-Pacific will not be liable for claims relating to any party's use of or reliance on information and data contained herein regardless of whether it is claimed that the information and data are inaccurate, incomplete or otherwise misleading.

APPENDIX D

PROJECT MANAGEMENT PLAN

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1.0 INTRODUCTION

The purpose of the project management plan (PMP) is to define the administrative and institutional tasks necessary to support removal/stabilization activities at radiological surface contamination sites located in the 300-FF-1 operable unit. The plan defines the responsibilities of the various participants, project tracking and reporting requirements, and organizational structure.

This PMP is included as an appendix to the Engineering Plan for the 300-FF-1 Operable Unit Radiological Surface Contamination Removal/Stabilization Activity. The engineering plan was prepared to ensure that the removal/stabilization activities were performed in a safe, effective manner that would not interfere with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) remedial investigation/feasibility study (RI/FS) activities. The engineering plan will be submitted for review to the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy, Richland Operations (DOE-RL), and the Washington Department of Ecology (Ecology). Once review of the engineering plan has been completed, the document will be included in the 300-FF-1 RI/FS administrative record.

2.0 REMOVAL/STABILIZATION ACTIVITIES

The 300-FF-1 operable unit radiological surface contamination removal/stabilization activities have been divided into three phases, described as follows:

- The first phase of the removal/stabilization activities is to develop the necessary documents required to perform the activity. The documents include the following:
 - Safety Assessment Document
 - Decommissioning Work Plan
 - Excavation Permit
 - Cultural Resources Review
 - Radiation Work Permit
 - Hazardous Waste Operations Permit
 - Cost Account Plan.

An offsite radiological exposure model must also be completed (in conjunction with the safety assessment) to ensure that the use of the HEPA-filtered vacuum system, to be utilized in the removal of radiological surface contaminants, does not result in an offsite exposure of more than 0.1 mrem. If the model indicates that the offsite exposure will exceed the 0.1-mrem limit, additional air permitting requirements may be necessary. If it is determined that extensive air permitting documentation will be necessary, use of the HEPA-filtered vacuum system will be reconsidered.

The second phase of the removal/stabilization activity involves implementing the removal and stabilization activities. The procedures to be followed in implementing these activities will be documented in the:

decommissioning work plan. The implementation phase will begin with field mobilization activities. This includes the procurement of the necessary materials (e.g., drums), performing any site-specific preparation activities, and conducting an activity-specific safety meeting to ensure that those participating in the activity are aware of the hazards involved and the steps necessary to mitigate those hazards.

The removal activities will be conducted at the sites indicated in Table 5.8 of the attached engineering plan prior to conducting the stabilization activities. If the successful removal of the radiological contaminants cannot be accomplished at specific sites, then these areas will also be stabilized with 12 to 18 in. of clean fill. The removal of surface debris located on the sites planned for stabilization will also occur at this time. The waste drums will be stored within the confines of burial ground 618-4 and/or 618-5 until such time as the waste is designated. The waste will then be transferred within 90 days to the appropriate disposal and/or storage facilities.

Once the removal activities have been completed, the geophysical survey will be conducted over the "undesigned landfill trenches" to identify the extent of stabilization necessary in this area. The stabilization activities will then occur, to be followed by installation of fence around the undesigned landfill trenches.

Once all the these activities have been completed, the third phase of the project will be initiated. This phase consists of preparing and issuing a report which documents the results of the project. This report will be made available to the 300-FF-1 RI Technical Coordinator, DOE-RL, EPA, and Ecology. A copy of this report will be included in the 300-FF-1 RI/FS administrative record.

A tentative implementation schedule has been completed (Figure 2-1) for these activities indicating the expected duration for each phase of the removal/stabilization activities. The exact timeframe when second and third phase activities begin will depend on other activities being performed in the operable unit. The scheduling of these activities must be coordinated with other projects being planned, including the RI activities and an interim response action planned for the 316-5 process trenches.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

3.1 INTERFACE OF REGULATORY AUTHORITIES AND DOE

The radiological surface contamination is located within the boundaries of the 300-FF-1 operable unit which is an active CERCLA site with RI/FS activities ongoing. As an active CERCLA operable unit, monthly unit manager meetings are held to status progress made and to resolve any outstanding issues concerning the RI/FS activities. The status of the removal/stabilization activities will be provided at these monthly meetings until the project is completed.

3.2 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization is graphically illustrated in Figure 3-1. The following describes the responsibilities of the various Westinghouse Hanford Company organizations involved in completing the radiological surface contamination removal/stabilization activities in the 300-FF-1 operable unit.

Environmental Engineering Remedial Action Section (81225) - Provides project management lead and coordinates technical resources for the removal/stabilization activities. Prepares, or causes to be prepared, necessary documents to accomplish removal/stabilization activities, including preparation of a final report summarizing accomplishments of activity.

Environmental Permits Section (81253) - Ensures all necessary air permitting/notification requirements have been accomplished prior to performing removal activities which will use HEPA-filtered vacuum system.

Environmental Field Services (81240) - Prepares and provides approved industrial health and safety documents (e.g., HWOP) as required. Provides a site safety officer to oversee health and safety monitoring during implementation of removal/stabilization activities. At conclusion of field activities, site safety officer will provide a letter detailing results of health and safety monitoring activities.

Hanford Restoration Operations (81400) - Coordinates all field activities and prepare or oversee preparation of decommissioning work plan, excavation permit, and associated cultural resource review. Provides all personnel and equipment necessary for performing radiological contamination removal activities including waste disposal. Also coordinates stabilization activities to be performed by Operation Support Services. Ensures that a field supervisor is present during all field activities. Field supervisor will maintain a field log book which provides a detailed description of field activities.

Operational Support Services (52200) - Performs all surface stabilization activities as directed by Hanford Restoration Operations Function.

Quality Assurance (38130) - Provides support to verify appropriate quality assurance requirements are addressed. Provides surveillance of removal/stabilization activities as necessary.

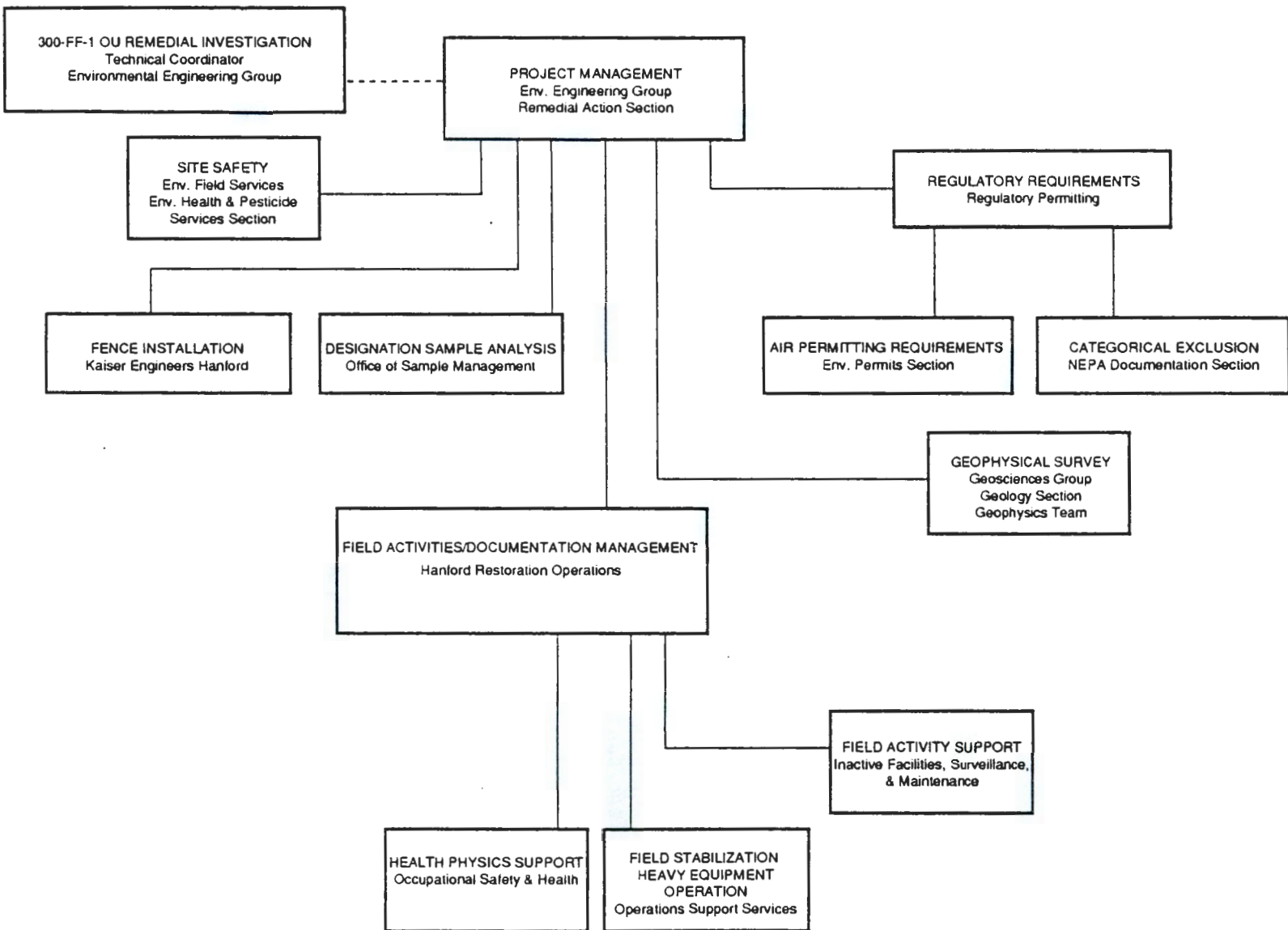
Health Physics (33110) - Provides support to prepare and issue necessary radiation work permit, and provides necessary Health Physics Technician support during all field activities.

Cultural Resources (PNL) - Provides documentation and support necessary to obtain excavation permit.

Office of Sampling Management (16500) - Arranges for waste designation sample analysis and performs data validation on analytical data obtained as a result of analysis.

Kaiser Engineers Hanford (KEH) - Provides personnel, equipment and building supplies necessary for installation of fence around undesignated landfill trenches located in north-east portion of 300-FF-1 operable unit; also prepares and obtains approval of necessary permits for performing this activity.

Figure 3-1. 300-FF-1 Radiological Removal/Stabilization Activity Project Organization.



4.0 SCHEDULE

The schedule for the implementing the interim response action at the radiological surface contaminated sites is provided in Figure 4-1. Implementation of the removal/stabilization activity is divided into three phases.

- **Field Mobilization Activities:** This phase includes the procurement of necessary materials and equipment, preparation of necessary permits and procedures, and conducting safety meetings necessary in performing the interim response action activities
- **Removal and Related Activities:** This phase includes performing the field activities
- **Report Preparation:** This phase involves preparing a final report documenting the accomplishments of the interim response action. This report will provide details on any future maintenance and monitoring requirements that may be necessary. Each phase of the interim response action is a critical path leading to completion of the project.

5.0 DOCUMENTATION AND RECORDS

All documents generated during the removal/stabilization activities will be considered secondary documents as defined in the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989). Internal review and approval of necessary documents required in performing the removal/stabilization activities will be conducted to ensure that the activities are performed in a safe and effective manner. The appropriate organizations which implement an activity will review and approve the documentation in conjunction with safety and quality assurance.

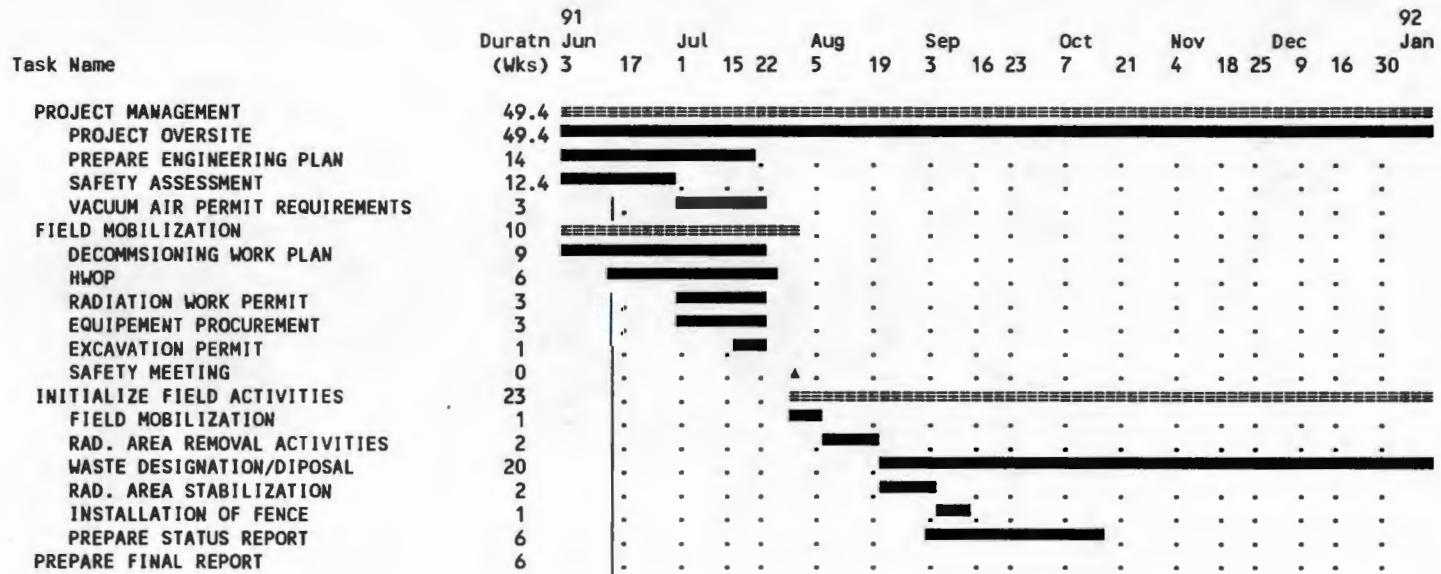
Records and reports generated during the activities will be forwarded to the Environmental Engineering Group for inclusion in the project records to be maintained by the project engineer in accordance with environmental investigations instruction (EII) 1.6 "Records Management" (WHC 1988). The appropriate records will be incorporated into the administrative record for the 300-FF-1 operable unit RI/FS, which is made available for public review.

6.0 QUALITY ASSURANCE

Quality assurance for the removal/stabilization activities will be addressed in the decommissioning work plan. The Quality Assurance personnel will perform routine surveillance activities to ensure compliance with controlling documents.

300-FF-1 SURFACE CONTAMINATION REMOVAL/STABILIZATION ACTIVITIES
 Responsible : ENVIRONMENTAL ENGINEERING REMEDIAL ACTION SECTION
 As-of Date : 13-Jun-91 Schedule File : RARA

DATES SUBJECT TO CHANGE



■ Detail Task ■ Summary Task ○○○○ Baseline
 ■ (Progress) ■ (Progress) ▶▶▶ Conflict
 ■ (Slack) ■ (Slack) ■ Resource delay
 Progress shows Percent Achieved on Actual ▲ Milestone

----- Scale: 2 days per character -----

Figure 4-1. Schedule for 300-FF-1 Surface Contamination Removal/Stabilization Activities.

7.0 FINANCIAL AND PROJECT TRACKING REQUIREMENTS

The Westinghouse Hanford Environmental Engineering Group will have the overall responsibility for planning and controlling the 300-FF-1 operable unit radiological surface contamination removal/stabilization activities, providing for effective technical, cost, and schedule baseline management. The management control system used for this project must meet the requirements of DOE Order 4700.1, *Project Management System* (DOE 1987), DOE Order 2250.1B, *Cost and Schedule Control Systems Criteria for Contract Performance Measurement* (DOE 1985).

The Westinghouse Hanford Management Control System (MCS) meets these requirements. The primary goals of the Westinghouse Hanford MCS are to provide methods for planning, authorizing, and controlling work in a manner will completes the project on schedule and with in budget, and to ensure that all planning and work performance activities are technically sound and in conformance with management and quality requirements.

8.0 REFERENCES

DOE, 1985. *Cost and Schedule Control Systems Criteria for Contract Performance Measurement*, DOE Order 2250.1B, U.S. Department of Energy, Washington D.C.

DOE, 1987. *Project Management System*, DOE Order 4700.1, U.S. Department of Energy, Washington D.C.

Ecology et al., 1989. *Hanford Federal Facility Agreement and Consent Order* Washington Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.