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MARCH 1993

PRELIMINARY DRAFT LFI/FFS FOR 1100-EM-2, 1100-EM-3 & 1100-IU-1.

ADDENDUM TO DOE/RL-92-67

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EXECUTIVE SUMMARY

This report has been prepared as an addendum to the final Remedial Investigation/Feasibility Study - Environmental Assessment Report (DOE/RL-92-67) for the 1100-EM-1 Operable Unit (OU) at the U.S. Department of Energy (DOE) Hanford Reservation located near the city of Richland in Benton County, Washington. The three remaining OUs, identified as 1100-EM-2, 1100-EM-3 AND 1100-IU-1 (Figure 1.1), are the focus of the information presented in this addendum. A limited field investigation/focused feasibility study (LFI/FFS) approach, consistent with the National Oil and hazardous Substance Pollution Contingency Plan (NCP), was undertaken for those three OUs. The results of those efforts are presented in this addendum.

The format of this addendum follows that of a streamlined or focused feasibility study (FFS) as discussed in the preamble to the NCP at 55 FR 8704, as well as section 300.430 of the NCP (55 FR Vol. 46). This addendum presents the findings of a series of limited field investigations (LFI's) undertaken between October, 1992, and January, 1993, at the three OU's. In addition, historical information, including; aerial photographs; Hanford waste information data system (WIDS) inputs on waste types, handling practices, or known soil or groundwater contamination; pertinent regulatory aspects (*e.g.* underground storage tanks regulated under the state UST program); and previous characterizations of the **(XX number)** waste management units (WMU's) were reviewed for these areas for indication of potential releases and spills of contaminants to the environment. No field sampling and analysis activities were undertaken during the LFI's. Figure 1.4 presents a process flow chart of the overall study, decision making and cleanup process for the OU's.

Once the environmental and regulatory information for each WMU was evaluated, each WMU was placed in one of four categories;

- o Already remediated or currently under regulation by the State or EPA under a statute other than CERCLA or MTCA.
- o Pending or a candidate for regulation by the State or EPA under a statute other than CERCLA or MTCA.
- o Not a candidate for regulation under another statute and is the site of a <u>likely</u> or <u>potential</u> release or spill of contaminants to the environment.
- o Not a candidate for regulation under another statute and is the site of a <u>known</u> release or spill of contaminants to the environment.

The LFI efforts identified **XX** additional WMU's beyond the initial WIDS inventory. The screening efforts resulted in the identification of **XX** WMU's that are currently or a candidate for management under other regulatory programs. Of the remaining WMUs, **XX** are considered to be likely or potential sites of releases or spills, and XX the site of known releases or spills. The last three categories were evaluated for cleanup under the FFS approach. The categories of WMU's evaluated for cleanup are further broken down by waste or site type and are tabulated below (Table ES-1).

TABLE ES-1. Waste Management Unit Summary

	NUMBER	APPROX VOL (Total)
USTs		" " " "
Soils contaminated with ABC		" " " "
Soils contaminated with XYZ		" " " "
Spills		" " " "
Septic Tanks		
Landfill/Debris sites		
GW Monitoring Locations	6	
(Others) PCB Transformers		
etc.		

check 3.1 3.2 3.3

The FFS approach is streamlined in the sense that, for much of the contaminated materials that will potentially be encountered at the three OU's, there are demonstarted and available treatment technologies. Therefore, it is not necessary to evaluate a wide range of treatment alternatives. Remediation of the waste or site types in Table ES-1 were evaluated using this approach. For contaminated soils and potential windblown dusts, two remedial approaches were evaluated; offsite disposal/treatment at a permitted RCRA or TSCA facility; and onsite thermal destruction (incineration). The latter was evaluated in order to assess potential savings that might result from on-site incineration of soils from multiple WMUs. It is estimated that at approximately XXX cubic yards of contaminated material, the cost of incineration becomes comparable to the cost of offsite disposal. Below that volume, offsite disposal is a less costly remedy.

The LFI/FFS approach also differs from the traditional CERCLA process in that a Human Health and Ecological Risk Assessments were not conducted for the three OU's, nor was the potential for contaminant migration rigorously investigated. In place of those activities, media-specific cleanup goals (Section 4.2) were established for soils and potential windblown dusts containing hazardous substances and site risks were evaluated in a qualitative manner. Soils and dusts would be sampled in the field during a combined remedial design/remedial action (RD/RA) process. Soils and dusts exceeding cleanup goals would be excavated, treated if necessary and properly disposed of in a permitted facility or incinerated onsite.

For groundwater, a monitoring and evaluation program would be implemented during the RD/RA process to evaluate the potential impacts, if any, to groundwater of contaminant releases at the WMUs. While this approach results in a greater degree of uncertainty in the "up front" stage of the CERCLA process, resources are focused on cleanup efforts. These efforts were undertaken with the intention to be consistent with the Hanford Site Past Practice Strategy (DOE/RL-1904) and efforts by EPA and Ecology to streamline the CERCLA process by utilizing the focused feasibility study approach as discussed in the NCP.

The cleanup remedies considered for each of the WMUs were evaluated against the nine evaluation criteria pursuant to the NCP 300.430 (e)(7). These evaluations were completed to provide an analysis of the ability of cleanup alternatives to meet the CERCLA program goals for remedial actions to protect human health and the environment, maintain that protection over time, and minimize the amount of untreated wastes.

This information will be used to support a Record of Decision (ROD) for the 1100 NLP site. Subsequent cleanup actions for the WMUs listed in this addendum would be evaluated for completeness during confirmational sampling that would be undertaken during remedial actions. Information collected during RD/RA activities would be placed in the site file under "Post-ROD Information"or a similarly titled category. Information that is expected to be collected post-ROD includes; additional historical data, design data and parameters, and field sampling results during and after remedial actions. Additional reporting requirements will include a Five Year Review and Construction Completion Reports. In the event that remedial actions differ significantly from the ROD, it is expected that an Explanation of Significant Differences (ESD), ROD Amendment, or a new ROD would be issued and the Administrative Record amended. These activities are discussed further in section 4.1.3 Post ROD Changes.

1.0 INTRODUCTION

The 1100 Area of the U.S. Department of Energy's (DOE) Hanford Reservation was placed on the National Priorities List in July 1989, pursuant to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. 9601 *et seq.*,. Based on both documented and undocumented past practices at the 1100 Area, it was determined that pollutants were released to the environment and that those contaminants might present a threat to the public health and welfare.

In anticipation of regulatory actions, the U.S. Department of Energy Field Office, Richland (DOE-RL) divided the 1100 Area into four operable units (OUs) and initiated CERCLA response planning. DOE-RL, the U. S. Environmental Protection Agency (EPA), and the Washington Department of Ecology (Ecology) jointly assigned the 1100-EM-1 Operable Unit the highest priority, within both the 1100 Area and the Hanford Site as a whole, due to concerns that groundwater contamination in the 1100-EM-1 could pose a threat to the North Richland wellfield. In the fall of 1992, it was determined that the additional 1100 area OUs; 1100-EM-2, 1100-EM-3 and 1100-IU-1, would be potential candidates for an accelerated evaluation that could enable <u>all</u> of the 1100 area OUs to be addressed in one Record of Decision (ROD). That ROD is currently scheduled to be issued in the summer of 1993. This accelerated approach would allow for more effective use of resources for cleanup activities and has the potential to greatly shorten the time frame associated with the CERCLA process.

1.1 PURPOSE OF ADDENDUM

The 1100-EM-1 Phase I RI report concentrated on the initial site characterization for the 1100-EM-1 Operable Unit. The Final RI/FS-EA Report focused on more complete site characterization of that area, as well as an additional investigation of problematic issues developed during Phase I. A description of the activities undertaken is found in the Phase II RI Supplemental Work Plan (Revision II) DOE/RL-90-37. The Final RI/FS-EA Report complements the initial characterization by providing a more definitive characterization of the nature and extent of the threats to human health and the environment posed by contaminant releases from that Operable Unit.

This Addendum presents the results of limited field investigations (LFIs) and a focused feasibility study (FFS) effort for the three other 1100 area OUs. The LFI/FFS approach differs from the traditional CERCLA process in that a Human Health and Ecological Risk Assessment were not conducted for the three OUs, nor was the potential for contaminant migration rigorously investigated. In place of these aspects, the decision was made to establish media specific cleanup goals for soils and potential windblown dusts containing hazardous substances. Soils and dusts would be sampled during a combined remedial design/remedial action (RD/RA) process. Soils and dusts exceeding the cleanup goals would be excavated and properly disposed of/treated in a permitted offsite facility.

For groundwater, a monitoring and evaluation program would be implemented during the RD/RA process to evaluate the potential impacts, if any, to groundwater of contaminant releases at the WMUs. While this approach results in greater uncertainty at the "up front" stage of the CERCLA process, it is intended to focus resources on cleanup efforts. These efforts were undertaken with the intention to be consistent with the Hanford Site Past Practice Strategy (DOE/RL-1904) and efforts by EPA and Ecology to streamline the CERCLA process by utilizing the focused feasibility study approach discussed in the NCP.

This addendum provides only sufficient redevelopment of material from the limited field investigations (LFIs) to allow the reader to follow the logic of the technical discussions presented in this addendum. Familiarity with additional investigative reports published on the 1100 Area that were reviewed during the LFIs is assumed for a critical review of the findings and recommendations presented in this document. A list of documents that were relied on to develop and present the information and evaluations in this addendum are included in Section 6.0 and are present in the 1100 Area Administrative Record,

The development of this addendum has been the result of a concurrent effort on the part of DOE, EPA, Ecology and the U.S. Army Corps of Engineers. In effect, this has resulted in an on-going regulatory review and comment process as information from the LFI and FFS activities was developed. As such, regulatory agencies have made comments during the addendum development, and DOE has had the opportunity to respond to those comments. Further revisions and/or modifications based on additional comments from regulators and/or the public to the Final RI/FS-EA Report, or this addendum, will follow guidelines as stated in paragraph 9.2.1 of the TPA.

1.2 Operable Unit Description

1100-EM-2: This OU is located in the southwest corner of the Hanford site near the north border of the City of Richland, Washington (Figures 1.1 and 1.2). The main feature of the OU is the 1171 Building, a vehicle service maintenance and repair facility constructed in the early 1950s. The main elements of this OU are several used oil tanks, steam pad and hoist ram storage tanks, and a hazardous waste storage area. Removal of an antifreeze underground storage tank (UST) from the OU in 1986 was addressed in the 1100-EM-1 RI/FS-EA Study.

1100-EM-3: This OU is located about 600 meters (1000 feet) northeast of the 1100-EM-2 OU (Figures 1.1 and 1.2). The OU contains approximately 20 permanent structures, some of which date back to 1951, that have been used for maintenance, warehouse, service support and offices in support of Hanford operations. Key OU elements include several hazardous waste storage and staging areas, a used oil underground storage tank (UST), and contaminated soil from a previously removed UST. Four fuel UST's were removed from the OU in 1991.

1100-IU-1: The main part of this OU is located on the northeastern slope of the Rattlesnake

Hills, approximately 24 km (15 miles) west of the 1100-EM-2 and 1100-EM-3 OU's as shown in Figure 1.1 and 1.3. The site is a former NIKE missile base consisting of structures which supported missile launch, control and maintenance functions, as well as living quarters for base personnel, storage buildings for hazardous substances used in the maintenance of the physical plant and missile operations. All base facilities are abandoned with the exception of the former barracks which are used for the Arid Lands Ecology Reserve Headquarters. Elements of concern include several septic tanks and drain fields, electrical transformers, UST's, and waste disposal areas. The OU is within the 311 square kilometer (120 sq mile) Arid Lands Ecology (ALE) Reserve.

1.3 NATIONAL ENVIRONMENTAL POLICY ACT

This report has also been prepared to address the requirements for an environmental assessment as defined in the Council on Environmental Quality regulations for implementing the procedural requirements of the National Environmental Policy Act (NEPA) and the DOE orders for implementing NEPA. These regulations and orders require an environmental assessment to provide brief discussions of the need for the proposal, alternatives considered, the environmental impacts associated with each alternative, and a listing of agencies and persons contacted.

The regulatory authority for the proposed action is discussed above in Section 1.1. The affected environment is described in detail below in Chapter 2. The environmental and human health impacts and the rationale for requisite actions at the site are presented in Section 2.9. In Chapter 4, remedial alternatives are presented and assessed. Effectiveness, implementability, and other criteria are also evaluated to determine if protection of human health and the environment are being addressed, and to meet the intent of regulatory criteria.

To date numerous agencies and persons have been contacted including: the Hanford Cultural Resources Laboratory; EPA Region 10, Hanford Project Office; Washington State Department of Ecology, Hanford Facility Project Office; and the Department of the Interior (DOI), National Oceanic and Atmospheric Administration (NOAA). Additional agencies and persons will be contacted through the public and regulatory review process for this document.

The DOE will use this LFI/FFS Addendum to the Final RI/FS-EA Report to determine whether the potential environmental impacts are significant enough to warrant further action at the 1100-EM-2, 1100-EM-3 and IU-1 operable units. Table 1.1 presents a directory of NEPA values that were evaluated as part of the LFI/FFS efforts. A Finding of No Significant Impact will be prepared and published by the DOE if it is determined that potential environmental impacts are not significant.

TABLE 1.1 Directory of NEPA Values and Location in 1100 Documents

TABLE 1.1 Directory of NEPA Values and Location in 1100 Documents

	DOE/RL-92-67 Addendum	DOE/RL-92-67
PHYSICAL CHARACTERISTICS		
Operable Unit Vicinity	Section 1.7	Section 1.4
Meteorology	Section 2.1.1	Section 2.1
Hydrology	Section 2.1.4	
Geology	Section 2.1.3	
ECOLOGICAL CHARACTERISTICS		
Human Ecology	Section 1.6.1	
Land Use	Section 4.2.3	
Water Use	Section 2.1.2, 2.2	
Cultural Resources	Section 1.5, 1.6	
Wildlife Ecology	Section 1.6.1	Appendix L
Terrestrial Ecology	Section 1.6.1	
Aquatic Ecology	Section 1.4.1	
Sensitive Environments	Section 1.6.1	
IMPACTS OF REMEDIAL ACTIONS		
Compliance with Statutory Law	Section 4.2, 4.4	
Short-Term Impacts	Section 4.4	
Long-Term Impacts	Section 4.4	
Impacts to Resources	Section 4.2, 4.4	
Effects to Public Health	Section 4.2	
AGENCIES/PERSONS CONTACTED	Section 1.3	
LAND USE, POLICIES, CONTROLS	Section 4.2.3	

1.4.1 Natural Resource Damage Assessments

CERCLA and the Clean Water Act (CWA), 33 U.S.C. 1251-1376, provide that natural resource trustees may assess damages to natural resources resulting from a discharge of oil or a release of a hazardous substance covered under CERCLA or the CWA and may seek to recover those damages. To this end, a Preliminary Natural Resource Survey (PNRS) was completed by NOAA. In summary, the findings of the PNRS were that....

1.4.2 Trustees for Natural Resources

The trustees for Natural Resources are NOAA, DOE, and the State of Washington. Potential trustees include the following Indian Tribes: Yakima Indian Reservation, Nez Perce Tribal Executive Committee, Federated Tribes of the Umatilla, and the Tribal Council Confederated Tribes of Warm Springs Reservation. According to the NCP [section 300.160 (a)(3)] the lead agency shall make available to the trustees of affected natural resources information and documentation that can assist the trustees in the determination of actual or potential natural resource injuries. Copies of this Addendum and the RI/FS-EA Report are to be made available to the trustees and potential trustees for Natural Resources.

[LOCATION OF FIGURES 1.1, 1.2, 1.3 & 1.4]

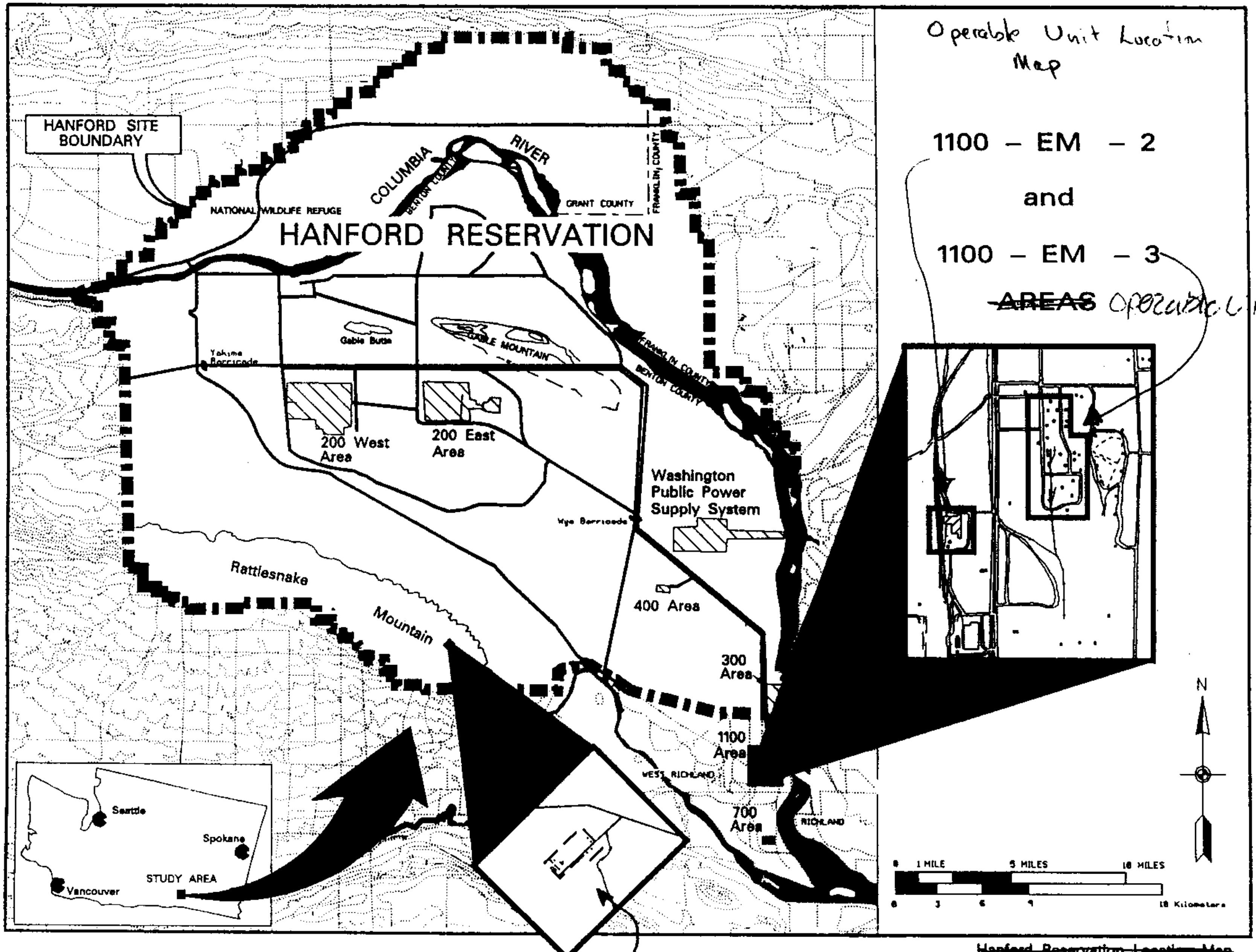
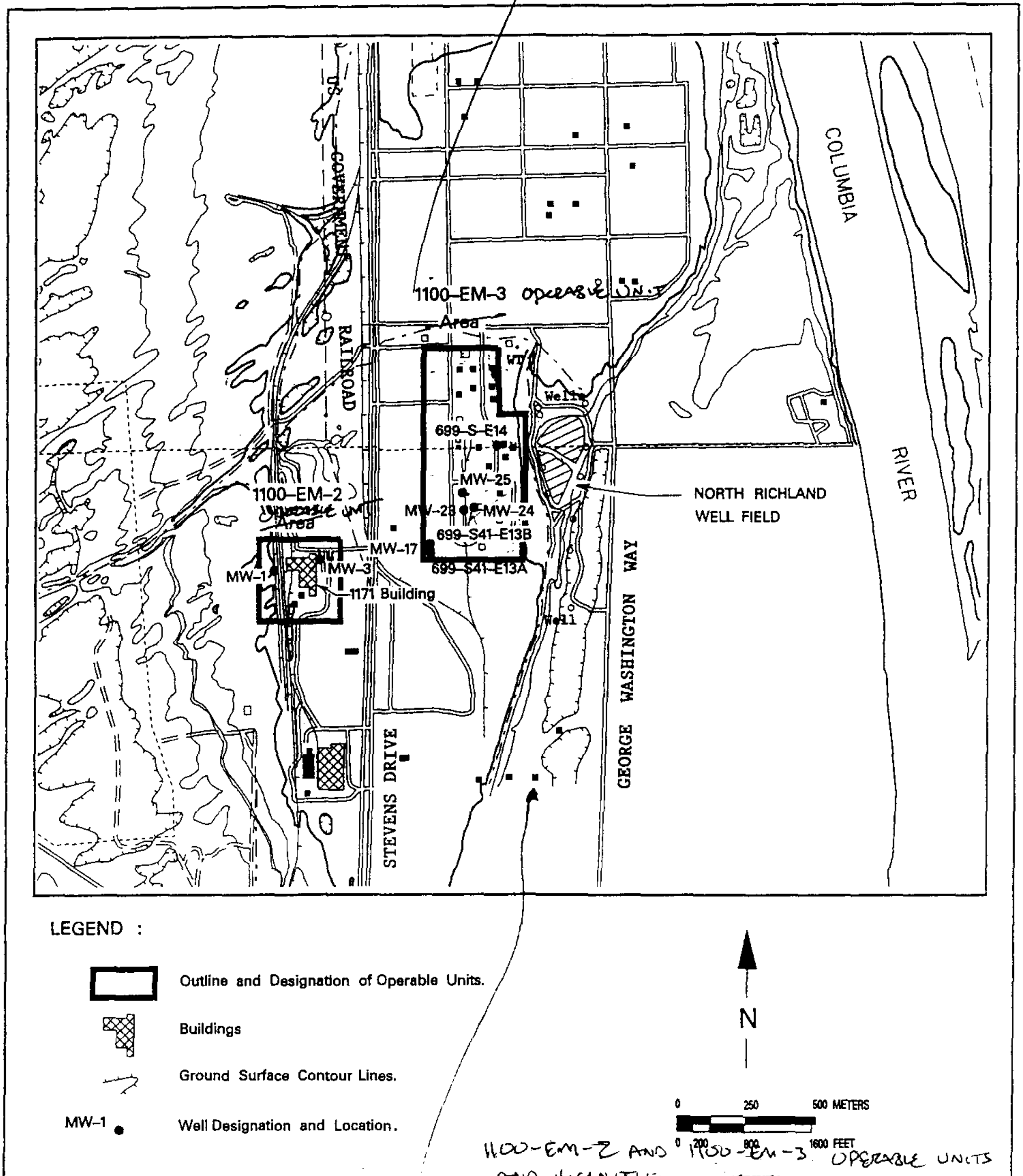


FIGURE 1.1 ~~Fig. 1-1~~

needs to be bolder type !!

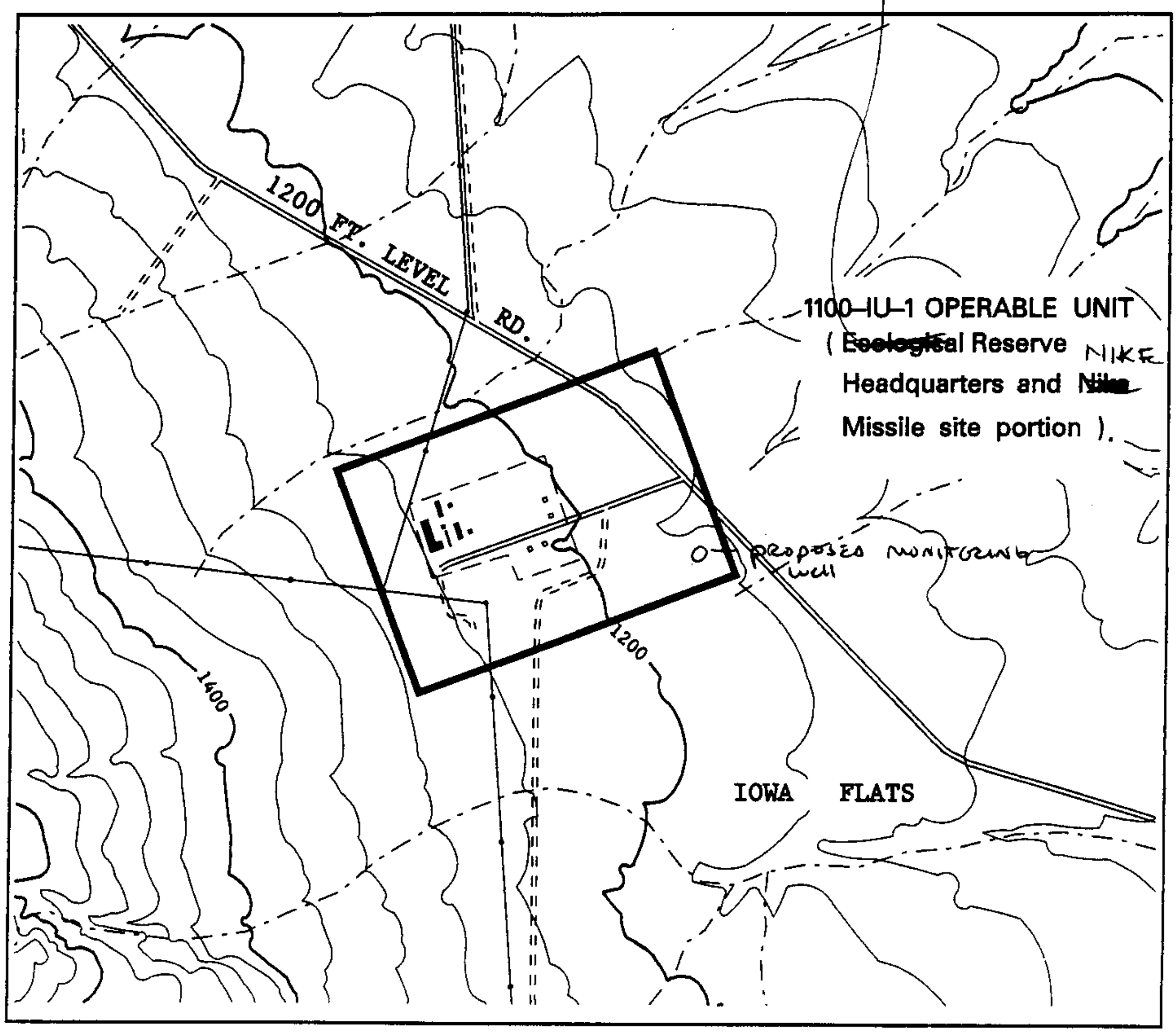
(+ why not a little bigger?)



1100-EM-2 AND 1100-EM-3 OPERABLE UNITS AND VICINITY.

what are square symbols?

Figure 1.2



LEGEND :

Outline and Designation of Operable Unit.

Buildings

Ground Surface Contour Lines.

o proposed Monitoring Well Location 1100-IU-1 OPERABLE UNIT

0 250 500 1000 METERS

0 750 1500 3000 FEET

N

~~Figure~~

Figure 1.3

LFI/FFS Flowchart

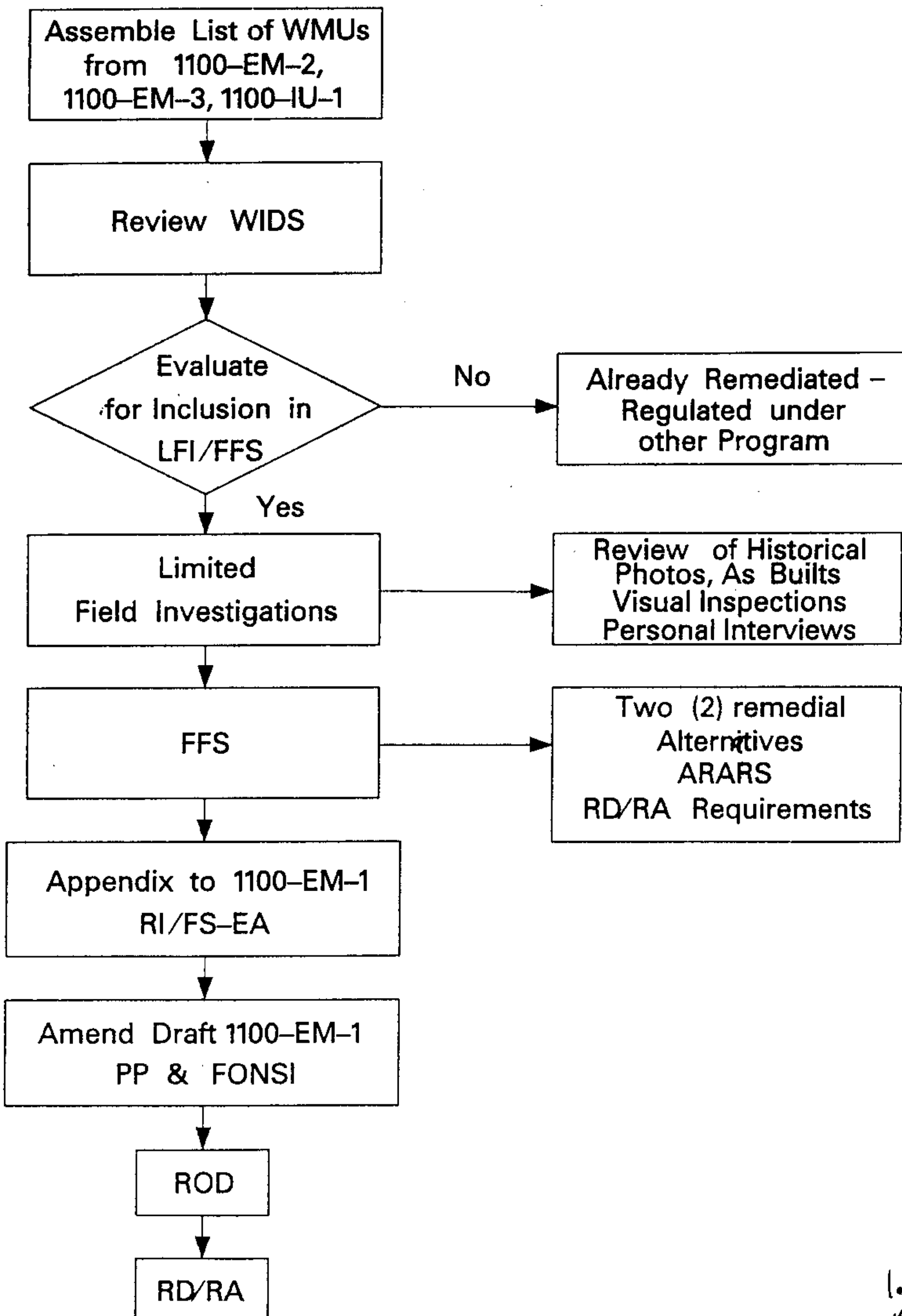


FIGURE 1.4

1.5 Historical Use

The following is a brief description of general historical use of the 1100-EM-2, 1100-EM-3,and 1100-IU-1 Operable Units.

1.5.1 1100-EM-2 Prior to 1950, a few small farms occupied the 1100 EM-2 OU area. The area near the existing 1171 building was dominated by a large sand dune and a waste water ditch, located about 1.2 kilometers (0.75 miles)north of the 1171 building. The 1171 building was constructed in the early 1950s and has been used primarily for vehicle and equipment maintenance since. The site also served as a warehousing and transportation distribution center. Most of these activities, along with gas station services and support of Hanford's bus transportation system, are still occurring today. An antifreeze disposal UST was removed beneath the 1171 building in 1986 and was addressed as part of the 1100-EM-1 OU RI/FS-EA Study.

1.5.2 1100-EM-3 Prior to 1943 the 1100-EM-3 Operable Unit, also referred to as the 3000 Area, was primarily used for agriculture related activities. A water supply ditch, still visible at the northern boundary of the OU, probably supplied farms surrounding Fruitvale, a former town located near the OU. In 1943, temporary office buildings supporting construction and engineering at the newly formed Hanford site began to be constructed at the OU. Throughout the 1940s, the OU and surrounding areas were used for office space and as a off-loading and warehousing area for construction supplies brought in on the Atomic Energy Commission - Hanford Works Railroad. By 1951, most of the temporary buildings were removed or demolished and, about this same time, were replaced by permanent structures many of which still exist today. The OU was part of a larger military camp, "Camp Hanford," and contained automotive repair and maintenance shops, gasoline storage and dispensing stations, an artillery repair and maintenance shop, a laundry, a dry cleaner, a cold storage, warehouses, a bakery, troop barracks, and administrative offices.

During the last 25 to 30 years, the 1100-EM-3 OU area was used for office and warehouse facilities in support of Hanford construction activities. Current activities at the OU include paint and sandblast operations, vehicle maintenance and repair, hazardous material storage, RCRA waste accumulation areas, warehousing, fabrication shops, radio maintenance, and radiography and research administrative offices.

1.5.3 1100-IU-1 Prior to government acquisition in 1942, the area near the 1100-IU-1 OU contained a few homesteads and natural gas wells (see adjacent areas discussion). A Nike missile site was constructed in the early 1950s, and continued to operate through the early 1960s. The Nike missile site consisted of two separate and distinct operating units; the launch area, located on the northeast slope of Rattlesnake Mountain, and the Integrated Fire Center (IFC) area, located on the top of the mountain. Maintenance of the missile batteries in a combat-ready status required the storage, handling, and disposal of missile components as well as solvents, fuels, hydraulic fluids, paints, and other materials.

In the late 1960s the buildings at the southwest end of the OU were converted into the headquarters of the Arid Lands Ecology (ALE) Laboratory and are still used as such. Office activities and laboratory work relating to ecological investigations are performed at the ALE Laboratory. The buildings and missile facility at the northeast end of the OU have not been known to be used for any significant waste producing activities since the ending of NIKE operations in the late 1960s and are intact, but abandoned, today.

1.6 Current Use

This section presents a brief description of the current usage of the 1100-EM-2, 1100-EM-3 and IU-1 OU's.

1100-EM-2 The 1171 building was constructed in the early 1950s and has been used primarily for vehicle and equipment maintenance since. The site also served as a warehousing and transportation distribution center. Most of these activities, along with gas station services and support of Hanford's bus transportation system, are still occurring today.

1100-EM-3 During the last 25 to 30 years, the 1100-EM-3 OU area has been used for office and warehouse facilities in support of Hanford construction activities. Current activities at the OU include paint and sandblast operations, vehicle maintenance and repair, hazardous material storage, RCRA waste accumulation areas, warehousing, fabrication shops, radio maintenance, and radiography and research administrative offices.

IU-1 In the late 1960s the buildings at the southwest end of the OU were converted into the headquarters of the Arid Lands Ecology (ALE) Laboratory and are still used as such. Office activities and laboratory work relating to ecological investigations are performed at the ALE Laboratory. The buildings and missile facility at the northeast end of the OU have not been known to be used for any significant waste producing activities since the ending of NIKE operations in the late 1960s and are intact, but abandoned, today.

1.6.1 Ecological Features

The ecology of the three OU's is briefly described in this section. For the 1100-EM-2 and 1100-EM-3 OU's, a summary of information presented in section 5.3.6 and Appendix L of the 1100-EM-1 RI/FS-EA report is presented. Due to the close proximity of the 1100-EM-1, 1100-EM-2 and 1100-EM-3 OU's the ecology of each OU is very similar.

1100-EM-2 and 1100-EM-3 summarize text from RI/FS-EA

IU-1 A summary of information from the report " Ecological Perspective of Land Use History: The Arid lands Ecology (ALE) Reserve (PNL - 7750), Battelle 1991) is presented.

The ALE, established in 1967, is comprised of 311 square kilometers (120 square miles) of shrub-steppe land, located generally on the north slopes of the Rattlesnake Hills, and functions as ecological research area. The ALE is a limited access area and completely surrounds the 1100-IU-1 OU. The ALE was set aside to preserve native vegetation types and serves as a ecological research area for the study of the shrub-steppe without human-related land use pressures. The closest general public access area is about 5 kilometers (3 miles) from the main OU area. Pacific Northwest Laboratory manages the ALE Reserve for the U.S. Department of Energy.

The vegetation of the area is characterized by widely distributed shrubs, perennial grasses ,and a few annual and many perennial herbs. The current density of shrub vegetation is greatly reduced due to fires in 1981 that burned approximately 80% of the ALE. Plant communities at the ALE include; winterfat, thyme buckwheat, sagebrush, cheatgrass, bluebunch, wheatgrass and bitterbrush.

1.7 Nearby Properties and Facilities

The North Richland Well Field, the 1100-EM-1 Operable Unit, and the City of Richland are located near the 1100-EM-2 and 1100-EM-3 OU's. (See Figure XXX)

The North Richland Well Field, located immediately east of the 1100-EM-3 OU, is part of a water supply system for the City of Richland. Columbia River water is pumped to the well field and allowed to percolate through the soil to the groundwater where it is withdrawn by water supply wells. Findings of the 1100-EM-1 RI indicate that the mounding in the groundwater surface as a result of the recharge prevents flow of natural groundwater from the 1100-EM-1 OU (located west of Stevens Drive) to the well field. This finding can be extended to the groundwater beneath the 1100-EM-2 OU situated within the 1100-EM-1 OU west of Stevens Drive. It is likely that this finding also applies to the groundwater beneath the 1100-EM-3 OU, however, the possibility of some migration path from the 1100-EM-3 OU to the well field cannot be ruled out due to their close proximity and to the complex hydrogeology that has not been characterized in great detail. Groundwater samples from wells within 1100-EM-3 OU and at the well field have not detected gasoline or diesel fuel contamination (Year End Report for 3000 Area Underground Storage Tanks (WHC-SD-EN-TI-O64).

Characterization of the facilities and contamination at the 1100-EM-1 OU was reported in Phase 1 Remedial Investigation For The Hanford Site 1100-EM-1 Operable Unit (DOE/RL-90-18) and in Final Remedial Investigation/Feasibility Study-Environmental Assessment Report for the 1100-EM-1 Operable Unit, Hanford (DOE/RL-92-67). The Final RI/FS-EA Report identified three subunits within the 1100-EM-1 OU that contained contaminants at levels that pose a potential long-term risk to human health. One of these subunits, the Horn Rapids Landfill, is separated physically (located 2.5 km [1.5 miles] to the northeast) and hydrogeologically from the 1100-EM-2/1100-EM-3 OU's. The other two subunits, the Ephemeral Pool located near the southwest corner of the 1100-EM-2 OU and the UN-1100-6 (Discolored Soil Site) located 300 meters north of the 1100-EM-2, share the same physical characteristics and hydrogeologic regime as the 1100-EM-2/1100-EM-3 OU's. Approximately 590 cubic meters (770 cubic yards) of contaminated soil exist at these two subunits and will likely be removed and disposed of as part of the 1100 Area clean-up. No significant groundwater contamination was detected in the 1100-EM-1 near the 1100-EM-2/1100-EM-3 OU's. A discussion of groundwater sampling results for the 1100-EM-2 and 1100-EM-3 OUs is presented in section 2.2 of this addendum.

The main part of the City of Richland lies to the south and southeast of the 1100-EM-2/1100-EM-3 OU's with the closest residential areas located about 600 meters (2000 feet) to the southeast. Property immediately surrounding the 1100-EM-3 OU belongs to the city with the most significant feature being the North Richland Well Field discussed above. Two educational facilities, Hanford High School and an extension campus of Washington State University, are located east of the 1100-EM-3 OU at distances of 600 meters (2000 feet) and 1000 meters (3300 feet), respectively. Office complexes and other facilities associated with Hanford Site work are located in the vicinity.

1100-IU-1 OU The Arid Lands Ecology (ALE) Reserve and an abandoned natural gas well field are the adjacent areas of primary interest for this OU.

The ALE, established in 1967, is comprised of 311 square kilometers (120 square miles) of shrub-steppe land, located generally on the north slopes of the Rattlesnake Hills, and functions as ecological research area. The ALE is a limited access area and completely surrounds the 1100-IU-1 OU. The ALE was set aside to preserve native vegetation types and serves as a ecological research area for the study of the shrub-steppe without human-related land use pressures. The closest general public access area is about 5 kilometers (3 miles) from the main OU area. Pacific Northwest Laboratory manages the ALE Reserve for the U.S. Department of Energy.

Natural gas was discovered on the north slopes of the Rattlesnake Hills in 1913. Between 1929 and 1941, nearly 1.3 billion cubic feet of gas was extracted from 16 wells,. drilled to depths from 200 to 1200 feet, located south and west of the main OU area. The well field is abandoned today.

SECTION 2 SITE DESCRIPTION

2.1 Physical Characteristics of the 1100 Area

A brief description of prevailing physical characteristics of the 1100 Area follows. Section 2 and appendix B of the RI/FS-EA Report (DOE/RL-92-67) and Section 3 of the Phase I RI Report (DOE/RL-90-18) contain additional detailed descriptions and accompanying references.

2.1.1 Meteorology

Meteorological data for the 1100-EM-2 and 1100-EM-3 Operable Units is equivalent to that described for the 1100-EM-1 Operable Unit (DOE/RL-92-67, chapter 2). Data presented therein was obtained from historical records gathered at the Hanford Meteorological Station (HMS), the Hanford 300 Area automated meteorological station, and the Richland, Washington Airport.

Precipitation in the vicinity of the 1100-IU-1 Operable Unit is greatly influenced by the presence of Rattlesnake Mountain, an east-west oriented, elongate ridge having approximately 900 meters (2950 feet) of topographic relief above Cold Creek Valley (figure 2.1). An annual average rainfall of 22 cm (8.22 in) is recorded for the NIKE launch site located at an elevation of approximately 1200 ft. Average annual precipitation at the NIKE control site located at the crest of Rattlesnake Mountain at an elevation of approximately 3500 ft is 20 cm (7.87 in) although this figure is suspect, and likely low, due to the possibility of high southwesterly winds at the crest preventing rainfall from being collected and accurately measured by rain gauges. The maximum average annual rainfall on Rattlesnake Mountain as a whole was measured at 28 cm (11 in) immediately north of the crest. Average monthly maximum and minimum temperature values at the NIKE launch site are 28°C and -3.7°C while at the control site averages are 24°C and -4.5°C, respectively (Thorp and Hinds, 1977).

2.1.2 Surface Water

Infiltration and evapotranspiration of almost all surface waters characterize the surface water hydrology of the 1100 area. No wetlands, surface water impoundments, or obvious drainage channels exist within the 1100-EM-2, 1100-EM-3 OU's. There are no wetlands or surface water impoundments at the 1100-IU-1 OU. Some erosion channels, active during heavy rainfall or snow melt events, exist on the slopes of Rattlesnake Mountain but none pass directly through the 1100-IU-1 OU. The closest surface water bodies to the Hanford Site 1100 Area are the Columbia and Yakima Rivers (figure 2.1). Available floodplain information indicates that the three OU's are not located within the limits of Columbia and Yakima River flood events having return periods of less than 500 years.

2.1.3 Geology

Local geologic settings are summarized in the following paragraphs. The discussion emphasizes topics that may have a direct bearing on the descriptions of contaminant transport in the environment and on the development of remedial alternatives as presented later in this document. Exhaustive presentations of the regional and local geology can be found in DOE/RL-90-18, DOE/RL-92-67, and Gaylord and Poeter, 1991.

2.1.3.1 1100-EM-2 and 1100-EM-3 Operable Units

The interpretation and description of the geology of the 1100-EM-2 and 1100-EM-3 Operable Units is based primarily on previous studies in the adjacent 1100-EM-1 Operable Unit and on geologic logs of monitoring wells installed within the 1100-EM-3 Operable Unit during Underground Storage Tank (UST) removal operations accomplished during 1991.

The generalized stratigraphic column for the 1100-EM-1 Operable Unit as shown in the 1100-EM-1 RI/FS-EA figure 2-2, is also applicable to both the 1100-EM-2 and 1100-EM-3 areas. Information obtained from the drilling of 22 soil borings and 23 groundwater monitoring wells during the 1100-EM-1 Operable Unit RI, and five groundwater monitoring wells installed between the 1100 Area and the city of Richland well field in 1988 (Bryce and Goodwin, 1989) was used to develop the idealized stratigraphic column depicted.

The shallow depth of these borings and wells pose substantial limitations on the reliability of the estimates for the actual depth, thickness, and characteristics of the lower portion of the Ringold Formation beneath the 1100-EM-2 and 1100-EM-3 Operable Units. None of the borings extended through the suprabasalt strata to bedrock.

A cross section identification map is provided in 1100-EM-1 RI/FS-EA figure 2-3. Cross section D-D", found in figure 2-6 of that document, was constructed with a northeast-southwest orientation through the 1100-EM-1 and 1100-EM-3 Operable Units. The chief feature to be noted on the section is the presence of sand and gravelly sand units beneath the 1100-EM-3 area. The geometry of these deposits suggests an alluvial channel origin, possibly from flooding relating to minor ice dam failures along the ancestral Columbia River in post-Missoula times (Reidel, personal communication, 1993). The actual channel cross-sectional geometry and its areal extent has not been determined due to the wide spacing of well clusters within the Hanford 3000 Area.

Geologic logs for monitoring well boreholes installed for the 1100-EM-1 study are included in DOE/RL-90-18, appendix F and DOE/RL-92-67, appendix A. Geologic logs for monitoring wells (MW-23, MW-24, MW-25) installed within the 1100-EM-3 Operable Unit as part of the UST removals are presented at the end of this section as figures 2.2, 2.3 and 2.4.

Descriptions of the basalt and suprabasalt stratigraphy as presented for the 1100-EM-1

Operable Unit in DOE/RL-92-67, chapter 2 are also applicable to the 1100-EM-2 and 1100-EM-3 Operable Units.

2.1.3.2 1100-IU-1 Operable Unit

Little in the way of detailed site geologic characterization with respect to shallow waste disposal has been accomplished at the 1100-IU-1 OU. The following sections have been excerpted from studies performed as part of geologic characterization activities performed for the Hanford Site Basalt Waste Isolation Project (Fecht *et al.*, 1984).

2.1.3.2.1 Structure

The Rattlesnake Mountain area lies within the Yakima Fold Belt, one of three structural subdivisions of the Columbia Plateau. Collectively, the Rattlesnake Mountain area consists of three distinct structural segments: Rattlesnake Mountain and its southeast extension to the Yakima River, Snively Basin, and the east-west trending segment of the Rattlesnake Hills. These structural features are anticlinal ridges and form the southern and western boundary of the Pasco Basin. Of the three segments, Rattlesnake Mountain is the principal area of concern to the current study as both divisions of the 1100-IU-1 Operable Unit lie within its bounds. The latter two structural segments will not be considered further.

Rattlesnake Mountain is typical of the anticlinal ridges that characterize the Yakima Fold Belt. It is asymmetrical with a northeast vergence and a faulted north limb. The fault along with the southeast extension of an inferred structure extending to its terminus near Milton-Freewater, Oregon form the Rattlesnake-Wallula alignment (RAW). The RAW is a structural element of the Cle-Elum Wallula lineament, a fundamental structural feature of the Columbia Plateau. Additional details concerning the structure of Rattlesnake Mountain and vicinity can be found in chapter 3 of Fecht *et al.*, 1982.

2.1.3.2.2 Geomorphology

Degradational processes are most active along the crest and upper flanks of Rattlesnake Mountain, with surface runoff being one of the most effective geomorphic agents in modifying the land surface. Erosion associated with running water has formed an extensive ephemeral drainage network of rills and gullies along the northern slopes of the feature. The sparse vegetation of the area permits eolian processes to entrain and transport fine-grained sediments to other down-wind sites.

Various sizes and types of landslides occur within the Rattlesnake Hills area. The failures are the result of mass-wasting processes along fault-induced escarpments. Near the crest at the southeast end of Rattlesnake Mountain is a relatively small scarp above a relatively large debris flow which extends to within two thirds of a mile of the NIKE Launch Site. The Mabton interbed apparently was the primary failure surface for this and many of the other larger landslides in the Rattlesnake Hills area.

Chemical processes active in the suprabasalt sediments and the top of basalt have decomposed the rocks and formed crusts, pans, and horizons primarily cemented by $CaCO_3$, with older crusts cemented by Fe_2O_3 and SiO_2. Calcium carbonate formation is common to sediments of the area and varies from weakly calcic to petrocalcic. Silicretes and ferricretes are rarely observed.

2.1.3.2.3 Stratigraphy

The NIKE Control Center portion of the 1100-IU-1 Operable Unit, located on the crest of Rattlesnake Mountain, is underlain by the Pomona Member of the Saddle Mountains Basalt Formation. The member varies in thickness throughout the Rattlesnake Mountain area from approximately 15 m (50 ft) at borehole S13-88 near the crest of Rattlesnake Mountain to 53 m (173 ft) at borehole DC-12 in Cold Creek Valley. Only one of the flows associated with this member occurs in the area and is typically fine-grained to glassy and contains wedge shaped plagioclase phenocrysts and rare olivine. The Pomona Member has been radiometrically dated at 12 mybp (McKee *et al.*, 1977). A normal stratigraphic section of the Columbia River Basalt Group is anticipated beneath the surface exposures.

There is less than one foot of eolian sediments and in situ weathered rock fragments overlying bedrock at the NIKE Control Site.

The NIKE Launch Site portion of the 1100-IU-1 Operable Unit, located at an elevation of approximately 366 m (1200 ft) on the northern slope of Rattlesnake Mountain in an area designated as "Iowa Flats", is underlain by the Elephant Mountain Member of the Saddle Mountains Basalt Formation. The member is 37 m (120 ft) thick at borehole DC-12, thins on the flanks of the ridges, and pinches out onto the Rattlesnake Mountain crest. The texture of the rock is medium-to-fine grained with abundant microphenocrysts of plagioclase. The Elephant Mountain Member has been radiometrically dated at 10.5 mybp (McKee *et al.*, 1977).

Suprabasalt stratigraphy in the vicinity of the NIKE Launch Site has not been well documented. Generalized geologic maps suggest the Ringold Formation does not extend to the location of the Launch Site structures (figure 2-2, Myers and Price, 1981). The Touchet Beds member of the Hanford formation are said to occur in the form of rhythmically bedded, fine-grained sands and silts within the stratigraphic section of Iowa Flats (Fecht *et al.*, 1982). The position of the deposits within the section are not known. The Touchet Beds member of the Hanford formation represents a low energy, slackwater deposit of floodwaters associated with catastrophic Pleistocene floods. Overlying the Touchet Beds across Iowa Flats are landslide, eolian, and talus deposits of varying thickness. Eolian deposits of silt and sand dominate the post-Hanford formation sediments in the vicinity of the Launch Site facilities. There are no subsurface borings near the Launch Site structures with logs of the detail required to determine the thickness of suprabasalt sediments. It is assumed that bedrock is less than 25 feet below the existing ground surface based on the presence of piles of freshly broken rock located a few hundred feet west of the underground bunkers. It appears the material was excavated during the installation of the underground facilities and 25 feet represents the approximate maximum depth of the facility foundations.

[LOCATION OF FIGURE 2.1]

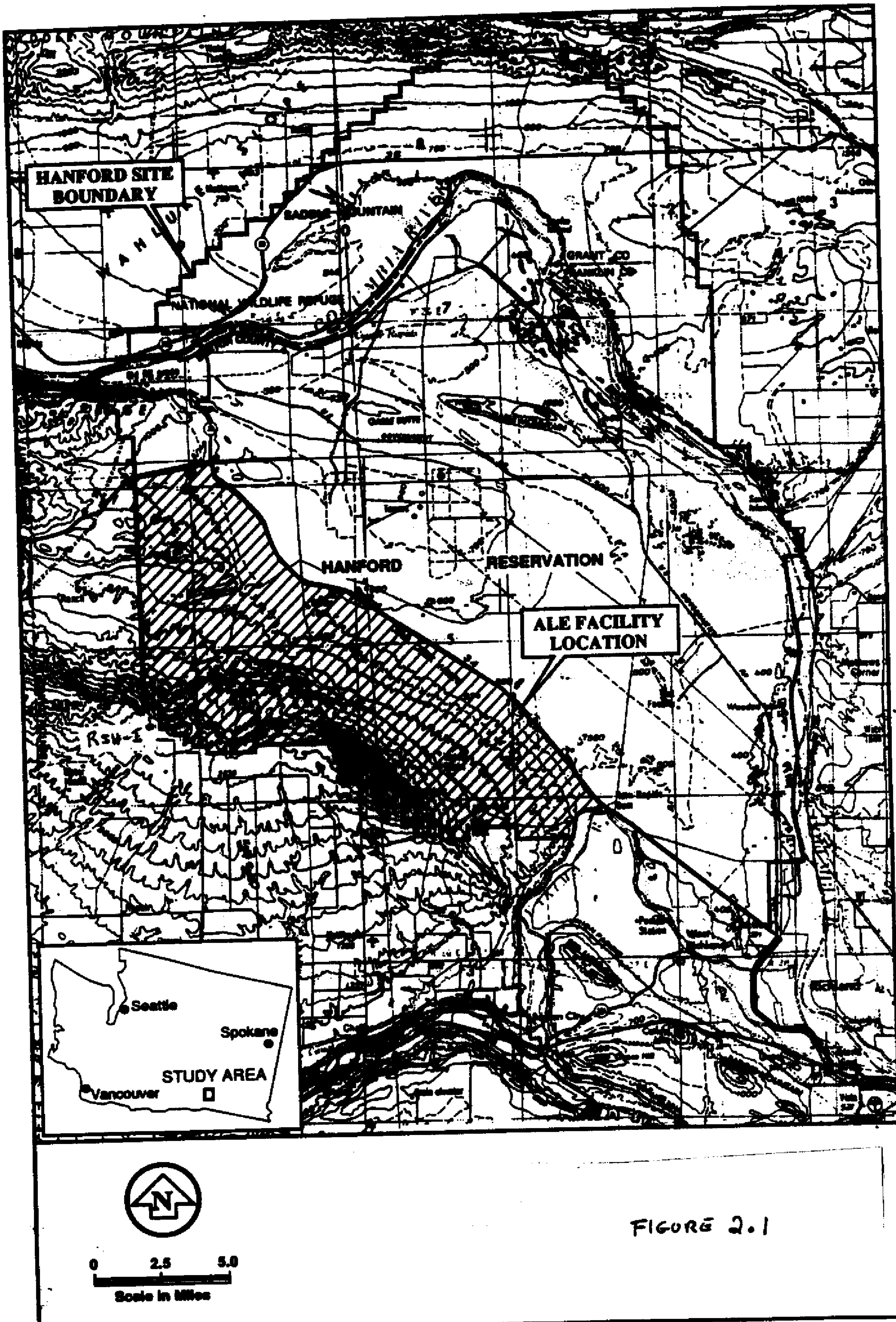

HANFORD SITE BOUNDARY
ALE FACILITY LOCATION
HANFORD
RESERVATION
NATIONAL WILDLIFE REFUGE
GRANT CO
Seattle
Spokane
Vancouver
STUDY AREA
N
0
2.5
5.0
Scale in Miles

FIGURE 2.1

2.1.4 Hydrogeology

Hydrogeology of the 1100-EM-2 and 1100-EM-3 OU's is distinctly different than that of the 1100-IU-1 and will be discussed separately.

2.1.4.1 1100-EM-2 and 1100-EM-3 Operable Units

Unsaturated zone thickness varies between about 12 to 18 meters (40 and 60 feet) at the 1100-EM-2 and 1100-EM-3 OU's. Although not conclusive, available information suggests a minimum of 0 to a maximum of 11 cm (4 inches) of annual seepage from precipitation reaches the saturated zone. Unsaturated zone modeling for the 1100-EM-1 OU, reported in DOE/RL-92-67, provides a best estimate range of 1 to 2 cm (0.35 to 0.7 inches) of average annual recharge to the saturated zone.

The unconfined aquifer is approximately 10.8 m (35.5 ft) thick at the 1100-EM-2 and 1100-EM-3 OU's, and is underlain by a clayey-silt aquitard that is about 5.5 m (18 ft) thick at monitoring well MW-17 located within the 1100-EM-3 OU. A confined aquifer, with groundwater flowing from west to east is found beneath the aquitard.

Prevailing groundwater flow of the unconfined aquifer is from the west (recharge from Yakima River) to the east (discharge to Columbia River) in the area surrounding the 1100-EM-2 and 1100-EM-3 OU's. Estimated maximum groundwater flow velocity beneath the site is 170 feet per year (Year End Report for 3000 Area Underground Storage Tanks, WHC-SD-EN-TI-064). Seasonal localized disruption of this flow occurs at the 1100-EM-2 and 1100-EM-3 OU's due to recharge at the North Richland well field located immediately east of 1100-EM-3. Recharge to the well field is at a 2:1 to 5:1 ratio in excess of water usage for 11 months of the year with normally no recharge for 1 month due to maintenance (WHC-SD-EN-TI-064). This recharge causes mounding in the groundwater surface below the well field, thus redirecting groundwater flow away from the mound. Seasonal redirection of the local unconfined groundwater flow beneath the 1100-EM-2 and 1100-EM-3 OU's results with flow generally being reversed to the westward direction. The time period of flow reversal is longer than that of natural flow conditions with the result being that it is unlikely that the natural groundwater beneath the 1100-EM-2 and 1100-EM-3 travels eastward to the North Richland well field but is diverted around it. A more detailed description of the unconfined aquifer flow regime and groundwater potentiometric surface maps are found in the 1100-EM-1 RI/FS-EA Report.

2.1.4.2 1100-IU-1 Operable Unit

The occurrence and nature of flow of the groundwater at the 1100-IU-1 is complex due to the steep hydraulic gradient and complex lithology at the site. A scarcity of reliable data points in the Rattlesnake Mountain area further complicates the development of an accurate representation of the local groundwater flow regime.

Groundwater flow beneath the crest of Rattlesnake Mountain occurs entirely within basalt bedrock. Very rough hydraulic head measurements performed in borehole RSH-1, the only subsurface exploratory boring located at the crest of Rattlesnake Mountain (figure 2.1), indicate the elevation of the local unconfined aquifer to be between 558 and 596 m (1820 to 1890 ft) above mean sea level; approximately 300 m (990 ft) below the ground surface at the borehole site and 450 m (1500 ft) below the highest point of the crest. Within the unsaturated basalt zone, numerous perched aquifers are anticipated with downward moisture migration being retarded at flow tops and along interflow clay horizons (Fecht *et al*, 1982). An abundance of springs along the slopes of Rattlesnake Mountain, 65% of which occurring between elevations 610 and 915 m (2000 and 3000 ft), likely result where perched aquifers and zones of higher hydraulic conductivity overlying zones of lower conductivity "daylight" to the ground surface (Schwab *et al*, 1979).

The juvenile hydrochemistry of the spring and well water (low total dissolved solids, calcium-bicarbonate chemical type) appears to be characteristic of a recharge area. The apparent downward head gradient in borehole RSH-l is also characteristic of a recharge area (Raymond and Tillson, 1968). Tritium concentrations of a few tens of picocuries per liter suggest a mixture of both pre- and post-1953 age spring waters in the Rattlesnake Mountain area; overall, the spring waters are considered young. This data suggests a moderate to rapid groundwater flow velocity within the Grande Ronde Basalt Formation, the estimated principle host formation for the unconfined aquifer.

2.2 Historical Groundwater Information

The following text summarizes the historical groundwater data available for the 1100-EM-2 and 1100-EM-3 areas for the period of time between January 1990 (Round 1) and March 1992 (Round 9). There are 2 groundwater monitoring wells in the 1100-EM-2 area and 7 groundwater monitoring wells in the 1100-EM-3 area, listed in Table 2.1 below. Complete data tables are presented at the end of this section as tables 2.2.2.1 through 2.2.2.8.

Table 2.1. Monitoring Wells Located in 1100-EM-2 and 1100-EM-3 Areas

1100-EM-2 Area Groundwater Monitoring Wells	1100-EM-3 Area Groundwater Monitoring Wells
MW-1	699-S-E14
MW-3	699-S41-E13A
	699-S41-E13B
	MW-17
	MW-23
	MW-24
	MW-25

Data for the first four groundwater monitoring events, Rounds 1-4 (January 1990 - December 1990), were collected and validated by Golder Associates according to Section 4 of the work plan (DOE-RL, 1989). Data quality met Level IV Contract Laboratory Program (CLP) analytical methods for organic and inorganic analyses and Level III for general chemistry and radionuclide analyses. All of the data reported met the criteria specified in the work plan and all quantitation limits were below the MCL levels current at the time of collection.

Data for the second five groundwater monitoring events, Rounds 5-9 (March 1991 - March 1992), were collected and validated by WHC Office of Sample Management for Rounds 5-6, and USACE for Rounds 7-9. Data quality met the criteria established in the Phase II Supplemental Work Plan (DOE/RL-90-37). Groundwater samples were analyzed for primary and relevant secondary drinking water, Washington Administrative Code (WAC) 173-304, RCRA groundwater monitoring parameters, general chemistry parameters, CLP Target Compound List (TCL) parameters, CLP Target Analyte List (TAL) parameters, coliform bacteria, and radiochemical parameters.

The results have been broken down into the categories of volatile organics, semivolatile organics, pesticides, metals, wet chemistry, and radioactive isotopes for ease of review. Maximum contaminant levels (MCL), proposed maximum contaminant levels (PMCL), secondary maximum contaminant levels (SMCL), and maximum contaminant level goals (MCLG) are presented with the analytical data in summary form in section 2.2 tables to facilitate comparison. The complete analytical data is presented at the end of the chapter and is tabulated according to monitoring well number, well identification tag, round number, and sample identifier where applicable and available.

2.2.1 1100-EM-2 Area Results

The results of volatile organics, semivolatile organics, pesticides, and herbicides analyses revealed the presence of no analyte compounds above the sample quantitation limits.

The inorganic data revealed several analytes detected above sample quantitation limits, which are presented in Table 2.2. The chromium concentration is above the MCL in one sample, which appears to be an anomalously high value, causing the average concentration to exceed the MCL. The average concentration of chromium without this value included is below the MCL. Nickel was found to be above the MCL in several samples in earlier rounds, and below the MCL in subsequent rounds. Screening the list of analytes for micronutrients (aluminum, calcium, magnesium, potassium, and sodium), analytes whose high concentrations appear to be anomalies limited to one or two samples (chromium and nickel), and contaminants detected below MCLs results in no inorganic analytes of potential concern.

Table 2.2. Inorganic Analytes

Analyte	# Rounds Detected	[Mean] ug/L	[Max] ug/L	MCL ug/L	PMCL ug/L	SMCL ug/L	MCLG ug/L	MTCA ug/L
Aluminum	2/6	1374	1960	-	-	50	-	-
Calcium	6/6	88065	146000	-	-	-	-	-
Chromium	4/6	51 (27)[1]	170	50	-	-	120	80
Copper	1/6	30	30	-	1300	1000	1300	592
Lead	3/6	2 JB	2.4 B	50	5	-	20	224
Magnesium	6/6	21617	29300	-	-	-	-	-
Manganese	6/6	145	352	-	-	50	-	3200
Nickel	5/6	87	137	-	-	-	100	320
Potassium	6/6	8096	13900	-	-	-	-	-
Sodium	6/6	33719	49800	-	-	-	-	-

Wet chemistry analytical data showed nitrate to exceed MCLs, Table 2.3.

Table 2.3. Wet Chemistry Parameters

Analyte	# Rounds Detected	[Mean] mg/L	[Max] mg/L	MCL mg/L	PMCL mg/L	SMCL mg/L	MCLG mg/L	MTCA mg/L
Nitrate	4/5	18	34 J	10	-	-	10	25.6

Radionuclide data for sampling rounds 1-4 were reported by Golder Associates as unvalidated data because the lower limits of detection (LLD) and minimum detectable activity (MDA) were not reported by the laboratories. Field blank data was used to determine upper tolerance limits (UTLs) and data was qualified with a "U" if the results were below the UTL for the particular parameter. The radionuclide results did not exceed RPD evaluation criteria for alpha, beta, tritium, radium and strontium results. Alpha radiation is above the MCL in one sample and appears to be an anomaly. The average concentration, calculated conservatively, is below the MCL. There is not a specific MCL for gross beta. Compliance with individual MCLs for beta emitters may be assumed if the average annual concentration of gross beta activity is less than 50 pCi/L, which is the case here. This results in no radionuclides of potential concern.

1 Mean with the 170 value omitted.

Table 2.4. Radionuclides

Analyte	# Rounds Detected	[Mean] pCi/L	[Max] pCi/L	MCL pCi/L	PMCL pCi/L	SMCL pCi/L	MCLG pCi/L	MTCA pCi/L
Alpha	5/6	6.5	17	15	-	-	0	-
Beta	6/6	13	24	see text	-	-	0	-

2.2.2 1100-EM-3 Area Results

The results of volatile organics, semivolatile organics, pesticides, and herbicides analyses revealed the presence of several analyte compounds above the sample quantitation limits, shown in Table 2.5. All of the identified compounds are flagged with a "J" qualifier signifying that they have been positively identified as being present but their concentration is uncertain. All of the analytes in Table 2.5 had an anomalous concentration in one or two samples while the majority of samples did not detect the contaminant.

Table 2.5. Organic, Pesticide, and Herbicide Analytes

Analyte	# Rounds Detected	[Mean] ug/L	[Max] ug/L	MCL ug/L	PMCL ug/L	SMCL ug/L	MCLG ug/L	MTCA ug/L
Phenol	1/6	-	5 J	-	-	-	-	-
Bis(2-ethylhexyl) phthalate	2/6	4 J	6 J	-	4	-	0	6.3
Tetrachloroethene	1/6	-	2 J	-	5	-	0	0.9
C12 Hydrocarbons	1/6	-	100 J	-	-	-	-	-

The inorganic data revealed several analytes detected above sample quantitation limits, which are presented in Table 2.6. All analytes are below MCLs or no MCL is proposed for the given analyte. After screening the list of analytes for micronutrients (aluminum, calcium, magnesium, potassium, sodium, etc.) and contaminants having an anomalous concentration during one round of sampling while the majority of rounds either did not detect the contaminant or detected it below MCLs left no inorganic analytes of potential concern.

Table 2.6. Inorganic Analytes

Analyte	# Rounds Detected	[Mean] ug/L	[Max] ug/L	MCL ug/L	PMCL ug/L	SMCL ug/L	MCLG ug/L	MTCA ug/L
Aluminum	3/6	565	1280	-	-	50	-	-
Barium	6/6	33	53.3 J	1000	5000	-	1500	1120
Calcium	6/6	37485	67000	-	-	-	-	-
Chromium	4/6	28	38.8	50	-	-	120	80
Iron	5/6	402	1930	-	-	300	-	-
Lead	3/6	3.6	3.8 J	50	5	-	20	224
Magnesium	6/6	7966	14000	-	-	-	-	-
Manganese	6/6	43	114	-	-	50	-	3200
Potassium	6/6	4416	5980	-	-	-	-	-
Sodium	6/6	13046	20900 J	-	-	-	-	-
Cyanide	1/6	-	0.01	-	-	-	200	320

Wet chemistry analytical data for 1100-EM-3 did not reveal any parameters of concern.

Radionuclide data for sampling rounds 1-4 were reported by Golder Associates from unvalidated data because the lower limits of detection (LLD) and minimum detectable activity (MDA) were not reported by the laboratories. Field blank data was used to determine upper tolerance limits (UTLs) and data was qualified with a "U" if the results were below the UTL for the particular parameter. The radionuclide results did not exceed RPD evaluation criteria for alpha, beta, tritium, radium and strontium results. Alpha and Beta were reported at values less than the MCLs.

Table 2.7. Radionuclides

Analyte	# Rounds Detected	[Mean] pCi/L	[Max] pCi/L	MCL pCi/L	PMCL pCi/L	SMCL pCi/L	MCLG pCi/L	MTCA pCi/L
Alpha	3/6	4	6.02	15	-	-	0	-
Beta	4/6	9	11.18	see text	-	-	0	-

2.2.3 Conclusions

Groundwater data from existing wells in the 1100-EM-2 area was analyzed for volatile organics, semivolatile organics, pesticides, herbicides, inorganics, wet chemistry parameters, and radionuclides. The analytical results indicate that nitrate is a potential contaminant of concern in the groundwater.

Groundwater data from existing wells in the 1100-EM-3 area was analyzed for volatile organics, semivolatile organics, pesticides, herbicides, inorganics, wet chemistry parameters, and radionuclides. The analytical results do not indicate that the presence of potential contaminants of concern in the groundwater.

2.3 Data Research

The data research undertaken for the three OUs to evaluate the potential for the presence of contaminants of concern consisted of evaluating existing information. No new information or analytical data was developed. A historical file review was conducted to identify and analyze inform,ation sources pertinent to past practice operations.

Reference sources that were reviewed include; aerial and historical photographs, land use maps and drawings, topographic maps, historical news clippings, Camp hanford drawings, construction as built drawings, published investigativereports from other, similar sites, published hanford articles and the Hanford Waste Information Data System (WIDS).

Local and state regulatory agency files were also reviewed. However, due to security associated with the past Hanford mission, only limited additional information was available from tose sources. A review of spill records was also undertaken. Spill records were primarily related to events in the past five years.

In addition to the review of historical information, site inspections and personal interviews were conducted. The results of those activities are presented in sections 2.4 and 2.5, respectively. Table 2.6 presents the combined results of these activities.

2.4 Site Inspections

Site visits were conducted at 1100 EM-2, EM-3 and 1100 IU-1 OUs between October 1992 and February 1993 to corroborate historical data and visually inspect for signs or evidence of contamination arising from past practices and site uses. Inspections at the IU-1 were hampered by the fact that the Tricities area experienced record snowfalls for the winter months. The inspection team walked over each area to confirm the location of suspect contamination sites such as underground storage tanks and landfills, which where identified in the TPA and in WIDS, review of air photos and Camp Hanford drawings, and through personnel interviews. During site visits the team looked for unusual features such as stained soils, stressed vegetation, debris piles, ect., to identify any new suspect sites. additional locations were identified during the site visit. Additional sites were found during the inspections and were added to the list of sites. Spill and cleanup records where reviewed when available and these spill sites where inspected after existing spill documentation was reviewed. A summary of the site inspections is included in Table 2.6.

2.5 Interviews

Interviews were conducted with individuals who had previously worked at the 1100-EM-2, 1100-EM-3 and 1100-IU-1 OUs. The interviews revealed accounts of oil being disposed of at the 1100-EM-3 OU by spreading it on the ground near the 1212, 1226, and 1227 buildings. The oil was spread by "driving around with a 55 gallon drum and a spreader bar until the oil was discharged." This was reported to be the method of oil disposal until the early 1980s. This time frame coincides with the installation of a waste oil tank at the site. Reports of discharging battery acid at an unidentified location within the 1100-EM-3 were also made. Other reports indicated that chrome and lead contaminated soil in the Jones HWSA (within the current 1100-EM-3 OU) had been excavated and hauled off-site. The extent of contamination had been determined visually and the excavated area had been backfilled.

Interviews with past workers at the NIKE missile site revealed that paints, solvents, fuels, unidentified drums (full and empty), and all other wastes from the missile site were disposed of in the on-site landfill. Oil was reportedly dumped close-by off-site. The operations at the control center on the top of the mountain were reported to be fairly clean, except for wastewater and some debris.

[LOCATION FOR TABLE 2.6]

TABLE 2.8 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
1100-IU-1 CONTROL CENTER	Elevation 3000 feet	Radio tubes, wire, debris on hillside	Walked the NE slope below site found surface glass, debris, no radio tubes
Potential Landfill at Control Center at top of Rattlesnake Mtn.	To be determined if landfill identified during LFI activity.	Interviews indicated no landfill on top. Two suspect locations identified in air photo.	Suspect locations are soil & rock borrow areas
6652-C UST at Control Center.	Verify location.	5000 gal diesel tank. Annual tightness testing performed.	Located at the south corner of the repair shop (building 6652-C). No evidence of spillage at fill port.
6652-C SSL Active Septic Tank & Associated Drainfield.	Verify location Check for outfall pipe location.	See drawing 18-02-36 plate 21.	Concern with outfall over NE slope. No visible drainage, minor erosion channels down slope are present.
6652-C SSL Inactive Septic Tank & Associated Drainfield.	Verify location Check for outfall pipe location.	Drainfield on top located on drawing 18-02-36 plate 21.	No outfall pipe at this site. System is not in use. No drainage or visible contamination.
Radar Berm & Pads.	Basalt berm, check for hydraulic fluid stains.	See drawing 18-02-36 plate 21.	No visible evidence of oil stains. North Tracking Radar Pad showed rust stains. Berms were snow covered during LFI.
H-52-C Surface Gas Tank Storage Area (2) - 475 gal tanks.	Verify location and check for stressed vegetation and stained soil.	Interview indicated area used for paintbrush and general cleanup - no containment was provided. Refer to drawing 18-02-36 plate 21.	Identified general site location. No visible soil staining.

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
Control Center Disposal Pits (4).	New Site identified during LFI activities.		Four pits approximately 2 feet deep by 3 feet in diameter. Contained solid waste (cans,bottles) .
BUILDING 6652-C Abandoned Under Ground Storage Tanks. Fuel Oil. (5) - 1000 gal.	Tanks may be located under the building.	Interview indicates that tanks where not removed during expansion of bldg 6652-C. Refer to drawing 18-02-36 plate 21.	Appears that the expansion to building 6652-C was built over the location of 4 of the tanks (questionable due to structural reasons). The LFI team was unable to observe the corner of the suspect area due to snow cover. One tank may be located on the east corner of the bldg.
Pumphouse Disposal Slope	NEW SITE		Noted visible evidence of dumping of solid waste on slope. Small debris pile at the top and waste concrete dumped on the slope.
Pumphouse Latrine Fuel Tanks.	Check for stained soil.	See drawing 18-02-36 plate 21. 1 - 1500 gal tank. 1 - 275 gal tank	Above ground fuel oil tanks have been removed. Soil was not observed due to snow coverage.
Transformer Locations (4).	Look for stains which could be potential PCB source.	Review drawing (site map #H-52-C).	No visible evidence of leakage. Benton PUD indicated PUD transformers above 50 ppm PCBs at this location have been removed.
Launch Site			
6652-G ALE Field Storage Building Septic Tank & Drainfield(4000 gal).	Inspect surface. Interview site personnel.	See drawing 18-02-36 plate 22.	Surface was not observed due to snow coverage. Need to complete interview.

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
Mound Site NW of Bldg 6652G.	Verify location and check for stressed vegetation and stained soil.	Refer to 89 air photo. Interview indicates that berm has been in place for over 21 years.	Appears to be a windbreak or the location of a soil research project by PNL's ALE Lab. Vegetation is established on the mound. Area has been scraped per air photo 1989. Surface was not observed due to snow coverage.
6652-I ALE Headquarters Septic Tank & Drainfield (6000 gal).	Inspect surface. Interview site personnel.	See drawing 18-02-36 plate 22 & 16-10-10 plate 7.	Surface was not observed due to snow coverage. Need to complete interview.
Ale Area Transformer Pads.	Identify pads and verify transformer as non-PCB. Check for stains which could be potential PCB source.	See drawing 18-02-36 plate 22. Transformers may have been on a pad in the past similar to Generator Bldg Transformers.	Transformers are on poles. No pads or visible leakage. Located West of 6652-PH(pumphouse). Benton PUD indicated PUD transformers above 50 ppm PCBs at this location were removed.
H-52-L Surface Gas Tank Storage Area. (2) - 475 gal tanks.	Verify location. Check for stained soil & stressed vegetation.	Interviews indicated area used for paintbrush and general cleanup - no containment. Refer to drawing 18-02-36 plate 22.	Site was not observed. Site is between building 6652-K and building 6652-O.
Abandoned USTs. (1) - 275gal oil (2) - 2000gal fuel oil (1) - 2000gal oil (1) - 3000gal fuel oil (1) - unknown vol oil	Verify location. Check for stained soil.	Locate sites using drawing 18-02-36 plate 22. Interview indicates that tanks may have been left with fuel inside.	Located 3000 gal fuel oil tank behind generator bldg. Remaining tanks need to be located.
6652-G UST. 2000gal fuel oil.	Contact WHC for updated info.	Refer to drawing 18-02-36 plate 22 and H-6-635.	Observed UST location. No visible leaks or stained soil was observed.

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
6652-P UST. Unknown volume, last contained diesel.	Contact WHC for updated info.	See drawing H-6-635. Tank located in 1989 during site inspection.	Site was not observed. 6652-P supplied diesel fuel to generator located inside of building 6652-P until building burned down.
6652-L UST. Unknown volume, last contained diesel.	Review existing volume data.	See drawing #H-6-226. Installed 1962	Tank located on the west side of bunker (Bldg.6652-L). Additional info needed on size/status.
H-52-L Missile Bunker sump. (Underground facilities).	Potential hazards. Missile fuel(red fuming nitric acid aniline, furfuryl alcohol, JP3/JP4, hydrazine). Check sump pump area.	Refer to drawings 40-02-03 & 26-03-03.	Several old transformers found. One was discarded on the pad at the surface. Sump areas appeared clean. Some batteries and what appears to be old monitoring equipment was located in the south missile sump. Potential existence of a large hydraulic fluid tank due to extensive hydraulic system.
Missile Bunker, Drainfield Active.	Inspect surface.	See drawing H-6-226	Area was snow covered during LFI.
Main Entrance Stained Soil.	NEW SITE		Observed stained soil and debris at location. Vegetation may be stressed, seasonal assesssment recommended.
Missile Bunker, Discharge Ditch.	Check Rock & gravel lined ditch for debris or contaminants. Locate catch basin. Verify discharge source as above or below ground.	See drawing 18-02-36 plate 22 and project file.	Source of waste water not determined. Water observed discharging into rock-filled trench. Discharge water contained particulate matter. Ditch was filled with snow.

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
H-52-L Missile Bunker, Landfill.	Located northwest of bunker.	Interviews indicate that this may contain demolition/remodeling debris from upgrade/repair of NIKE Base & Emergency Control Center. See air photo 1992.	Identified rock and soil debris from Bunker excavation. Area was littered with paint cans, construction debris, wires and cables.
JP4 Fuel Pad.	Concrete pad, check for spill/stains.	See drawing 18-02-36 plate 22.	No evidence of stains or spills on or around pad.
H-52-L NIKE Base Landfill.	Located 100 yards southeast of Main Gate.	Refer to air photos 8-16-55 & 1992. Interviews indicated that everything used to support the operation went into a Landfill close to the site. See project file.	Area has debris at surface, many old road and excavation scars, numerous areas of discolored soil and possibly stressed vegetation. Scattered debris consisted of cans, bottles, metal and construction debris. Noted small ephemeral stream channels. Possibly stressed vegetation, recommend seasonal assessment.
Missile Refueling Area Berm.	Potential historical pesticide/defoliant usage.	See drawing 18-02-36 plate 22.	Vegetation is sparse on berm.
Acid Neutralization Pit.	Check containment integrity.	See drawing 18-02-36 plate 22.	Concrete drainage pit filled with soil and vegetation.
Missile Refueling JP-4 Fueling Station Area .	Check for spills, fuel may have drained into acid sump.	See drawing 18-02-36 plate 22.	No visible evidence of spills. Vegetation is growing in concrete cracks the and acid sump between concrete pads.

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
Missile Assembly & Test Bldg. Inactive Septic System.	Potential hazards include Chlorinated Hydrocarbons,and Total petroleum hydrocarbons (TPH).	Building 6652-O was location of electrical parts cleaning operations. Drawing H-6-225 disposal system location differs from Drawing 18-02-36.	No surface stains visible. Suspect that drain field extends under fence.
Generator Bldg Transformer Pad.	Electrical hazard. PUD security lock on fence. Check cement pad for spill stains, PCB potential.	Military transformers and pad replaced in 1960. See drawing 26-03-05.	Observed leaking transformer and stained cement pad . Transformers and pad removed February, 1993. Lab analysis shows 9ppm PCB for removed transformer per Benton PUD. No soil samples taken during LFI to verify absense or presense of contamination due to past practice activities.
Missile Assembly & Test Bldg UST. (1) - 275 gal fuel oil	Verify above or below ground tank.	See drawing 18-02-36 plate 22.	Above ground tank appears to be in use. No stains or leakage observed.
Missile Maintenance & Assembly Area Acid Storage Shed.	Check for stained soil & stressed vegetation.	See drawing 18-02-36 plate 22.	Vegetation is stressed and soil is discolored in this area. Bare soil was observed near the shed. A drainage ditch from this location goes under the fence towards the NIKE Landfill to the west. Vegetation is stressed and soil is discolored along this drainage ditch.
Missile Maintenance & Assembly Area Paint Shed.	Check for stained soil & stressed vegetation.	See drawing 18-02-36 plate 22.	Paint shed has been removed. A block shed is located nearby which probably replaced the aluminum paint shed. No visible stains in this location.

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
Flammable Storage Block Shed.	NEW SITE		Block Shed may have replaced Paint Shed. Flammable sign on shed. Storage racks located outside of building. Bare soil was observed around shed. Vegetation is stressed and soil is discolored in this area.
Missile Maintenance & Assembly Area Dry Well Drum.	Located in southeast corner of site within the fenced area.	See drawing 18-02-36 plate 22.	Observed 55 gallon drum buried in soil. Vegetation around area is sparse. Observed 55 gallon drum laying on side near opening of buried drum. Drum marked "Dry Cleaning Solution (60-10-4F)".
Generator Bldg.	Generator oil - PCBs potential. Check for disposal area.	See drawing 18-02-36 plate 22.	Observed 3 small transformers and other electrical equipment. Sumps may have collected leakage from generators. Building is falling apart, potential friable asbestos and lead particulate.
Site Entry Loading Dock.	Refer to 1989 air photo during LFI. Inspect Surface.	Activity area in 1955 Air Photo.	This was a loading dock area. No visible stains or contamination noted.
Horseshoe Site.	Refer to 1989 air photo during LFI.	Refer to 1989 air photo during LFI. Site shape defined by horseshoe shape road excavation noted in 1989 air photo.	Possible demolished building or disposal site. Extensive debris. Observed large pieces of what appears to be dried paint and scattered household trash (old cans and broken pop bottles).
Elevator Doors.	NEW SITE	Refer to drawings 40-02-03 & 26-03-03.	Observed tar substance used as a sealant around edges of Launch Pad & Elevator Door, PCB potential.
1100-EM-2			

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
Steam Pad Tank #2 UST 1171-2.	Inspect surface.		4000 gal fiberglass tanks last contained wastewater.
Steam Pad Tank #3 UST 1171-3.		Installed 1984.	Scheduled for removal in 1993/94.
700 Area Waste Solvent Tank (Unit 703-1).	Inspect surface.	See WIDS.	Tank has been removed and site remediated.
Tar Flow	NEW SITE		Observed soft tar like substance that remains on the surface and has flowed about 150 feet northeast into a drainage channel. Vegetation is sparse. Flow is located about 1,050 feet north of the northwest corner of the 1171 building.
Stained Sands	NEW SITE		Observed stained sands on east slope of sandune. No vegetation observed on the stained sands. The area is about 20'x 20' and is located 888 feet north of the northwest corner of the 1171 building.
Neptunes Potato & Separator Tank. (Trident).	Check for stained soil & stressed vegetation.	Refer to air photo 1-30-1948 # 2-169.	Walked along existing trench. No visible evidence of a release or stress to the environment was observed. The three distribution trenches at the end of the main trench have been disturbed and are no longer visible due to agricultural activities. Concrete tank observed which may be associated with the trench.

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
Bus Lot Dry Wells (6).	NEW SITE	A site plan was obtained showing drywell locations.	Observed drywells located south and southwest of the 1170 Bus Station. Five wells are open and currently receive stormwater/rainwater from paved parking lot which drains into soil under parking lot. One drywell has been paved over and was not visible. Informed DOE & KEH project managers of Drywell locations/regulatory concerns. Drywells will be addressed under project # LO 44.
Bus Shop Underground Hoist Rams.	Check for leaks.	Hoists replaced in 1986 due to leakage.	No visible evidence of leakage. Analysis of soil sampling indicates that remediation was complete.
Hazardous Staging Area.	Check for spills.	See WIDS.	This was a RCRA less than 90 day storage area (now closed). No visible evidence of leakage. Waste was containerized, no leaks or spills reported.
1171-4 UST.	Check for spills.	UST installed 1953 for used oil.	UST located inside light equipment shop. Annual Tightness Test Performed, UST removal scheduled for 1993/94.
1171-5 UST.	Check for spills.	UST installed 1953 for used oil.	Annual Tightness Test Performed, UST removal scheduled for 1993/94.
1171-6 UST.	Check for spills.	UST installed 1953 for used oil.	UST is under temporary closure and removal scheduled during the upgrade of the 1171 shop building.
1100-EM-3			

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
1234 Simulated High-Level Waste Slurry Treatment & Storage Yard.	Check for spills/stained soil.	Storage began in 1981. See WIDS.	Site secure, LFI walkthrough of storage area not performed. Discussion with PNL indicates that spills have been cleaned up and a RCRA Closure Plan has been submitted to EPA and Ecology.
1240 French Drain.	NEW SITE		Drain is located west side by loading dock. No evidence of spills into drain. No evidence that drain is attached to sewer (reported to discharge into soil). PCB satellite collection area close to drain.
1240 Hazardous Waste Staging Area.	Check for spills/stained soil.	See WIDS. Pad was used since 1951 to stage/store hazardous substances.	RCRA Satellite Area. Two drains in storage pad that drain into the soil. Pad has old stains on it.
1240 Compressor Oil Spill Area.	NEW SITE		Observed area of old spill, area is clean. Records indicate spill cleaned up to less than 2 ppm PCBs in soil.
1240 Suspect Spill area.	NEW SITE		Observed spill area on south end of 1240 building. No record or knowledge of spill found. Appears to be a pliable adhesive mixed with metals and floor sweepings disposed over the years.
JA Jones Yard Hazardous Waste Staging Area.	Check for drums,leaks and spills.	See WIDS.	Area was clean & graveled. Interview indicated that past spills were cleaned up. Lack of info on confirmatory sampling.

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
Unplanned Release (of mixed waste)	Observe site. 2.0E- 06 Ci of Cs-134 in 1,650mL solution disposed of in sink.	See WIDS. Solution was discharged accidently into Richland city sewer system in 1973. The sink, trap and drain were surveyed after the discharge; no radioactivity was found.	Building was secure at time of inspection. It was reported that the building would be demolished. No observation was made during LFI.
1208 Sandblast Area.	NEW SITE	Refer to air photos ASCS 8-20-62 (This air photo shows the activity occurring in Aug, 1962). 1992 photo shows wind blown wastes.	Observed waste sandblast sand containing residual paint & metal chips. Current operations are limited to a small area. Potential for wastes to migrate offsite towards North Richland wellfield and recharge ponds .
1218 Service Station.	NEW SITE	Refer to drawing # 18-02-36.	Inspected existing concrete pad. Observed two 8" drains in pad, piping and a brass cap attached to piping.
1212/1227 Suspected Battery Acid Disposal Area.	NEW SITE	Interview indicated that batteries had been emptied here for 20 years prior to 1980.	Surface stains where observed and attributed to leaks from vehicles. Area is covered with gravel.
1226 Suspect Waste Oil Disposal Area.	NEW SITE	Interview indicated that waste oil had been spread for 20 years prior to 1980.	Located between building 1226 & 1212. Area was paved over and/or covered with gravel.
JA Jones Steam Plant Drain Pad.	NEW SITE	Refer to drawing 18-02-36 pl-4.	Inspected pad and drains. Could not determine where drain system discharged. No visible evidence of contamination.
JA Jones Oil Storage Tanks (2). Unknown volume.	NEW SITE	Found old JA Jones drawing that indicated tank location. Copy in project file.	Located tank site, area covered with snow during LFI. Tanks may have been above ground and supplied fuel for Steam Plant.

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
1262 Transformer Pad.	NEW SITE	Refer to drawing 18-02-36 plate 4.	Pad appears to have held transformers in the past. No visible stains observed.
1208 HWSA.	Check for spills.	See WIDS RCRA Satellite Area.	Observed wastes stored on concrete pad in containers. No evidence of contamination observed.
1235 Bottle Dock.	Check for spills	RCRA storage records held by KEH.	Inspected RCRA less than 90 day storage area. No evidence of contamination observed.
1226 HWSA.	Check for spills	See WIDS	Observed wastes stored on concrete pad in containers. No evidence of contamination observed.
12 UST Removal/Closure Sites.	Check for spills	See drawings 18-02-02 & 18-02-36 plate 10	No evidence of contamination observed.
3000-12 UST.	Check for spills at oil tank fill pipe.	See WIDS	Observed small oil stain on soil at tank site. UST is temporarily closed.
1212 Bottle Dock.	NEW SITE	See drawings 18-02-02 & 18-02-36 plate 10	No evidence of contamination observed at abandoned bottle dock.
Southwest Corner Dirt Mound.	NEW SITE		Observed metal debris in mound. No evidence of spills. Mound appears to be a source for fill material or storage of excavated soil.

TABLE 2.6 SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100 IU-1, 1100 EM-2, AND 1100 EM-3

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
1262 Solvent Tanks (3). Last contained Carbon Tetrachloride.	Check for spills	Refer to drawings # 18-02-09, 36-04-35 & 36-04-31. Extractor Tank D-25 20 gal Extractor Tank D-26 100 gal Dirty Solvent Tank D-32 1125 gal Clean Solvent Tank D-32 1125 gal	Did not observe soil during LFI due to snow cover.

2.6 Potential Contaminants of Concern.

The identification of potential waste types for the 1100-EM-2, EM-3, and IU-1 Areas is based upon historical information about typical chemicals and materials that were used at the sites collected from the Waste Information Data System (WIDS), previous site investigations, and site reconnaissance activities.

2.7.1 1100-EM-2 Area

The potential contaminants of concern for the 1100-EM-2 Area are 1,1,1-trichloroethane (700 Area UST waste solvent tank) and poly-chlorinated biphenols (1100 Area bus shop), see Table 2.7.1.

Table 2.7.1. Potential Contaminants for 1100-EM-2

Operable Unit	Waste Management Unit	Contaminant
1100-EM-2		
	700 Area UST Waste Solvent Tank	1,1,1-Trichloroethane (TCA)
	1100 Area Bus Shop	Poly-Chlorinated Biphenols (PCBs)

2.7.2 1100-EM-3 Area

In the 1100-EM-3 Area the potential contaminants include nitrates (1234 storage yard), lead (3000 Area Jones Yard HWSA), carbon tetrachloride (1262 solvent tanks), and PCBs (1262 transformer pad), see Table 2.7.2.

Table 2.7.2. Potential Contaminants for 1100-EM-3

Operable Unit	Waste Management Unit	Contaminant
1100-EM-3		
	1234 Storage Yard	Nitrates
	3000 Area Jones Yard HWSA	Lead
	1262 Solvent Tanks	Carbon Tetrachloride
	1262 Transformer Pad	PCBs

2.7.3 1100-IU-1 Area (NIKE Missile site)

Studies of NIKE Missile sites for WHC by IT Corporation (MLW-SVV-073751, I-92-19) revealed that releases fall into four general categories; incidental, accidental, intentional and unanticipated. Incidental release consist of minor release accompanying normal site operations. Accidental releases occurred due to fuel spillage while filling USTs, and leakage of hydraulic fluid from missiles, launchers and elevators. Intentional releases involved the midnight dumping of unsymmetrical dimethylhydrazene (UMDH), waste solvents and oils. Unanticipated releases from transformers containing PCBs resulted due to vandalism or negligence, and asbestos released during the demolition of buildings.

Typical chemicals used at Nike sites (DOE/RL/12074-5 Rev. 0) include aniline, petroleum distillates, chlorinated solvents such as carbon tetrachloride, trichloroethene, trichloroethane, and perchlorethene, alcohols, inhibited red fuming nitric acid (IRFNA), unsymmetrical dimethylhydrazene (UDMH), phosphoric acid, alodine powder, chromium oxides, acetone, paints containing chromium and lead, tricresyl phosphate, ethylene glycol, pesticides, herbicides, PCBs (transformer oil), and hydraulic fluid.

Table 2.7.3. Potential Contaminants for 1100-IU-1

Operable Unit	Waste Management Unit	Contaminant
1100-IU-1		
	Missile Maintenance & Assembly Area Transformer Pad	PCBs
	Anti-Aircraft Artillery	Unexploded Ordnance
	Missile Assembly Area	Petroleum Distillates
		Chlorinated Solvents
		Alcohols
	Missile Fueling and Warheading Area	Dimethylhydrazene (UDMH)
		Inhibited red fuming nitric acid (IRFNA)
		Aniline
		Furfuryl Alcohol
		Ethylene oxide
		Hydrocarbons such as JP-4 fuel
	Missile Maintenance and Testing	Phosphoric Acid
		Alodine powder

		Chromium trioxide
		Sodium dichromate
		Petroleum distillates
		Carbon tetrachloride
		Trichloroethene
		Trichloroethane
		Perchlorethene
		Alcohol
		Acetone
		Paints containing Cr and Pb
		Missile hydraulic fluid
		Tricresyl Phosphate
	General Launcher and Magazine Maintenance	Hydraulic fluid
		Paints
		Solvents
	Control Center Operations Maintenance	Solvents used for cleaning electrical parts
		Ethylene glycol
	Vehicle Maintenance	Petroleum, oils and lubricants (POLs)
	Facility Maintenance	Lead paints
		Pesticides and herbicides
	Utilities	Above and below ground storage tanks used for gasoline or fuel oil, hydraulic fluid, and transformers (PCBs)
	Deactivation	Solvents, fuels, paints, asbestos-containing debris

[LOCATION OF FIGURES 2.2, 2.3 & 2.4 TEST BORING FEILD LOGS]

[LOCATION OF COMPLETE GW SAMPLING RESULTS, WITH QUALIFIERS]

3.0 Regulatory Status of 1100-EM-2, 1100-EM-3 and IU-1 Waste Management Units

This chapter presents information on the regulatory status of each waste management unit (WMU) that has been identified in the 1100-EM-2, 1100-EM-3 and IU-1 Operable Units. Once the historical and environmental information presented in Chapter 2 was collected, regulatory information for each WMU was evaluated and each WMU was placed in one of four categories;

o Already remediated or currently under regulation by the State or EPA under a statute other than CERCLA or MTCA.

o Pending or a candidate for regulation by the State or EPA under a statute other than CERCLA or MTCA.

o Not a candidate for regulation under another statute and is the site of a likely or potential release or spill of contaminants to the environment.

o Not a candidate for regulation under another statute and is the site of a known release or spill of contaminants to the environment.

The WMUs that were placed under the first category, "currently under regulation" are presented in Table 3.1. It is not expected that those WMUs will require any further CERCLA or MTCA regulatory review and would not be candidates for inclusion in the 1100 Area NPL designation. The WMUs that were placed under the second category, "pending or candidate for regulation" are presented in Table 3.2. Those WMUs will require a decision by EPA or Ecology regarding whether to address those WMUs under the CERCLA/MTCA processes or to administratively place them under other regulatory programs such as RCRA or UST. Those sites were also evaluated as part of the FFS efforts. The WMUs from the third and fourth categories, as well as those from the third category are presented in Table 3.3. A process flowchart is presented in figure 3.1.

3.1 Overview of RCRA, UST Regulatory Requirements

This section provides an overview of the regulatory mechanisms and cleanup requirements of the state administered RCRA and UST programs for the Hanford facility. This is intended to demonstrate the type of actions that have been or are planned for the WMUs that are currently administered under these programs (see Table 3.1) It also provides a framework to evaluate and compare/contrast cleanup actions for WMUs listed in Table 3.2 in the event those WMUs are regulated under RCRA or UST, or are retained in the CERCLA/MTCA process.

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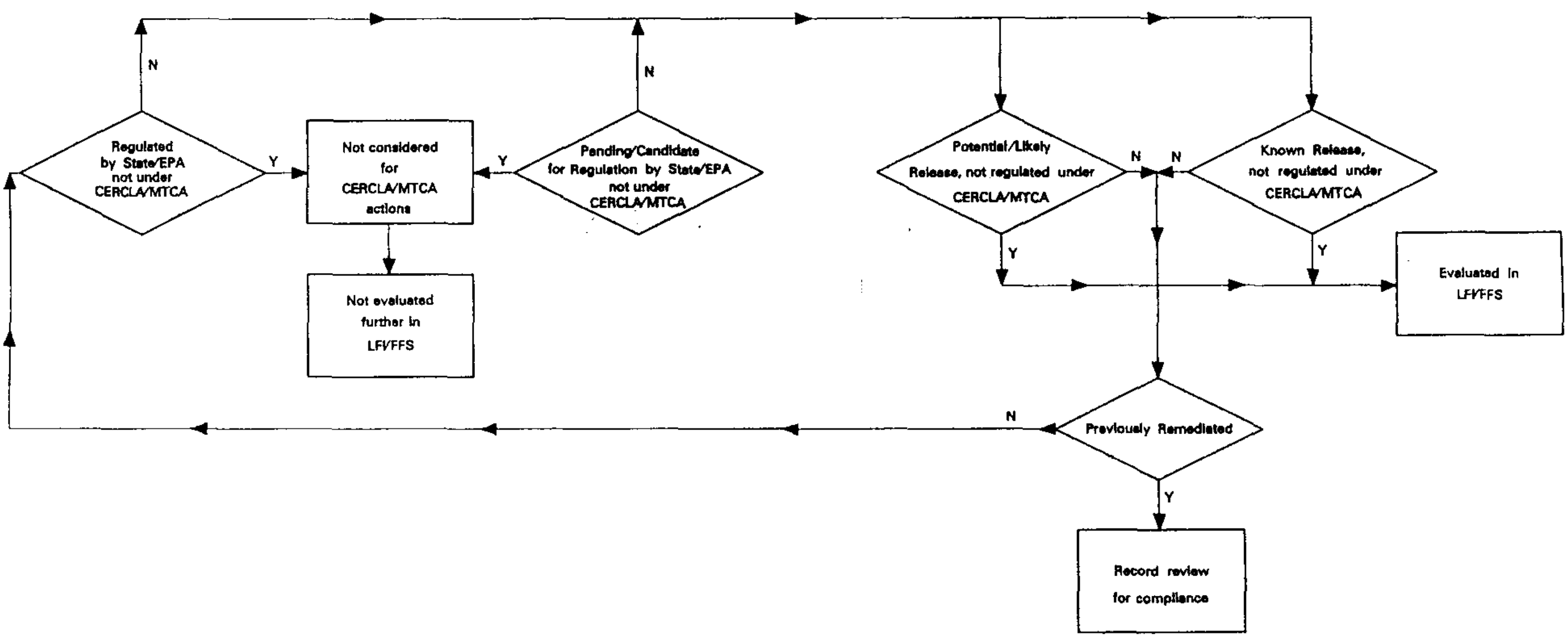

FIGURE 3.1

TABLE 3.1 WASTE MANAGEMENT UNITS FROM 1100-EM-2, 1100-EM-3 and 1100-IU-1 OPERABLE UNITS CURRENTLY REGULATED OR PREVIOUSLY REMEDIATED

WASTE SITE	LFI/FFS ACTIVITY	CURRENT REGULATORY AUTHORITY	POTENTIAL CERCLA ACTIVITY
1100-EM-2			
Bus Shop Underground Hoist Rams.	Visual Inspection. Personnel Interviews. Review Analysis Results of Previously Sampled Soils.	RCRA	None Anticipated. Site Remediated.
Hazardous Staging Area.	Visual Inspection. Personnel Interviews. Review RCRA Satellite Accumulation Area. Program.	RCRA	None Anticipated at this time based on current knowledge.
Used Oil Tank 4 (Unit 1171-4).	Visual Inspection. Personnel Interviews. Review UST Program.	UST	None Anticipated at this time based on current knowledge.
Used Oil Tank 5 (Unit 1171-5).	Visual Inspection. Personnel Interviews. Review UST Program.	UST	None Anticipated at this time based on current knowledge.
Used Oil Tank 6 (Unit 1171-6).	Visual Inspection. Personnel Interviews. Review UST Program.	UST	None Anticipated at this time based on current knowledge.
700 Area Waste Solvent Tank. (Unit 703-1).	Visual Inspection. Personnel Interviews. Review Closure Documentation.	UST	None Anticipated. Site Remediated.
1100-EM-3			
1208 Hazardous Waste Staging Area.	Visual Inspection. Personnel Interviews. Review RCRA Satellite Accumulation Area. Program.	RCRA	None Anticipated at this time based on current knowledge.
1226 Hazardous Waste Staging Area.	Visual Inspection. Personnel Interviews. Review RCRA Satellite Accumulation Area. Program.	RCRA	None Anticipated at this time based on current knowledge.
1240 Hazardous Waste Staging Area.	Visual Inspection. Personnel Interviews. Review RCRA Satellite Accumulation Area. Program.	RCRA	None anticipated at this time based on current knowledge.
Simulated High-Level Waste Slurry TSD.	Visual Inspection. Personnel Interviews. Review RCRA Satellite Accumulation Area. Program.	RCRA	None anticipated at this time based on current knowledge.

WASTE SITE	LFI/FFS ACTIVITY	CURRENT REGULATORY AUTHORITY	POTENTIAL CERCLA ACTIVITY
Twelve (12) UST Removal/Closure Sites.	Visual Inspection. Personnel Interviews. Review UST Program.	UST	None Anticipated at this time based on current knowledge.
1235 Bottle Dock.	Visual Inspection. Personnel Interviews. Review RCRA Satellite Accumulation Area Program.	RCRA	None anticipated at this time based on current knowledge.
1240 Compressor Spill Area.	Visual Inspection. Personnel Interviews. Review Spill Documentation.	TSCA	None anticipated . Site Remediated.
JA Jones Yard Hazardous Waste Staging Area.	Visual Inspection. Personnel Interviews. Review RCRA Program. Review Spill Documentation.	RCRA	None anticipated at this time based on current knowledge.
Unplanned Release (of mixed waste).	Visual Inspection. Review Spill Documentation.	RCRA	None anticipated at this time based on current knowledge.
Southwest Corner Dirt Mound.	Visual Inspection. Personnel Interviews.	RCRA	None anticipated at this time based on current knowledge.
1212 Bottle Dock.	Visual Inspection. Personnel Interviews. Review RCRA Program. Review Spill Documentation.	RCRA	None anticipated at this time based on current knowledge.
Used Oil Tank (3000-12 UST).	Visual Inspection. Personnel Interviews. Review UST Program.	UST	None anticipated at this time based on current knowledge.
1100-IU-1			
Transformer Locations (4 at control center).	Visual Inspection. Personnel Interviews.	TSCA	None anticipated at this time based on current knowledge.
ALE Area Transformer Pads.	Visual Inspection. Personnel Interviews.	TSCA	None anticipated at this time based on current knowledge.
6652-P UST.	Visual Inspection. Personnel Interviews. Review UST Program.	UST	None Anticipated at this time based on current knowledge.
6652-L UST.	Visual Inspection. Personnel Interviews. Review UST Program.	UST	None Anticipated at this time based on current knowledge.
Generator Building (Transformer Pad).	Visual Inspection. Personnel Interviews.	TSCA	None anticipated at this time based on current knowledge.
Site Entry (Loading Dock).	Visual Inspection. Personnel Interviews. Analyze Aerial Photos.	RCRA	None anticipated at this time based on current knowledge.
Potential Landfill at control center top of Rattlesnake Mtn.	Visual Inspection. Personnel Interviews. Analyze Aerial Photos.	RCRA	None anticipated at this time based on current knowledge.
6652-C Control Center UST.	Verify Location & Status of managment by PNL under UST Program.	UST	None anticipated at this time based on current knowledge.

TABLE 3.2 CANDIDATE WMUS FOR REGULATION UNDER RCRA/UST 1100-EM-2, 1100-EM-3 and 1100-IU-1 OPERABLE UNITS

WASTE SITE	LFI/FFS ACTIVITY	POTENTIAL REMEDIATION ACTIVITY
1100-EM-2		
Bus Lot Dry Wells (6).	Visual Inspection Personnel Interviews Review Records	Soil Sampling & Waste Evaluation. Remove Waste. Confirmatory Sampling. Coordinate with stormwater drainage plan activities in project LO44.
Steam Pad Tank # 2 4000 gal Fiberglass tank last contained wastewater.	Review GW Data. Visual Inspection. Personnel Interviews. Review UST Program.	Perform UST Closure.
Steam Pad Tank # 3 4000 gal Fiberglass tank last contained wastewater.	Review GW Data. Visual Inspection. Personnel Interviews. Review UST Program.	Install Wells and Monitor. Perform UST Closure.
1100-EM-3		
1208 Sandblast Area.	Visual Inspection. Personnel Interviews. Review RCRA Satellite Accumulation Area Program.	Drum & Ship with Confirmatory Sampling. (potential for offsite suface waste migration near Richland recharge reservoir ponds).
1100-IU-1		
6652-G UST 2000 gal Fuel Oil Tank.	Review Records. Confirm Location & Volume.	Remove UST. Ship Soils/UST to TSDF. Perform Confirmatory Sampling.
Missile Maintenance & Assembly Area 275 gal Fuel Oil Tank.	Review Records. Confirm Location, Use, & Volume.	Perform Soil Sampling. Remove Tank.

TABLE 3.3 LIST OF WMUs WITH KNOWN OR SUSPECTED CONTAMINANT RELEASES AND POTENTIAL REMEDIAL ACTIONS FOR 1100-EM-2, 1100-EM-3 AND 1100-IU-1.

WASTE SITE	LFI/FFS ACTIVITIES	POTENTIAL REMEDIAL ACTIVITY
1100-EM-2		
Tar Flow.	Visual Inspection Evaluate Aerial Photos Personnel Interviews	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling
Stained Sands.	Visual Inspection Evaluate Aerial Photos Personnel Interviews	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Neptunes Potato & Separator Tank (TRIDENT).	Visual Inspection Evaluate Aerial Photos Personnel Interviews	Take Soil Samples. Perform Soil Gas Survey. Remove Waste. Perform Confirmatory Sampling.
1100-EM-3		
1240 SUSPECT SPILL AREA.	Visual Inspection Personnel Interviews Review Records	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
JA Jones Oil Storage Tanks (2) Unknown volume.	Visual Inspection. Personnel Interviews. Review Records.	Geophysical Survey. Remove UST. Ship Soils/UST to TSDF. Perform Confirmatory Sampling.
1262 Transformer Pad.	Visual Inspection. Personnel Interviews. Review Records.	Sample Soil & Pad(PCBs). Remove Pad & Soil to TSD.
1262 Solvent Tanks (4) Last contained Carbon Tetrachloride.	Visual Inspection. Personnel Interviews. Review Records. Eval Exist Groundwater Data.	Soil Sampling & Waste Evaluation. Geophysical Survey. Remove Waste. Perform Confirmatory Sampling. Install Groundwater Monitoring Wells.
1240 French Drain.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
1226 Suspect Waste Oil Disposal Area.	Visual Inspection. Personnel Interviews. Review Records. Install Groundwater Monitoring Well.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
JA Jones Steam Plant Drain Pad.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling. Install Groundwater Monitoring Wells.
1218 Service Station.	Visual Inspection. Personnel Interviews. Review Records.	Remove UST. Ship Soils/UST to TSDF. Perform Confirmatory Sampling.
1212/1227 Suspect Battery Acid Disposal Area.	Visual Inspection. Personnel Interviews. Review Records. Install Groundwater Monitoring Well.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
1100-IU-1		
6652-C SSL Active Septic System.	Visual Inspection Personnel Interviews Review Records	Soil Sampling Soil Gas Survey
6652-C SSI Inactive Septic System.	Visual Inspection Personnel Interviews Review Records	Soil Sampling Soil Gas Survey

WASTE SITE	LFI/FFS ACTIVITIES	POTENTIAL REMEDIAL ACTIVITY
Radar Berm & Pads.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
H-52-C Surface Gas Tank Area(2 - 475 gallon tanks).	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Control Center Disposal Pits (4).	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Geophysical Survey. Excavate Test Pit & Remove Waste. Perform Confirmatory Sampling.
Building 6652-C Abandoned UST (5 - 1000 gallon fuel oil tanks).	Visual Inspection. Personnel Interviews. Review Records. Evaluate UST Program.	Geophysical Survey. Ship Soils/UST to TSDF. Perform Confirmatory Sampling.
Pumphouse Disposal Slope.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Pumphouse Latrine 1500 Gallon Fuel Oil Storage Tank.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Pumphouse Latrine 275 Gallon Fuel Oil Tank.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
6652-G ALE Field Storage Building Septic System.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling Soil Gas Survey
Mound Site NW of Building 6652-G.	Visual Inspection. Personnel Interviews. Review Records.	Geophysical Survey. Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
6652-I ALE Headquarters Septic System.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling. Soil Gas Survey.
Abandoned Under Ground Storage Tanks. 6652-H 275 gal oil. 6652-H 2000 gal oil. 6652-I 2000 gal fuel oil. 6652-J 2000 gal fuel oil. 6652-HI unknown volume fuel oil. Generator Building UST 3000 gal fuel oil.	Visual Inspection. Personnel Interviews. Review UST Program. Review Records.	Geophysical Survey Remove USTs Drum & Ship with Confirmatory Sampling. Install Groundwater Monitoring Wells.
Missile Bunker Sump(underground facilities).	Visual Inspection. Personnel Interviews. Review Records.	Perform Geophysical Survey. Close Building (demolition or reuse).
Missile Bunker Landfill.	Visual Inspection. Personnel Interviews. Review Records. Evaluate Aerial Photos.	Soil Sampling & Waste Evaluation. Soil Gas & Geophysical Survey Remove Waste. Perform Confirmatory Sampling. Install Groundwater Monitoring Wells. Establish Points Of Compliance.
Missile Refueling Area Berm.	Visual Inspection Personnel Interviews Review Records	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Acid Neutralization Pit.	Visual Inspection Personnel Interviews Review Records	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.

WASTE SITE	LFI/FFS ACTIVITIES	POTENTIAL REMEDIAL ACTIVITY
Missile Refueling JP-4 Fueling Area.	Visual Inspection Personnel Interviews Review Records	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Missile Assembly & Test Building Inactive Septic System.	Visual Inspection Personnel Interviews Review Records	Perform Soil Gas Survey & Geophysical Survey. Sample Soil.
Missile Maintenance & Assembly Area Acid Storage Shed.	Visual Inspection Personnel Interviews Review Records	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
JP4 Fuel Pad.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Missile Bunker Drainfield(active).	Visual Inspection. Personnel Interviews. Review Records.	Perform Soil Gas Survey & Geophysical Survey. Sample Soil.
Missile Bunker Discharge Ditch.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Main Entrance Stained Soil.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
H-52-L Surface Gas Tank Storage Area (2 - 475 gallon tanks).	Visual Inspection. Personnel Interviews. Review Records. Evaluate Aerial Photos.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Generator Building.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling. Building Demolition.
Horseshoe Site.	Visual Inspection. Personnel Interviews. Review Records. Evaluate Aerial Photos.	Soil Sampling & Waste Evaluation. Soil gas & Geophysical Survey. Remove Waste. Perform Confirmatory Sampling. Install Groundwater Monitoring Wells. Establish Points Of Compliance.
Elevator Doors.	Visual Inspection.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Flamable Storage Block Shed.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Missile Maintenance & Assembly Area Paint Shed.	Visual Inspection. Personnel Interviews. Review Records. Evaluate Aerial Photos.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Missile Maintenance & Assembly Area Dry Well Drum.	Visual Inspection. Personnel Interviews. Review Records.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
H-52-L NIKE Base Landfill.	Visual Inspection. Personnel Interviews. Review Records. Evaluate Aerial Photos.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling. Perform Soil Gas Survey & Geophysical Survey. Install Groundwater Monitoring Wells. Establish Points Of Compliance.

3.1.2 RCRA

The State of Washington's Dangerous Waste Regulations (Chapter 173-303 WAC) establishes requirements for generators, transporters, and facilities managing hazardous waste. This regulation is the mechanism by which the Hazardous Waste Management Act of 1976 (70.105 RCW) is implemented and carries out portions of Chapter 70.A RCW and Subtitle C of Public Law 94-580, the Resource Conservation and Recovery Act. Its purpose is to designate those solid wastes which are dangerous or extremely hazardous, provide for surveillance and monitoring of those wastes, provide for a framework to track waste from generation to disposition, establish Treatment, Storage and Disposal (TSD) Facility requirements, establish requirements for the states' extremely hazardous waste disposal facility, establish a permitting program for TSD facilities and encourage recycling, reuse and recovery to the maximum extent possible.

3.1.3 UST

Chapter 173-360 WAC addresses the potential threat caused by leaking underground storage tanks (UST) containing petroleum products or other regulated substances. The State of Washington Department of Ecology was directed by Chapter 90.76 RCW to develop an UST program that, at a minimum, met the requirements of the federal UST program according to Part 280 of RCRA. The legislative intent was that the state-wide requirements for technical standards and corrective action must be at least as stringent, and, meet the objectives as outlined in federal regulations.

[LOCATION FOR FIGURE 3.1]

[LOCATION FOR TABLES 3.1, 3.2 & 3.3]

4.0 FOCUSED FEASIBILITY STUDY

4.1 Presentation of Concept & Process Elements

The National Contingency Plan (NCP) in both the preamble and main text incorporate, goals, expectations and management principles that favor a *bias for action.* The introduction to section 300.430 of the NCP states..."***The purpose of the remedy selection process is to reduce, or control risks to human health and the environment. Remedial actions are to be implemented as soon as site data and information make it possible to do so.***" *The preamble on page 8704 also reflects this bias for action.* ***"EPA expects to take early action at sites where appropriate, and to remediate sites in phases using operable units as early actions to eliminate, reduce or control the hazards posed by a site, or to expedite the completion of total site cleanup. In deciding whether to initiate early actions, EPA must balance the desire to definitively characterize site risks and analyze alternative remedial approaches for addressing those threats in great detail with the desire to implement protective measures quickly."***

" To implement an early action under a remedial authority, an operable unit for which an interim action is appropriate is identified. Data sufficient to support the interim action decision is extracted from the ongoing RI/FS that is underway for the site or final operable unit and an appropriate set of alternatives is evaluated. Few alternatives, and in some cases perhaps only one, should be developed for interim actions. A completed baseline risk assessment generally will not be available or necessary to justify an interim action. Qualitative risk information should be organized that demonstrates that the action is necessary to stabilize the site, prevent further degradation, or achieve significant risk reduction quickly. Supporting data, including risk information, and the alternatives analysis can be documented in a focused RI/FS. However, in cases where the relevant data can be summarized briefly and the alternatives are few and straightforward, it may be adequate and more appropriate to document this supporting information in the proposed plan that is issued for public comment. This information should also be documented in the ROD. While documentation of the interim action decisions may be more streamlined than for final actions, all public, state and natural resource trustee participation procedures specified elsewhere in this rule must be followed for such actions."

"On a project specific basis, recommendations to ensure that the RI/FS and remedy selection process is conducted as effectively and efficiently as possible include:
1. Focusing the remedial analysis to collect only additional data needed to develop and evaluate alternatives and to support design.
2. Focusing the alternative development and screening step to identify an appropriate number of potentially effective and implementable alternatives to be analyzed in detail. Typically, a limited number of alternatives will be evaluated that are focused to the scope of the response action planned.
3. Tailoring the level of detail of the analysis of the nine evaluation criteria (see below) to the scope and complexity of the action. The analysis for an operable unit may well be less

rigorous than that for a comprehensive remedial action designed to address all site problems.
4. Tailoring selection and documentation of the remedy based on the limited scope or complexity of the site problem and remedy.
5. Accelerating contracting procedures and collecting samples necessary for remedial design during public comment period."

This is further reflected in section 300.430(e)(1); "***...The lead agency may develop a feasibility study to address a specific site problem or the entire site. The development and evaluation of alternatives shall reflect the scope and complexity of the remedial action under consideration and the site problems being addressed."*** *and ...* ***"The lead agency shall include an alternatives screening step, when needed, to select a reasonable number of alternatives for detailed analysis."***

The Focused Feasibility Study approach tailors data gathering and remedial alternative analysis in a manner such that experiences from remediating the *same type* or *similar* sites is utilized. This approach is intended to accelerate and significantly reduce the RI/FS process in order to implement cleanups sooner in the overall process schedule. The WMUs in the 1100-EM-2, 1100-EM-3 and 1100-IU-1 areas are "site types" that the same or similar circumstances have been encountered and effectively remediated. For example, the WMU identified as XXXX is known/suspected to have soils contaminated with XXXX due to its use as a XXXX. At NPL sites where the circumstances and soil contamination is similar, offsite disposal and/or thermal destruction has been selected and implemented. This remedial action approach has been identified as having sufficient success at similar site types and therefore a rigorous field investigation and subsequent detailed analysis of cleanup alternatives is not necessary. Instead, the LFI/FFS approach discussed in the previous sections was undertaken.

The following sections of this chapter present more information on the remedial actions that were developed for the 1100-EM-2, 1100-EM-3 and 1100-IU-1 areas.

4.1.2 Regulatory Decision Process

This section describes the components of decision documentation options that might be appropriate for the 1100 Area Consolidation OUs.

The ROD process for CERCLA sites can be tailored depending on site specific circumstances. There are several types of remedial action decisions that have been made: the Standard or Final Action ROD; the No Action ROD; Early Action ROD (usually undertaken using removal authorities); Interim Action ROD; and Contingency ROD. One ROD may contain more than one kind of action. For the 1100 Area OUs, the selected actions could include Final, No Action and Interim Action determinations. Depending on the results of RD/RA activities for the 1100 Area Consolidation OUs, a NO Action ROD (if no contamination is found that warrants remediation) or ROD Amendment (contamination is found at levels requiring remediation) for groundwater may be appropriate.

Generally, if Interim Actions are specified in a ROD, a subsequent ROD or ROD Amendment would be issued to specify Final Actions. A description of each type of ROD is given below.

o **Standard ROD** Generally this is a decision document that presents final response actions for a site. "Final response actions are those actions that address the principal threats posed by the site or operable unit, that comply with statutory requirements, and that address the statutory preference for treatment as a principal element." (EPA 1989)

o **No Action ROD** Is generally issued under three specified sets of circumstances;

1. When the site or a specified problem or area of the site (i.e. operable unit) poses no current or potential threat to human health or the environment;

2. When CERCLA does not provide the authority to take remedial action; or

3. When a previous response eliminated the need for further remedial action.

o **Early Action ROD** These are generally final actions taken once the need for a response action has been identified, that if not implemented would likely result in migration of contamination to areas that are not contaminated. This is typically undertaken using removal authorities pursuant to CERCLA section 104 or 106.

o **Interim Action ROD.** These generally are not final actions, rather they are usually actions undertaken to control the release of contamination rather than eliminate it. This could also include activities such as temporary storage until a final remedial action was undertaken. ex...

o **Contingency ROD** Typically a contingency ROD would be issued when there is significant uncertainty that the remedial action(s) will be able to meet cleanup goals. The ROD would identify a an alternative approach that would be implemented as a contingency remedy.

4.1.3 Post ROD Changes

The LFI/FFS approach, by its nature, results in a level of uncertainty greater than that which is usually associated with the traditional RI/FS process. The potential often exists for new information to be generated after a ROD has been signed that may affect the selected remedial action(s). The LFI/FFS process increases this potential. This section discusses the various levels of new information that might be generated and the corresponding administrative and informational activities would be appropriate.

In the event that information is generated during RD/RA activities that affects the scope, performance or cost of the remedial action(s) selected in the ROD, certain administrative and informational actions will be required. Depending on the nature of the changes, if any, brought about by the new information, one of three actions described in the EPA Guidance on Preparing Superfund Decision Documents (OSWER Directive 9355.3-02) would be appropriate. That document states that "After a ROD is signed, new information may be generated during the RD/RA process that could affect the remedy selected in the ROD. The lead agency [for the 1100 Area CERCLA activities it is EPA] should analyze this new information to determine if changes should be made to the selected remedy. Three types of changes could occur: (1) non-significant changes; (2) significant changes; and (3) fundamental changes. If non-significant or minor changes are made, they should be recorded in the post-decision document file; if significant changes are made to a component of the remedy in the ROD, these changes should be documented in an Explanation of Significant Differences (ESD); and if fundamental changes are made to the overall remedy, these changes should be documented in a ROD amendment."

The guidance document provides further information on evaluating additional information, determining which is the suitable category for documenting changes and the administrative and public participation steps involved for each category. In addition, examples for each category are presented. The following paragraphs briefly describe the categories and provide hypothetical examples for the 1100 Area consolidated operable units.

o **Non-Significant Changes.** These are changes that fall within the scope of normal evaluations, such as value engineering studies, made during the course of remedial and construction. Typically these are changes that optimize performance and/or minimize remedy costs. "This may result in minor or non-significant changes to the type and/or cost of materials, equipment, facilities, services, and supplies used to implement the remedy." (EPA 1989). Examples of non-significant changes that could be encountered during RD/RA activities for the 1100 Area consolidated OUs include, but are not limited to; identification of additional abandoned underground storage tanks for remediation, refinement of cost and/or volume estimates for remediation of contaminated soils in those areas; minor modifications to implementation schedules. Changes of this nature would be documented in the site file or through a remedial design fact sheet.

o **Explanation of Significant Difference**. These are significant changes to a component of a remedy. Changes of this type do not fundamentally alter the overall approach intended by the selected remedy, rather they are changes in timing, cost or implementability. Examples that could be encountered during RD/RA activities for the 1100 Area Consolidated OUs include, but are not limited to; the volume estimate for disposal increases by 50 % with a subsequent significant increase in cost and time to implement the remedy; **(other examples.....)** Changes of this nature would be published in a local newspaper and the ESD would be placed in the Administrative Record file and information repositories. "A formal public comment period, public meeting, and Responsiveness Summary are not required when issuing and ESD." (EPA 1989) o **Fundamental Change Requiring ROD Amendment.** These are fundamental changes to the hazardous waste management approach selected in the ROD requiring the selection of a different remedial action alternative. Examples of fundamental changes for the 1100 Area Consolidation OUs might include, but are not limited to; on-site incineration due to lack of offsite disposal capacity; the presence of contamination in groundwater at levels that require active groundwater remediation. Changes of this nature would require that the public participation and documentation procedures specified in section 117 of CERCLA be met. In summary this would require the issuance of a revised proposed plan, a formal public comment period, response to public comments and the issuance of a ROD amendment. All of the relevant documentation would be placed i n the Administrative Record and the information repositories.

4.2 Evaluation of Remedial Action Objectives

As discussed in the previous chapter, the focused feasibility study approach does not require an extensive screening of a range of potential remedial alternatives, rather a single or limited number of alternatives may be appropriate for evaluation. This section provides information on two remedial alternatives; offsite disposal and onsite incineration. The latter was evaluated to determine if onsite incineration would be a viable alternative in the event sufficient contaminated soil was found in the 1100-EM-2, 1100-EM-3 and IU-1 areas. The results of cost estimation and comparison indicates that XXXX volume of contaminated soils could potentially make the cost of onsite incineration comparable to offsite disposal. The activities and specific considerations for the offsite disposal alternative are presented by WMU "site type" and a cost summary for each operable unit is provided.

The alternatives presented in this section were identified as appropriate waste management technologies. The alternatives presented should ensure the protection of human health and the environment and should involve the complete elimination or destruction of hazardous substances at the site, the reduction of concentrations of hazardous substances to acceptable health-based levels, prevention of exposure to hazardous substances via engineering or institutional controls, or some combination of the above. Considerations that were made in identifying the alternatives include;

o Development of remedial action objectives (RAO's) specifying contaminants and media of interest, potential exposure pathways, and preliminary remediation goals. Preliminary remediation goals are based on chemical-specific ARAR's, when available, other pertinent information (*e.g.*, carcinogenic slope factors), and site-specific, risk-related factors.

o Develop general response actions for each medium of interest defining the actions that may be taken, singularly or in combination, to satisfy the remedial action objectives for the site.

o Identification of preliminary volume estimates or areas to which general response actions might be applied, taking into account the requirements for protectiveness as identified in the remedial action objectives and the chemical and physical characterization of the OU's.

4.2.1 Remedial Action Objectives

RAO's are site specific goals that define the extent of cleanup necessary to achieve the specified level of remediation at the site. The RAO's include preliminary remediation goals derived from ARAR's, the points of compliance, and the restoration timeframe for the remedial action. These goals are formulated to meet the overall goal of CERCLA, which is to provide protection to overall human health and the environment.

This section describes the RAO's for the 1100-EM-2, 1100-EM-3 and IU-1 OU's. Contaminants of potential concern were identified in section 2.9 based on past practices at the WMUs. The potential for adverse effects to human health and the environment were evaluated in a qualitative manner. The evaluations presented in the following sections, primarily consist of a comparison of known or potentially present contaminants to regulatory cleanup goals and advisory levels.

4.2.3 Land Use

A key component in the identification of ARAR's is the determination of current and potential future land use at the site. The current use and long range planning by the city, county, and Hanford Site planners show this site as industrial (appendix J). Area planners expect that the current land use patterns will remain unchanged as long as the Hanford Site exists. If control of the site is relinquished by the Government, land use in the vicinity of the Operable Unit would be expected to remain unchanged due to the presence of established commercial and industrial facilities that could be readily utilized by the private sector.

4.2.4 Preliminary Remediation Goals (PRG's)

PRG's are goals that when achieved will both comply with ARAR's and result in residual risks that fully satisfy the NCP requirements for the protection of human health and the environment. Chemical-specific PRG's establish concentration goals for contaminants in medias of concern based on the land use at the site. For the 1100-EM-2, 1100-EM-3 and IU-1 OU's, chemical-specific PRG concentrations were determined by ARAR's. ARAR's include concentration levels set by Federal or state environmental regulations. PRG's for this report are either based on MCL's set under the Safe Drinking Water Act (SDWA) or clean-up levels determined under the State of Washington's Model Toxics Control Act (MTCA).

4.2.5 Media Specific PRG's. PRG's for the ingestion and dermal contact exposure pathways for contaminated operable unit soils were derived using the MTCA (WAC) 173-340]. For these exposure pathways, the points of compliance for contaminated soil sites will be throughout the subunit from ground surface to a depth of 15 feet.

4.2.6 Evaluation of Potential Risks. In place of quantitative human health and ecological risk assessments, a qualitative evaluation was made by presenting state and federal risk based cleanup goals and advisories for known or potential contaminants to establish a basis for potential remedial activities. Tables 4.2.6 was developed to present a baseline against which to evaluate RD/RA activities to achieve RAO's, PRG's for compliance with cleanup goals.

[LOCATION OF TABLE Table 4.2.6 Preliminary Remediation Goals for Soils]

4.2.7 ARAR Overview and Initial Identification of ARARs for the 1100-EM-2, 1100-EM-3, and 1100-IU-1 Operable Units

Section 121 (d) of CERCLA as amended by SARA requires fulfillment of state and federal Applicable and Relevant and Appropriate Requirements (ARARS). Subpart E of Section 300.400(g) of the National Contingency Plan states that, " lead and support agencies shall identify requirements applicable to the release or remedial action contemplated based upon an objective determination of whether the requirement specifically addresses a hazardous substance, pollutant, contaminant, remedial action, or other circumstance found at a CERCLA site." A requirement may be either applicable or relevant and appropriate. Applicable requirements are legal, published, remedial or control standards and other environmental safeguarding statutes promulgated by Federal and State governments that address specific site conditions. Relevant and appropriate requirements are those Federal and State authorized criteria which are sufficiently similar to other problems or situations that the requirement may be used at the subject site. A formal definition for ARARS can be found in Appendix M, of the Final Remedial Investigation/Feasibility Study - Environmental Assessment (RI/FS-EA) Report for the 1100-EM-1 Operable Unit.

4.2.8 Types of ARARS

Ambient or Chemical Specific. These are numerical values which are health or risk based criteria to determine the acceptable concentration of a chemical that may be found in, or discharged to, a specific environmental media.

Location Specific. These are constraints on the concentration of a hazardous substance or on restorative activities based on site location.

Action Specific. These are technology or activity based requirements or limitations on actions taken with respect to hazardous waste site remediation.

There are a limited number of chemical-specific requirements; therefore, it is frequently necessary to use chemical-specific advisory levels, such as carcinogenic slope factors or reference doses (RfDs). While not ARAR's, these chemical-specific advisory levels may factor into the establishment of protective cleanup goals and are "to be considered" (TBC), (EPA, 1988).

Based on referenced descriptions, there are no cultural resource areas such as archaeologic and/or historic sites; no endangered or threatened species and their critical habitats; nor environmentally important natural resource areas such as floodplains, wetlands, important farmlands, and/or aquifer recharge zones in the areas affected by the remedial action alternatives. Therefore, potential location specific ARAR's addressing remedial actions at these types of sites have not been included.

4.2.9 Ambient or Chemical Specific ARARS

The focus of this preliminary identification of ARARs is based on current knowledge of the individual WMU's reported through the Waste Information Data System (WIDS) and site reconnaissance activities. The waste and site information gathered will be used to provide a decision framework to support accelerated cleanup actions consistent with the NCP. Specific contaminants have been reported in the WIDS. This section will evaluate potential ARARs and TBCs for those contaminants, as well as for potential contaminants that may be present due to past activities at the WMUs. Reported contaminants and respective operable and WMUs are listed in Table4.2.9.1 below. Only limited water quality analysis are available at this time. Therefore, references to standards is primarily intended for future use in evaluating potential future groundwater sampling and analysis for contaminant concentrations that may exceed published criteria.

TABLE 4.2.9.1 Reported Contaminants of the 1100-EM-2, EM-3, & IU-1 OUs.

Operable Unit	Waste Management Unit	Contaminant
1100-EM-2	700 Area UST Waste Solvent Tank	1,1,1-Trichloroethane (TCA)
	1100 Area Bus Shop	Poly-chlorinated biphenols (PCBs)
1100-EM-3	1234 Storage Yard	Nitrates
	3000 Area Jones Yard HWSA	Lead (Pb)
	1262 Solvent Tanks	Carbon Tetrachloride (CCl4)
	1262 Transformer Pad	PCBs
1100-IU- 1	NIKE Missile Maintenance Assembly Area/Transformer Pad	PCBs
	Anti-Aircraft Artillery	Unexploded Ordnance

Operable units 1100-EM-2, 1100-EM-3, and 1100-IU- 1 contain additional sub-units with generally identified contamination and will require sampling and analysis to determine specific chemicals. The additional contaminants and PRGs are identified in Table 4.2.6.

4.2.9.1 Drinking Water Standards (40 CFR 141 and 143, WAC 246-290-310)

National, primary drinking water regulations were developed and must be attained for present and potential sources of drinking water. Drinking water standards are published in 40 CFR 141 as Maximum Contaminant Levels (MCL) and Maximum Contaminant Level Goals (MCLG). Chapter 246-290-310 WAC accommodates state promulgated MCLs and are shown with federal levels in Table 4.2.9.2 below.

TABLE 4.2.9.2 Federal and State MCLs

Contam	Federal MCL (ppm)	Federal MCLG (ppm)	State MCL (ppm)
TCA	0.20	0.20	--
PCB	0.0005	0	--
Nitrate	10.0	10.0	10.0
Pb	0.05	0	0.05
CCl4	0.005	0	--

-- MCL not published

Secondary Maximum Contaminant Levels (SMCL) are set forth in 40 CFR 143 and in WAC 173-246-310. SMCLs, used to assess the aesthetic qualities of drinking water are not enforceable but intended as guidelines and therefore are to be considered.

4.2.9.2 Protection of Surface Waters (U.S.C. 1251, 40 CFR 116 & 117, WAC 173-201 and Quality Criteria for Water)

The objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the nations surface waters. If the identified contaminants are introduced to surface water bodies through run-off or direct discharge or to groundwater through infiltration, the above listed ARARS will be examined. The Columbia River is considered Class A waters (WAC 173-201) and its quality must be maintained for public health and enjoyment as well as the health and welfare of aquatic plant and animal life. Table 4.2.9.3 shows the available criteria for human and aquatic life.

TABLE 4.2.9.3 CWA Water Quality Criteria (mg/L)

	Protection of Human Health		Protection of Aquatic Life	
	Water & Fish Consump.	Fish Only	Freshwater Acute/Chr-	Marine Acute/Chr-
TCA	18.4	10301		
PCB	7.9E-8	7.9E-8	.002/.000014	.01/.00003
Nitrate	10	--	-/-	-/-
Pb	.05	--	.08/.0032	0.1/.0056
CCl4	.0004	.0069		

Hazardous substances are listed in 40 CFR 116. The discharge of these substances to surface or groundwaters shall not exceed the Reportable Quantity (RQ) specified in 40 CFR 117. For the subject operable units, the current and potential contaminants of concern and respective RQ are as follows: CCl4 = 10 lbs, PCB = 1 lb.

4.2.9.3 Action and Cleanup Levels (40 CFR 300-430, 40 CFR 761, OSWER 9355.4-01, RCRA 261, 268, WAC 173-303 and WAC 173-340)

a. Water The NCP provides general guidance for the acceptable exposure levels for the protection of human health and the environment. Clean-up requirements are generally based on ARARS if available. For systemic toxicants, clean-up levels are based on the potential risk to receptors and are set below the concentration that would adversely impact the human population over a lifetime. For carcinogens, clean-up levels are set below the concentration that represents an upper bound lifetime cancer risk of between 10-4 to 10-6. As discussed earlier, a quantitative risk assessment was not performed for this addendum. If MCLs are available, surface and groundwater contaminant clean-up should be at or below the standard for source or potential source of drinking water. Treatment standards for listed wastes are published in 40 CFR 268, Land Disposal Restrictions. If wastes from the 700 Area Waste Solvent Tank and the 1262 Solvent Tank (1,1,1-TCA and carbon tetrachloride, respectively) are categorized as wastewater at the time of disposal treatment standards under 40 CFR 268.41 would be 1.05 and 0.05 ppm respectively.

b. Soils For soil, remediation levels are guided by future land use. OSWER Directive 9355.4-01 states that the PCB action level for industrial sites should be in the range of 10 to 25 ppm. Site specific exposure assumptions dictate actual clean-up levelS and closure requirements. Storage and disposal of PCB contaminated waste requires specified methods when concentrations exceed 50 ppm (40 CFR 761). Soil samples collected from 1100-EM-2, the 1100 Area Bus Shop contained PCB concentrations of < 0.25 ppm.

PCBs greater than 50 ppm present an unreasonable risk to human health and the environment for controlled access sites, while concentrations exceeding 25 ppm present unreasonable risk at uncontrolled access sites. Disposal of PCBs with concentrations from 50-500 ppm is allowed in chemical waste landfills or by incineration. For concentrations greater than 500 ppm, incineration is the only disposal alternative. Chemical waste landfills must meet specific requirements for soils, geomembranes, hydrologic conditions, flood protection, topography and monitoring systems as outlined in 40 CFR 761.75. Incinerators must meet the combustion and monitoring requirements of 40 CFR 761.70.

Regulations that cover the cleanup of PCBs spilled or leaked to the environment are "to be considered" and are found at 40 CFR 761.120. Items covered include the disposal of debris and materials used in cleanup and the statistical sampling required to determine the completeness of the cleanup.

OSWER directive 9355.4-01 provides guidance "to be considered" for remedial actions at CERCLA sites with PCB contamination. For industrial site with restricted access appropriate actions for soils contaminated with 50 ppm PCBs or less can consist of a 12 inch soil cover and long term maintenance and monitoring.

RCRA Part 261 and WAC 173-303 have determined regulatory levels for toxicity based on the Toxicity Characteristics Leaching Procedure (TCLP). Regulatory levels under RCRA and dangerous waste designation under WAC 173-303 for Carbon Tetrachloride and Lead are .05 ppm and 5.0 ppm respectively. Lead was reported through WIDS at 978 ppm in soil from 1100-EM-3, Jones Yard Hazardous Waste Storage Area. The analytical method used to determine lead concentration in the soil is not known therefore is inappropriate to compare with TCLP analysis at this time. RCRA Part 268.41 has tabulated treatment standards for nonwastewater listed wastes. For the solvents TCA and CC14 the standards are 0.41 and 0.96 respectively. Lead treatment standards are dependent upon the generation process.

c. Air Quality (40 CFR 50, 40 CFR 61, and WAC 173-400)

The federal, state and local governments have set air pollution standards for the Hanford Reservation. Through the use of Best Available Technologies (BAT), these standards are technically feasible and reasonably attainable. General standards for maximum emissions are outlined in 40 CFR 50 (Reference: 40 CFR 50-National Primary and Secondary Ambient Air Quality Standards) and WAC 173-400. Standards for the specific contaminants of concern and regulatory reference are as follows:

o 150 ug/m3 on a 24 hour average for particulates

o 1.5 ug/m3 average over a calendar quarter for lead

Carbon Tetrachloride was designated as a hazardous air pollutant in the Federal

Register 50 FR 32621 8-13-85 cited in 40 CFR 61 Subpart A National Emission Standards for Hazardous Air Pollutants. WAC 173-470 defines ambient air quality standards which air equivalent to the federal standards in 40 CFR 50.

d. Model Toxics Control Act (MTCA) WAC 173-340

There are three basic methods for establishing clean-up levels for soil or water under MTCA; methods A,B, and C. Basically, Method A is for sites that are relatively straightforward and or involve only a few hazardous substances, all of which must be listed in the Method A tables, Method B clean-up criteria is established for the media of concern using applicable federal and state laws or by using the risk equations specified in 173-340-720 through 750, and Method C clean-up levels are set using three sub-criteria:

o concentrations at least as stringent as federal and state law.

o concentrations which will not cause contamination of the groundwater exceeding the levels of 173-340-720. and;

o for individual substances, concentrations that equal to or greater than 100 times groundwater clean-up level in 173-340-720.

A more extensive discussion of MTCA methods can be found in Appendix M of the 1100-EM-1 RI/FS-EA Report.

4.2.10 Location Specific ARARs (50 CFR 17, WAC 232-12)

Under the authority of 50 CFR 17 - Endangered and Threatened Wildlife and Plants several bird species are listed that use the Columbia River as a migratory flyway. The subject birds include bald eagle, falcon, ferruginous hawk, and sandhill crane listed as endangered and the Aleutian Canada goose listed as threatened. The Washington Department of Wildlife has designated two bird species as sensitive, the swainson's hawk and long-billed curlew. WAC 232-12 lists the white pelican as endangered.

4.2.11 Action Specific ARARs

The potential remedial activities contemplated at this time include; establishment of additional groundwater monitoring locations, drum and shipment of waste, removal of USTs, onsite incineration, geophysical surveys, field screening and confirmatory sampling. In addition, Closure and Post-closure activities may occur at any site designated a solid waste management unit. Accordingly, preliminary ARAR identification will follow this initial scenario. Regulations addressing air quality cited in Sub-section 2.5 above are to be considered under action specific ARARs pending identification of remedial actions for each operable sub-unit.

4.2.11.1 Well Installation (RCW 18.104. WAC 173-160. WAC 173-162)

The Washington Department of Ecology has the authority to require the licensing of water well contractors and operators and to regulate the construction of water wells under RCW 18.104. Washington Administrative Codes 173 - 160 and 162 set forth the specific regulations for RCW 18.104.

4.2.11.2 Drum and Shipment of Wastes (RCW 70.105. 49 CFR Sub-C. 40 CFR 263, WAC 173-240, 40 CFR 262)

A comprehensive state-wide framework for overall management and control of hazardous waste intended to prevent land, air, and water pollution and conserve natural, economic, and energy resources is set forth under RCW 70.105. The requirements of 49 CFR Subchapter C, 40 CFR 263, and WAC 173-240 would govern the packaging and shipment of hazardous materials from each operable unit. These regulations prohibit the transportation of hazardous materials in commerce unless the material is properly classed, described, packaged, labeled, and in a suitable condition for handling and shipment. If wastes are to be transported off-site these requirements are applicable. If any remedial action occurring at the subject operable units involves assigning hazardous waste as a secondary waste stream, that action must meet applicable standards for hazardous waste generators outlined in 40 CFR 262 and shipping records for that secondary waste must be kept for three years after off-site transportation.

4.2.11.3 Removal of USTs (40 CFR 280. 40 CFR 264, WAC 173-340, WAC 173-360, 40 CFR 302)

The underground storage tanks identified to date contain or have contained petroleum products or septic wastes. Regulations which outline corrective action, closure and release reporting are found in the above citations. During removal of the USTs it may be found that the soil and or groundwater is contaminated requiring an investigation under Subpart F of 280 and WAC 173-340-450. It is expected hat eventually all the UST sites would be closed under Subpart G of 280 and/or WAC 173-360. And any future spills or releases should be reported under Subpart E of 280, WAC 173-240 or 40 CFR 302 (Unplanned or nonroutine releases).

4.2.11.4 **Geophysical Surveys and Confirmatory Sampling (29 CFR 1910, WAC 296-62, 40 CFR 264, 42 U.S.C. 6901 WAC 173-303)**

State and federal OSHA regulations will govern all on-site work on the Hanford Reservation therefore will be applicable during geophysical surveys and sampling activities (29 CFR 1910 and WAC 296-62). Analysis of hazardous waste must be performed before shipment to a Treatment, Storage, or Disposal (TSD) Facility. If wastes are to be treated, stored, or disposed as part of a remedial action, RCRA (42 U.S.C. 6901), 40 CFR 264, and WAC 173-303 will become applicable.

4.2.11.5 Incineration of Soils (40 CFR 264, Subpart O)

Incinerators used for the treatment of contaminated soil and debris are subject to the "applicable" requirements of 40 CFR 264, Subpart O. Contaminated waste feeds must be analyzed for characteristic RCRA wastes. Contaminated ash and residue must be properly disposed of. Destruction removal efficiencies for principal organic hazardous constituents and for PCB's and dioxins shall be 99.99 percent and 99.9999 percent respectively. Emissions of hydrogen chloride (HCl) gases shall not exceed 1.0 kg/hr or 1 percent of the HC1 in the stack gases prior to entering any pollution control device. Provisions for monitoring combustion temperature, waste feed rate, combustion gas, and carbon dioxide formation shall be in place. Particulate emissions are not to exceed 0.08 grains/dry standard cubic foot. For the incineration of PCB contaminated soils, incineration requirements shall comply with requirements in 40 CFR 761.

4.3 Presentation of Remedial Technologies

This section presents on overview of the technical components that would be required for offsite disposal or onsite incineration. Examination of the WMU's that are included in the 1100 OU's reveals that there aare six general categories of WMU's. Approaches and/or activities required to address each of the WMU categories is listed below.

4.3.1 Offsite Disposal

The activities for offsite disposal of the six general WMU "site types"

4.3.1.1 Underground Storage Tanks, NIKE Base Sumps and Cisterns.

o Geophysical surveys, where needed, to identify the volume of abandoned UST and to locate underground piping associated with the UST.

o Excavation of UST, sump, cistern and piping, sampling/excavation of visibly stained or contaminated soils adjacent to the UST, sump, cistern and piping.

o Confirmatory sampling of excavated areas to determine if cleanup goals have been met.

o Temporary onsite storage of materials during confirmational sampling activities. Any temporary storage facilities would be required to meet RCRA requirements for temporary storage facilities of hazardous wastes.

o Transportation and disposal of contaminated materials in accordance with applicable state and federal requirements.

o Backfilling of excavated areas with clean fill and revegetation where appropriate.

4.3.1.2 Solvent Tanks, Steampad Tanks.

o Demolition of the tanks.

o Sampling/excavation of visibly stained or contaminated soils adjacent to the tanks.

o Confirmatory sampling of excavated areas to determine if cleanup goals have been met.

o Temporary onsite storage of material during confirmational sampling. Any temporary storage facilities would be required to meet RCRA requirements for temporary storage facilities for hazardous wastes.

o Transportation and disposal of contaminated materials in accordance with applicable federal and state requirements.

o Backfilling of excavated areas with clean fill and revegetation where appropriate.

4.3.1.3 Spills/Stained Soils.

o Excavation of visibly stained/contaminated soils.

o Sampling of material to determine the nature of the spill.

o Confirmatory sampling of excavated areas to determine if cleanup goals have been met.

o Additional excavation and sampling in the event the original excavation does meet cleanup goals.

o Temporary onsite storage of materials during confirmational sampling. Any temporary storage facility would be required to meet the RCRA requirements for temporary storage facilities for hazardous wastes.

o Transportation and disposal of contaminated materials in accordance with applicable federal and state requirements.

4.3.1.4 Control Center Landfill, Missile Bunker Landfill, NIKE Base Landfill.

o Feild screening tests would be undertaken to determine the presence or absence of contaminants above cleanup goals.

o Geophysical surveys would be undertaken, as appropriate to determine the presence or absence of buries materials that may contain or be associated with contaminants of concern.

o Soil gas surveys would be conducted as appropriate to determine the presence or absence of VOCs.

o Trenching activities would be undertaken in conjunction with non-intrusive methodologies to further characterized below ground conditions.

o In the event contamination is found at levels requiring remediation, confirmatory soil sampling would be undertaken to verify the achievement of cleanup goals.

o In the event unexploded ordinance is encountered, the U.S. Army Corps Huntsville, Alabama District would notified and assistance requested.

4.3.1.5 NIKE Base Refueling Operations.

o Excavation of visibly stained/contaminated soils.

o Sampling of material to determine the nature of the spill.

o Confirmatory sampling of excavated areas to determine if cleanup goals have been met.

o Additional excavation and sampling in the event the original excavation does meet cleanup goals.

o Temporary onsite storage of materials during confirmational sampling. Any temporary storage facility would be required to meet the RCRA requirements for temporary storage facilities for hazardous wastes.

o Transportation and disposal of contaminated materials in accordance with applicable federal and state requirements.

4.3.1.6 Miscellaneous IU-1 Structures. (Paint Building, Transformer Pad, Acid Storage Building)

o Sampling of surfaces

o Sampling of drains, sumps.

o Excavation of visibly stained/contaminated soils.

o Sampling of material to determine the nature of the spill.

o Confirmatory sampling of demolished structures/excavated areas to determine if cleanup goals have been met.

o Additional excavation and sampling in the event cleanup goals were not met by initial efforts.

o Temporary onsite storage of materials during confirmational sampling. Any temporary storage facility would be required to meet the RCRA requirements for temporary storage facilities for hazardous wastes.

o Transportation and disposal of contaminated materials in accordance with applicable federal and state requirements.

4.3.2 Onsite Thermal Destruction

As discussed above, this alternative was evaluated to determine if the costs of this alternative would be comparable to that of offsite disposal. Onsite incineration would be limited to contaminated soils, sediments, and small debris. Larger items such as tanks, piping and demolition debris would be disposed of offsite. The activities for the various WMUs would be the same as those previously listed for the offsite disposal option. The difference would be that after the temporary onsite storage for soils, sediments, smaller debris step, those materials would be processed through an onsite incinerator. The residual materials would be placed back into the excavated areas and covered with clean fill. The operation of the incinerator would be required to comply with RCRA requirements for operation of incinerators, but would not be required to be a permitted operation since the activities would be conducted entirely onsite.

4.3.3 Groundwater Monitoring.

In addition to the remediation activities for the WMUs described above, additional groundwater monitoring locations should be established in the 1100-EM-2, 1100-EM-3 and IU-1 areas. Three new locations should be established at the 1100-EM-3 OU between potential source areas and the North Richland wellfield. The approximate locations are shown on figure XXX. One exploratory well should be established at the 1100-IU-1 in the vicinity of the NIKE Missile Base landfill, then more, if needed, after the initial well provides basic groundwater information such as depth to the water table and occurrence of perched aquifers. The potentiometric head of an existing well near the 1100-IU-1 is approximately 240 meters (800 feet) below the ground surface. However, perched water tables above this may exist. Determining the number and location of additional wells that may be needed for the IU-1 can be better accomplished after review of information gathered from an exploratory well installation. No additional wells are needed at the 1100-EM-2 OU, which already has two wells immediately adjacent to the 1171 building. The groundwater at existing and new monitoring locations should be sampled on a quarterly basis for up to one year to determine if there have been any adverse impacts to the groundwater from past activities at the OUs.

Two additional monitoring locations should be established for further characterization of the groundwater flow regime near the 1100-EM-3 and the North Richland wellfeild. The locations are:

o 600 meters (200 feet) northeast of the North Richland wellfeild near the intersection of 1st Street and Port of Benton Boulevard.

o Near the southern boundary of the city of Richland property, approximately 600 meters (2000 feet) south of the wellfeild.

4.3.4 Costs.

The cost estimates for the two options were developed using the U.S. Army Corps of Engineers MCACES Gold cost estimating system. The complete cost estimates are presented in detail in the Appendix. The Appendix contains detailed cost estimates for the initial capital construction costs of each of the alternatives. Capital costs presented in the following paragraphs are taken from these estimates. Life-cycle O&M costs are estimated based on utility usage and historical costs supplied by various equipment vendors. These costs are reflected by a present worth cost using a annual discount rate of 8.5 percent used over the lifetime of the alternative. There are several factors which may contribute to the uncertainty of the costs presented. In the case of soils, uncertainty in volume estimates due to limited sampling data could greatly influence costs. Quantity estimates in this report were based on conservative parameters.

[NOTE TO REVIEWERS...COSTS ESTIMATES PRESENTED HERE ARE PRELIMINARY IN NATURE. THIS ESTIMATE WAS DEVELOPED EARLY IN THE LFI/FFS PROCESS AND DOES NOT INCLUDE ALL OF THE WMUS. A REVISED ESTIMATE IS BEING PREPARED TO REFLECT ADDITIONAL INFORMATION (AND ADDITIONAL WMUS) GATHERED SINCE THE ESTIMATE WAS FIRST MADE. FOR THE PURPOSES OF COMPARISON, THE COST ESTIMATES PRESENTED HERE WERE DEVELOPED BASED ON THE SAME ASSUMPTIONS AND THEREFORE ARE USEFUL FOR A COMPARATIVE ANALYSIS.]

In summary the estimated costs for the alternatives is as follows.

<u>Offsite Disposal.</u>

	1100-EM-2	1100-EM-3	IU-1
Contract	$ 82,000	$ 159,000	$ 357,000
S&A	$ 30,000	$ 48,000	$ 438,000
Contingency	$ 56,000	$ 65,000	$ 180,080
Total Cost	$ 226,000	$ 272,000	$ 1,018,600

The estimated total for all three operable units is $1,516,000. This does not include groundwater monitoring, which is presented at the end of this section.

Onsite Incineration

The costs provided here include the offsite disposal of debris that would not be processed by an incinerator unit (i.e. large construction debris, metallic items).

	1100-EM-2	1100-EM-3	IU-1
Contract	$ 371,000	$ 289,000	$ 353,000
S&A	$ 63,000	$ 58,000	$ 589,000
Contingency	$ 95,000	$ 83,000	$ 337,080
Total Cost	$ 425,000	$ 429,000	$ 1,630,600

Groundwater Monitoring.

The estimate presented below is for five seventy foot wells in the 1100-EM-3 area, and one 800 foot exploratory well in the IU-1 area, and sampling and analysis in all three OU's.

The estimated costs associated with groundwater monitoring is presented in this section. It should be noted that due to Hanford specific DOE policies, groundwater monitoring well installation is considered a construction activity, this fact, along with other site specific constraints, results in costs of installation of monitoring wells that range from $800 to over $5000 per foot. The value of $850 per foot (WHC Kaiser 1992) was used for the estimating purposes. By comparison, the typical average cost of installation of groundwater monitoring wells at most Superfund sites is $125 per foot.

	1100-EM-2	1100-EM-3	IU-1
Contract	$ - 0 -	$ 298,000	$ 680,000
S&A	$ 12,000	$ 60,000	$ 12,000
Contingency	$ 12,000	$ 45,000	$ 81,000
Total Cost	$ 24,000	$ 403,000	$ 773,000

4.4 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

4.4.1 INTRODUCTION

The candidate remedial alternatives are evaluated in detail in this section. The evaluation criteria used in this analysis are presented in section 4.4.2. Detailed descriptions of the alternatives are presented in section 4.4.3. After each alternative is individually assessed against these criteria, a comparative analysis is made to evaluate the relative performance of each alternative in relation to the specific evaluation criteria.

The alternatives were evaluated using three broad criteria: effectiveness, implementability, and cost. These criteria are defined as follows (EPA, 1988a):

- Effectiveness Evaluation--Each alternative is evaluated as to its effectiveness in providing protection and the achievement of reductions in toxicity, mobility, or volume. Both long- and short-term components of effectiveness are evaluated; long-term referring to the period after the remedial action is complete, and short-term referring to the construction and implementation period. Reduction of toxicity, mobility, or volume refers to changes in one or more characteristics of the hazardous substances or contaminated media by the use of treatment that decreases the inherent threats or risks associated with the hazardous material.

- Implementability Evaluation--Implementability, as a measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial action alternative, is used to evaluate the process options with respect to the conditions at the Operable Units. Technical feasibility refers to the ability to construct, reliably operate, and meet technology-specific regulations for process options until a remedial action is complete. Administrative feasibility refers to the ability to obtain approvals from the appropriate entities, the availability of treatment, storage, or disposal services and capacity, and the requirements for, and availability of, specific equipment and technical specialists.

- Cost Evaluation--Both capital and operation and maintenance (O&M) costs are considered. This evaluation includes those O&M costs that will be incurred, even after the initial remedial action is complete. Potential future remediation costs are considered to the extent that they can be defined. Present worth analysis should be used during this screening to evaluate expenditures that occur over different time periods. In this way, costs for different actions are compared on the basis of a single figure for each alternative.

4.4.2 EVALUATION CRITERIA

Each alternative is evaluated against nine criteria. They are: the overall protection of human health and the environment; compliance with ARAR's; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost; state acceptance; and community acceptance. Five of the criteria consider a number of subcriteria to allow a more thorough analysis and evaluation. State and community acceptance are appropriately reviewed during the development of the proposed plan. Evaluation of these two criteria are beyond the scope of this report. The criteria and subcriteria are those described in FS guidance (EPA, 1989) and are briefly summarized below.

Criterion 1 - Overall Protection of Human Health and the Environment

This evaluation criterion provides a final check to assess whether each alternative meets the requirements that it is protective of human health and the environment. The overall assessment of protection draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARAR's.

This evaluation focuses on how an alternative achieves protection over time and how site risks are reduced. The analysis considers how each source of contamination is to be eliminated, reduced, or controlled for each alternative.

Criterion 2 - Compliance with ARAR's

This evaluation criterion is used to determine whether each alternative meets the Federal and state ARAR's that have been identified. The analysis summarizes the requirements that are applicable or relevant and appropriate to the alternative and describes how each is met. The following is addressed for the detailed analysis of ARAR's:

- Compliance with chemical specific ARAR's;
- Compliance with action-specific ARAR's; and
- Compliance with location-specific ARAR's.

Criterion 3 - Long-Term Effectiveness and Permanence

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of the risks remaining at the site after response objectives have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. The following sub-criteria are addressed:

- Magnitude of residual risk;
- Adequacy of controls; and
- Reliability of controls.

Criterion 4 - Reduction of Toxicity, Mobility, or Volume Through Treatment

This evaluation criterion addresses both the Federal and state statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substance as their principal element. This preference is satisfied when treatment is used to reduce the principal threats at a site through the destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible reduction in contaminant mobility, or reduction in total volume of contaminated media.

The evaluation focuses on the following specific factors for a particular remedial alternative:

- The treatment processes the remedy employs, and the materials they to be treated;
- The amount of hazardous materials that to be destroyed or treated, including how the principal threat(s) are addressed;
- The degree to which the treatment is irreversible;
- The type and quantity of treatment residuals that remain; and
- Whether the alternative satisfies the statutory preference for treatment as a principal element.

Criterion 5 - Short-Term Effectiveness

This evaluation criterion addresses the effects of the alternative during the construction and implementation phase until remedial response objectives are met (*e.g.*, a cleanup target has been met). Alternatives are evaluated with respect to their effects on human health and the environment during implementation of the remedial action. The following factors are addressed:

- Protection of the community during remedial actions;

- Protection of workers during remedial actions;
- Environmental impacts; and
- Time until remedial action objectives are met.

Criterion 6 - Implementability

The implementability criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. The following factors are analyzed:

- Technical feasibility including construction and operation, reliability of technology, and the ease of undertaking additional remedial action;
- Administrative feasibility; and
- Availability of services and materials including offsite storage and treatment capacity, and the availability of equipment, services, and personnel.

Criterion 7 - Cost

The cost of each alternative is presented including estimated capital, annual costs, and present worth costs. The accuracy of all costs are within the plus 50-percent to minus 30-percent range specified in the guidance. Capital costs include the direct costs of equipment, labor, and materials necessary to install remedial alternatives. Annual costs are post-construction costs necessary to ensure effectiveness of the remedial action. Present worth costs are calculated to evaluate expenditures that occur over different time periods by discounting all future costs and annual costs to a common base year. For this report a discount rate of 8.5 percent was used to determine present worth costs. Detailed costs are presented in the appendix to this addendum.

Criterion 8 - State Acceptance

State acceptance is assessed based on the evaluation of the technical and administrative issues and concerns that state regulatory agencies have regarding each of the alternatives. This criterion will be addressed in the Record of Decision (ROD) once comments on the RI/FS report and the proposed plan are received.

Criterion 9 - Community Acceptance

This assessment evaluates the issues and concerns the public may have regarding each of the alternatives. As with state acceptance, this criterion will be addressed in the Record of Decision once comments on the RI/FS report and proposed plan are received.

4.4.3 EVALUATION OF SOIL AND DEBRIS REMEDIAL ALTERNATIVES

The soil and debris remedial alternatives (offsite disposal and offsite incineration) are evaluated against the seven criteria that are possible to address at this time in the following paragraphs. At the conclusion of the individual evaluations a comparative analysis is made.

4.4.3.1 Alternative S-0 (No Action)

Under this alternative, no action would be taken to remediate the waste management units (WMUs) in the three operable units (OU's). Groundwater monitoring of existing wells would be implemented.

Criterion 1. In the absence of sufficient environmental data, it is uncertain whether remedial action objectives for the WMU's would be satisfied. The potential for exposure to contaminated soil by industrial onsite workers in the 1100-EM-2 and 1100-EM-3 OU's would be possible. The IU-1 OU is part of the ALE which has been closed to the public since 1940. Therefore, human contact with potential contaminants is unlikely. Any potential ecological impacts are unknown at this time.

Criterion 2. In the event that contaminants are found at the WMUs that exceed state or federal criteria, those cleanup levels would not be achieved by this alternative.

Criterion 3. Potential residual risks would remain as stated above. Groundwater monitoring limited to existing wells would not be a reliable or adequate control to determine if contaminants are migrating from the WMUs. Continued industrial land use in the 1100-EM-2 and 1100-EM-3 OUs would ensure that potential exposure would be limited to onsite workers.

Criterion 4. There would be no reduction in the toxicity, mobility, or volume of the contaminants under this alternative.

Criterion 5. Because no remedial actions are involved there would be no short-term risks to remedial workers or the public. There would be no impacts to the environment due to construction or operation.

Criterion 6. This alternative would be easily implemented. Monitoring would be conducted using established procedures. No permits, special equipment, or specialists would be required.

Criterion 7. The estimated present worth cost of this alternative is $48,000.

4.4.3.2 Alternative S-1 offsite Disposal

Under this alternative soils and debris at the 1100-EM-2, 1100-EM-3 and IU-1 OUs that are found to exceed cleanup goals would be removed and disposed of offsite. Additionally, groundwater monitoring would be conducted. In the event that during remedial actions complete achievement of cleanup goals is determined to be impracticable, access restrictions could be needed for areas where residual contaminants remain. The approach to make such an evaluation is discussed further in secion 5.3.

Criterion 1. In the event that contaminants are found at the WMUs that exceed state or federal criteria, it is expected that remedial action objectives would be satisfied by this alternative. Potential onsite receptor exposure to contaminated materials would be significantly reduced by reducing the toxicity of the contaminants through removal and offsite disposal of the contaminants, and, if needed, access restrictions.

Criterion 2. All ARAR's will be met. The contaminated material will be hauled by a licensed DOT hazardous waste hauler. The receiving facility will have a permit to operate a RCRA facility, or if needed, a TSCA approved facility.

Criterion 3. Cleanup to state or federal cleanup levels at the WMUs would reduce potential residual risks at those sites. Groundwater monitoring would be implemented as appropriate or necessary to evaluate if contaminants are migrating from the WMUs and if additional remedial measures are necessary.

Criterion 4. The offsite disposal of contaminated soil and debris would reduce the mobility of the contaminant onsite. Disposal in a controlled RCRA and/or TSCA facility would limit the mobility of the contaminant offsite. The volume and toxicity of any contaminated soil and debris would be unchanged. In the event residuals of the contaminant would still exist, mobility of those residuals would remain essentially the same.

Criterion 5. There would not be any short-term risks to the community during the implementation phase of this alternative. Control measures would be taken to control any fugitive dust as part of any remedial action. Remedial workers will be required to wear protective coveralls to protect against dermal exposure.

During remediation, there would be some disruption of the environment due to earthmoving activities. However, after the sites are remediated, the areas will be regraded to restore the land to near original conditions. In the event excavation at the IU-1 landfills is necessary, topsoil would be provided and the area seeded to dryland grass to provide habitat for birds and small mammals. The removal and offsite disposal actions can be completed within 6 months of beginning site work.

Criteria 6. Implementability. Removal of soil and debris to an offsite facility is easily implemented. Excavation of material will be by using conventional earthmoving equipment.

Confirmatory testing will be conducted to verify that cleanup goals have been achieved. An approved RCRA/TSCA facility with more than sufficient capacity is located at Arlington, Oregon, approximately 145 km (90 miles) away. A number of licensed DOT hazardous waste haulers are available who could transport this material. Earth materials for backfill are available within a 16.1-km (10-mile) radius of the site. No special permits are required.

Criteria 7. Cost. The estimated present worth cost of this alternative is $1,108,000.

4.4.3.3 Alternative S-2 Onsite Incineration

As discussed in section 4.2.2, this alternative considers the use of onsite incineration for the destruction of organic contaminants at the WMUs. Downgradient groundwater monitoring is employed to evaluate thwe effectiveness of remedial actions.

Criterion 1. Remedial action objectives would be met through this alternative. Potential human health threats would be reduced, if cleanup goals are achieved.

Criterion 2. It is expected that state and federal cleanup levels would be met under this alternative. The onsite incineration facility would meet RCRA standards for incineration facilities and also meet regional air quality standards. Ash from the process would be expected to have little residual contaminant and should meet requirements to allow replacement at the excavated areas of the WMUs.

Criterion 3. There should be little or no residual risks associated with remediation of the WMUs. If contaminants above background remain, groundwater monitoring should provide reliable controls to establish if subsequent releases occur.

Criterion 4. Toxicity of the contaminants would be significantly reduced as these processes typically have 99.9999 percent destruction removal efficiencies. Incineration of soils will not reduce volume substantially. Mobility of remaining residuals, if any, would remain the same.

Criterion 5. There should be no risk to the community during remediation under proper operating conditions. Air quality would be monitored and the operation would not proceed if emissions did not meet standards. Remedial workers would require protective clothing to prevent dermal contact. Impacts to the environment would consist of the excavation of contaminated materials and the construction of a pad to house incineration facilities. After remediation these areas would be regraded to return the site to near original conditions.

Criterion 6. Vendors are available to supply onsite incineration facilities that have proven effectiveness in remediating soils with similar contaminants. Operation of the incinerator is typically done by vendor supplied operators. Ashes would be tested to determine if cleanup goals are being met. The incinerator must meet the requirements of RCRA and be approved by state agencies in accordance with the TPA.

Criterion 7. The estimated present worth cost of this alternative is $1,630,000.

4.4.3.4 Comparative Analysis

In the following analysis, alternatives S-0, S-1 and S-2 are evaluated in relation to one another for each of the evaluation criteria. The purpose of this analysis is to identify the relative advantages and disadvantages of each alternative.

Criterion 1. In the event that contaminants are found that exceed state or federal risk based levels, Alternative S-0 would not be protective of human health. S-1 and S-2 would meet the remedial action objectives. For Alternative S-1, protection of human health would be provided by reducing the risks through removal and offsite disposal. Alternative S-2, would achieve protection through incineration.

Criterion 2. In the event that contaminants are found that exceed state or federal criteria, S-1 and S-2 have the potential of meeting ARAR's. For alternative S-0, MTCA cleanup levels would not be not attained. The efficiency of cleanup activities would need to be evaluated in order to evaluate if MTCA cleanup levels can be met. Confirmational sampling would be required to make such a determination.

Criterion 3. Alternative S-2 offers a greater degree of long-term permanence because that alternative uses a treatment method that permanently reduces toxicity through destruction. Alternative S-1 also has a high degree of long-term permanence because removed offsite to a controlled facility. No long-term maintenance is currently expected for the WMUs. Alternative S-0 would not reduce any residual site risks.

Criterion 4. Alternative S-0 does not reduce toxicity, mobility or volume. Alternative S-1 would reduce <u>onsite</u> toxicity, mobility and volume through offsite disposal. Under Alternative S-2 toxicity, mobility and volume for contaminants present in the incinerated materials would be achieved. Overall soil volume is not reduced through incineration, although hazardous constituents within the soil are essentially elimated.

Criterion 5. All alternatives present relatively low risks to the community during implementation. Some fugitive dust emissions from excavation activities are anticipated although precautions would be taken to reduce these to protect both remedial workers and the community. Risks to remedial workers for all other alternatives will be reduced by using protective clothing.

The onsite incineration option of alternative S-2 is estimated to take less than 1 year to complete. Alternative S-1 is estimated to take approximately 6 months to complete.

Criterion 6. All alternatives are technically easy to implement. Alternative S-2 requires mobilization, set up, and trial testing of the incinerator to ensure that applicable standards are met. Operating personnel would be supplied by the vendor. Offsite disposal facilities considered in alternative S-1 all have adequate capacity to receive potentially contaminated soils and debris. Also, there are numerous licensed haulers who are able to transport such materials.

Criterion 7. The no action alternative has the least total present worth costs. The costs presented are associated with annual groundwater monitoring of existing wells in the three OUs for the next 30 years. Offsite disposal costa are estimated to be $1,108,000, while onsite incineration costs are estimated to $1,630,000, or approximately 60 percent more. A summary of costs is presented in table ZZZZ [will be provided when revised estimate is completed]

4.4.5 EVALUATION OF GROUNDWATER REMEDIAL ALTERNATIVES

As discussed in section 2.1.4, currently there is only limited information on groundwater conditions in the 1100-EM-2, 1100-EM-3 and IU-1 OUs. Due to this fact, the development of remedial alternatives beyond No Action or Groundwater Investigations at this time would be of limited value. Therefore, only those two options are briefly evaluated below.

4.4.5.1 Alternative GW-0 No Action

No active groundwater investigations would be undertaken under this alternative. Existing administrative controls that specify land use and restrict well drilling for consumptive purposes would remain in place. It is expected that any new facilities in the 1100-EM-2 and 1100-EM-3 OUs would receive water supplied through the City of Richland's distribution network. It is not expected that any drinking water wells would be installed in the IU-1 OU due to the fact it is included in the Arid Lands Ecological (ALE) reserve.

Criterion 1. In the event that contaminants are present that exceed state or federal health based levels, and, in the future, the groundwater is used for human consumption, this alternative would not be protective.

Criterion 2. In the event that contaminants are present that exceed SDWA MCLs that ARAR's would not be met.

Criterion 3. In the event that contaminants are present that exceed state or federal health based levels, any potential the long term incremental cancer risk would not be addressed.

Criterion 4. In the event that contaminants are present that exceed state or federal health based levels, the toxicity, mobility and volume of those contaminants would not be addressed by the no action alternative.

Criterion 5. In absence of undertaking any groundwater investigations, this criteria does not apply to the alternative.

Criterion 6. In absence of undertaking any groundwater investigations, this criteria does not apply to the alternative.

Criterion 7. The estimated monitoring costs associated with this alternative are $48,000.

4.4.5.2 Alternative GW-1 Monitoring and Evaluation.

Under this alternative additional monitoring wells would be installed in the 1100-EM-2, and in the IU-1 OUs. It is expected that, at a minimum, additional groundwater monitoring locations in the IU-1 and EM-3 OUs discussed in section 4.3.3 would be established. If contaminants above MCL's are detected at any of these wells, appropriate remedial measures would then be evaluated. In addition, as discussed in section 4.3.3, the utility of additional monitoring locations would be established based on the results of RD/RA activities for the 1100-EM-2, 1100-EM-3 and IU-1 OUs.

Criterion 1. By undertaking groundwater investigations, the evaluation of potential risks to human health can be accomplished.

Criterion 2. This alternative would be expected to provide sufficient information to determine if SDWA MCL's are being met in groundwater.

Criterion 3. Groundwater monitoring is a reliable control to determine if further longer term actions are required.

Criterion 4. In the event that contaminants are present in groundwater, this alternative would enable decision makers to evaluate appropriate remedial technologies and/or institutional controls for reduction of contaminant toxicity, volume or mobility. As in the evaluation of remedial alternative for contaminants in groundwater in the 1100-EM-1 OU, contaminant toxicity and volume could be reduced through treatment, dispersion, diffusion, and dilution. In the event that similar contaminants are found in the 1100-EM-2, 1100-EM-3 or IU-1 OUs, the 1100-EM-1 remedial alternatives would directly apply.

Criterion 5. Risks associated with activities to establish groundwater monitoring locations are low.

Criterion 6. This alternative is technically easily implemented with the only new activity consisting of establishing groundwater monitoring locations. Groundwater monitoring is expected to reliably evaluate the presence or absence of contaminants above MCL's. Remedial action(s) could easily be initiated in a relatively short timeframe in the event contaminants are found at levels requiring remediation..

Criterion 7. The estimated present worth costs of this alternative is $1,200,000. These costs include the capital costs of installation annual monitoring of new and existing monitoring locations over a 30-year period.

4.4.5.3 Comparative Analysis

The purpose of this analysis is to identify the relative advantages and disadvantages of each alternative. The alternatives are evaluated in relation to one another for each of the evaluation criteria in the paragraphs that follow.

Criterion 1. Groundwater monitoring is expected to reliably evaluate the presence or absence of contaminants to determine if site RAO's for groundwater are being achieved. While there are no current users of the groundwater and the continued use of institutional controls will ensure that consumptive use of the aquifer does not occur, the 1100-EM-3 OU is directly adjacent to the North Richland wellfield. Therefore it has the highest potential for adverse impacts to current domestic water supplies.

Criterion 2. Groundwater monitoring is expected to reliably evaluate the presence or absence of contaminants above MCL's. In the event that contaminants are found at levels requiring remediation, remedial alternatives evaluated for the 1100-EM-1 OU could be implemented in order to achieve ARARs.

Criterion 3. Neither alternative provides for long-term effectiveness or permanence in the event that contaminants are present in groundwater at levels that exceed MCL's. Alternative GW-1 would be expected to provide sufficient information to determine (1) what contaminants, if any, are present at levels requiring remediation and (2) appropriate remedial actions, if necessary.

Criterion 4. Neither alternative GW-0 or GW-1 would directly reduce toxicity, mobility or volume of contaminants, if present. Alternative GW-1 would be expected to provide sufficient information to determine appropriate remedial actions, if necessary, to address contaminant toxicity, mobility and volume.

Criterion 5. Both alternatives present low remedial risks to the community and to onsite remedial workers.

Criterion 6. Both alternatives are easy to implement technically.

Criterion 7. The estimated costs for alternatives GW-0 and GW-1 are $48,000 and $1,200,000, respectively. In the event that remedial actions are required, costs for remedial technologies were prepared for the 1100-EM-1 OU and are presented in Table 8-4 of the main text of the 1100-EM-1 RI/FS-EA document.

5.0 Activities for Remedial Design and Remedial Action

This section presents an overview of activities that would need to be undertaken to implement and evaluate remedial actions for the 1100-EM-2, 1100-EM-3 and IU-1 OU's.

5.1 Pre-ROD Activities

The LFI/FFS process identified numerous WMU's within the three OU's that are potential candidates for remedial action. Many of these WMU's could be further evaluated through field screening activities, such as field sampling and analysis, further inventory of physical features and refined estimates for demolition of structures. As noted in the NCP (NCP......), activities of this nature could proceed in parallel to the ROD process. Collection of environmental data and refinement of physical descriptions of the OU's would allow for a more rapid initiation and completion of any selected remedial actions.

5.2 Administrative Requirements

Numerous administrative requirements would need to be addressed to implement RD/RA activities. These include the development and regulatory approval of an addendum to existing 1100 Area Health and Safety Plans, Sampling and Analysis Plans, and Quality Assurance/Quality Control Plans. In addition, permits, to the extent permits are required, would need to be obtained prior to the initiation of certain activities (e.g. transportation permits for offsite disposal).

5.3 Sampling and Analysis Activities

The following discussion of sampling and analysis activities is designed to outline a process to better establish the nature and extent of potential contaminants in the 1100-EM-2, EM-3, and IU-1 Operable Units (OUs). This includes activities that could be undertaken both pre- and post-ROD.

As discussed in section 4.3, there are four general categories of key elements to be investigated; underground storage tanks (used oil, antifreeze, solvent, fuel, etc.), areas of potential PCB contamination (maintenance and assembly areas, transformer pads), areas where spills may have occurred (maintenance areas, shops, storage areas), and landfills. For USTs, PCB areas, and spill locations the sampling and analysis approach would be to perform field screening to determine if contamination exceeds the cleanup goals. If so, it is expected that the contaminated area would be excavated and remediated by offsite treatment/disposal or onsite thermal destruction. Confirmational sampling and analysis would then be done to demonstrate that cleanup goals have been reached, or demonstrated that complete attainment of cleanup goals would represent a substantial and disproportion cost per MTCA. To demonstrate the latter, volumes of contaminated material, mass of contaminants removed and associated reduction in risk, would be compared with estimates of remaining volume, mass of contaminants and residual risk would be developed. Cost/benefit analyses could be undertaken and reviewed by theparticipatory parties. In the event contamination above cleanup goals remains at a WMU, the use of institutional controls such as deed and access restrictions would be evaluated. The landfill sampling and analysis approach would be to combine field screening methods with geophysical and soil gas studies prior to intrusive activities such as trenching and prior to establishing multiple groundwater monitoring locations.

5.3.1 Sampling and Analysis for 1100-EM-2 OU

Sampling and analysis focuses primarily on USTs, areas of PCB contamination, and spills. USTs should be sampled by collecting soil from beneath the USTs locations and analyze for TPH as gasoline, diesel, BETX, antifreeze, or solvents as appropriate for the USTs' history. Soil samples should be collected under transformer pads and analyzed for PCBs. Soil samples should be collected for suspected spill sites analyzed for the analytes. Specific recommendations include:

Perform initial field screening using immunoassay techniques to provide a yes/no answer as to the presence of contaminants above the action level. If contaminants are present above the action level excavate and remediate the contaminated area.

Undertake confirmatory sampling and analysis using field screening and up to 10% CLP to validate the effectiveness of remediation. Once remediation is accomplished the sites would be backfilled with clean material.

5.3.2 Sampling and Analysis for 1100-EM-3 OU

Sampling and analysis activities would be the same for EM-3 as EM-2 due to the similar nature of contaminant categories.

5.3.3 Sampling and Analysis for 1100-IU-1 OU

Landfills in the IU-1 OU would be characterized using a combination of field screening methods, soil gas sampling, and geophysical surveys appropriate for the suspected contaminants. If contamination is identified through this process additional reconnaissance and detailed surveys should be conducted as follows:

Collect soils samples at the sites for the identified analytes.

Identify trends in disposal histories based on the sampling and analysis.

If trends indicate removal actions are required, perform coarse grid geophysical surveys of suspect disposal sites having a high probability of contamination.

Perform soil gas surveys.

Implement confirmatory sampling and analysis at suspect sites.

Undertake intrusive investigations, such as trenching, as needed.

Establish the need for groundwater monitoring using the criteria below.

5.4 Groundwater Monitoring Activities

Groundwater monitoring activities would initially involve sampling of existing monitoring locations, establishment of additional locations in the EM-3 OU, and undertaking exploratory activities in the IU-1 OU. Based on the findings of the initial activities, determinations would be made regarding the utility of establishing additional monitoring locations and/or evaluating remedial actions. As discussed in section 4.4.5, the evaluation of treatment technologies in the main text of the RI/FS-EA report may provide sufficient information and analyses of appropriate cleanup technologies, should they be needed. In the event that groundwater remediation is required, it is expected that a ROD amendment would be issued.

5.5 Coordination of 1100-EM-1, 1100-EM-2, 1100-EM-3 and IU-1 Activities

An advantage of the acceleration of CERCLA activities in the 1100-EM-2, 1100-EM-3 and IU-1 OU's would be to enable cleanup activities for all four 1100 Area OU's to occur simultaneously. Figure 5.1 presents a process flow chart of activities for all four OU's. Savings in time, mobilization and demobilization costs, realization of economies of scale, an focusing resources on remediation are some of the potential benefits of this approach.

5.6 Summary of Candidate WMU's For Remediation.

Table 5.1 presents summary information of the WMU's identified as candidate sites for remediation. Included in the table are preliminary volume and activity estimates along with a description of the general remedial activites that woould be required to address the WMU. The WMU's are number to correspond with locations shown in fugures 5.2, 5.3 and 5.4.

[LOCATION OF TABLE 5.1 & FIGURES 5.2, 5.3 & 5.4]

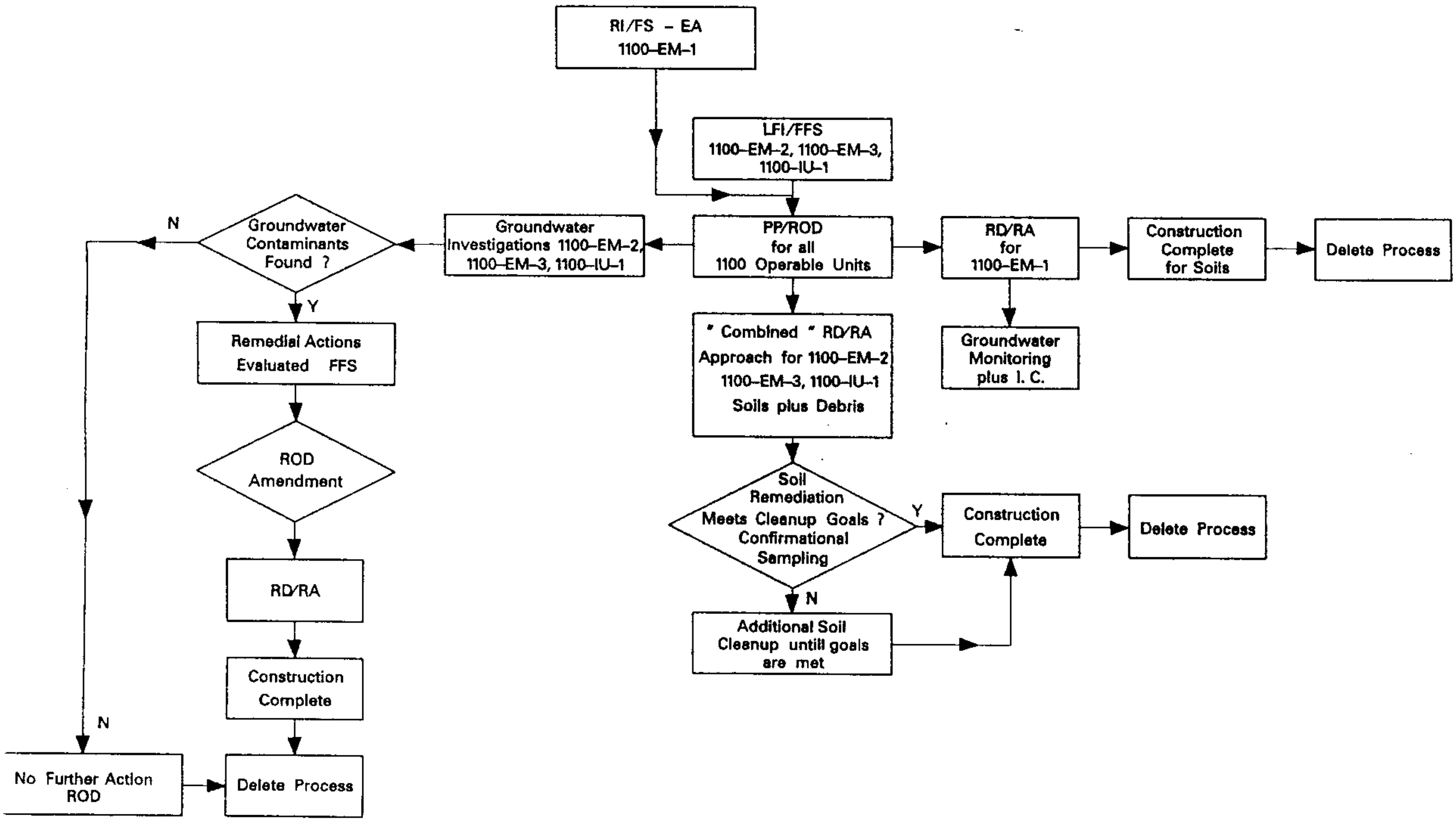
RI/FS – EA
1100-EM-1
LFI/FFS
1100-EM-2, 1100-EM-3,
1100-IU-1
PP/ROD
for all
1100 Operable Units
Groundwater
Investigations 1100-EM-2,
1100-EM-3, 1100-IU-1
Groundwater
Contaminants
Found ?
N
Y
Remedial Actions
Evaluated FFS
ROD
Amendment
RD/RA
Construction
Complete
Delete Process
N
No Further Action
ROD
RD/RA
for
1100-EM-1
Construction
Complete
for Soils
Delete Process
Groundwater
Monitoring
plus I. C.
" Combined " RD/RA
Approach for 1100-EM-2
1100-EM-3, 1100-IU-1
Soils plus Debris
Soil
Remediation
Meets Cleanup Goals ?
Confirmational
Sampling
Y
N
Construction
Complete
Delete Process
Additional Soil
Cleanup untill goals
are met

FIGURE 5.1

Table 5.1 RD/RA Activities for Table 3.2 and 3.3 WMUs.

Table 3.2 Waste Management Units	Conservative Estimate of Contamination *	RD/RA Activites
1100-EM-2		
Bus Lot Dry Wells (6).	60 Cubic Yards(CY) Soil (10 CY/dry well)	Soil Sampling & Waste Evaluation. Remove Waste to TSDF. Confirmatory Sampling. Coordinate with stormwater drainage plan activities in project L044.
Steam Pad Tank # 2 4000 gal Fiberglass tank last contained wastewater.	Tank, 20 CY Soil	Perform UST Closure.
Steam Pad Tank # 3 4000 gal Fiberglass tank last contained wastewater.	Tank, 20 CY Soil	Perform UST Closure.
1100-EM-3		
1208 Sandblast Area.	160 CY Soil	Drum & Ship Soils to TSDF Confirmatory Sampling. (potential for offsite surface waste migration near Richlandwellfield recharge ponds).
1100-IU-1		
6652-G UST 2000 gal Fuel Oil Tank.	Tank, 20 CY Soil 1000 gal Fuel Oil	Ship Soils/UST to TSDF or Incinerate. Confirmatory Sampling.
Missile Maintenance & Assembly Area 275 gal Fuel Oil Tank.	Tank, 20 CY Soil 135 Gal FuelOil	Ship Soils/UST to TSDF or Incinerate. Confirmatory Sampling.

* Assumptions include:

- o For USTs...20CY Soil/UST Removal.
- o Depth of Potential Contamionation = 3 Feet.
- o Tanks are 1/2 full with last liquid known to be stored based on several observations.
- o Fuel, Oil, Solvents will be recycled to the extent possible.

Table 3.3 Wast Management Unit	Conservative Estimate of Contamination	RD/RA Activites
1100-EM-2		
Tar Flow.	60 Cubic Yards Soil & Tars	Soil Sampling & Waste Evaluation. Wastes to TSDF or Incinerate. Confirmatory Sampling.
Stained Sands.	45 CY Soils (20 ft x20 ft x3 ft)	Soil Sampling & Waste Evaluation. Wastes to TSDF or Incinerate. Confirmatory Sampling.
Neptunes Potato & Separator Tank (TRIDENT).	Unknown Volume. Trench is 2600 ft x 4 ft Original Trench longer, irrigation circle now covers last 600 feet	Soil Feild Screening. Soil Gas Survey. If Needed, Wastes to TSDF or Incinerate. Confirmatory Sampling.
1100-EM-3		
1240 Suspect Spill Area.	20 CY Soils	Soil Sampling & Waste Evaluation. Wastes to TSDF or Incinerate. Confirmatory Sampling.
JA Jones Oil Storage Tanks (2) Unknown volume.	Tanks, 40 CY Soils (20 CY/Tank)	Geophysical Survey. Ship Soils/UST to TSDF or Incinerate Soils. Confirmatory Samping.
1262 Transformer Pad.	10 CY Soils & Debris (6 ft x 6 ft Pad).	Sample Soil & Pad(PCBs). Remove Pad & Soil to TSDF or Incinerate Soils.
1262 Solvent Tanks (4) Last contained Carbon Tetrachloride.	Tanks, 40 CY Soils, 1000 gal Solvents.	Soil Sampling & Waste Evaluation. Geophysical Survey. Tanks, Soils to TSDF or Incinerate Wastes. Confirmatory Sampling.
1240 French Drain.	20 CY Soils	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
1226 Suspect Waste Oil Disposal Area.	275 CY Soils. (50 ft x 50 ft x 3 ft)	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Perform Confirmatory Sampling.
JA Jones Steam Plant Drain Pad.	20 ft x 10 ft Pad.	Pad Surface, Soil Sampling & Waste Evaluation. Geophysical Survey. Wastes to TSDF or Incinerate. Confirmatory Sampling.
1218 Service Station.	Tank, 20 CY Soil	Soil Sampling. Soils/UST to TSDF or Incinerate Soils. Confirmatory Sampling.
1212/1227 Suspect Battery Acid Disposal Area.	25 CY Soils (45ft x 5ft x 3ft)	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
1100-IU-1		
6652-C SSL Active Septic System.	27 CY Soils (35 ft x 7 ft x 3 ft)	Soil Sampling Soil Gas Survey
6652-C SSI Inactive Septic System.	650 CY Soils (30 ft x 300 ft x 3 ft)	Soil Sampling Soil Gas Survey Wastes to TSDF or Incinerate Confirmatory Sampling,

Table 3.3 Wast Management Unit	Conservative Estimate of Contamination	RD/RA Activites
Radar Berm & Pads.	40 CY Soils.	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
H-52-C Surface Gas Tank Area(2 - 475 gallon tanks).	45 CY Soils 20 ft x 20 ft x 3 ft	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
Control Center Disposal Pits (4).	15 CY Soil (total) 10 ft Diameter x 3 ft depth	Soil Sampling & Waste Evaluation. Geophysical Survey. Wastes to TSDF or Incinerate. Confirmatory Sampling.
Building 6652-C Abandoned UST (5 - 1000 gallon fuel oil tanks).	Tanks, 100 CY Soils. (20 CY soil/tank) 2500 gal fuel oil	Geophysical Survey. Soils/UST to TSDF or Incinerate Soils. Confirmatory Sampling.
Pumphouse Disposal Slope.	40 CY Soils	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
Pumphouse Latrine 1500 Gallon Fuel Oil Storage Tank.	Tank Already Removed 5 CY Soils.	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
Pumphouse Latrine 275 Gallon Fuel Oil Tank.	Tank Already Removed 5 CY Soils..	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
6652-G ALE Field Storage Building Septic System.	890 CY Soils 200 ft x 40 ft x 3 ft.	Soil Sampling & Evaluation Soil Gas Survey Soils to TSDF or Incinerate Confirmatory Sampling.
Mound Site NW of Building 6652-G.	20 CY Soils.	Geophysical Survey. Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
6652-I ALE Headquarters Septic Tank & Drainfield 6000 gal Tank	Tank, 1800 CY Soils. (15 ft x 150 ft x 3 ft) (70 ft x 100 ft x 3 ft) (70 ft x 100 ft x 3 ft)	Soil Sampling. Soil Gas Survey. Tank/Soils to TSDF or Incinerate Soils Confirmatory Sampling
Abandoned Under Ground Storage Tanks. 6652-H 275 gal oil. 6652-H 2000 gal oil. 6652-I 2000 gal fuel oil. 6652-J 2000 gal fuel oil. 6652-HI unknown volume fuel oil. Generator Building UST 3000 gal fuel oil.	Tanks, 120 CY Soils, 4500 gal Fuel Oil. 1000 gal Oil. (20 CY Soil/Tank)	Soil Sampling. Geophysical Survey Tanks, Soils to TSDF or Incinerate Confirmatory Sampling.
Missile Bunker Sump(underground facilities).	Asbestos Covered Pipes	Sample Asbestos Bag & Dispose Asbestos Close Building (demolition or reuse).
Missile Bunker Landfill.	1.25 Acre Area.	Soil Sampling. Soil Gas & Geophysical Survey If neeeded: Trenching/Test Pits Wastes to TSDF or Incinerate. Confirmatory Sampling. Groundwater Monitoring.

Table 3.3 Wast Management Unit	Conservative Estimate of Contamination	RD/RA Activites
Missile Refueling Area Berm.	VOL ????s (1 ft x ?? ft x ?? ft) (Herbicide Applications)	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate Confirmatory Sampling.
Acid Neutralization Pit.	20 CY Soil (40 ft x 5 ft x 3 ft)	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
Missile Refueling JP-4 Fueling Area.	10 CY Soil	Soil Sampling & Waste Evaluation. Soils to TSDF r Incinerate. Confirmatory Sampling.
Missile Assembly & Test Building Inactive Septic System.	155 CY Soil (70 ft x 20 ft x 3 ft)	Soil sampling. Soil Gas Survey & Geophysical Survey. Soils to TSDF or Incinerate Confirmatory Sampling.
Missile Maintenance & Assembly Area Acid Storage Shed.	20 CY Soil.	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
JP4 Fuel Pad.	10 CY Soil.	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
Missile Bunker Drainfield(active).	85 CY Soils (15 ft x 50 ft x 3 ft)	Soil Gas Survey & Geophysical Survey. Soil Sampling. If Needed; Soils to TSDF or Incinerate. Confirmatory Sampling.
Missile Bunker Discharge Ditch.	40 CY Soils.	Soil Sampling & Waste Evaluation. Soil Sampling. Soils to TSDF or Incinerate. Confirmatory Sampling.
Main Entrance Stained Soil.	20 CY Soil.	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
H-52-L Surface Gas Tank Storage Area (2 - 475 gallon tanks).	Tanks, 45 CY Soil. (20 ft x 20 ft x 3 ft)	Soil Sampling & Waste Evaluation. Tanks, Soilto TSDF or Incinerate Confirmatory Sampling.
Generator Building.	4 CY Soil & Debris (40 ft x 20 ft Wood Frame Bldg with Concrete Floor.)	Soil Sampling & Waste Evaluation. Building Demolition. Soi/debris to TSDF or Incinerate Confirmatory Sampling
Horseshoe Site.	0.5 Acre Disturbed Soils	Soil Sampling. Soil gas & Geophysical Survey. If needed; Wastes to TSDF or Incinerate Confirmatory Sampling. Install Groundwater Monitoring Wells.
Elevator Doors.	Visual Inspection.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Flamable Storage Block Shed.		Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Missile Maintenance & Assembly Area Paint Shed.	5 CY Soil.	Soil Sampling. Soils to TSDF or Incinerate. Confirmatory Sampling.

Table 3.3 Wast Management Unit	Conservative Estimate of Contamination	RD/RA Activites
Missile Maintenance & Assembly Area Dry Well Drum.		Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
H-52-L NIKE Base Landfill.	1.5 Acre Area.	Soil Sampling. Soil Gas & Geophysical Survey If neeeded: Trenching/Test Pits Wastes to TSDF or Incinerate. Confirmatory Sampling. Groundwater Monitoring.

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