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Draft Limited Field Investigation/ Focused Feasibility Study for the 1100-EM-2, 1100-EM-3, and 1100-IU-1 Operable Units, Hanford

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Office of Environmental Restoration and
Waste Management

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Approved for Public Release

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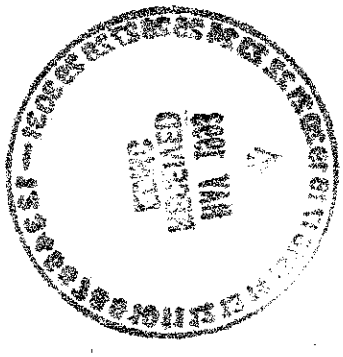

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EXECUTIVE SUMMARY

This report has been prepared as an addendum to the final Remedial Investigation/ Feasibility Study Report (DOE/RL-92-67) for the 1100-EM-1 Operable Unit (OU), one of four OU's within the 1100 Area, at the U.S. Department of Energy Hanford Site located near the city of Richland in Benton County, Washington. The three additional OU's, 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 OU's. The results of those efforts are presented in this addendum.

The format of this addendum follows that of a streamlined or focused feasibility study 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 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 (UST's) regulated under the state UST program]; and previous characterizations of 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 ES-1 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:

- Already remediated or currently under regulation by the State or EPA under a statute other than the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or the Model Toxics Control Act (MTCA).
- Pending or a candidate for regulation by the State or EPA under a statute other than CERCLA or MTCA.
- 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.
- 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 18 additional WMU's beyond the initial WIDS inventory. The screening efforts resulted in the identification of 32 WMU's that are currently, or are a candidate for, management under other regulatory programs. Of the remaining WMU's, 43 are considered to be likely or potential sites of releases or spills, and 7 are sites 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 in table ES-1.

LFI/FFS Flowchart

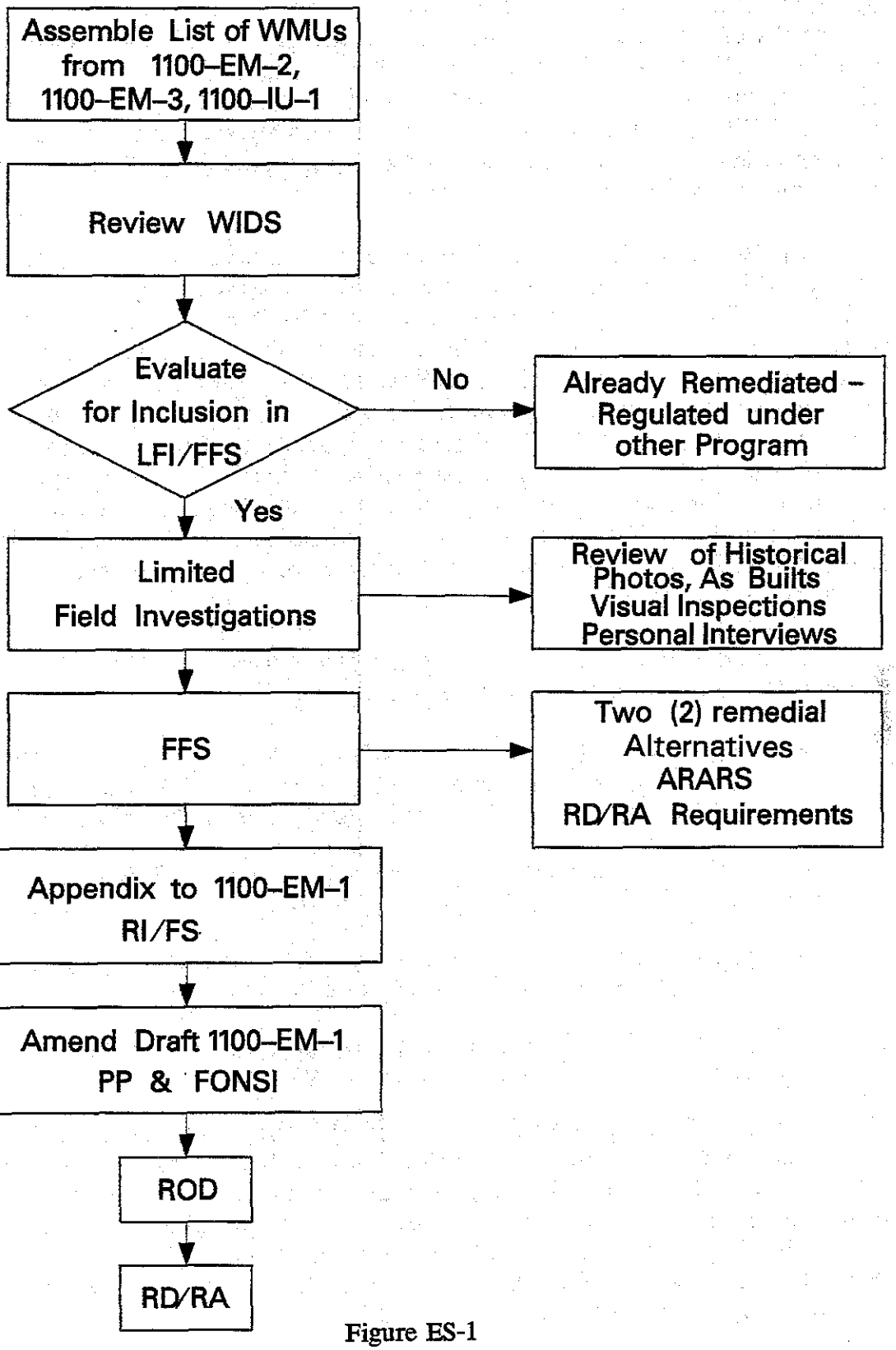


Figure ES-1

Table ES-1. Waste Management Unit Summary

WMU	Number	Approximate Volume (Total)
Underground Storage Tanks	21	380 Cubic Yards
Soil Sites with Metals	6	440 Cubic Yards
Soil Sites with Organics	12	940 Cubic Yards
Spills	5	125 Cubic Yards
Septic Systems	6	3,600 Cubic Yards
Debris Sites	2	10 Cubic Yards
PCB Transformers/Pads	6	410 Cubic Yards
Others	2	No Estimate
Landfills	2	Approximately 5 Acres
GW Monitoring Locations	6	

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 demonstrated 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 Resource Conservation and Recovery Act (RCRA) or Toxic Substance Control Act (TSCA) facility; and onsite thermal destruction (incineration). The latter was evaluated in order to assess potential savings that might result from onsite incineration of soils from multiple WMU's.

The LFI/FFS approach also differs from the traditional CERCLA process in that qualitative Human Health and Ecological Risk Assessments were conducted for the three OU's. Furthermore, the potential for contaminant migration was not rigorously investigated. In place of those activities, media-specific cleanup goals (paragraph 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 should be implemented during the RD/RA process to evaluate the potential impacts, if any, to groundwater of contaminant releases at the WMU's. 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 FFS approach as discussed in the NCP.

The cleanup remedies considered for each of the WMU's 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; namely, 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 Superfund site. Subsequent cleanup actions for the WMU's listed in this addendum would be evaluated for completeness during confirmatory 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 Report. In the event that remedial actions differ significantly from the ROD, it is expected that an Explanation of Significant Differences, ROD Amendment, or a new ROD would be issued and the Administrative Record amended. These activities are discussed further in paragraph 4.1.2.

1.0 INTRODUCTION

The 1100 Area of the U.S. Department of Energy's (DOE) Hanford Site 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 (OU's) 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 OU 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 Well Field. In the fall of 1992, it was determined that the additional 1100 Area OU's (1100-EM-2, 1100-EM-3 and 1100-IU-1) would be potential candidates for an accelerated evaluation that could enable all of the 1100 Area OU's to be addressed in one Record of Decision (ROD). That ROD is currently scheduled to be issued in the fall of 1993. This accelerated approach would allow for more effective use of resources for cleanup activities and has the potential to greatly shorten the timeframe associated with the CERCLA process.

1.1 PURPOSE OF ADDENDUM

The 1100-EM-1 Phase I Remedial Investigation (RI) report concentrated on the initial site characterization for the 1100-EM-1 OU. The Final Remedial Investigation/Feasibility Study (RI/FS) 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 Report complements the initial characterization by providing a more definitive characterization of the nature and extent of potential threats to human health and the environment posed by contaminant releases from that OU.

This addendum presents the results of limited field investigations (LFI's) and a focused feasibility study (FFS) effort for the three other 1100 Area OU's. The LFI/FFS approach differs from the traditional CERCLA process in that qualitative Human Health and Ecological Risk Assessments were conducted for the three OU's. In addition, the potential for contaminant migration was not rigorously investigated. In place of those evaluations, 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 or incinerated onsite. For groundwater, a monitoring and evaluation program should be implemented during the RD/RA process to evaluate the potential impacts, if any, to

groundwater of contaminant releases at the WMU's. 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 of being 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 FFS approach discussed in the NCP.

This addendum provides only sufficient redevelopment of material from the LFI's 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 LFI's 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 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 ongoing 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, or this addendum, will follow guidelines as stated in paragraph 9.2.1 of the Tri-Party Agreement.

1.2 OPERABLE UNIT DESCRIPTION

1.2.1 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 1950's. 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.

1.2.2 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 UST, and contaminated soil from a previously removed UST. Four fuel UST's were removed from the OU in 1991.

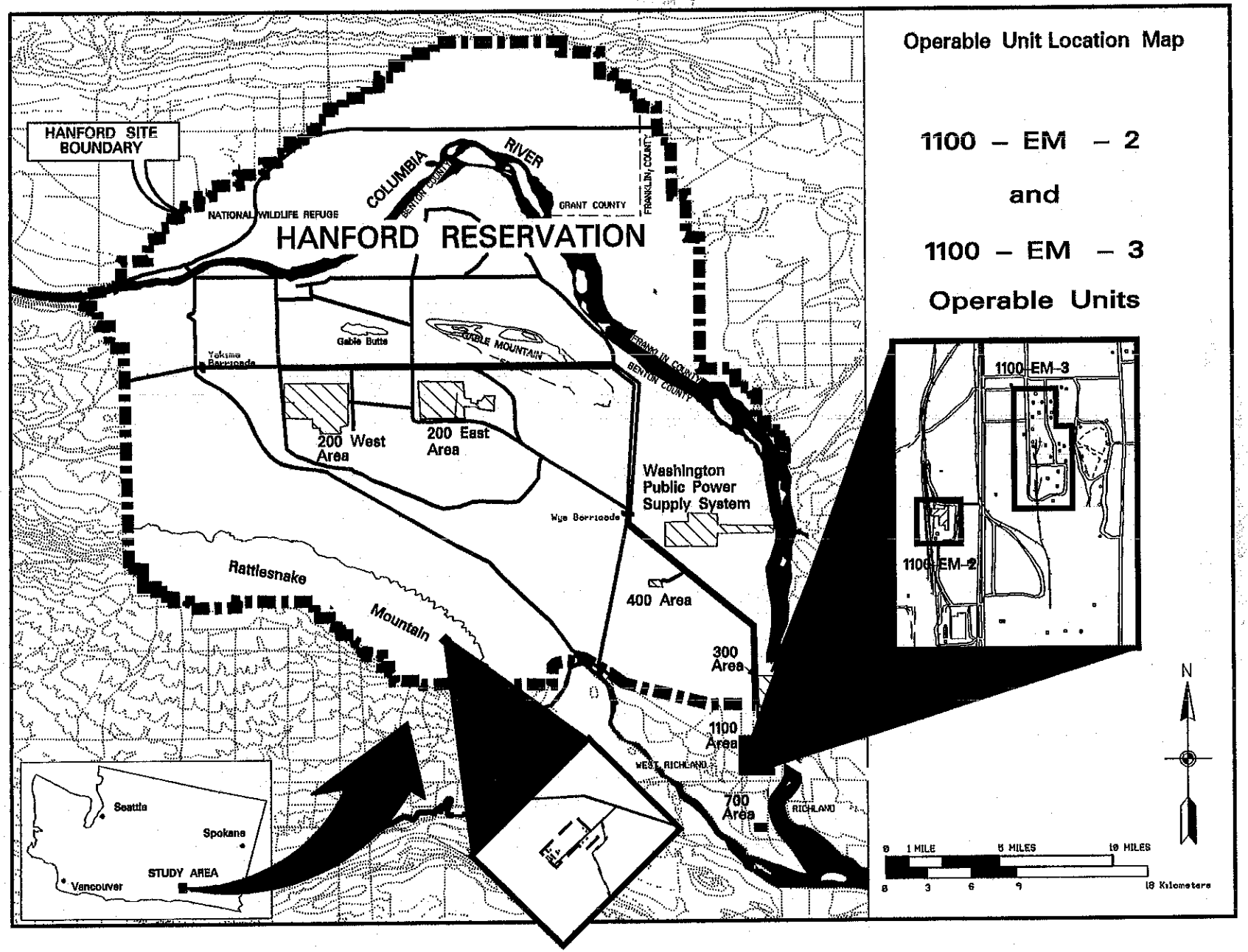
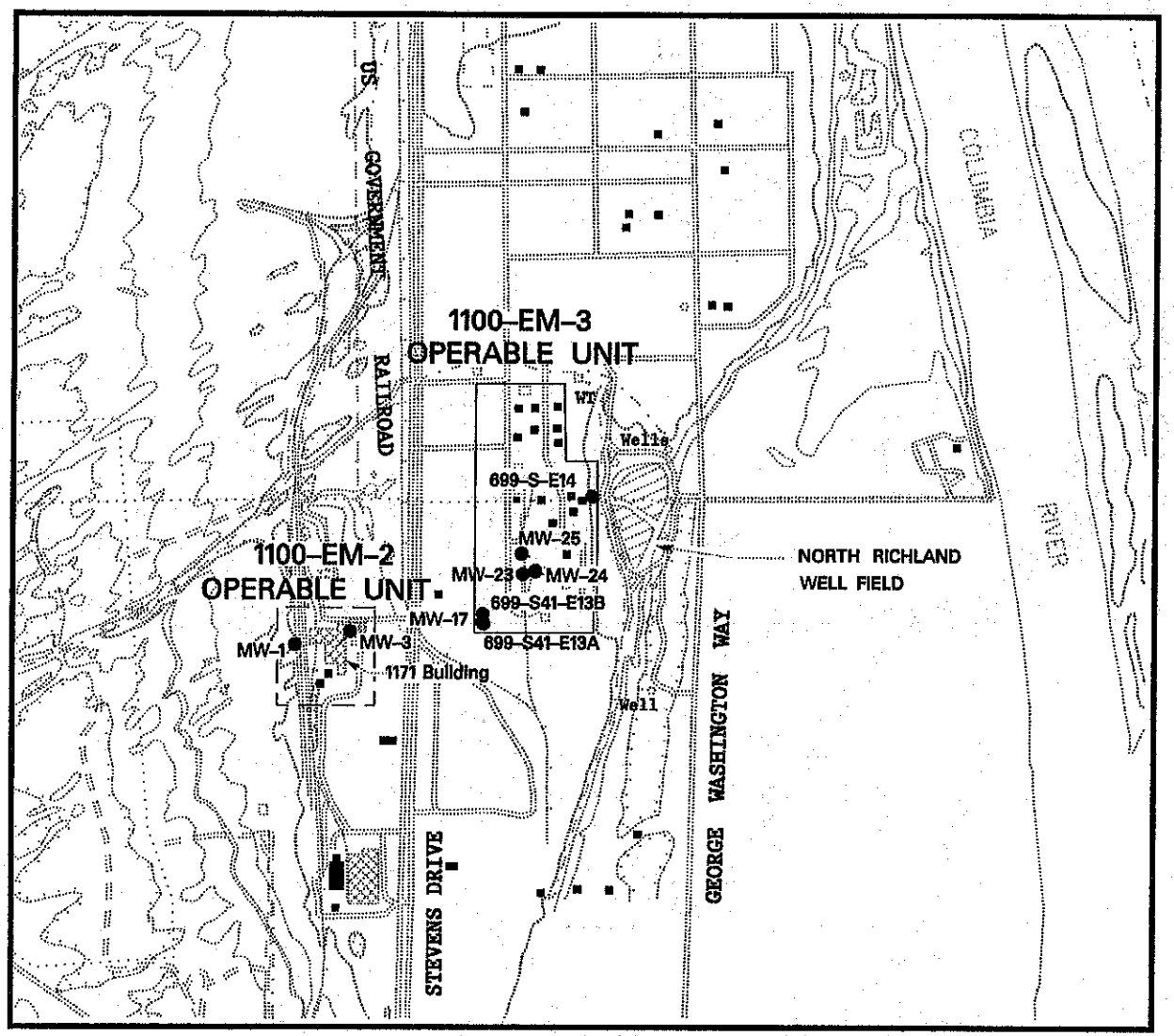

Operable Unit Location Map
1100 – EM – 2
and
1100 – EM – 3
Operable Units
HANFORD SITE BOUNDARY
HANFORD RESERVATION
COLUMBIA RIVER
NATIONAL WILDLIFE REFUGE
GRANT COUNTY
FRANKLIN COUNTY
BENTON COUNTY
Gable Butte
Gable Mountain
Yakima Barricade
200 West Area
200 East Area
Washington Public Power Supply System
Wye Barricade
Rattlesnake Mountain
400 Area
300 Area
1100 Area
700 Area
WEST RICHLAND
RICHLAND
1100-EM-3
1100-EM-2
N
0 1 MILE 5 MILES 10 MILES
0 3 6 9 18 Kilometers
Seattle
Spokane
STUDY AREA
Vancouver
1100 – IU – 1 Operable Unit

Figure 1-1



LEGEND :

MW-1 ● Well Designation and Location.

Outline and Designation of Operable Units.

Buildings

N

0 250 500 METERS

0 200 800 1600 FEET

1100-EM-2 and 1100-EM-3 Operable units and Vicinity.

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Figure 1-2

1.2.3 1100-IU-1

The main part of this OU is located on the northeastern slope of the Rattlesnake Hills, approximately 24 kilometers (km) (15 miles) west of the 1100-EM-2 and 1100-EM-3 OU's as shown in figures 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, and 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 (ALE) 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 km (120 square mile) ALE Reserve.

1.3 NATIONAL ENVIRONMENTAL POLICY ACT

This report has also been prepared to address the requirements 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.

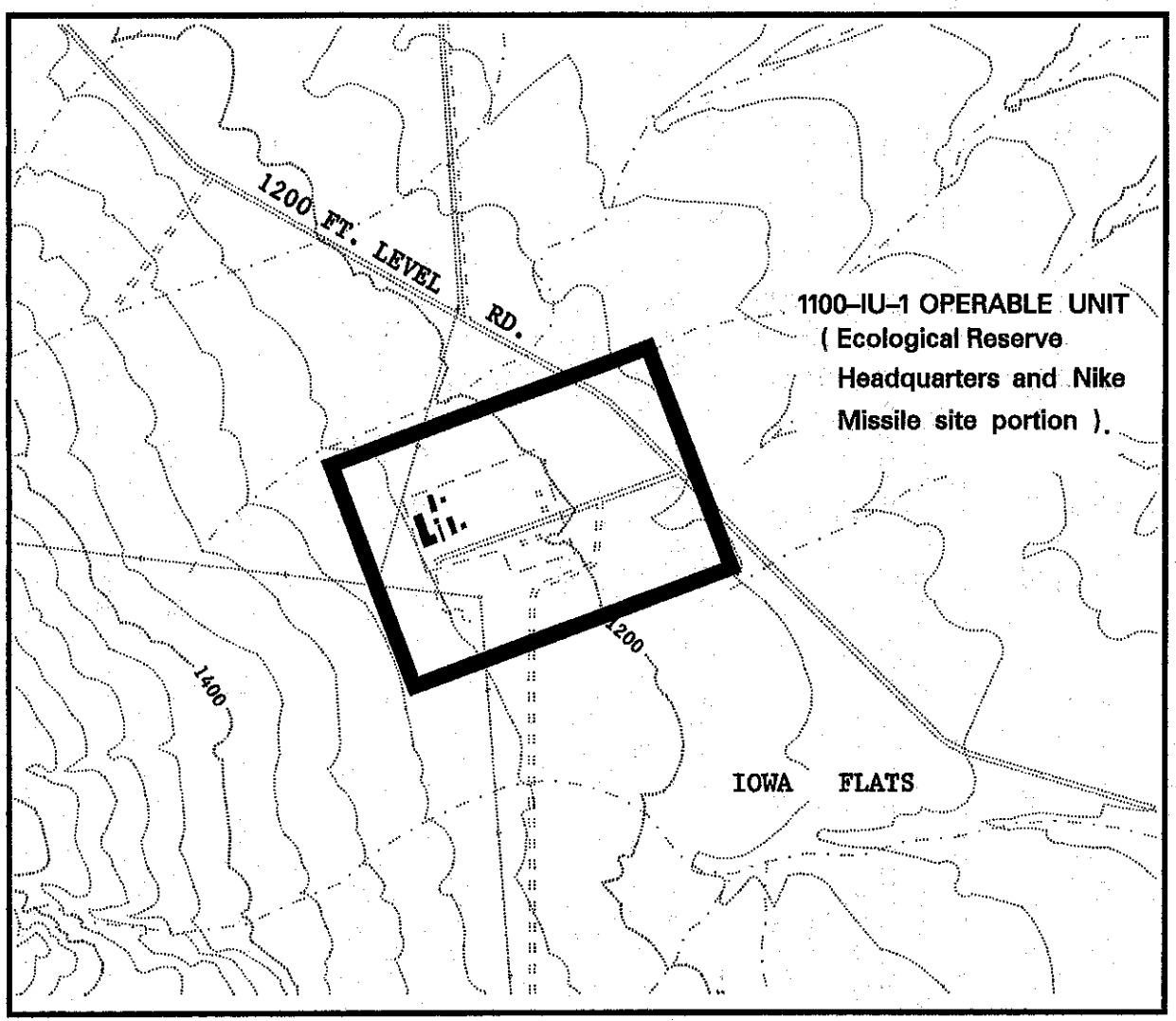
The regulatory authority for the proposed action is discussed above in paragraph 1.1. The affected environment is described in detail in section 2. The environmental and human health impacts and the rationale for requisite actions at the site are presented in paragraph 4.2. In section 4, remedial alternatives 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, 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 Report to determine whether the potential environmental impacts are significant enough to warrant further actions under NEPA at the 1100-EM-2, 1100-EM-3, and 1100-IU-1 OU's. Table 1-1 presents a directory of NEPA values that were evaluated as part of the LFI/FFS efforts.

1.3.1 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 for the Hanford site. The PNRS noted chemical contaminants



LEGEND :

Outline and Designation of Operable Unit.

Buildings

N

0 250 500 1000 METERS

0 750 1500 3000 FEET

1100–IU–1 Operable Unit.

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Figure 1–3

Table 1-1. Directory of NEPA Values and Location in 1100 Documents

NEPA VALUE	1100 DOCUMENT	1100 DOCUMENT
	DOE/RL-92-67 (Vol. IV, Addendum)	DOE/RL-92-67 (Vols. I-III)
PHYSICAL CHARACTERISTICS		
Operable Unit Vicinity	Section 1.6	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 4.2.2	
Water Use	Section 2.1.2, 2.2	
Cultural Resources	Section 1.5.5, 1.6	
Wildlife Ecology	Section 1.5.4	Appendix L
Terrestrial Ecology	Section 1.5.4, 1.6.1	Appendix L
Aquatic Ecology	Section 1.5	Appendix L
Sensitive Environments	Section 1.5.4, 1.5.5, 1.6.1	
IMPACTS OF REMEDIAL ACTIONS		
Compliance with Statutory Law	Section 4.1, 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 4.2.2	

associated with past activities in the 1100 Area such as lead, sulfuric acid and ethylene glycol. The PNRS also noted that groundwater in the 1100 Area is close to the surface and, therefore, could be impacted by release of contaminants. The PNRS discusses impacts to wildlife within the context of effects of radionuclides on several species of birds and fish. Radionuclides are not associated with past activities at the 1100 Area.

1.3.2 Trustees for Natural Resources

The identified trustees for Natural Resources are the Department of Commerce, the Department of the Interior, DOE, the State of Washington and the State of Oregon. Additional potential trustees include the following Indian Tribes: Yakima Indian Nation, Nez Perce, Federated Tribes of the Umatilla Reservation, and the 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 1100-EM-1 RI/FS are to be made available to the trustees and potential trustees for natural resources.

1.4 HISTORICAL USE

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

1.4.1 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 wastewater ditch, located about 1.2 km (0.75 miles) north of the 1171 building. The 1171 building was constructed in the early 1950's 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 RI/FS.

1.4.2 1100-EM-3

Prior to 1943, the 1100-EM-3 OU, 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 1940's, the OU and surrounding areas were used for office space and as an 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, 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, Resources Conservation and Recovery Act (RCRA) waste accumulation areas, warehousing, fabrication shops, radio maintenance, and radiography and research administrative offices.

1.4.3 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 1950's and continued to operate through the early 1960's. 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 1960's, the buildings at the southwest end of the OU were converted into the headquarters of the 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 1960's and are intact, but abandoned, today.

1.5 CURRENT USE

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

1.5.1 1100-EM-2

The 1171 building was constructed in the early 1950's and has been used primarily for vehicle and equipment maintenance since. The area 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.

1.5.2 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.

1.5.3 1100-IU-1

In the late 1960's, the buildings at the southwest end of the OU were converted into the headquarters of the 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 1960's and are intact, but abandoned, today. Current ALE management policies are presented in the ALE Facility Management Plan (Battelle, 1993).

1.5.4 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 in paragraph 5.3.6 and appendix L of the 1100-EM-1 RI/FS report is presented. The appendix to this addendum contains a complete listing of endangered, candidate, and threatened wildlife species at the Hanford site. Due to the close proximity to the 1100-EM-1 OU, the ecology of the 1100-EM-2 and 1100-EM-3 OU's is very similar.

1.5.4.1 1100-EM-2 and 1100-EM-3. The results of wildlife surveys and ecological evaluations for the 1100-EM-1 OU are presented in paragraphs 2.7 and 3.7 of the Phase I 1100-EM-1 RI/FS Report (DOE/RL 90-18). The 1100-EM-2 and 1100-EM-3 OU's are largely a mix of light industrial and commercial activities. Terrestrial vegetation of the area includes the presence of some sagebrush and bunchgrass communities. Due to the extensive alteration of habitat in the two OU's, little wildlife habitat remains.

1.5.4.2 1100-IU-1. A summary of information from the report "Ecological Perspective of Land Use History: The Arid Lands Ecology (ALE) Reserve" (Hinds and Rogers, 1991) is presented below:

> The ALE, established in 1967, is comprised of 311 square km (120 square miles) of shrub-steppe land, located generally on the north slopes of the Rattlesnake Hills and functions as an 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 an 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 km (3 miles) from

the main OU area. Pacific Northwest Laboratory manages the ALE Reserve for DOE.

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 percent of the ALE. Plant communities at the ALE include: winterfat, thyme buckwheat, sagebrush, cheatgrass, bluebunch, wheatgrass, and bitterbrush. Wetlands present in the ALE are associated with springs fed by local groundwater. A spring originating from Snively Canyon and Rattlesnake Spring both flow for approximately one half mile prior to returning to groundwater. Wetlands are present along the surface course of the two springs. Additionally, there are numerous other small year-round springs (*e.g.*, Bobcat Canyon spring) and hundreds of seasonal ephemeral springs.

1.5.5 Cultural Resources

In addition to the information provided in the previous sections concerning land use and ecological features, cultural resources pursuant to NEPA and Section 106 of the National Historic Preservation Act (36 CFR part 800) are addressed in this section. Cultural resources typically include historic and archaeologic sites, National Register sites, ancestral cemeteries or burial grounds, usual and accustomed fishing sites, anadromous fisheries, sites for practice of traditional Indian religion, subsistence and medicinal plants, and old homesites and place names.

1.5.5.1 1100-EM-2 and 1100-EM-3. As discussed above, the current use of these areas is primarily light industrial/commercial. The past and prehistory of the Columbia Plateau included hunter-gatherers that adapted to seasonal changes to resources. Earliest identifiable inhabitants adapted to specialized resource niches. As climatic changes to a more arid climate evolved, later inhabitants developed a more mobile adaptation centered around the area rivers. Subsequent climate changes in the area affected indigenous populations resulting in ongoing adaptations to utilize changes to resources. (PNL, 1989)

1.5.5.2 1100-IU-1. The physical structures contained within the overall ALE facility include the former NIKE Missile Base and Control Center, abandoned gas wells, and the former homesteads. For the purposes of CERCLA cleanup activities, only the NIKE Missile Base and Control Center are under consideration. The NIKE facilities were built in the 1950's and, therefore, are not eligible for inclusion on the National Register of historical places. Other structures such as the homesteads and gas wells that are pre-1943 construction may be eligible for the register.

The greater area of Rattlesnake Mountain is considered a Traditional Cultural Property, which may also be eligible for the register. These aspects, as well as the presence of wetlands and threatened and endangered species will require close coordination with interested and affected tribes and the State of Washington Historic Preservation Office.

Prior to initiating any potential cleanup activities at the NIKE facilities, a cultural resource survey would need to be conducted to evaluate any undisturbed ground that could be impacted by such activities. If areas are identified that could be impacted by cleanup activities, a mitigation plan would need to be developed and reviewed by tribal and state authorities prior to initiating cleanup.

1.6 NEARBY PROPERTIES AND FACILITIES

This section provides a brief overview of nearby physical features and land usage in the vicinity of the three OU's.

1.6.1 1100-EM-2 and 1100-EM-3 Operable Units

The North Richland Well Field, the 1100-EM-1 OU, and the City of Richland are located near the 1100-EM-2 and 1100-EM-3 OU's (see figure 1-2). 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/FS 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 pathway from the 1100-EM-3 OU to the well field cannot be ruled out due to their close proximity and 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-064).

Characterization of the facilities and contamination at the 1100-EM-1 OU was reported in Phase I Remedial Investigation for the Hanford Site 1100-EM-1 Operable Unit (DOE/RL-90-18) and in the 1100-EM-1 RI/FS (DOE/RL-92-67). The 1100-EM-1 RI/FS 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 and 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 OU) share the same physical characteristics and hydrogeologic regime as the 1100-EM-2 and 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 cleanup. No significant groundwater contamination was detected in the 1100-EM-1 near the 1100-EM-2 and 1100-EM-3 OU's. A discussion of groundwater sampling results for the 1100-EM-2 and 1100-EM-3 OU's is presented in paragraph 2.2 of this addendum.

The main part of the City of Richland lies to the south and southeast of the 1100-EM-2 and 1100-EM-3 OU's with the closest residential areas located about 600 meters (2,000 feet) to the southeast. Property immediately surrounding the 1100-EM-3 OU belongs to the City of Richland, 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 (2,000 feet) and 1,000 meters (3,300 feet), respectively. Office complexes and other facilities associated with Hanford Site work are located in the vicinity.

1.6.1 1100-IU-1 Operable Unit

The 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 km (120 square miles) of shrub-steppe land located generally on the north slopes of the Rattlesnake Hills and functions as an 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 an ecological research area for the study of the shrub-steppe without human-related land use pressures. The ALE is the largest designated Research Natural Area in the Pacific Northwest. Additionally, the entire Hanford site outside of the exclusion areas (100, 200, 300 Areas) is designated as the Hanford National Environmental Research Park. The purpose of the park is to study the environmental impacts of energy developments and to inform the public of available options for environmental and land use. Studies at the park include biotic transport processes, the dynamics of arid land ecosystems, mineral cycling processes, dynamics of wild populations, and remote sensing studies.

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 1,200 feet, located south and west of the main OU area. The well field is abandoned today.

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2.0 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 1100-EM-1 RI/FS (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 OU's is equivalent to that described for the 1100-EM-1 OU (DOE/RL-92-67, section 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 OU is greatly influenced by the presence of Rattlesnake Mountain, an east-west oriented, elongated ridge having approximately 900 meters (2,950 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 1,200 ft. Average annual precipitation at the NIKE control site located at the crest of Rattlesnake Mountain, at an elevation of approximately 3,500 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 (82°F) and -3.7°C (25°F) while at the control site averages are 24°C (75°F) and -4.5°C (24°F), respectively (Thorp and Hinds, 1977; PNL, 1983).

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 and 1100-EM-3 OU's. There are wetlands and springs at the ALE. Some erosion channels, active during heavy rainfall or snowmelt 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.

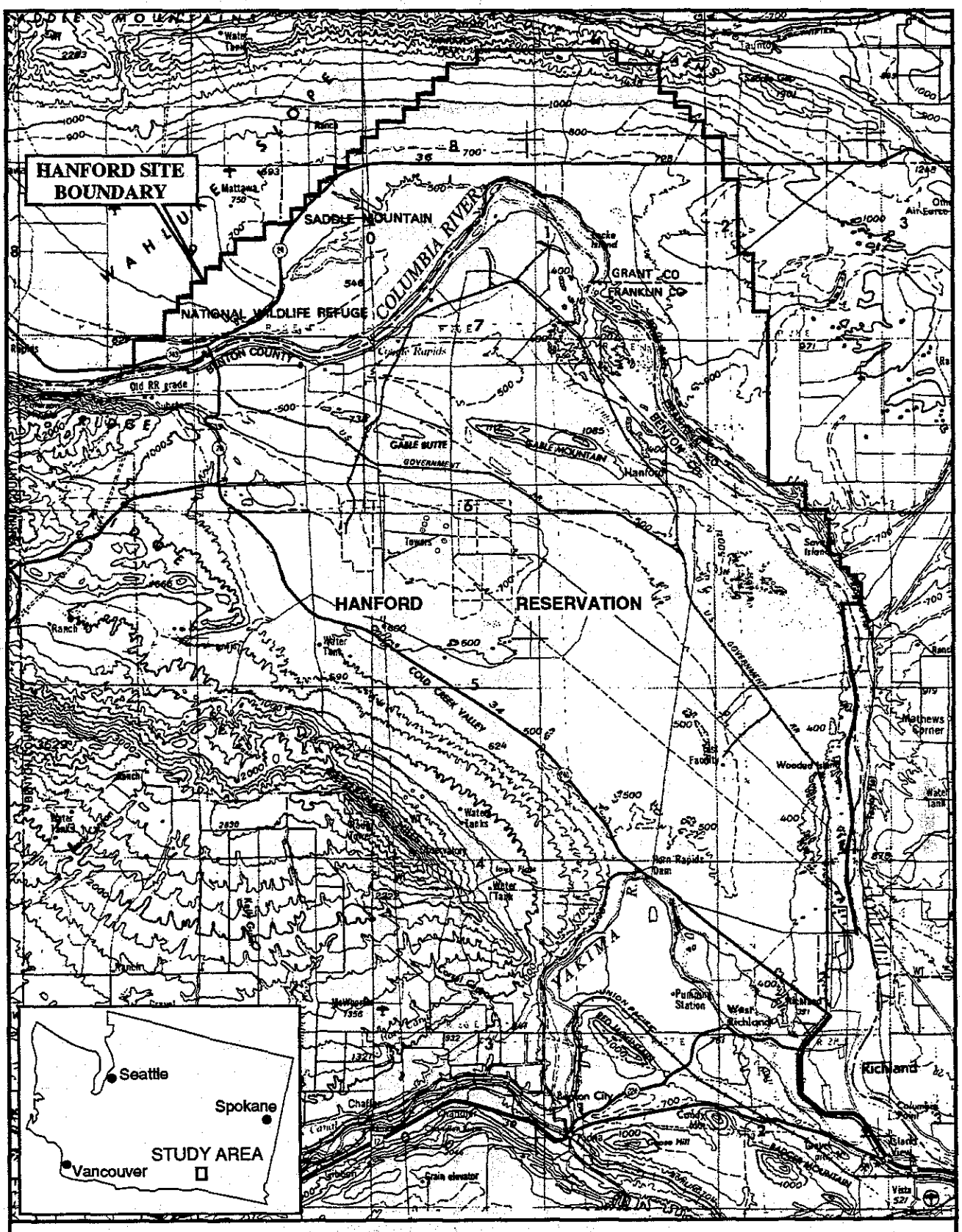

Figure 2-1. Hanford Area Physical Features

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. Extensive presentations of the regional and local geology can be found in DOE/RL-90-18, DOE/RL-92-67, WHC-MR-0391, and Gaylord and Poeter, 1991.

2.1.3.1 1100-EM-2 and 1100-EM-3 OU's. The interpretation and description of the geology of the 1100-EM-2 and 1100-EM-3 OU's is based primarily on previous studies in the adjacent 1100-EM-1 OU and on geologic logs of monitoring wells installed within the 1100-EM-3 OU during UST removal operations accomplished in 1991.

The generalized stratigraphic column for the 1100-EM-1 OU as shown in the 1100-EM-1 RI/FS, figure 2-2, is also applicable to both the 1100-EM-2 and 1100-EM-3 OU's. Information obtained from the drilling of 22 soil borings and 23 groundwater monitoring wells during the 1100-EM-1 OU RI and 5 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 poses 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 OU's. None of the borings extended through the suprabasalt strata to bedrock.

A cross-section identification map is provided in the 1100-EM-1 RI/FS, figure 2-3. Cross-section D-D", figure 2-6 of the 1100-EM-1 RI/FS, was constructed with a northeast-southwest orientation through the 1100-EM-1 and 1100-EM-3 OU's. 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, and MW-25 installed within the 1100-EM-3 OU as part of the UST removals are presented in the appendix to this addendum.

Descriptions of the basalt and suprabasalt stratigraphy as presented for the 1100-EM-1 OU in DOE/RL-92-67, chapter 2, are also applicable to the 1100-EM-2 and 1100-EM-3 OU's.

2.1.3.2 1100-IU-1 OU. 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 OU 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 OU, 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. It is typically fine-grained to

glassy and contains wedge shaped plagioclase phenocrysts and rare olivine. The Pomona Member has been radiometrically dated at 12 million years before present (McKee *et al.*, 1977). A normal stratigraphic section of the Columbia River Basalt Group is anticipated beneath the surface exposures.

There is less than 1 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 OU, located at an elevation of approximately 366 m (1,200 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 million years before present (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 is 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.

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 OU's. 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 the 1100-EM-1 RI/FS, provides a best estimate range of 1 to 2 cm (0.35 to 0.7 in) 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 OU's 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.

2.1.4.2 1100-IU-1 OU. 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 (1,820 to 1,890 ft) above mean sea level; approximately 300 m (990 ft) below the ground surface at the borehole site and 450 m (1,500 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 percent of which occur between elevations 610 and 915 m (2,000 and 3,000 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-1 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 two groundwater monitoring wells in the 1100-EM-2 area and seven groundwater monitoring wells in the 1100-EM-3 area listed in table 2-1. Complete data tables are presented in the appendix to this addendum.

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-S40-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 through 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 maximum contaminant levels (MCL's) current at the time of collection.

Data for the next five groundwater monitoring events, Rounds 5 through 9 (March 1991 - March 1992), were collected and validated by Westinghouse Hanford Company (WHC) Office of Sample Management for Rounds 5 and 6, and by the U.S. Army Corps of Engineers for Rounds 7 through 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. MCL's, proposed maximum contaminant levels (PMCL's), secondary maximum

Wet chemistry analytical data showed nitrate to exceed MCL's, 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 Rounds 1 through 4 were reported by Golder Associates as invalidated data because the lower limits of detection and minimum detectable activity were not reported by the laboratories. Field blank data was used to determine upper tolerance limits and data was qualified with a "U" if the results were below the upper tolerance limit for the particular parameter. The radionuclide results did not exceed relative percent difference (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 MCL's 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.

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. The data are 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.

for alpha, beta, tritium, radium, and strontium results. Alpha and beta were reported at values less than the MCL's.

Table 2-7. Radionuclides

Analyte	# Rounds Detected	[Mean] pc/L	[Max] pc/L	MCL pc/L	PMCL pc/L	SMCL pc/L	MCLG pc/L	MTCA pc/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 OU 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 OU 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 OU's to evaluate the potential for the presence of contaminants of concern consisted of evaluating existing information. No new information or analytical data was developed. An historical file review was conducted to identify and analyze information 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 investigative reports 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 those sources. A review of spill records was also undertaken. Spill records were primarily related to events in the past 5 years.

In addition to the review of historical information, site inspections and personal interviews were conducted. The results of those activities are presented in paragraphs 2.4 and 2.5, respectively. Table 2-8 presents the combined results of these activities.

Table 2-8. SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 (Page 1 of 11)

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
1100-EM-2			
Steam Pad Tank #2 UST 1171-2.	Inspect surface.	Installed 1984.	4000 gal fiberglass tanks last contained wastewater. Scheduled for removal in 1993/94.
Steam Pad Tank #3 UST 1171-3.			
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 sand dune. 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.
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.

Table 2-8. SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 (Page 2 of 11)

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
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			
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 materials.	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 PCB's in soil.

Table 2-8. SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 (Page 3 of 11)

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
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.
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 (1234) 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 Well Field 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 plate 4.	Inspected pad and drains. Could not determine where drain system discharged. No visible evidence of contamination.

Table 2-8. SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 (Page 4 of 11)

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
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.
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 2-8. SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 (Page 5 of 11)

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
1262 Solvent Tanks (4).	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 (Last contained Cleaning Solvent Potentially Carbon Tetrachloride).	Did not observe soil during LFI due to snow cover.
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.	6000 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.

Table 2-8. SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 (Page 6 of 11)

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
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.
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. (4) - 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 PCB's at this location have been removed.
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.
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.

Table 2-8. SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 (Page 7 of 11)

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
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 PCB's 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 bldg 6652-O.
Abandoned UST's. (1) - 275 gal oil (2) - 2000 gal fuel oil (1) - 2000 gal 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. 2000 gal 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.
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.

Table 2-8. SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 (Page 8 of 11)

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
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 assessment 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.
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.

Table 2-8. SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 (Page 9 of 11)

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
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.
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 9 ppm PCB's for removed transformer per Benton PUD. No soil samples taken during LFI to verify absence or presence of contamination due to past practice activities.

Table 2-8. SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 (Page 10 of 11)

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
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.
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 - PCB's 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.

Table 2-8. SUMMARY OF LIMITED FIELD INVESTIGATION OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 (Page 11 of 11)

WASTE MANAGEMENT UNIT	SITE CONSIDERATIONS	HISTORICAL FILE REVIEW COMMENTS	SITE ASSESSMENT COMMENTS/FINDINGS
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.

2.6 POTENTIAL CONTAMINANTS OF CONCERN

The identification of potential waste types for the 1100-EM-2, 1100-EM-3, and 1110-IU-1 OU's is based upon historical information about typical chemicals and materials that were used at the sites collected from the WIDS, previous site investigations, and site reconnaissance activities.

2.6.1 1100-EM-2 Area

The potential contaminants of concern for the 1100-EM-2 Area are chlordane; 1,1,1-trichloroethane (TCA) (700 Area UST waste solvent tank); and polychlorinated biphenyls (PCB's) (1100 Area bus shop), see table 2-9.

Table 2-9. Potential Contaminants for the 1100-EM-2 Operable Unit

Waste Management Unit	Potential Contaminant
700 Area UST Waste Solvent Tank	TCA Chlordane
1100 Area Bus Shop	PCB's

2.6.2 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 (CCl_4) (1262 solvent tanks), and PCB's (1262 transformer pad), see table 2-10.

Table 2-10. Potential Contaminants for the 1100-EM-3 Operable Unit

Waste Management Unit	Potential Contaminant
1234 Storage Yard	Nitrates
3000 Area Jones Yard HWSA	Lead
1262 Solvent Tanks	CCl_4
1262 Transformer Pad	PCB's

2.6.3 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 releases consisted of minor release accompanying normal site operations. Accidental releases occurred due to fuel spillage while filling UST's, and leakage of hydraulic fluid from missiles, launchers, and elevators. Intentional releases involved the dumping of unsymmetrical dimethylhydrazene (UDMH), waste

solvents, and oils. Unanticipated releases from transformers containing PCB's resulted from 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 CCl_4, trichloroethene, trichloroethane, and perchlorethene, alcohols, inhibited red fuming nitric acid, UDMH, phosphoric acid, alodine powder, chromium oxides, acetone, paints containing chromium and lead, tricresyl phosphate, ethylene glycol, pesticides, herbicides, PCB's (transformer oil), and hydraulic fluid.

Table 2-11. Potential Contaminants for the 1100-IU-1 Operable Unit

Waste Management Unit	Potential Contaminant
Missile Maintenance & Assembly Area Transformer Pad	PCB's
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
	CCl_4
	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
Facility Maintenance	Lead paints
	Pesticides and herbicides
Utilities	Transformers (PCB's), above and below ground storage tanks used for gasoline or fuel oil, and hydraulic fluid
Deactivation	Solvents, fuels, paints, asbestos-containing debris

3.0 REGULATORY STATUS OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1 WASTE MANAGEMENT UNITS

This section 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 1100-IU-1 OU's. Once the historical and environmental information presented in section 2 was collected, regulatory information for each WMU was evaluated and each WMU was placed in one of four categories:

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

The WMU's that were placed under the first category, "currently under regulation," are presented in table 3-1. It is not expected that those WMU's will require any further CERCLA or MTCA regulatory review and would not be candidates for inclusion in the 1100 Area Superfund designation. The WMU's that were placed under the second category, "pending or candidate for regulation," are presented in table 3-2. Those WMU's will require a decision by EPA or Ecology regarding whether to address them under the CERCLA or 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 WMU's from the third and fourth categories are presented in table 3-3. A process flowchart is presented in figure 3-1.

3.1 OVERVIEW OF RESOURCE CONSERVATION AND RECOVERY ACT, UNDERGROUND STORAGE TANK 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 WMU's that are currently administered under these programs (see table 3-1). It also provides a framework to evaluate and compare/contrast cleanup actions for WMU's listed in table 3-2 in the event those WMU's are regulated under RCRA or UST, or are retained in the CERCLA or MTCA processes.

3.1.1 Resource Conservation and Recovery Act

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 of the RCRA. Its purpose is to designate those solid wastes that are dangerous or extremely hazardous; provide for surveillance and monitoring of those wastes; provide a framework to track waste from generation to disposition; establish treatment, storage, and disposal facility requirements; establish requirements for the state's extremely hazardous waste disposal facility; establish a permitting program for treatment, storage, and disposal facilities; and encourage recycling, reuse, and recovery to the maximum extent possible.

3.1.2 Underground Storage Tanks

Chapter 173-360 WAC addresses the potential threat caused by leaking UST's containing petroleum products or other regulated substances. The State of Washington Department of Ecology was directed by Chapter 90.76 RCW to develop a 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 be at least as stringent and meet the objectives as outlined in Federal regulations.

Figure 3-1. Regulatory Evaluation of WMU's

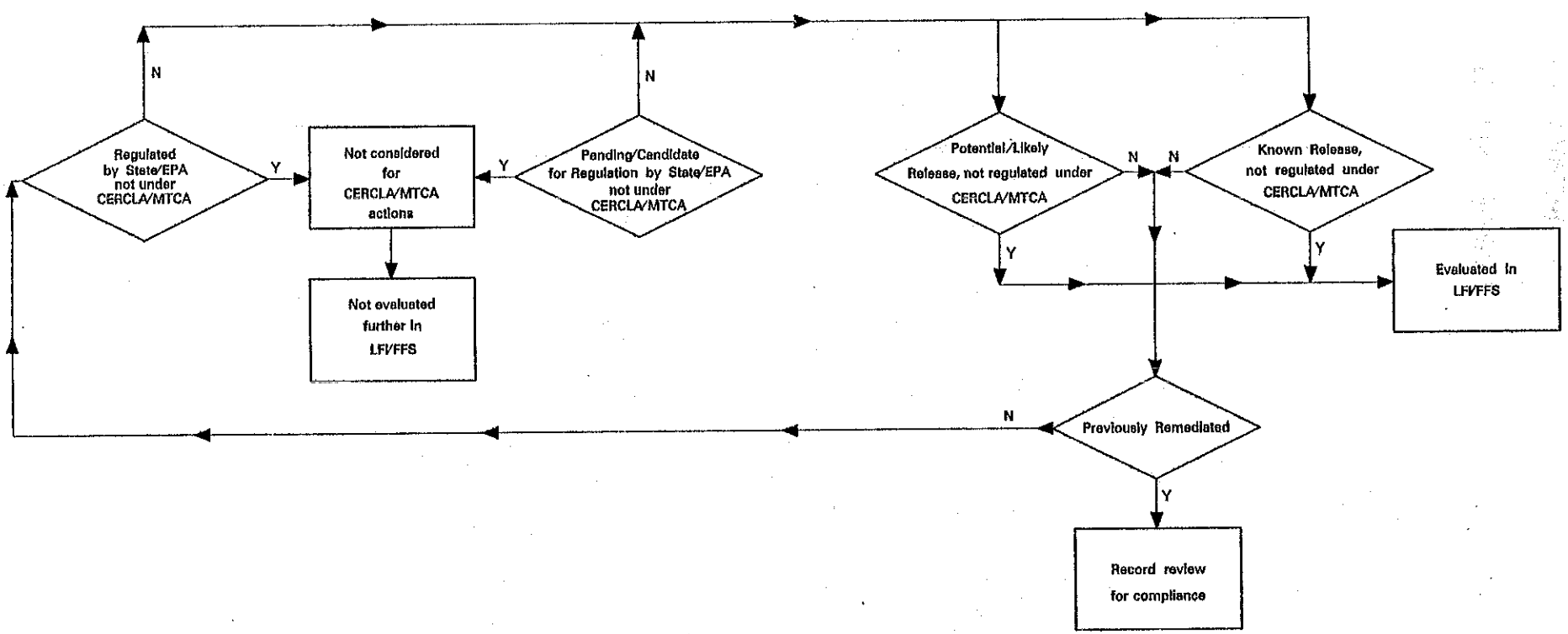

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Table 3-1. WASTE MANAGEMENT UNITS FROM 1100-EM-2, 1100-EM-3 and 1100-IU-1 OPERABLE UNITS CURRENTLY REGULATED OR PREVIOUSLY REMEDIATED (Page 1 of 3)

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.

Table 3-1. WASTE MANAGEMENT UNITS FROM 1100-EM-2, 1100-EM-3 and 1100-IU-1 OPERABLE UNITS CURRENTLY REGULATED OR PREVIOUSLY REMEDIATED (Page 2 of 3)

WASTE SITE	LFI/FFS ACTIVITY	CURRENT REGULATORY AUTHORITY	POTENTIAL CERCLA ACTIVITY
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.
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.

Table 3-1. WASTE MANAGEMENT UNITS FROM 1100-EM-2, 1100-EM-3 and 1100-IU-1 OPERABLE UNITS CURRENTLY REGULATED OR PREVIOUSLY REMEDIATED (Page 3 of 3)

WASTE SITE	LFI/FFS ACTIVITY	CURRENT REGULATORY AUTHORITY	POTENTIAL CERCLA ACTIVITY
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 management by PNL under UST Program.	UST	None anticipated at this time based on current knowledge.

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Table 3-2. CANDIDATE WMU'S FOR REGULATION UNDER RCRA/UST 1100-EM-2, 1100-EM-3 and 1100-IU-1 OPERABLE UNITS (Page 1 of 1)

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 surface 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.

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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 (Page 1 of 6)

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. Evaluate 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.

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 (Page 2 of 6)

WASTE SITE	LFI/FFS ACTIVITIES	POTENTIAL REMEDIAL ACTIVITY
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
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.

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 (Page 3 of 6)

WASTE SITE	LFI/FFS ACTIVITIES	POTENTIAL REMEDIAL ACTIVITY
Building 6652-C Abandoned UST (4 - 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-HA 275 gal oil. 6652-HO 2000 gal oil. 6652-I 2000 gal fuel oil. 6652-J 2000 gal fuel oil. 6652-HI unknown volume fuel oil. 6652 HJ 2000 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).

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 (Page 4 of 6)

WASTE SITE	LFI/FFS ACTIVITIES	POTENTIAL REMEDIAL ACTIVITY
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.
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.

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 (Page 5 of 6)

WASTE SITE	LFI/FFS ACTIVITIES	POTENTIAL REMEDIAL ACTIVITY
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.
Flammable 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.

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 (Page 6 of 6)

WASTE SITE	LFI/FFS ACTIVITIES	POTENTIAL REMEDIAL ACTIVITY
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.

4.0 FOCUSED FEASIBILITY STUDY

4.1 PRESENTATION OF CONCEPT AND PROCESS ELEMENTS

The National Contingency Plan (NCP) in both the preamble and main text incorporates 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 implement remedies that eliminate, 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 summarized in the ROD. While the documentation of 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 the 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 FFS approach tailors data gathering and remedial alternative analysis in such a manner 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 WMU's in the 1100-EM-2, 1100-EM-3 and 1100-IU-1 OU's are "site types" that the same or similar circumstances have been encountered and effectively remediated. For example, the WMU identified as "Missile Refueling JP-4 Fueling Area" is known/suspected to have soils contaminated with JP-4 fuel due to its use as a refueling area. At Superfund 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 OU's.

4.1.1 Regulatory Decision Process

This section describes the components of decision documentation options that might be appropriate for the 1100-EM-2, 1100-EM-3, and 1100-IU-1 OU's.

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 OU's, the selected actions could include Final, No Action, and Interim Action determinations. Depending on the results of RD/RA activities for the 1100-EM-2, 1100-EM-3, and 1100-IU-1 OU's, 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.

- **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, 1989a)

- **No Action ROD.** This is generally issued under three specified sets of circumstances:

  a. 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.

  b. When CERCLA does not provide the authority to take remedial action.

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

- **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.

- **Interim Action ROD.** These generally are not final actions; 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.

- **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 an alternative approach that would be implemented as a contingency remedy in the event that the initial remedy or technology did not achieve cleanup goals.

4.1.2 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 that 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 [Office of Solid Waste and Emergency Response (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-EM-2, 1100-EM-3, and 1100-IU-1 OU's.

- **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 design 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, 1989a) Examples of non-significant changes that could be encountered during RD/RA activities for the 1100-EM-2, 1100-EM-3, and 1100-IU-1 OU's include, but are not limited to, identification of additional abandoned UST's for remediation, refinement of cost and/or volume estimates for remediation of contaminated soils in those areas, and minor modifications to implementation schedules. Changes of this nature would be documented in the site file and/or through a remedial design fact sheet.

- **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-EM-2, 1100-EM-3, and 1100-IU-1 OU's include, but are not limited to, the volume estimate for disposal increases by 50 percent with a subsequent significant increase in cost and time to implement the remedy. 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 an ESD." (EPA, 1989a)

- **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-EM-2, 1100-EM-3, and 1100-IU-1 OU's might include, but are not limited to, onsite incineration due to lack of offsite disposal capacity or 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 in the Administrative Record and the information repositories.

4.2 EVALUATION OF REMEDIAL ACTION OBJECTIVES

As discussed in the previous section, the FFS 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 1100-IU-1 OU's. The results of cost estimation and comparison indicates that the cost of onsite incineration is considerably higher than offsite disposal within the range of volume estimates for remediation. The activities and specific considerations for the offsite disposal alternative are presented by WMU "site type" and a cost summary for each OU 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:

- 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 legally applicable, or relevant and appropriate, requirements (ARAR's) of Federal and State environmental standards (when available); other pertinent information (*e.g.*, carcinogenic slope factors); and site-specific, risk-related factors.

- Development of 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.

- 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 RAO's 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 1100-IU-1 OU's. Contaminants of potential concern were identified in paragraph 2.6 based on past practices at the WMU's. 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.

4.2.2 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 the 1100-EM-2 and 1100-EM-3 OU's as industrial (1100-EM-1 RI/FS, 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 OU's 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. The 1100-IU-1 OU is expected to remain as part of the overall ALE facility and, therefore, remain within the ecological reserve.

4.2.3 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 1100-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 cleanup levels determined under the MTCA.

4.2.4 Media-Specific PRG's

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

4.2.5 Evaluation of Potential Risks

In place of quantitative human health and ecological risk assessments, a qualitative evaluation was made by presenting Federal and State risk-based cleanup goals and advisories for known or potential contaminants to establish a basis for potential remedial activities. Table 4-1 was developed to present a baseline against which to evaluate RD/RA activities to achieve RAO's and PRG's for compliance with cleanup goals.

4.2.6 ARAR Overview and Initial Identification of ARAR's for the 1100-EM-2, 1100-EM-3, and 1100-IU-1 OU's

Section 121 (d) of CERCLA, as amended, requires fulfillment of ARAR's. Subpart E of Section 300.400(g) of the NCP 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 ARAR's and a complete listing of potential ARAR's for the 1100 Area can be found in appendix M of the 1100-EM-1 RI/FS.

4.2.7 Types of ARAR's

- **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 (RfD's). 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, 1988b)

4.2.8 Ambient or Chemical-Specific ARAR's

The focus of this preliminary identification of ARAR's is based on current knowledge of the individual WMU's reported through the 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 ARAR's and TBC's for those contaminants, as well as for potential contaminants that may be present due to past activities at the WMU's. Only those chemicals reportedly used at the WMU's and the respective OU's and WMU's are listed in table 4-2. Only limited water quality analyses 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. Reported Contaminants of the 1100-EM-2, 1100-EM-3, and 1100-IU-1 OU's

Operable Unit	Waste Management Unit	Contaminant
1100-EM-2	700 Area UST Waste Solvent Tank	1,1,1-Trichloroethane (TCA)
	1100 Area Bus Shop	PCB's
1100-EM-3	1234 Storage Yard	Nitrates
	3000 Area Jones Yard HWSA	Lead (Pb)
	1262 Solvent Tanks	CCl_4
	1262 Transformer Pad	PCB's
1100-IU-1	NIKE Missile Maintenance Assembly Area/Transformer Pad	PCB's
	Anti-Aircraft Artillery	Unexploded Ordnance

The 1100-EM-2, 1100-EM-3, and 1100-IU-1 OU's contain additional subunits with generally identified potential contamination associated with activities at similar operations. They will require sampling and analysis to determine specific chemicals. PRG's for those potential contaminants are identified in table 4-1.

4.2.8.1 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 MCL's and MCLG's. Chapter 246-290-310 WAC accommodates state promulgated MCL's. The Federal and State MCL's are shown in table 4-3 below.

Table 4-3. Federal and State MCL's

	Federal MCL	Federal MCLG	State MCL
Contam	(ppm)	(ppm)	(ppm)
TCA	0.2000	0.20	--
PCB	0.0005	0.00	--
Nitrate	10.0000	10.00	10.00
Pb	0.0500	0.00	0.05
CCl_4	0.0050	0.00	--

-- MCL not published

SMCL's are set forth in 40 CFR 143 and in WAC 173-246-310. SMCL's used to assess the aesthetic qualities of drinking water are not enforceable but are intended as guidelines and, therefore, are to be considered.

4.2.8.2 Protection of Surface Waters (U.S.C. 1251, 40 CFR 116 and 117, WAC 173-201 and Quality Criteria for Water). The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. If the identified contaminants are introduced to surface water bodies through runoff or direct discharge or to groundwater through infiltration, the ARAR's listed above 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 4-4 shows the available criteria for human and aquatic life.

Table 4-4. CWA Water Quality Criteria (mg/L)

	Protection of Human Health		Protection of Aquatic Life	
	Water & Fish Consumption	Fish Only	Freshwater Acute/Chronic	Marine Acute/Chronic
TCA	18.4	1030	-/-	-/-
PCB	7.9E-8	7.9E-8	.002/.000014	.01/.00003
Nitrate	10	---	-/-	-/-
Pb	.05	---	.08/.0032	0.1/.0056
CCl_4	.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 OU's, the current and potential contaminants of concern and respective RQ are as follows: CCl_4 = 10 lbs, PCB = 1 lb.

4.2.8.3 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)

4.2.8.3.1 Water. The NCP provides general guidance for the acceptable exposure levels for the protection of human health and the environment. Cleanup requirements are generally based on ARAR's if available. For systemic toxicants, cleanup 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, cleanup levels are set below the concentration that represents an upper bound lifetime cancer risk of between 1×10^{-4} to 1×10^{-6}. As discussed earlier, a quantitative risk assessment was not performed for this addendum. If MCL's are available, surface and groundwater contaminant cleanup 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 (TCA and CCl_4, 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.

4.2.8.3.2 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 cleanup 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 less than 0.25 ppm.

PCB's greater than 50 ppm may present an unreasonable risk to human health and the environment for controlled access sites, while concentrations exceeding 25 ppm may present unreasonable risk at uncontrolled access sites. Disposal of PCB's with concentrations from 50 to 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 PCB's 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 sites with restricted access, appropriate actions for soils contaminated with 50 ppm PCB's or less can consist of a 30-cm (12-in) 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 CCl_4 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 HWSA. The analytical method used to determine lead concentration in the soil is not known; therefore, it is inappropriate to compare with TCLP analysis at this time. RCRA Part 268.41 has tabulated treatment standards for non-wastewater listed wastes. For the solvents TCA and CCl_4, the standards are 0.41 and 0.96, respectively. Lead treatment standards are dependent upon the generation process.

4.2.8.3.3 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, 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:

- 150 $\mu g/m^3$ on a 24-hour average for particulates.
- 1.5 $\mu g/m^3$ average over a calendar quarter for lead.

CCl_4 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 are equivalent to the Federal standards in 40 CFR 50.

4.2.8.3.4 MTCA WAC 173-340. There are three basic methods for establishing cleanup 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 cleanup 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. Method C cleanup levels are set using three subcriteria:

- Concentrations at least as stringent as Federal and State law.
- Concentrations which will not cause contamination of the groundwater exceeding the levels of 173-340-720.
- For individual substances, concentrations that are equal to or greater than 100 times groundwater cleanup 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.

4.2.9 Location-Specific ARAR's (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 the long-billed curlew. WAC 232-12 lists the white pelican as endangered. As noted in paragraph 1.5.4, a complete listing of endangered, threatened, and candidate wildlife species is presented in the appendix to this addendum.

4.2.10 Action-Specific ARAR's

The potential remedial activities contemplated at this time include establishment of additional groundwater monitoring locations, drum and shipment of waste, removal of UST's, 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 paragraph 4.2.8.3.3 above are to be considered under action-specific ARAR's pending identification of remedial actions for each operable subunit.

4.2.10.1 Well Installation (RCW 18.104, WAC 173-160, and WAC 173-162). 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. WAC 173-160 and WAC 173-162 set forth the specific regulations for RCW 18.104.

4.2.10.2 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 OU. 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 offsite, these requirements are applicable. If any remedial action occurring at the subject OU's 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 3 years after offsite transportation.

4.2.10.3 Removal of UST's (40 CFR 280. 40 CFR 264, WAC 173-340, WAC 173-360, 40 CFR 302). The UST's 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 UST's, 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 that eventually all the UST sites would be closed under Subpart G of 280 and/or WAC 173-360. Future spills or releases should be reported under Subpart E of 280, WAC 173-240 or 40 CFR 302 (Unplanned or nonroutine releases).

4.2.10.4 Geophysical Surveys and Confirmatory Sampling (29 CFR 1910, WAC 296-62, 40 CFR 264, 42 U.S.C. 6901 WAC 173-303). Federal and State OSHA regulations will govern all onsite work on the Hanford Reservation and, 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 Facility. If wastes are to be treated, stored, or disposed of as part of a remedial action, RCRA (42 U.S.C. 6901), 40 CFR 264, and WAC 173-303 will become applicable.

4.2.10.5 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 HCl 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-EM-2, 1100-EM-3, and 1100-IU-1 OU's reveals that there are six general categories of WMU's. Approaches and/or activities required to address each of the WMU categories are listed below.

4.3.1 Offsite Disposal

The activities associated with offsite disposal of contaminated soil and debris associated with the six general WMU "site types" are presented below.

4.3.1.1 Underground Storage Tanks, NIKE Base Sumps, and Cisterns.

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

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

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

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

- Transportation and disposal of contaminated materials in accordance with ARAR's.

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

4.3.1.2 Solvent Tanks, Steampad Tanks.

- Demolition of the tanks.

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

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

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

- Transportation and disposal of contaminated materials in accordance with ARAR's.

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

4.3.1.3 Spills/Stained Soils.

- Excavation of visibly stained/contaminated soils.

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

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

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

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

- Transportation and disposal of contaminated materials in accordance with ARAR's.

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

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

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

- Soil gas surveys would be conducted, as appropriate, to determine the presence or absence of volatile organic compounds.

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

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

- In the event unexploded ordinance is encountered, the U.S. Army Corps of Engineers, Huntsville District (Alabama) would be notified and assistance requested.

4.3.1.5 NIKE Base Refueling Operations.

- Excavation of visibly stained/contaminated soils.

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

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

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

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

- Transportation and disposal of contaminated materials in accordance with applicable Federal and State requirements.

4.3.1.6 Miscellaneous 1100-IU-1 OU Structures (Paint Building, Transformer Pad, Acid Storage Building)

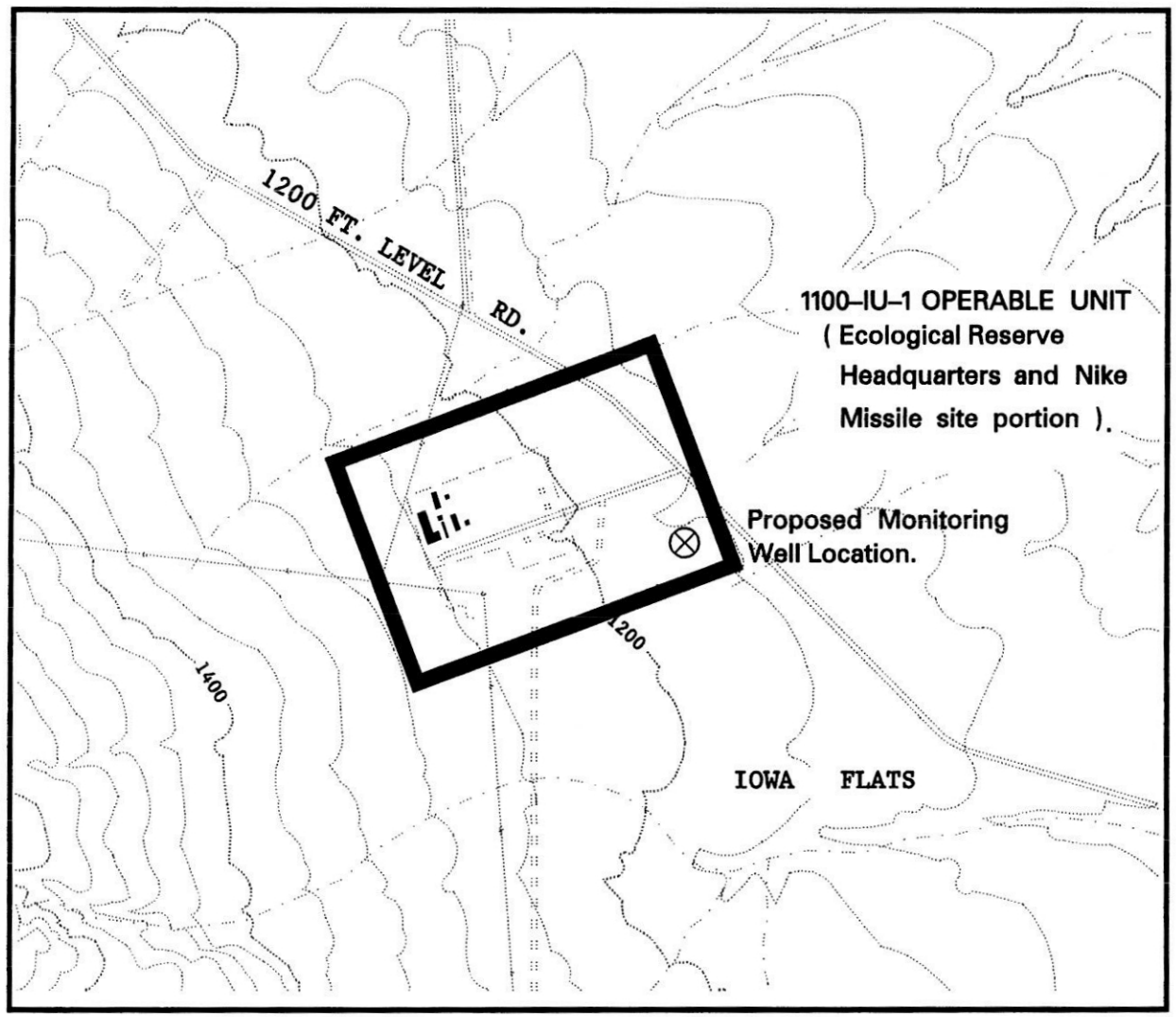
- Sampling of surfaces.
- Sampling of drains and sumps.
- Excavation of visibly stained/contaminated soils.
- Sampling of material to determine the nature of the spill.
- Confirmatory sampling of demolished structures/excavated areas to determine if cleanup goals have been met.
- Additional excavation and sampling in the event cleanup goals were not met by initial efforts.
- Temporary onsite storage of materials during confirmatory sampling. Any temporary storage facility would be required to meet the RCRA requirements for temporary storage facilities for hazardous wastes.
- 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 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 other activities for the various WMU's would be the same as those previously listed for the offsite disposal option. The residual materials would be placed back into the excavated areas and covered with clean fill. The operation of the incinerator would comply with RCRA requirements for operation of incinerators, but would not require a permit since the activities would be conducted entirely onsite.

4.3.3 Groundwater Monitoring

In the event that the remediation activities for the WMU's described above indicates the potential for contaminant impacts to groundwater, additional groundwater monitoring locations could be established in the 1100-EM-2, 1100-EM-3, and 1100-IU-1 OU's. Three new locations could be established at the 1100-EM-3 OU between potential source areas and the North Richland Well Field. The potential locations are shown on figure 4-1. One exploratory well could be established at the 1100-IU-1 OU in the vicinity of the NIKE Missile Base landfill (see figure 4-2). If needed, more will be drilled after the initial well provides basic groundwater information such as depth to the water table and occurrence of

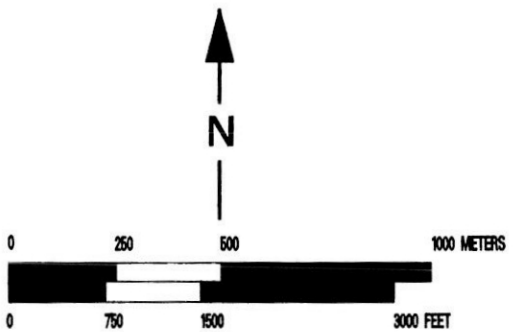


LEGEND :

⊗ Proposed Monitoring Well.

Outline and Designation of Operable Unit.

Buildings



Proposed Monitoring Well Location at the 1100–IU–1 Operable Unit.

Figure 4–2

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The estimated total for all three operable units is $4,455,000. 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	1100-IU-1
Contract	$742,000	$591,000	$3,917,000
Sampling & Analysis	$148,000	$118,000	$784,000
Contingency	$119,000	$191,000	$1,283,080
Total Cost	$1,010,000	$899,000	$6,065,000

The estimated total cost for the three OU's is $7,974,000. This does not include groundwater monitoring, which is presented at the end of this section.

Groundwater Monitoring

The estimate presented below is for five 70-foot wells in the 1100-EM-3 OU, one 800-foot exploratory well in the 1100-IU-1 OU, and sampling and analysis.

The estimated costs associated with groundwater monitoring are presented in this section. It should be noted that, due to Hanford-specific 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 $5,000 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 approximately $125 per foot.

	1100-EM-2	1100-EM-3	1100-IU-1
Contract	- 0 -	$434,000	$942,000
Sampling & Analysis	$24,000	$87,000	$188,000
Contingency	$10,000	$104,000	$226,000
Total Cost	$34,000	$625,000	$1,356,000

The estimated total cost for the establishment of additional monitoring locations plus sampling and analysis is $2,015,000.

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 paragraph 4.4.2. Detailed descriptions of the alternatives are presented in paragraph 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 OU's. 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 feasibility study guidance (EPA, 1988a) 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 requirement 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 subcriteria are addressed for the detailed analysis of ARAR's:

- Compliance with chemical-specific ARAR's.
- Compliance with action-specific ARAR's.
- 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 subcriteria are addressed:

- Magnitude of residual risk.
- Adequacy of controls.
- 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 to be treated.
- The amount of hazardous materials 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.
- 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.
- 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.
- 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. Present worth costs are usually calculated for remedial actions that take place over different time periods by discounting all future costs and annual costs to a common base year. For this report, present worth costs were not calculated due to the fact that the low volume of potentially contaminated materials could be remediated by either alternative in a short (9- to 18-month) time period. 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 ROD once comments on the Proposed Plan and supporting documents 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 ROD once comments on the Proposed Plan and supporting documents 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 WMU's in the three 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 1100-IU-1 OU is part of the ALE which has been closed to the public since 1940. Therefore, contact with potential contaminants is limited. Any potential ecological impacts are unknown at this time.

Criterion 2. In the event that contaminants are found at the WMU's that exceed Federal or State 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 WMU's. Continued industrial land use in the 1100-EM-2 and 1100-EM-3 OU's 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. There is no cost associated with this alternative.

4.4.3.2 Alternative S-1 (Offsite Disposal). Under this alternative, soils and debris at the 1100-EM-2, 1100-EM-3, and 1100-IU-1 OU's that are found to exceed cleanup goals would be removed and disposed of offsite. 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 paragraph 5.3.

Criterion 1. In the event that contaminants are found at the WMU's that exceed Federal or State 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 would be met. The contaminated material will be hauled by a licensed Department of Transportation hazardous waste hauler. The receiving facility would be required to have a permit to operate a RCRA facility or, if needed, a Toxic Substance Control Act (TSCA) approved facility.

Criterion 3. Cleanup to Federal or State levels at the WMU's 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 WMU's and if additional remedial measures are necessary.

Criterion 4. The offsite disposal of contaminated soil and debris would reduce the mobility of the contaminants onsite. Disposal in a permitted RCRA and/or TSCA facility would limit the mobility of the contaminant. The volume and toxicity of any contaminated soil and debris would be unchanged. In the event residuals of the contaminant 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 would 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 would be regraded to restore the land to near-original conditions. In the event excavation at the 1100-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 to 9 months of beginning site work.

Criterion 6. 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 Department of Transportation licensed 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.

Criterion 7. The estimated cost of this alternative is $4,455,000.

4.4.3.3 Alternative S-2 (Onsite Incineration). As discussed in paragraph 4.2.2, this alternative considers the use of onsite incineration for the destruction of organic contaminants at the WMU's.

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 Federal and State 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 WMU's.

Criterion 3. There would be little or no residual risks associated with remediation of the WMU's. If contaminants above background levels remain, groundwater monitoring would 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 would 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. Potential impacts to the environment would consist of the excavation of contaminated materials and the construction of a pad to house incineration facilities. After remediation, those 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 RCRA requirements and be approved by State agencies in accordance with the Tri-Party Agreement. The incineration alternative would require meeting substantive permit requirements and would require a demonstration of effectiveness through a test burn. These activities typically require 12 to 18 months to complete.

Criterion 7. The estimated cost of this alternative is $7,974,000.

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 Federal or State risk based levels, Alternative S-0 would not be protective of human health. Alternatives 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 and destruction of the contaminants.

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

Criterion 3. Alternative S-0 would not reduce any residual site risks. Alternative S-1 has a high degree of long-term permanence because contaminants would be removed

offsite to a controlled facility. Alternative S-2 offers a greater degree of long-term permanence because it uses a treatment method that permanently reduces toxicity through destruction. No long-term maintenance is currently expected for the WMU's.

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

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 would be reduced by using protective clothing. Alternative S-1 is estimated to take approximately 6 to 9 months to complete. Alternative S-2 is estimated to take 1 to 2 years to complete.

Criterion 6. All alternatives are technically easy to implement. 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. 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.

Criterion 7. Alternative S-0 has no cost. Alternative S-1 costs are estimated to be $4,455,000, while Alternative S-2 costs are estimated to $7,974,000 (approximately 79 percent greater).

4.4.4 Potential Groundwater Activities

As discussed in paragraph 2.1.4, currently there is only limited information on groundwater conditions in the 1100-EM-2, 1100-EM-3, and 1100-IU-1 OU's. Potential additional groundwater monitoring locations were identified in section 4.3.3. Those locations, as well as additional locations, would be established in the event that information developed during remediation of the WMU's indicates the potential for contaminant impacts to groundwater.

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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 1100-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 preamble to the NCP (Federal Register, Volume 55, No. 46, page 8704), 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). Paragraphs 4.2.8, 4.2.9, and 4.2.10 contain a listing of ARAR's for which substantive requirements would need to be met.

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, 1100-EM-3, and 1100-IU-1 OU's. This includes activities that could be undertaken both pre- and post-ROD.

As discussed in paragraph 4.3, there are four general categories of key elements to be investigated: UST's (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 PCB areas, spill locations, and UST closure activities, the sampling and analysis approach would be to perform field screening to determine if contamination exceeds the cleanup goals. If contaminants exceeding cleanup goals are found, it is expected that the contaminated area would be excavated and remediated by offsite treatment/disposal or onsite thermal destruction. Confirmatory sampling and analysis would then be done to demonstrate that cleanup goals have been reached, or demonstrate 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. Cost/benefit analyses could be undertaken and reviewed by the participating agencies. 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 groundwater monitoring locations.

5.3.1 Sampling and Analysis for 1100-EM-2 OU

Sampling and analysis focuses primarily on UST closure activities, areas of PCB contamination, and spills. UST's should be sampled by collecting soil from beneath the UST locations and analyzing for total petroleum hydrocarbons as gasoline; diesel; benzene, ethylbenzene, toluene, and xylenes (BETX); antifreeze; or solvents as appropriate for the UST's history. Soil samples should be collected under transformer pads and analyzed for PCB's. Soil samples should be collected for suspected spill sites and 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 methods and by sending up to 10 percent of the samples to a CLP laboratory 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 the 1100-EM-3 OU as for the 1100-EM-2 OU due to the similar nature of contaminant categories.

5.3.3 Sampling and Analysis for 1100-IU-1 OU

Landfills in the 1100-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 and, as discussed in previous sections, establishment of additional locations in the 1100-EM-3 OU and undertaking exploratory activities in the 1100-IU-1 OU. Based on the findings of the initial activities, determinations would be made regarding the benefit of establishing additional monitoring locations and/or evaluating remedial actions. As discussed in paragraph 4.4.5, the evaluation of treatment technologies in the main text of the 1100-EM-1 RI/FS 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 1100-IU-1 OPERABLE UNIT ACTIVITIES

A potential advantage of the acceleration of CERCLA activities in the 1100-EM-2, 1100-EM-3, and 1100-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 and mobilization and demobilization costs, realization of economies of scale, and 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 activities that would be required to address the WMU. The general location of the WMU's within each OU are shown in figures 5-2, 5-3, 5-4, and 5-5.

Figure 5-1. CERCLA Investigation, Decision-Making, and Cleanup Process for 1100 Area Operable Units

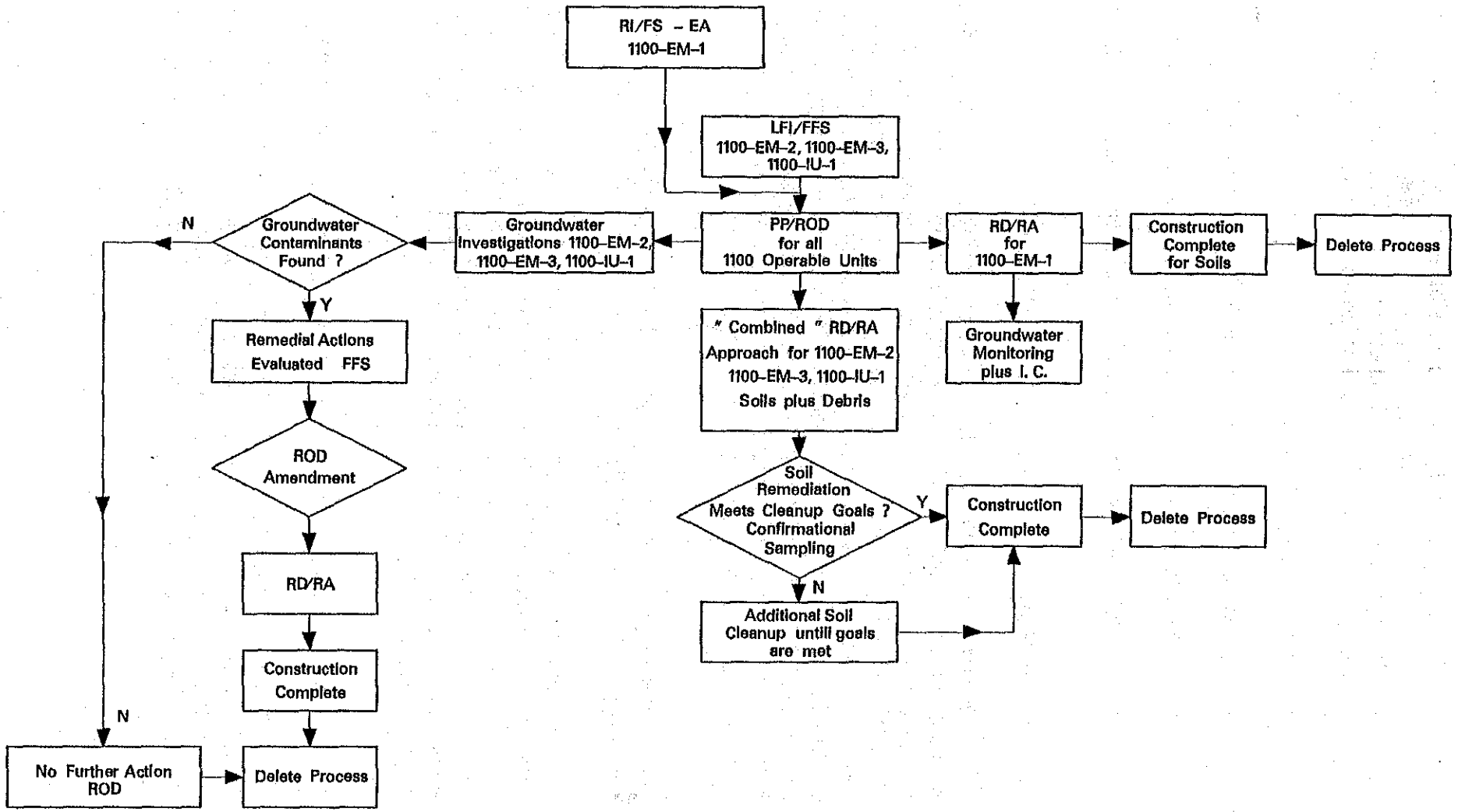


Table 5-1. RD/RA Activities for Table 3-2 and 3-3 WMU's (Page 1 of 6)

Table 3-2 Waste Management Units	Conservative Estimate of Contamination *	RD/RA Activities
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 LO44.
Steam Pad Tank # 2 4000 gal Fiberglass tank last contained wastewater.	Tank, 20 CY Soil	Perform Closure.
Steam Pad Tank # 3 4000 gal Fiberglass tank last contained wastewater.	Tank, 20 CY Soil	Perform Closure.
1100-EM-3		
1208 Sandblast Area.	210 CY Soil (75 ft x 75 ft x 1 ft)	Drum & Ship Soils to TSDF Confirmatory Sampling. (potential for offsite surface waste migration near Richland Well Field 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 Fuel Oil	Ship Soils/UST to TSDF or Incinerate. Confirmatory Sampling.

* Assumptions include:

- For UST's...20 Cubic Yards (CY) Soil per UST Removal.
- Depth of Potential Contamination = 3 Feet.
- Tanks are 1/2 full with last liquid known to be stored(based on several observations).
- Fuel, Oil, Solvents will be recycled to the extent possible.

Table 5-1. RD/RA Activities for Table 3-2 and 3-3 WMU's (continued)
(Page 2 of 6)

Table 3-3 Waste Management Unit	Conservative Estimate of Contamination *	RD/RA Activities
1100-EM-2		
Tar Flow.	110 Cubic Yards Soil & Tars (110 ft x 30 ft x 1 ft)	Soil Sampling & Waste Evaluation. Wastes to TSDF or Incinerate. Confirmatory Sampling.
Stained Sands.	45 CY Soils (20 ft x 20 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 Field Screening. Soil Gas Survey. If Needed, Wastes to TSDF or Incinerate. Confirmatory Sampling.
1100-EM-3		
1240 Suspect Spill Area.	5 CY Soils (10 ft x 10 ft x 1 ft)	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 Sampling.
1262 Transformer Pad.	10 CY Soils & Debris (6 ft x 6 ft Pad).	Sample Soil & Pad(PCB's). 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 (Estimate, dimensions to be determined)	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.

Table 5-1. RD/RA Activities for Table 3-2 and 3-3 WMU's (continued)
(Page 3 of 6)

Table 3-3 Waste Management Unit	Conservative Estimate of Contamination *	RD/RA Activities
JA Jones Steam Plant Drain Pad.	20 ft x 10 ft Pad.	Pad Surface, Drains & 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.	140 CY Soils (250 ft x 5 ft x 3 ft)	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 SSL 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,
Radar Berm & Pads.	Pad (16 ft x 16 ft) 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 (4 - 1000 gallon fuel oil tanks).	Tanks, 80 CY Soils. (20 CY soil/tank) 2500 gal fuel oil	Geophysical Survey. Soils/UST to TSDF or Incinerate Soils. Confirmatory Sampling.
Pumphouse Disposal Slope.	30 CY Soils (5 ft x 5 ft x 2 ft) (85 ft x 10 ft x 1 ft)	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.

Table 5-1. RD/RA Activities for Table 3-2 and 3-3 WMU's (continued)
(Page 4 of 6)

Table 3-3 Waste Management Unit	Conservative Estimate of Contamination *	RD/RA Activities
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. (Visual Estimate)	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-HA 275 gal oil. 6652-HO 2000 gal oil. 6652-I 2000 gal fuel oil. 6652-J 2000 gal fuel oil. 6652-HI unknown volume fuel oil. 6652 HJ 2000 gal fuel oil.	Tanks, 120 CY Soils, 4200 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 Insulation.	Sample Asbestos Bag & Dispose Asbestos Geophysical Survey. Decon (2) Concrete Sumps. Close Building (demolition or reuse).
Missile Bunker Landfill.	1.25 Acre Area.	Soil Sampling. Soil Gas & Geophysical Survey If needed: Trenching/Test Pits Wastes to TSDF or Incinerate. Confirmatory Sampling. Groundwater Monitoring.

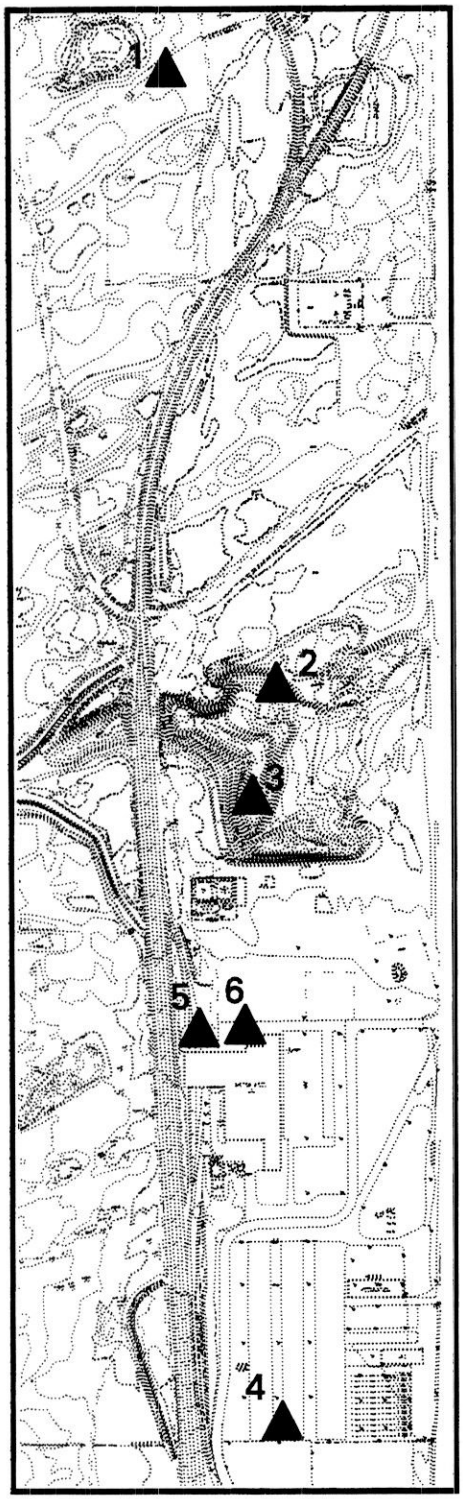
Table 5-1. RD/RA Activities for Table 3-2 and 3-3 WMU's (continued)
(Page 5 of 6)

Table 3-3 Waste Management Unit	Conservative Estimate of Contamination *	RD/RA Activities
Missile Refueling Area Berm.	Herbicide Applications 600 CY Soils	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.	45 CY Soil (20 ft x 20 ft x 3 ft)	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.	25 CY Soil. (15 ft x 15 ft x 3 ft)	Soil Sampling & Waste Evaluation. Soils to TSDF or Incinerate. Confirmatory Sampling.
JP-4 Fuel Pad.	10 CY Soil. (10 ft x 10 ft x 3 ft)	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.	80 CY Soils. [(2) - 70 ft x 5 ft x 3 ft ditches]	Soil Sampling & Waste Evaluation. Soil Sampling. Soils to TSDF or Incinerate. Confirmatory Sampling.
Main Entrance Stained Soil.	30 CY Soil. (18 ft x 15 ft x 3 ft)	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, Soil to TSDF or Incinerate Confirmatory Sampling.
Generator Building.	20 CY Soil & Debris (40 ft x 20 ft Wood Frame Bldg with Concrete Floor.)	Surface, Soil Sampling & Waste Evaluation. Building Demolition. Soil/debris to TSDF or Incinerate Confirmatory Sampling

Table 5-1. RD/RA Activities for Table 3-2 and 3-3 WMU's (continued)
(Page 6 of 6)

Table 3-3 Waste Management Unit	Conservative Estimate of Contamination *	RD/RA Activities
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.	5 CY Debris [(2) - 12 ft x 33 ft blast pads, elevator doors]	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Flammable Storage Cinderblock Shed.	10 CY Soil. Visual Estimate.	Soil Sampling & Waste Evaluation. Remove Waste. Perform Confirmatory Sampling.
Missile Maintenance & Assembly Area Paint Shed.	10 CY Soil & Debris (10 ft x 10 ft x 3 ft)	Soil Sampling. Soils to TSDF or Incinerate. Confirmatory Sampling.
Missile Maintenance & Assembly Area Dry Well Drum.	5 CY Soil (5 ft x 5 ft x 5 ft)	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 needed: Trenching/Test Pits Wastes to TSDF or Incinerate. Confirmatory Sampling. Groundwater Monitoring.

LEGEND :



2 Location Symbol and Number.

Buildings.

1) Neptunes Potato and Separator Tank . (Trident)

2) Tar Flow.

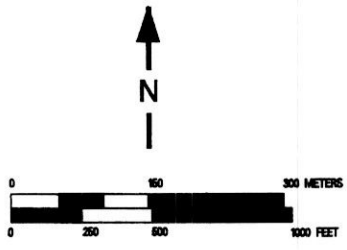
3) Stained Sands.

4) Bus Lot Dry Wells.

5) Steam Pad Tank No. 3.

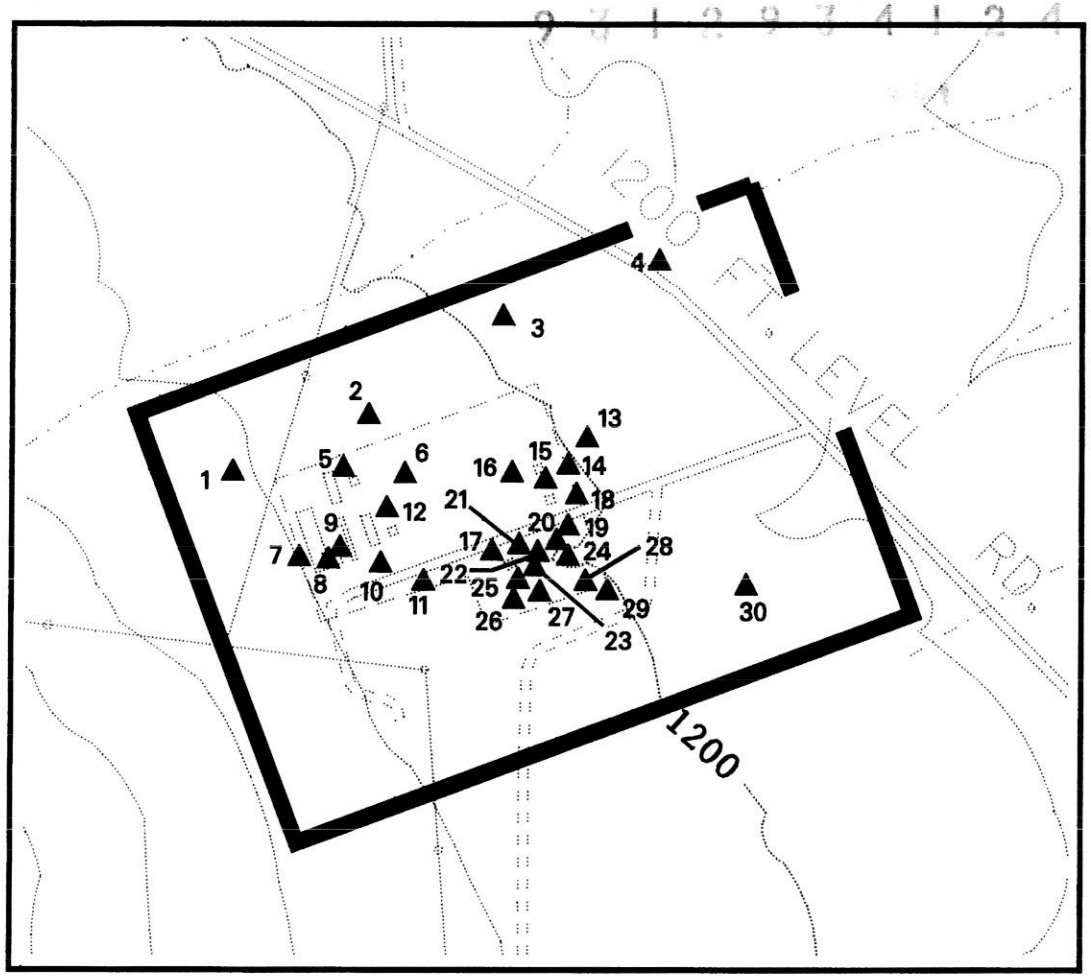
6) Steam Pad Tank No. 2.

Contour interval is 0.5 meter.



1100–EM–2 Operable Unit

Figure 5–2

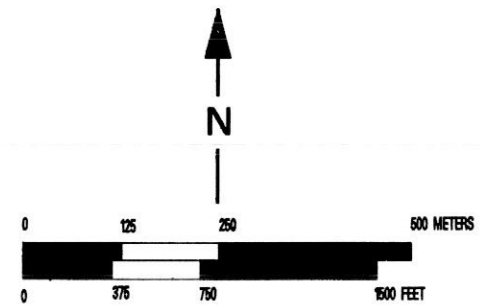


LEGEND :

13 ▲ Suspected Contamination Location and Number.

Outline and Designation of Operable Unit.

Buildings



DESCRIPTION

1) Mound Site NW of Building 6652–G.
2) 6652–G Septic Tank & Drainfield.
3) Missile Bunker Landfill.
4) Horseshoe Site.
5) 6652–G UST.
6) 6652–I Septic Tank & Drainfield.
7) 6652–J UST.
8) 6652–HO and HA Oil Tanks.
9) 6652–HJ Oil tank.
10) 6652 HI Fuel Oil UST
11) H–52–L Surface Gas Tanks.
12) 6652–I UST.
13) Missile Bunker Drainfield.
14) Missile Bunker Discharge Ditch.
15) Missile Bunker Underground Facilities.
16) Elevator Doors.
17) Missile Assembly & Test Building Oil Tank.
18) Main Entrance Stained Soil.
19) Acid Neutralization Pit.
20) Missile Refueling Station.
21) JP4 Fuel Pad.
22) Generator Building 6652–P.
23) 6652–P UST.
24) Missile Refueling Area Berm.
25) Missile Assembly & Test Building Septic System.
26) Paint Shed Area.
27) Flammable Storage Block Shed.
28) Acid Storage Shed.
29) Dry Well Drum.
30) Nike Base Landfill.

1100–IU–1 Operable Unit (Ecological Reserve Headquarters and NIKE Missile Launch Site Portion). Figure 5–4

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APPENDIX CONTENTS

1100-EM-2 AND 1100-EM-3 GROUNDWATER MONITORING DATA

TEST BORING FIELD LOGS

AERIAL PHOTOS OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1

APPENDIX CONTENTS (Continued)

SELECTED DRAWINGS OF 1100-EM-3 AND 1100-IU-1

ENDANGERED, THREATENED, AND CANDIDATE
WILDLIFE AND PLANTS AT THE HANFORD SITE

APPENDIX CONTENTS (Continued)

COST ESTIMATES

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1100-EM-2 AND 1100-EM-3 GROUNDWATER MONITORING DATA

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Table 2.2.2 Organics, Pesticides, and Herbicides Data for 1100-EM-2

MONITORING WELL		MW-1		MW-3		MW-1		MW-3		MW-1		MW-3		MW-1	
WELL ID		S41-E11		S41-E12		S41-E11		S41-E12		S41-E11		S41-E12		S41-E11	
ROUND		1		1		2		2		3		3		4	
SAMPLE ID		B0023T		B0064T		B000G9RE		B000J2		B00CP9		B00CT5		B00DC5	
PARAMETERS (units ug/l)	MCLs (ug/L)														
VOLATILE ORGANICS															
Chloromethane	NA	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	-	NR
Trichlorofluoromethane	NA	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR
Bromomethane	NA	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	-	NR
Vinyl Chloride	2	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	-	NR
Chloroethane	NA	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	-	NR
Methylene Chloride	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
Acetone	NA	2.00	U	2.00	U	10.00	U	10.00	U	10.00	U	10.00	U	-	NR
Carbon Disulfide	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
1,1-Dichloroethene	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
1,1-Dichloroethane	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
cis-1, 2-Dichloroethene	NA	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR
trans-1, 2-Dichloroethene	NA	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR
1,2 Dichloroethene (Total)	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
Chloroform	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
1,2-Dichloroethane	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
2-Butanone	NA	2.00	U	2.00	U	10.00	U	10.00	U	10.00	U	10.00	U	-	NR
Tetrahydrofuran	NA	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR
1,1,1-Trichloroethane	200	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
Carbon Tetrachloride	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
Vinyl Acetate	NA	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	-	NR
Bromodichloromethane	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
1,2-Dichloropropane	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
cis-1,3-Dichloropropene	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
trans-1,3-Dichloropropene	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
Trichloroethene	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
Dibromochloromethane	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
1,1,2-Trichloroethane	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
Benzene	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
Bromoform	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
Trans-1,3-Dichloropropene	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	-	NR
4-Methyl-2-Pentanone	NA	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	-	NR
2-Hexanone	NA	2.00	U	2.00	U	10.00	U	10.00	U	10.00	U	10.00	U	-	NR

MONITORING WELL		MW-1		MW-3		MW-1		MW-3		MW-1		MW-3		MW-1	
WELL ID		S41-E11		S41-E12		S41-E11		S41-E12		S41-E11		S41-E12		S41-E11	
ROUND		1		1		2		2		3		3		4	
SAMPLE ID		B0023T		B0064T		B000G9RE		B000J2		B00CP9		B00CT5		B00DC5	
PARAMETERS (units ug/l)	MCLs (ug/L)														
Hexachlorobutadiene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
4-Chloro-3-methylphenol	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
2-Methylnaphthalene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
Hexachlorocyclopentadiene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
2,4,6-Trichlorophenol	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
2,4,5-Trichlorophenol	NA	50.00	U	50.00	UJ	50.00	U	50.00	U	50.00	U	50.00	U	50.00	UJ
2-Chloronaphthalene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
2-Nitroaniline	NA	50.00	U	50.00	UJ	50.00	U	50.00	U	50.00	U	50.00	U	50.00	UJ
Dimethylphthalate	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
Acenapththylene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
2,6-Dinitrotoluene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
3-Nitroaniline	NA	50.00	U	50.00	UJ	50.00	U	50.00	U	50.00	U	50.00	U	50.00	UJ
Acenaphthene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
2,4-Dinitrophenol	NA	50.00	U	50.00	UJ	50.00	U	50.00	U	50.00	U	50.00	U	50.00	UJ
4-Nitrophenol	NA	50.00	U	50.00	UJ	50.00	U	50.00	U	50.00	U	50.00	U	50.00	UJ
Dibenzofuran	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
2,4-Dinitrotoluene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
Diethylphthalate	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
4-Chlorophenyl-phenylether	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
Fluorene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
4-Nitroaniline	NA	50.00	U	50.00	UJ	50.00	U	50.00	U	50.00	U	50.00	U	50.00	UJ
4,6-Dinitro-2-methylphenol	NA	50.00	U	50.00	UJ	50.00	U	50.00	U	50.00	U	50.00	U	50.00	UJ
N-nitrosodipheylamine	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
4-bromophenyl-phenylether	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
Hexachlorobenzene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
Pentachlorophenol	1	50.00	U	50.00	UJ	50.00	U	50.00	U	50.00	U	50.00	U	50.00	UJ
Phenanthrene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
Anthracene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
Di-n-Butylphthalate	NA	10.00	U	10.00	UJ	10.00	U	2.00	J	10.00	U	10.00	U	10.00	UJ
Fluoranthene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
Pyrene	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
Butylbenzylphthalate	NA	10.00	U	10.00	UJ	10.00	U	10.00	U	10.00	U	10.00	U	10.00	UJ
3,3'-Dichlorobenzidine	NA	20.00	U	20.00	UJ	20.00	U	20.00	U	20.00	U	20.00	U	20.00	UJ

MONITORING WELL		MW-1		MW-3		MW-1		MW-3		MW-1		MW-3		MW-1	
WELL ID		S41-E11		S41-E12		S41-E11		S41-E12		S41-E11		S41-E12		S41-E11	
ROUND		1		1		2		2		3		3		4	
SAMPLE ID		B0023T		B0064T		B000G9RE		B000J2		B00CP9		B00CT5		B00DC5	
PARAMETERS (units ug/l)	MCLs (ug/L)														
Aroclor-1232	0.5	0.50	U	0.50	U	0.50	U	0.50	U	5.00	U	0.50	U	0.50	UJ
Aroclor-1242	0.5	0.50	U	0.50	U	0.50	U	0.50	U	5.00	U	0.50	U	0.50	UJ
Aroclor-1248	0.5	0.50	U	0.50	U	0.50	U	0.50	U	5.00	U	0.50	U	0.50	UJ
Aroclor-1254	0.5	1.00	U	1.00	U	1.00	U	1.00	U	10.00	U	1.00	U	1.00	UJ
Aroclor-1260	0.5	1.00	U	1.00	U	1.00	U	1.00	U	10.00	U	1.00	U	1.00	UJ
HERBICIDES															
2,4,5-TP (Silvex)	50	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR
2,4-D	70	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR

MONITORING WELL		MW-3		MW-1	MW-3	MW-1		MW-3		MW-1	MW-3
WELL ID		S41-E12		S41-E11	S41-E12	S41-E11		S41-E12		S41-E11	S41-E12
ROUND		4		5	5	6		6		7	7
SAMPLE ID		B00DC9		not sampled	not sampled	B00ZC6		B00ZD0		not sampled	not sampled
PARAMETERS (units ug/l)	MCLs (ug/L)										
Tetrachloroethene	5	5.00	U	-	-	5.00	U	5.00	U	-	-
1,1,2,2-Tetrachloroethane	NA	5.00	U	-	-	5.00	U	5.00	U	-	-
Toluene	1000	5.00	U	-	-	5.00	U	5.00	U	-	-
Chlorobenzene	100	5.00	U	-	-	5.00	U	5.00	U	-	-
Ethylbenzene	700	5.00	U	-	-	5.00	U	5.00	U	-	-
Styrene	100	5.00	U	-	-	5.00	U	5.00	U	-	-
m, p-xylene	NA	-	NR	-	-	-	NR	-	NR	-	-
o-xylene	NA	-	NR	-	-	-	NR	-	NR	-	-
Xylenes (Total)	10000	5.00	U	-	-	5.00	U	5.00	U	-	-
C12 Hydrocarbons	NA	-	NR	-	-	-	NR	-	NR	-	-
Total Trihalomethanes	NA	5.00	U	-	-	-	NR	-	NR	-	-
SEMI-VOLATILES											
Phenol	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Bis(2-Chloroethyl)ether	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
1,3-Dichlorobenzene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
1,4-Dichlorobenzene	75	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Benzyl Alcohol	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
1,2-Dichlorobenzene	600	10.00	UJ	-	-	10.00	U	10.00	U	-	-
2-Methylphenol	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Bis(2-chloroisopropyl)ether	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
4-Methylphenol	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
N-nitroso-di-n-propylamine	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Hexachloroethane	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Nitrobenzene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Isophorone	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
2-Nitrophenol	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
2,4-Dimethylphenol	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Benzoic Acid	NA	50.00	UJ	-	-	50.00	U	50.00	U	-	-
Bis(2-chloroethoxy)methane	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
2,4-Dichlorophenol	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
1,2,4-Trichlorobenzene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Naphthalene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
4-Chloroaniline	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-

MONITORING WELL		MW-3		MW-1	MW-3	MW-1		MW-3		MW-1	MW-3
WELL ID		S41-E12		S41-E11	S41-E12	S41-E11		S41-E12		S41-E11	S41-E12
ROUND		4		5	5	6		6		7	7
SAMPLE ID		B00DC9		not sampled	not sampled	B00ZC6		B00ZD0		not sampled	not sampled
PARAMETERS (units ug/l)	MCLs (ug/L)										
Benzo(A)anthracene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Chrysene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Bis(2-ethylhexyl)phthalate	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Di-n-octylphthalate	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Benzo(b)fluoranthene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Benzo(k)fluoranthene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Benzo(a)pyrene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Indeno(1,2,3-cd)pyrene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Dibenz(a,h)anthracene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
Benzo(g,h,i)perylene	NA	10.00	UJ	-	-	10.00	U	10.00	U	-	-
PESTICIDES											
Alpha-BHC	NA	0.05	UJ	-	-	0.05	U	0.05	U	-	-
Beta-BHC	NA	0.05	UJ	-	-	0.05	U	0.05	U	-	-
Delta-BHC	NA	0.05	UJ	-	-	0.05	U	0.05	U	-	-
Gamma-BHC (Lindane)	NA	0.05	UJ	-	-	0.05	U	0.05	U	-	-
Heptachlor	0.4	0.05	UJ	-	-	0.05	U	0.05	U	-	-
Aldrin	NA	0.05	UJ	-	-	0.05	U	0.05	U	-	-
Heptachlor Epoxide	0.2	0.05	UJ	-	-	0.05	U	0.05	U	-	-
Endosulfan I	NA	0.05	UJ	-	-	0.05	U	0.05	U	-	-
Dieldrin	NA	0.10	UJ	-	-	0.10	U	0.10	U	-	-
4,4'-DDE	NA	0.10	UJ	-	-	0.10	U	0.10	U	-	-
Endrin	NA	0.10	UJ	-	-	0.10	U	0.10	U	-	-
Endosulfan II	NA	0.10	UJ	-	-	0.10	U	0.10	U	-	-
4,4'-DDD	NA	0.10	UJ	-	-	0.10	U	0.10	U	-	-
Endosulfan Sulfate	NA	0.10	UJ	-	-	0.10	U	0.10	U	-	-
4,4'-DDT	NA	0.10	UJ	-	-	0.10	U	0.10	U	-	-
Methoxychlor	40	0.50	UJ	-	-	0.50	U	0.50	U	-	-
Endrin Ketone	NA	0.10	UJ	-	-	0.10	U	0.10	U	-	-
Alpha-Chlordane	NA	0.50	UJ	-	-	0.50	U	0.50	U	-	-
Gamma-Chlordane	NA	0.50	UJ	-	-	0.50	U	0.50	U	-	-
Toxaphene	3	1.00	UJ	-	-	1.00	U	1.00	U	-	-
Aroclor-1016	0.5	0.50	UJ	-	-	0.50	U	0.50	U	-	-
Aroclor-1221	0.5	0.50	UJ	-	-	0.50	U	0.50	U	-	-

MONITORING WELL		MW-1	MW-3	MW-1	MW-3		MW-1	MW-3
WELL ID		S41-E11	S41-E12	S41-E11	S41-E12		S41-E11	S41-E12
ROUND		7.5	7.5	8	8		9	9
SAMPLE ID		not sampled	not sampled	not sampled	B01BT6		not sampled	not sampled
PARAMETERS (units ug/l)	MCLs (ug/L)							
VOLATILE ORGANICS								
Chloromethane	NA	-	-	-	5.00	U	-	-
Trichlorofluoromethane	NA	-	-	-	-	NR	-	-
Bromomethane	NA	-	-	-	5.00	U	-	-
Vinyl Chloride	2	-	-	-	5.00	U	-	-
Chloroethane	NA	-	-	-	5.00	U	-	-
Methylene Chloride	NA	-	-	-	5.00	U	-	-
Acetone	NA	-	-	-	10.00	U	-	-
Carbon Disulfide	NA	-	-	-	5.00	U	-	-
1,1-Dichloroethene	NA	-	-	-	5.00	U	-	-
1,1-Dichloroethane	NA	-	-	-	5.00	U	-	-
cis-1, 2-Dichloroethene	NA	-	-	-	-	NR	-	-
trans-1, 2-Dichloroethene	NA	-	-	-	-	NR	-	-
1,2 Dichloroethene (Total)	NA	-	-	-	5.00	U	-	-
Chloroform	NA	-	-	-	5.00	U	-	-
1,2-Dichloroethane	5	-	-	-	5.00	U	-	-
2-Butanone	NA	-	-	-	10.00	U	-	-
Tetrahydrofuran	NA	-	-	-	-	NR	-	-
1,1,1-Trichloroethane	200	-	-	-	5.00	U	-	-
Carbon Tetrachloride	5	-	-	-	5.00	U	-	-
Vinyl Acetate	NA	-	-	-	10.00	U	-	-
Bromodichloromethane	NA	-	-	-	5.00	U	-	-
1,2-Dichloropropane	5	-	-	-	5.00	U	-	-
cis-1,3-Dichloropropene	NA	-	-	-	5.00	U	-	-
trans-1,3-Dichloropropene	NA	-	-	-	5.00	U	-	-
Trichloroethene	5	-	-	-	5.00	U	-	-
Dibromochloromethane	NA	-	-	-	5.00	U	-	-
1,1,2-Trichloroethane	NA	-	-	-	5.00	U	-	-
Benzene	5	-	-	-	5.00	U	-	-
Bromoform	NA	-	-	-	5.00	U	-	-
Trans-1,3-Dichloropropene	NA	-	-	-	5.00	U	-	-
4-Methyl-2-Pentanone	NA	-	-	-	10.00	U	-	-
2-Hexanone	NA	-	-	-	10.00	U	-	-

MONITORING WELL		MW-1	MW-3	MW-1	MW-3		MW-1	MW-3
WELL ID		S41-E11	S41-E12	S41-E11	S41-E12		S41-E11	S41-E12
ROUND		7.5	7.5	8	8		9	9
SAMPLE ID		not sampled	not sampled	not sampled	B01BT6		not sampled	not sampled
PARAMETERS (units ug/l)	MCLs (ug/L)							
Hexachlorobutadiene	NA	-	-	-	40.00	U	-	-
4-Chloro-3-methylphenol	NA	-	-	-	40.00	U	-	-
2-Methylnaphthalene	NA	-	-	-	40.00	U	-	-
Hexachlorocyclopentadiene	NA	-	-	-	40.00	U	-	-
2,4,6-Trichlorophenol	NA	-	-	-	40.00	U	-	-
2,4,5-Trichlorophenol	NA	-	-	-	200.00	U	-	-
2-Chloronaphthalene	NA	-	-	-	40.00	U	-	-
2-Nitroaniline	NA	-	-	-	200.00	U	-	-
Dimethylphthalate	NA	-	-	-	40.00	U	-	-
Acenapthylene	NA	-	-	-	40.00	U	-	-
2,6-Dinitrotoluene	NA	-	-	-	40.00	U	-	-
3-Nitroaniline	NA	-	-	-	200.00	U	-	-
Acenaphthene	NA	-	-	-	40.00	U	-	-
2,4-Dinitrophenol	NA	-	-	-	200.00	U	-	-
4-Nitrophenol	NA	-	-	-	200.00	U	-	-
Dibenzofuran	NA	-	-	-	40.00	U	-	-
2,4-Dinitrotoluene	NA	-	-	-	40.00	U	-	-
Diethylphthalate	NA	-	-	-	40.00	U	-	-
4-Chlorophenyl-phenylether	NA	-	-	-	40.00	U	-	-
Fluorene	NA	-	-	-	40.00	U	-	-
4-Nitroaniline	NA	-	-	-	200.00	U	-	-
4,6-Dinitro-2-methylphenol	NA	-	-	-	200.00	U	-	-
N-nitrosodipheylamine	NA	-	-	-	40.00	U	-	-
4-bromophenyl-phenylether	NA	-	-	-	40.00	U	-	-
Hexachlorobenzene	NA	-	-	-	40.00	U	-	-
Pentachlorophenol	1	-	-	-	200.00	U	-	-
Phenanthrene	NA	-	-	-	40.00	U	-	-
Anthracene	NA	-	-	-	40.00	U	-	-
Di-n-Butylphthalate	NA	-	-	-	40.00	U	-	-
Fluoranthene	NA	-	-	-	40.00	U	-	-
Pyrene	NA	-	-	-	40.00	U	-	-
Butylbenzylphthalate	NA	-	-	-	40.00	U	-	-
3,3'-Dichlorobenzidine	NA	-	-	-	80.00	U	-	-

MONITORING WELL		MW-1	MW-3	MW-1	MW-3		MW-1	MW-3
WELL ID		S41-E11	S41-E12	S41-E11	S41-E12		S41-E11	S41-E12
ROUND		7.5	7.5	8	8		9	9
SAMPLE ID		not sampled	not sampled	not sampled	B01BT6		not sampled	not sampled
PARAMETERS (units ug/l)	MCLs (ug/L)							
Aroclor-1232	0.5	-	-	-	-	NR	-	-
Aroclor-1242	0.5	-	-	-	-	NR	-	-
Aroclor-1248	0.5	-	-	-	-	NR	-	-
Aroclor-1254	0.5	-	-	-	-	NR	-	-
Aroclor-1260	0.5	-	-	-	-	NR	-	-
HERBICIDES								
2,4,5-TP (Silvex)	50	-	-	-	-	NR	-	-
2,4-D	70	-	-	-	-	NR	-	-

Table 2.2.3 Inorganic Data for 1100-EM-2

MONITORING WELL		MW-1		MW-1		MW-3		MW-3		MW-1		MW-1	
WELL ID		6-S41-E11		6-S41-E11		6-S41-E12		6-S41-E12		6-S41-E11		6-S41-E11	
ROUND		1		1		1		1		2		2	
SAMPLE ID		B0023T		B0023D		B0064T		B0064D		B000G9		B000H0	
PARAMETERS (units = ug/l)	MCLs (ug/l)	unfiltered		filtered		unfiltered		filtered		unfiltered		filtered	
METALS													
Aluminum	NA	189.00	U	82.60	U	1960.00		1350.00		83.30	U	138.00	U
Antimony	6.00	21.00	U	21.40	J	21.00	U	21.00	U	17.00	U	17.00	U
Arsenic	NA	1.00	U	1.00	U	2.30	U	2.60	U	2.70	J	3.00	J
Barium	NA	103.00	J	97.70	J	137.00	J	65.80	J	50.50	J	49.70	J
Beryllium	4.00	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Cadmium	5.00	2.00	U	2.90	U	2.00	U	2.00	U	3.00	U	3.00	U
Calcium	NA	87400.00		85300.00		144000.00		56400.00		64400.00		64400.00	
Chromium	100.00	11.70	U	4.40	U	4.20	U	8.80	U	56.80	J	5.00	UJ
Cobalt	NA	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U
Copper	NA	5.10	U	4.00	J	4.70	J	4.50	J	3.20	U	3.20	U
Iron	NA	227.00	J	50.50	J	2810.00	J	1820.00	J	305.00	J	35.50	UJ
Lead	NA	2.30	J	1.00	U	4.30	U	4.40	U	2.00	U	2.00	U
Magnesium	NA	18900.00		18500.00		32100.00		12900.00		13900.00	J	14200.00	J
Manganese	NA	352.00		352.00		276.00		121.00		26.60		24.50	
Mercury	2.00	0.20	U	0.20	U	0.20	U	0.50	U	0.20	U	0.20	U
Nickel	100.00	11.70	U	7.00	U	7.00	U	7.00	U	101.00		73.80	
Potassium	NA	8690.00		8510.00		11400.00		4160.00	J	6820.00		6870.00	
Selenium	50.00	2.00	U	2.00	U	1.00	UJ	1.00	U	2.00	UJ	2.00	UJ
Silver	NA	2.00	U	2.00	U	2.00	U	2.00	U	3.00	U	3.00	U
Sodium	NA	30800.00	J	29000.00	J	49200.00	J	18900.00	J	24800.00	J	24900.00	J
Thallium	2.00	1.00	UJ	1.00	U	1.00	UJ	1.00	UJ	4.00	U	4.00	U
Vanadium	NA	5.60	U	6.20	U	13.90	U	5.20	U	6.10	J	6.70	J
Zinc	NA	2.00	U	2.00	U	5.70	U	6.90	U	4.50	J	5.20	J
Cyanide	200.00	10.00	U	-	NR	10.00	U	-	NR	0.01	U	-	NR

Table 2.2.3 Inorganic Data for 1100-EM-2

MONITORING WELL		MW-1		MW-1		MW-3		MW-3		MW-1	MW-3
WELL ID		6-S41-E11		6-S41-E11		6-S41-E12		6-S41-E12		6-S41-E11	6-S41-E12
ROUND		4		4		4		4		5	5
SAMPLE ID		B00CP9		B00DC69		B00DC9		B00DD0			
PARAMETERS (units = ug/l)	MCLs (ug/l)	unfiltered		filtered		unfiltered		filtered		not sampled	not sampled
METALS											
Aluminum	NA	65.70	J	40.50	J	82.50	J	62.50	J	-	-
Antimony	6.00	50.00	U	50.00	U	50.00	U	50.00	U	-	-
Arsenic	NA	2.60	J	2.80	J	1.60	UJ	1.60	UJ	-	-
Barium	NA	63.30	J	61.30	J	139.00	J	136.00	J	-	-
Beryllium	4.00	0.30	U	0.30	U	0.30	J	0.30	U	-	-
Cadmium	5.00	3.00	U	3.00	U	4.30	J	3.30	J	-	-
Calcium	NA	72100.00		71400.00		13800.00		13600.00		-	-
Chromium	100.00	25.50		10.00	U	16.70		10.90		-	-
Cobalt	NA	5.00	U	5.00	U	5.00	U	5.00	U	-	-
Copper	NA	4.00	U	4.00	U	4.00	U	4.00	U	-	-
Iron	NA	177.00		24.10	U	301.00		35.50	J	-	-
Lead	NA	1.50	U	1.50	U	1.50	U	1.50	U	-	-
Magnesium	NA	15400.00		15200.00		29200.00		29300.00		-	-
Manganese	NA	7.70	J	3.40	J	45.00		43.30		-	-
Mercury	2.00	0.10	UJ	0.10	UJ	0.10	UJ	0.10	UJ	-	-
Nickel	100.00	86.60		74.30		61.70		79.60		-	-
Potassium	NA	7530.00		7500.00		10600.00		10500.00		-	-
Selenium	50.00	1.70	UJ	1.70	UJ	1.70	UJ	1.70	UJ	-	-
Silver	NA	6.00	U	6.00	U	6.00	U	6.00	U	-	-
Sodium	NA	24500.00	J	24300.00	J	47400.00	J	44500.00	J	-	-
Thallium	2.00	3.00	U	3.00	UJ	3.00	UJ	3.00	UJ	-	-
Vanadium	NA	5.00	U	6.60	J	5.30	J	5.00	U	-	-
Zinc	NA	1.60	J	1.50	J	2.30	J	1.70	J	-	-
Cyanide	200.00	0.00		-	NR	-	NR	-	NR	-	-

Table 2.2.3 Inorganic Data for 1100-EM-2

MONITORING WELL		MW-1	MW-3	MW-1		MW-1		MW-3		MW-3	
WELL ID		6-S41-E11	6-S41-E12	S41-E11		S41-E11		S41-E12		S41-E12	
ROUND		7.5	7.5	8		8		8		8	
SAMPLE ID				B01BT3		B01BT4		B01BT6		B01BT7	
PARAMETERS (units = ug/l)	MCLs (ug/l)	not sampled	not sampled								
METALS											
Aluminum	NA	-	-	75.00	J	129.00	J	139.00	J	80.40	J
Antimony	6.00	-	-	44.00	U	44.00	U	49.80	J	47.80	J
Arsenic	NA	-	-	4.00	J	3.50	J	3.20	J	1.30	J
Barium	NA	-	-	65.00	J	64.40	J	146.00	J	138.00	J
Beryllium	4.00	-	-	1.00	U	1.00	U	1.00	U	1.00	U
Cadmium	5.00	-	-	4.00	U	4.00	U	4.00	U	4.00	U
Calcium	NA	-	-	87900.00		88700.00		146000.00		142000.00	
Chromium	100.00	-	-	13.40		7.00	U	170.00		7.00	U
Cobalt	NA	-	-	4.00	U	4.00	U	4.00	U	4.00	U
Copper	NA	-	-	15.20	J	28.80		30.40		13.60	J
Iron	NA	-	-	272.00		80.30	J	2050.00		49.10	J
Lead	NA	-	-	2.40	J	1.00	U	2.60	B	1.50	B
Magnesium	NA	-	-	18500.00		18600.00		32200.00		31400.00	
Manganese	NA	-	-	11.70	J	12.50	J	25.60		9.30	J
Mercury	2.00	-	-	0.20	U	0.20	U	0.20	U	0.20	U
Nickel	100.00	-	-	134.00		96.90		140.00		106.00	
Potassium	NA	-	-	8150.00		8180.00		10500.00		10900.00	
Selenium	50.00	-	-	2.00	U	20.00	U	10.00	U	1.00	U
Silver	NA	-	-	4.00	U	4.00	U	4.00	U	4.00	U
Sodium	NA	-	-	28900.00		28900.00		49800.00		48400.00	
Thallium	2.00	-	-	4.00	U	1.00	U	10.00	U	10.00	U
Vanadium	NA	-	-	16.70	J	16.80	J	12.40	J	12.70	J
Zinc	NA	-	-	8.30	J	12.70	J	10.60	J	5.00	U
Cyanide	200.00	-	-	10.00	U	--	NR	10.00	U	--	NR

Table 2.2.4 Wet Chemistry Data for 1100-EM-2

MONITORING WELL		MW-1		MW-3		MW-1		MW-3		MW-1		MW-3	
WELL ID		S41-E11		S41-E12		S41-E11		S41-E12		S41-E11		S41-E12	
ROUND		1		1		2		2		3		3	
SAMPLE ID		B00024		B00065		B000G9		B000J2		B00CP9		B00CT5	
PARAMETERS (units = mg/l)	MCLs (mg/l)												
WET CHEMISTRY													
Alkalinity (CaCO3)	NA	261.00		303.00		200.00		225.00		209.00		319.00	
Ammonia as N	NA	0.05	UC	0.06	C	3.90		0.02	UJ	0.02	U	0.02	U
Bromide	NA	1.00	U	1.00	U	0.20	U	0.20		0.20		0.30	
Chemical Oxygen Demand	NA	10.00	U	15.00	U	8.50	J	13.00	J	5.00	U	6.00	
Chloride	NA	58.00		173.00		28.40		127.30		41.30		143.50	
Coliform (mpn)	NA	2.20	U	2.20	U	-	NR	-	NR	-	NR	-	NR
Conductance (units = umhos/cm)	NA	720.00		1280.00		536.00		1100.00		650.00		1100.00	
Dissolved Oxygen	NA	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR
Fluoride	2.00	0.50	U	0.50	U	0.30		0.10	U	0.30	J	0.50	J
Nitrate	10.00	9.80		15.80		17.28		6.65	C	19.94	C	11.96	C
Nitrite	1.00	1.00	U	1.00	U	-	NR	-	NR	-	NR	-	NR
pH	6.5 - 8.5	7.86		7.28		7.91		7.46		8.04		7.10	
Phosphate	NA	1.00	U	1.00	U	0.50	U	0.50	U	0.70	U	0.80	U
Sulfate	250.00	29.80		32.20		26.60		25.60		27.20		28.90	
Temperature (C)	NA	16.10		16.90		16.90		19.70		18.10		18.40	
Total Dissolved Solids	500.00	391.00		648.00		370.00		695.00		360.00		690.00	
Turbidity (units = mg/l)	1.00	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR

Table 2.2.4 Wet Chemistry Data for 1100-EM-2

MONITORING WELL		MW-1	MW-3	MW-1	MW-3	MW-1		MW-3
WELL ID		S41-E11	S41-E12	S41-E11	S41-E12	S41-E11		S41-E12
ROUND		7	7	7.5	7.5	8		8
SAMPLE ID		not sampled	not sampled	not sampled	not sampled	B01BT3		not sampled
PARAMETERS (units = mg/l)	MCLs (mg/l)							
WET CHEMISTRY								
Alkalinity (CaCO3)	NA	-	-	-	-	240.00		-
Ammonia as N	NA	-	-	-	-	-	NR	-
Bromide	NA	-	-	-	-	-	NR	-
Chemical Oxygen Demand	NA	-	-	-	-	-	NR	-
Chloride	NA	-	-	-	-	-	NR	-
Coliform (mpn)	NA	-	-	-	-	-	NR	-
Conductance (units = umhos/cm)	NA	-	-	-	-	720.00		-
Dissolved Oxygen	NA	-	-	-	-	-	NR	-
Fluoride	2.00	-	-	-	-	-	NR	-
Nitrate	10.00	-	-	-	-	-	NR	-
Nitrite	1.00	-	-	-	-	-	NR	-
pH	6.5 - 8.5	-	-	-	-	-	NR	-
Phosphate	NA	-	-	-	-	-	NR	-
Sulfate	250.00	-	-	-	-	-	NR	-
Temperature (C)	NA	-	-	-	-	-	NR	-
Total Dissolved Solids	500.00	-	-	-	-	-	NR	-
Turbidity (units = mg/l)	1.00	-	-	-	-	-	NR	-

Table 2.2.5 Radionuclide Data for 1100-EM-2

MONITORING WELL		MW-1		MW-3		MW-1		MW-3		MW-1		MW-3		MW-1	
WELL ID		S41-E11		S41-E12		S41-E11		S41-E12		S41-E11		S41-E12		S41-E11	
ROUND		1		1		2		2		3		3		4	
SAMPLE ID		B00024		B00065		B000H2		B000J5		B00CQ2		B00CT8		B00DC7	
PARAMETERS (units = pCi/l)	MCLs (pCi/l)														
Radiochemistry															
Alpha	15.00	8.44		17.00		1.96	U	1.72	U	3.09		0.74	U	0.67	U
Beta	(a)	12.70		14.70		3.49	U	7.91		12.11		12.52		9.24	
Tritium	20,000 (total body)	127.00	U	222.00	U	-580.00	U	150.00	U	-724.00	R	516.00	U		
Radium	5.00	0.45	U	2.36		0.35	U	1.56	U	0.10	U	1.20	U	-450.00	U
Strontium	NA	-	NR	-	NR	0.25	U	-0.90	U	0.21	U	0.95	U	0.31	U
Strontium-90	8 (bone marrow)	-0.03	U	-0.13	U	-	NR	-	NR	-	NR	-1.10	R	-0.36	U

(a) Average annual concentration shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem per year

Table 2.2.5 Radionuclide Data for 1100-EM-2

MONITORING WELL		MW-1	MW-3	MW-1		MW-3		MW-1	MW-3
WELL ID		S41-E11	S41-E12	S41-E11		S41-E12		S41-E11	S41-E12
ROUND		7.5	7.5	8		8		9	9
SAMPLE ID		not sampled	not sampled					not sampled	not sampled
PARAMETERS (units = pCi/l)	MCLs (pCi/l)								
Radiochemistry									
Alpha	15.00	-	-	11 ± 5		>2		-	-
Beta	(a)	-	-	24 ± 2.0		18 ± 2.0		-	-
Tritium	20,000 (total body)	-	-	-	NR	-	NR	-	-
Radium	5.00	-	-	-	NR	-	NR	-	-
Strontium	NA	-	-	-	NR	-	NR	-	-
Strontium-90	8 (bone marrow)	-	-	-	NR	-	NR	-	-

(a) Average annual concentration shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem per year

Table 2.2.6 Organics, Pesticides, and Herbicides Data for 1100-EM-3

MONITORING WELL		MW-17						MW-17				MW-17	
WELL ID		6-S41-E13C		6-S41-E13A		6-S41-E13B		6-S41-E13C		6-S41-E13A		6-S41-E13C	
ROUND		1		1		1		2		2		3	
SAMPLE ID		B00038		B0057T		B00044		B000L1		B000L7		BOOCS3	
PARAMETERS (units ug/l)	MCLs (ug/l)												
VOLATILE ORGANICS													
Chloromethane	NA	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U
Bromomethane	NA	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U
Vinyl Chloride	2	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U
Chloroethane	NA	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U
Methylene Chloride	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Acetone	NA	2.00	U	2.00	U	2.00	U	10.00	U	10.00	U	10.00	U
Carbon Disulfide	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
1,1-Dichloroethene	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
1,1-Dichloroethane	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
1,2 Dichloroethene (Total)	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Chloroform	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
1,2-Dichloroethane	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
2-Butanone	NA	2.00	U	2.00	U	2.00	U	10.00	U	10.00	U	10.00	U
1,1,1-Trichloroethane	200	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Carbon Tetrachloride	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Vinyl Acetate	NA	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U
Bromodichloromethane	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
1,2-Dichloropropane	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Cis-1,3-Dichloropropene	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Trichloroethene	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Dibromochloromethane	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
1,1,2-Trichloroethane	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Benzene	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Trans-1,3-Dichloropropene	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Bromoform	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
4-Methyl-2-Pentanone	NA	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U
2-Hexanone	NA	2.00	U	2.00	U	2.00	U	10.00	U	10.00	U	10.00	U
Tetrachloroethene	5	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
1,1,2,2-Tetrachloroethane	NA	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Toluene	100	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Chlorobenzene	100	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Ethylbenzene	700	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U

MONITORING WELL		MW-17						MW-17				MW-17	
WELL ID		6-S41-E13C		6-S41-E13A		6-S41-E13B		6-S41-E13C		6-S41-E13A		6-S41-E13C	
ROUND		1		1		1		2		2		3	
SAMPLE ID		B00038		B0057T		B00044		B000L1		B000L7		BOOCS3	
PARAMETERS (units ug/l)	MCLs (ug/l)												
2-Nitroaniline	NA	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U
Dimethylphthalate	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Acenapththylene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
2,6-Dinitrotoluene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
3-Nitroaniline	NA	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U
Acenaphthene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
2,4-Dinitrophenol	NA	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U
4-Nitrophenol	NA	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U
Dibenzofuran	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
2,4-Dinitrotoluene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Diethylphthalate	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
4-Chlorophenyl-phenylether	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Fluorene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
4-Nitroaniline	NA	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U
4,6-Dinitro-2-methylphenol	NA	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U
N-nitrosodipheylamine	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
4-bromophenyl-phenylether	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Hexachlorobenzene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Pentachlorophenol	1	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U	50.00	U
Phenanthrene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Anthracene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Di-n-Butylphthalate	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Fluoranthene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Pyrene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Butylbenzylphthalate	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
3,3'-Dichlorobenzidine	NA	20.00	U	20.00	U	20.00	U	20.00	U	20.00	U	20.00	U
Benzo(A)anthracene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Chrysene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Bis(2-ethylhexyl)phthalate	NA	10.00	U	10.00	U	10.00	U	2.00	J	10.00	U	6.00	J
Di-n-octylphthalate	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Benzo(b)fluoranthene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Benzo(k)fluoranthene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U
Benzo(a)pyrene	NA	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U	10.00	U

Table 2.2.6 Organics, Pesticides, and Herbicides Data for 1100-EM-3

MONITORING WELL		MW-17						MW-17				MW-17	
WELL ID		6-S41-E13C		6-S41-E13A		6-S41-E13B		6-S41-E13C		6-S41-E13A		6-S41-E13C	
ROUND		1		1		1		2		2		3	
SAMPLE ID		B00038		B0057T		B00044		B000L1		B000L7		BOOCS3	
PARAMETERS (units ug/l)	MCLs (ug/l)												
2,4-D	70	-	NR	-	NR	-	NR	-	NR	-	NR	-	NR

Table 2.2.6 Organics, Pesticides, and Herbicides Data for 1100-EM-3

MONITORING WELL						MW-17					
WELL ID		6-S41-E13A		6-S41-E13B		6-S41-E13C		6-S41-E13A		6-S41-E13B	
ROUND		3		3		4		4		4	
SAMPLE ID		B00CS7		B00CT1		B00DC1		B00DB3		B00DB7	
PARAMETERS (units ug/l)	MCLs (ug/l)										
Styrene	100	1.00	U	1.00	U	5.00	U	5.00	U	-	NR
Xylenes (Total)	10000	1.00	U	1.00	U	5.00	U	5.00	U	-	NR
Total Trihalomethanes	NA	-	NR	-	NR	-	NR	-	NR	-	NR
SEMI-VOLATILES											
Phenol	NA	10.00	U	10.00	U	5.00	J	10.00	UJ	10.00	UJ
Bis(2-Chloroethyl)ether	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
2-Chlorophenol	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
1,3-Dichlorobenzene	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
1,4-Dichlorobenzene	75	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
Benzyl Alcohol	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
1,2-Dichlorobenzene	600	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
2-Methylphenol	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
Bis(2-chloroisopropyl)ether	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
4-Methylphenol	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
N-nitroso-di-n-propylamine	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
Hexachloroethane	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
Nitrobenzene	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
Isophorone	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
2-Nitrophenol	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
2,4-Dimethylphenol	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
Benzoic Acid	NA	50.00	U	50.00	U	50.00	UJ	50.00	UJ	50.00	UJ
Bis(2-chloroethoxy)methane	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
2,4-Dichlorophenol	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
1,2,4-Trichlorobenzene	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
Naphthalene	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
4-Chloroaniline	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
Hexachlorobutadiene	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
4-Chloro-3-methylphenol	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
2-Methylnaphthalene	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
Hexachlorocyclopentadiene	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
2,4,6-Trichlorophenol	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
2,4,5-Trichlorophenol	NA	50.00	U	50.00	U	50.00	UJ	50.00	UJ	50.00	UJ
2-Chloronaphthalene	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ

Table 2.2.6 Organics, Pesticides, and Herbicides Data for 1100-EM-3

MONITORING WELL						MW-17					
WELL ID		6-S41-E13A		6-S41-E13B		6-S41-E13C		6-S41-E13A		6-S41-E13B	
ROUND		3		3		4		4		4	
SAMPLE ID		B00CS7		B00CT1		B00DC1		B00DB3		B00DB7	
PARAMETERS (units ug/l)	MCLs (ug/l)										
Indeno(1,2,3-cd)pyrene	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
Dibenz(a,h)anthracene	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
Benzo(g,h,i)perylene	NA	10.00	U	10.00	U	10.00	UJ	10.00	UJ	10.00	UJ
PESTICIDES											
Alpha-BHC	NA	0.05	U	0.05	U	0.05	UJ	0.05	UJ	0.05	UJ
Beta-BHC	NA	0.05	U	0.05	U	0.05	UJ	0.05	UJ	0.05	UJ
Delta-BHC	NA	0.05	U	0.05	U	0.05	UJ	0.05	UJ	0.05	UJ
Gamma-BHC (Lindane)	NA	0.05	U	0.05	U	0.05	UJ	0.05	UJ	0.05	UJ
Heptachlor	0.4	0.05	U	0.05	U	0.05	UJ	0.05	UJ	0.05	UJ
Aldrin	NA	0.05	U	0.05	U	0.05	UJ	0.05	UJ	0.05	UJ
Heptachlor Epoxide	0.2	0.05	U	0.05	U	0.05	UJ	0.05	UJ	0.05	UJ
Endosulfan I	NA	0.05	U	0.05	U	0.05	UJ	0.05	UJ	0.05	UJ
Dieldrin	NA	0.10	U	0.10	U	0.10	UJ	0.10	UJ	0.10	UJ
4,4'-DDE	NA	0.10	U	0.10	U	0.10	UJ	0.10	UJ	0.10	UJ
Endrin	NA	0.10	U	0.10	U	0.10	UJ	0.10	UJ	0.10	UJ
Endosulfan II	NA	0.10	U	0.10	U	0.10	UJ	0.10	UJ	0.10	UJ
4,4'-DDD	NA	0.10	U	0.10	U	0.10	UJ	0.10	UJ	0.10	UJ
Endosulfan Sulfate	NA	0.10	U	0.10	U	0.10	UJ	0.10	UJ	0.10	UJ
4,4'-DDT	NA	0.10	U	0.10	U	0.10	UJ	0.10	UJ	0.10	UJ
Methoxychlor	40	0.50	U	0.50	U	0.50	UJ	0.50	UJ	0.50	UJ
Endrin Ketone	NA	0.10	U	0.10	U	0.10	UJ	0.10	UJ	0.10	UJ
Alpha-Chlordane	NA	0.50	U	0.50	U	0.50	UJ	0.50	UJ	0.50	UJ
Gamma-Chlordane	NA	0.50	U	0.50	U	0.50	UJ	0.50	UJ	0.50	UJ
Toxaphene	3	1.00	U	1.00	U	1.00	UJ	1.00	UJ	1.00	UJ
Aroclor-1016	0.5	0.50	U	0.50	U	0.50	UJ	0.50	UJ	0.50	UJ
Aroclor-1221	0.5	0.50	U	0.50	U	0.50	UJ	0.50	UJ	0.50	UJ
Aroclor-1232	0.5	0.50	U	0.50	U	0.50	UJ	0.50	UJ	0.50	UJ
Aroclor-1242	0.5	0.50	U	0.50	U	0.50	UJ	0.50	UJ	0.50	UJ
Aroclor-1248	0.5	0.50	U	0.50	U	0.50	UJ	0.50	UJ	0.50	UJ
Aroclor-1254	0.5	1.00	U	1.00	U	1.00	UJ	1.00	UJ	1.00	UJ
Aroclor-1260	0.5	1.00	U	1.00	U	1.00	UJ	1.00	UJ	1.00	UJ
HERBICIDES											
2,4,5-TP (Silvex)	50	-	NR	-	NR	-	NR	-	NR	-	NR

MONITORING WELL		MW-17		MW-17	
WELL ID		S41-E13A		S41-E13A	
ROUND		5		6	
SAMPLE ID#		B00HS9		B00ZC2	
PARAMETERS (units ug/l)	MCLs (ug/l)				
VOLATILE ORGANICS					
Chloromethane	NA	10.00	UJ	10.00	U
Trichlorofluoromethane	NA	-	NR	-	NR
Bromomethane	NA	10.00	UJ	10.00	U
Vinyl Chloride	2	10.00	UJ	10.00	U
Chloroethane	NA	10.00	UJ	10.00	U
Methylene Chloride	NA	5.00	UJ	5.00	U
Acetone	NA	35.00	U	10.00	U
Carbon Disulfide	NA	5.00	UJ	5.00	U
1,1-Dichloroethene	NA	5.00	UJ	5.00	U
1,1-Dichloroethane	NA	5.00	UJ	5.00	U
cis-1,2-Dichloroethene	NA	-	NR	-	NR
Trans-1,2-Dichloroethene	NA	-	NR	-	NR
1,2-Dichloroethene (total)	NA	5.00	UJ	5.00	U
Chloroform	NA	5.00	UJ	5.00	U
1,2-Dichloroethane	5	5.00	UJ	5.00	U
2-Butanone	NA	10.00	UJ	10.00	U
Tetrahydrofuran	NA	-	NR	-	NR
1,1,1-Trichloroethane	200	5.00	UJ	5.00	U
Carbon Tetrachloride	5	5.00	UJ	5.00	U
Vinyl Acetate	NA	10.00	UJ	10.00	U
Bromodichloromethane	NA	5.00	UJ	5.00	U
1,2-Dichloropropane	5	5.00	UJ	5.00	U
cis-1,3-Dichloropropene	NA	5.00	UJ	5.00	U
Trans-1,3-Dichloropropene	NA	5.00	UJ	5.00	U
Trichloroethene	5	5.00	UJ	5.00	U
Dibromochloromethane	NA	5.00	UJ	5.00	U
1,1,2-Trichloroethane	NA	5.00	UJ	5.00	U
Benzene	5	5.00	UJ	5.00	U
Bromoform	NA	5.00	UJ	5.00	U
Trans-,1,3-Dichloropropene	NA	-	NR	-	NR
4-Methyl-2-Pentanone	NA	10.00	UJ	10.00	U
2-Hexanone	NA	10.00	UJ	10.00	U

Table 2.2.6 Organics, Pesticides, and Herbicides Data for 1100-EM-3

MONITORING WELL		MW-17		MW-17	
WELL ID		S41-E13A		S41-E13A	
ROUND		5		6	
SAMPLE ID#		B00HS9		B00ZC2	
PARAMETERS (units ug/l)	MCLs (ug/l)				
1,2,4-Trichlorobenzene	NA	10.00	U	10.00	U
Naphthalene	NA	10.00	U	10.00	U
4-Chloroaniline	NA	10.00	U	10.00	U
Hexachlorobutadiene	NA	10.00	U	10.00	U
4-Chloro-3-Methylphenol	NA	10.00	U	10.00	U
2-Methylnaphthalene	NA	10.00	U	10.00	U
Hexachlorocyclopentadiene	NA	10.00	U	10.00	U
2,4,6-Trichlorophenol	NA	10.00	U	10.00	U
2,4,5-Tricholorophenol	NA	50.00	U	50.00	U
2-Chloronaphthalene	NA	10.00	U	10.00	U
2-Nitroaniline	NA	50.00	U	50.00	U
Dimethyl Phthalate	NA	10.00	U	10.00	U
Acenaphthylene	NA	10.00	U	10.00	U
2,6-Dinitrotoluene	NA	10.00	U	10.00	U
3-Nitoaniline	NA	50.00	U	50.00	U
Acenaphthene	NA	10.00	U	10.00	U
2,4-Dinitrophenol	NA	50.00	U	50.00	U
4-Nitrophenol	NA	50.00	U	50.00	U
Dibenzofuran	NA	10.00	U	10.00	U
2,4-Dinitrotoluene	NA	10.00	U	10.00	U
Diethylphthalate	NA	10.00	U	10.00	U
4-Chlorophenyl-phenylether	NA	10.00	U	10.00	U
Fluorene	NA	10.00	U	10.00	U
4-Nitroaniline	NA	50.00	U	50.00	U
4,6-Dinitro-2-Methylphenol	NA	50.00	U	50.00	U
N-Nitrosodiphenylamine (1)	NA	10.00	U	10.00	U
4-Bromophenyl-phenylether	NA	10.00	U	10.00	U
Hexachlorobenzene	NA	10.00	U	10.00	U
Pentachlorophenol	1	50.00	U	50.00	U
Phenanthrene	NA	10.00	U	10.00	U
Anthracene	NA	10.00	U	10.00	U
Di-n-Butylphthalate	NA	10.00	U	10.00	U
Fluoranthene	NA	10.00	U	10.00	U

Table 2.2.6 Organics, Pesticides, and Herbicides Data for 1100-EM-3

MONITORING WELL		MW-17		MW-17	
WELL ID		S41-E13A		S41-E13A	
ROUND		5		6	
SAMPLE ID#		B00HS9		B00ZC2	
PARAMETERS (units ug/l)	MCLs (ug/l)				
Toxaphene	3	1.00	U	1.00	U
Aroclor-1016	0.5	0.50	U	0.50	U
Aroclor-1221	0.5	0.50	U	0.50	U
Aroclor-1232	0.5	0.50	U	0.50	U
Aroclor-1242	0.5	0.50	U	0.50	U
Aroclor-1248	0.5	0.50	U	0.50	U
Aroclor-1254	0.5	1.00	U	1.00	U
Aroclor-1260	0.5	1.00	U	1.00	U

Table 2.2.6 Miscellaneous Organic Data for 1100-EM-3

MONITORING WELL	MW-23		MW-25		MW-25		MW-24		MW-24	
WELL ID										
DATE	2/19/92		2/19/92		2/19/92		7/7/92		7/7/92	
SAMPLE ID	B05XQ8		B05XR1		B05XR5		B06CZ3		B06CZ4	
PARAMETERS										
Analytical Testing										
Volatile Organics (8240)	-	NR	-	NR	-	NR	-	NR	ND	
Benzene, ethylbenzene, toluene, and xylenes (BETX) - (ppm)	-	NR	ND		ND		ND		-	NR
Lead (Pb) - (ppm)	-	NR	ND		-	NR	-	NR	0.009	
Total Petroleum Hydrocarbons (TPH)	-	NR	ND		ND		-	NR	-	NR

MONITORING WELL	MW-25		MW-25		MW-24	
WELL ID						
DATE	7/7/92		7/7/92		7/7/92	
SAMPLE ID	B06D01		B06D02		B06D03	
PARAMETERS						
Analytical Testing						
Volatile Organics (8240)	-	NR	-	NR	-	NR
Benzene, ethylbenzene, toluene, and xylenes (BETX) - (ppm)	ND		ND		ND	
Lead (Pb) - (ppm)	-	NR	-	NR	-	NR
Total Petroleum Hydrocarbons (TPH)	-	NR	-	NR	-	NR

Table 2.2.7 Inorganic Data for 1100-EM-3

MONITORING WELL		MW-17		MW-17							
WELL ID		6-S41-E13C		6-S41-E13C		6-S41-E13A		6-S41-E13A		6-S41-E13B	
ROUND		1		1		1		1		1	
SAMPLE ID		B00038		B00038D		B00046		B00046D		B00044	
PARAMETERS (units = ug/l)	MCLs (ug/l)	unfiltered		filtered		unfiltered		filtered		unfiltered	
METALS											
Aluminum	NA	1280.00		276.00		144.00	U	91.40	U	113.00	U
Antimony	6	21.00	UJ	21.00	U	21.00	UJ	21.00	U	21.00	UJ
Arsenic	50	2.10	B	2.50	B	3.30	B	4.80	U	3.90	B
Barium	2000	38.80	B	21.00	J	21.60	B	20.40	B	50.70	B
Beryllium	4	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Cadmium	5	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U
Calcium	NA	24600.00	J	24300.00		30100.00	J	30600.00		53500.00	J
Chromium	100	20.10		8.30	U	38.80		2.00	U	7.20	U
Cobalt	NA	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U
Copper	NA	2.00	U	2.00	U	2.00	U	3.20	B	2.00	U
Iron	NA	1930.00		412.00		240.00		13.50	U	163.00	
Lead	50	2.20	U	2.30	UJ	2.20	U	2.00	U	2.00	U
Magnesium	NA	5590.00		5340.00		6320.00		5680.00		11600.00	
Manganese	NA	84.50	J	68.20		5.00	J	1.50	B	9.90	J
Mercury	2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Nickel	100	7.00	U	7.00	U	30.70	U	7.00	U	7.00	U
Potassium	NA	3830.00	B	3490.00	B	3720.00	B	3880.00	B	5440.00	
Selenium	50	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Silver	NA	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U
Sodium	NA	18000.00	J	17500.00	J	5710.00	J	6190.00		15800.00	J
Thallium	2	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Vanadium	NA	4.50	U	2.60	U	9.10	B	10.40	U	8.20	B
Zinc	NA	5.10	U	3.50	U	2.00	U	2.00	U	2.30	U
Cyanide	200	10.00	U	**	NR	10.00	U	**	NR	10.00	U

MONITORING WELL						MW-17		MW-17			
WELL ID		6-S41-E13B		6-S41-E13B		6-S41-E13C		6-S41-E13C		6-S41-E13A	
ROUND		2		2		3		3		3	
SAMPLE ID		B000M1		B000M2		B00CS3		B00CS4		B00CS7	
PARAMETERS (units = ug/l)	MCLs (ug/l)	unfiltered		filtered		unfiltered		filtered		unfiltered	
METALS											
Aluminum	NA	145.00	B	87.00	U	223.00	U	92.30	U	115.00	U
Antimony	6	17.00	U	17.00	U	27.00	U	27.00	U	27.00	U
Arsenic	50	4.70	B	3.50	B	6.30	B	2.90	B	7.70	B
Barium	2000	58.90	B	58.20	B	21.40	B	18.50	B	16.60	B
Beryllium	4	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Cadmium	5	3.00	U	3.00	U	3.00	U	3.00	U	3.00	U
Calcium	NA	59800.00		67000.00		24200.00		24400.00		25600.00	
Chromium	100	7.70	B	5.00	U	4.00	U	35.30		9.30	B
Cobalt	NA	3.00	U	3.00	U	2.00	U	2.00	U	2.00	U
Copper	NA	10.90	U	2.00	U	3.00	U	3.00	U	3.00	U
Iron	NA	72.10	U	18.90	U	199.00		114.00		34.20	B
Lead	50	2.00	U	10.00	U	2.00	U	2.00	U	3.20	
Magnesium	NA	12300.00		14000.00		5390.00		5240.00		5420.00	
Manganese	NA	20.70		21.50		104.00		98.90		1.00	U
Mercury	2	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Nickel	100	15.00	U	15.00	U	21.00	U	21.00	U	21.00	U
Potassium	NA	5580.00		5890.00		3510.00	UJ	3470.00	B	3170.00	UJ
Selenium	50	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ	2.00	UJ
Silver	NA	3.00	U	3.00	U	4.00	U	4.00	U	4.00	U
Sodium	NA	17700.00	J	19400.00	J	16300.00		17900.00		4480.00	J
Thallium	2	4.00	U	4.00	U	1.00	U	1.00	U	1.00	U
Vanadium	NA	7.00	B	6.40	B	3.70	U	3.00	U	8.60	U
Zinc	NA	40.00	UJ	21.50	U	2.00	U	2.00	U	2.00	U
Cyanide	200	0.01	U	**	NR	10.00	U	2.00	U	10.00	U

MONITORING WELL										MW-17	
WELL ID		6-S41-E13A		6-S41-E13A		6-S41-E13B		6-S41-E13B		S31-E13A	
ROUND		4		4		4		4		5	
SAMPLE ID		B00DB3		B00DB3		B00DB7		B00DB7		B00HS9	
PARAMETERS (units = ug/l)	MCLs (ug/l)	unfiltered		filtered		unfiltered		filtered		unfiltered	
METALS											
Aluminum	NA	31.70	B	40.50	B	31.10	B	24.80	B	39.40	B
Antimony	6	50.00	U	50.00	U	50.00	U	50.00	U	37.00	U
Arsenic	50	3.90	J	3.80	J	4.20	J	4.60	J	4.60	B
Barium	2000	17.40	B	17.80	B	53.30	B	52.20	B	39.60	B
Beryllium	4	0.30	U	0.30	U	0.30	U	0.30	U	2.00	U
Cadmium	5	3.00	U	3.00	U	3.00	U	3.00	U	4.00	U
Calcium	NA	25700.00		24400.00		59400.00		58900.00		50300.00	
Chromium	100	28.20		10.00	U	10.00	U	10.00	U	4.70	B
Cobalt	NA	5.00	U	5.00	U	5.00	U	5.00	U	2.00	U
Copper	NA	4.00	U	4.00	U	4.00	U	4.00	U	4.00	U
Iron	NA	112.00		22.40	U	27.40	U	15.30	U	59.30	B
Lead	50	1.50	U	1.50	U	1.50	U	1.50	U	3.00	U
Magnesium	NA	5400.00		5390.00		12700.00		12500.00		10300.00	
Manganese	NA	2.60	B	1.10	B	7.80	B	11.30	B	2.00	U
Mercury	2	0.10	UJ	17.20	B	0.10	UJ	0.10	UJ	0.20	U
Nickel	100	17.20	B	10.00	U	10.00	U	10.00	U	20.00	U
Potassium	NA	3460.00	B	3600.00	B	5980.00		5960.00		5020.00	
Selenium	50	1.70	UJ	1.70	UJ	1.70	UJ	1.70	UJ	4.00	UJ NW
Silver	NA	6.00	U	6.00	U	6.00	U	6.00	U	5.00	U
Sodium	NA	4710.00	J	4440.00	J	15400.00	J	15300.00	J	8080.00	
Thallium	2	3.00	UJ	3.00	U	3.00	U	3.00	U	6.00	U
Vanadium	NA	8.70	B	6.90	B	5.60	B	5.80	B	8.30	B
Zinc	NA	2.10	B	1.80	B	2.00	B	6.00	B	4.00	U
Cyanide	200	**	NR	**	NR	0.00		**	NR	10.00	U

Table 2.2.8 Wet Chemistry Data for 1100-EM-3

MONITORING WELL		MW-17						MW-17			
WELL ID		6-S41-E13C		6-S41-E13A		6-S41-E13B		6-S41-E13C		6-S41-E13A	
ROUND		1		1		1		2		2	
SAMPLE ID		B00038		B00047		B00045		B000L1		B000L7	
PARAMETERS (units = mg/l)	MCLs (mg/l)										
WET CHEMISTRY											
Alkalinity as CaCO3	NA	113.00		104.00		221.00		110.00		130.00	
Ammonia as N	NA	0.05	UC	0.05	UC	0.05	UC	0.02	U	0.02	U
Bromide	NA	1.00	U	1.00	U	1.00	U	0.20	U	0.20	U
Chloride	NA	2.70		1.80		8.50		2.60		4.00	
Chemical Oxygen Demand	NA	15.00	U	10.00	U	10.00	U	5.00	U	5.00	U
Coliform (mpn)	NA	2.20	U	2.20	U	1.00	U	**	NR	**	NR
Field Specific Conductance (us/cm)	NA	280.00		260.00		500.00		246.00		278.00	
Fluoride	2.00	0.50	U	0.50	U	0.50	U	0.30		0.20	
Nitrate	10.00	0.50	U	6.40		2.50		0.44	UC	5.76	C
Nitrite	1.00	1.00	U	1.00	U	1.00	U	**	NR	**	NR
pH	6.5 - 8.5	7.79		7.85		7.53		8.23		8.38	
Temperature (C)	NA	14.80		14.60		14.70		17.00		16.70	
Phosphate	NA	1.40		1.00	U	1.00	U	2.40		0.60	U
Sulfate	250.00	13.80		10.50		9.80		15.60		11.30	
Total Dissolved Solids	500.00	150.00		144.00		263.00		180.00		190.00	

Table 2.2.8 Wet Chemistry Data for 1100-EM-3

MONITORING WELL					
WELL ID		6-S41-E13A		6-S41-E13B	
ROUND		4		4	
SAMPLE ID		B00DB3		B00DB7	
PARAMETERS (units = mg/l)	MCLs (mg/l)				
WET CHEMISTRY					
Alkalinity as CaCO3	NA	85.00		215.00	
Ammonia as N	NA	0.20	U	0.20	U
Bromide	NA	1.00	U	1.00	U
Chloride	NA	1.00	U	1.00	U
Chemical Oxygen Demand	NA	5.00	U	5.00	U
Coliform (mpn)	NA	**	NR	**	NR
Field Specific Conductance (us/cm)	NA	20.00		**	NR
Fluoride	2.00	0.20		0.20	
Nitrate	10.00	5.00	J	2.00	J
Nitrite	1.00	1.00	UJ	1.00	UJ
pH	6.5 - 8.5	8.18		**	NR
Temperature (C)	NA	15.90		**	NR
Phosphate	NA	1.00	U	1.00	U
Sulfate	250.00	10.00		10.00	
Total Dissolved Solids	500.00	112.00		262.00	

Table 2.2.9 Radionuclide Data for 1100-EM-3

MONITORING WELL						MW-17					
WELL ID		6-S41-E13A		6-S41-E13B		6-S41-E13C		6-S41-E13A		6-S41-E13B	
ROUND		1		1		2		2		2	
SAMPLE ID		B00047		B00045		B000L4		B000M0		B000M4	
PARAMETERS (units = pCi/l)	MCLs (pCi/l)										
Radiochemistry											
Alpha	15	0.49	U	6.02		0.89	U	0.93	U	3.74	
Beta	(a)	2.63	U	4.87	U	0.89	U	1.34	U	9.39	
Tritium	20,000 (total body)	205.00	U	215.00	U	-400.00	U	-76.00	U	160.00	U
Radium	5	0.07	U	0.16	U	-0.72	U	-0.55	U	-0.59	U
Strontium	NA	**	NR	**	NR	-2.04	U	-1.06	U	-1.36	U
Strontium-90	8 (bone marrow)	0.12	U	0.47	U	**	NR	**	NR	**	NR

(a) Average annual concentration shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem per year

MONITORING WELL				MW-17	
WELL ID		6-S41-E13B			
ROUND		4		6	
SAMPLE ID		B00DB9			
PARAMETERS (units = pCi/l)	MCLs (pCi/l)				
Radiochemistry					
Alpha	15	-1.34	U	>3	
Beta	(a)	2.82	U	6.2 ± 2.7	
Tritium	20,000 (total body)	-350.00	U	**	NR
Radium	5	-0.16	U	**	NR
Strontium	NA	-1.12	U	**	NR
Strontium-90	8 (bone marrow)	**	NR	**	NR

(a) Average annual concentration shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem per year

TEST BORING FIELD LOGS

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CORPS OF ENGINEERS
WALLA WALLA DISTRICT

Site 1100 Area Consolidation — Page 1 of 3 Pages

Boring No. MW-23 Desig. MW-23 Diam.(Casing) ____

Co-ordinates N 111189.2 E 593987.5

TEST BORING FIELD LOG

Elevation Top of Boring	406.51 ft	M.S.L	Hammer Wt. ____	Boring Started	DEC 3 91
Total Overburden Drilled	74.0	Feet	Hammer Drop ____		
Elevation Top of Rock	____	M.S.L	Casing Left ____	Boring Completed	DEC 4 91
Total Rock Drilled	0.0	Feet	Subsurface Water Data ▽ 52.7 ▼ ____	Page	____
Elev. Bottom of Boring	____	M.S.L	Obs. Well ____		
Total Depth of Boring	74.0	Feet	Drilled By:	K. DeHart	
Core Recovered ____ %	Boxes ____	No.	Mfg. Des. Drill:	SD-150	
Core Recovered ____ Ft: ____	Diam. ____	In.	Inspected By:		
Soil Samples ____ In. Diam.	____	2 No.	Classification By:	V.L. King (WHC)	
Soil Samples ____ In. Diam.	____	No.	Classification By:		

SCALES ELEV.	SCALES DEPTH	CORE/SAMPLE NO. SYMBOL	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT CORE REC'VY	SAMPLING & CORING OPERATIONS	WELL	MATL	CLASSIFICATION OF MATERIALS
	5								0.0 - 47.0 FILL. Ground was excavated to a depth of 47.0 feet in an attempt to remove petroleum contaminated soil. The resulting hole was backfilled with the excavated material after it had been allowed to aerate and the petroleum products to evaporate.
	10								
	15								
	20								

GENERAL REMARKS:

All logging by Westinghouse-Hanford personnel, Drilling Contractor - Harrison-Western Company

BORING No. MW-23

Site 1100 Area Consolidation Boring No. MW-23 Desig. MW-23 Page 2 of 3 Pages

SCALES ELEV.	SCALES DEPTH	CORE/SAMPLE NO. SYMBOL	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT / CORE REC'VY	SAMPLING & CORING OPERATIONS	WELL	MATL	CLASSIFICATION OF MATERIALS
	30								
	35								
	40								
	45								
				47.0 49.0					47.0 - 51.5 silty GRAVEL; 90% gravel, 10% silt w/a trace of sand; 5Y5/1; dry; moderately sorted; gravel: subangular to subrounded; 95% basalt, 5% other; silt: 85% basalt, 10% quartz, 5% felsic; no visible reaction to acid. Sand content increasing to 5% at 50.0 ft.
	50			49.0 51.0					51.5 - 52.7 GRAVEL w/interbedded silt and clay; 70% gravel, 25% silt and clay, 5% sand; 5Y3/1; moist; moderately sorted; angular to subangular to subrounded; 80% basalt, 15% quartz, 5% felsics; no visible reaction to acid.
	55								52.7 - 57.0 gravelly silty SAND; 25% gravel, 25% silt, 50% sand; 5Y4/1; wet; poorly sorted; angular to subangular; 45% quartz, 45% basalt, 10% felsics; no visible reaction to acid.
	60								57.0 - 74.0 SAND; 95% sand, 5% gravel; wet; fairly well sorted; subangular to subrounded; 50% quartz, 35% basalt, 10% felsics, w/trace of mica (5%); no reaction to acid. 59.0 ft. SAND; 100% sand; 5Y3/1; wet; very well sorted; 60% quartz, 30% basalt, 5% felsic, 5% mica; no visible reaction to acid.
	65								

BORING NO. MW-23

Site 1100 Area Consolidation Boring No. MW-23 Desig. MW-23 Page 3 of 3 Pages

SCALES		CORE/SAMPLE			BLOWS PER FT / CORE REC'VY	SAMPLING & CORING OPERATIONS	WELL	MAT'L	CLASSIFICATION OF MATERIALS
ELEV.	DEPTH	NO. SYMBOL	SIZE	DEPTH RANGE					
									Bottom of hole @ 74 ft depth

BORING No. MW-23

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U.S. ARMY
CORPS OF ENGINEERS
WALLA WALLA DISTRICT

TEST BORING FIELD LOG

Site 1100 Area Consolidation — Page 1 of 2 Pages

Boring No. MW-24 Desig. MW-24 Diam.(Casing) 7.38"

Co-ordinates N 111186.3 E 594024.3

Elevation Top of Boring	406.74 ft M.S.L	Hammer Wt.	Boring Started NOV 19 91
Total Overburden Drilled	68.0 Feet	Hammer Drop	
Elevation Top of Rock	M.S.L	Casing Left	Boring Completed NOV 21 91
Total Rock Drilled	0.0 Feet	Subsurface Water Data ▽ 52.4 ▼	Page
Elev. Bottom of Boring	M.S.L	Obs. Well	
Total Depth of Boring	68.0 Feet	Drilled By:	K. DeHart
Core Recovered ____ %	Boxes ____ No.	Mfg. Des. Drill:	SD-150
Core Recovered ____ Ft: ____	Diam. ____ In.	Inspected By:	
Soil Samples ____ In. Diam.	8 No.	Classification By:	V.L. King (WHC)
Soil Samples ____ In. Diam.	____ No.	Classification By:	

SCALES ELEV.	SCALES DEPTH	CORE/SAMPLE NO. SYMBOL	CORE/SAMPLE SIZE	BLOWS PER FT DEPTH RANGE	BLOWS PER FT CORE REC'VY	SAMPLING & CORING OPERATIONS	WELL	MATL	CLASSIFICATION OF MATERIALS
									0.0 - 4.0 Fill
	5								4.0 - 5.0 gravelly SAND; 85% coarse, medium, and fine grained sand, 15% gravel, trace of silt; 5Y2.5/1; moist; sand: 70% quartz, 20% basalt, 10% felsics and other lithics (mica, etc.); angular to subangular; gravel: small to medium pebbles; basalt and quartzite; no visible reaction to acid.
	10								5.0 - 7.3 gravelly SAND; 90% sand, 10% gravel; sand: medium to fine grained; gravel: small pebbles; moist (due to rain); 50% quartz, 40% basalt, 10% lithics (5-8% felsics, 2% mica); moderately sorted; 5Y2.5/1; angular to subangular; pebbles subrounded to rounded.
	15								7.3 - 18.8 silty GRAVEL; 50% silt, 50% gravel; 5Y4/1; dry; poorly to moderately sorted; angular to subangular to subrounded; 50% quartz, 40% basalt, 10% lithics; slight reaction to acid. Same as above with a trace of sand.
	20			18.8 21.3					18.8 - 26.4 silty GRAVEL; 85% gravel, 15% silt, trace of sand; pebbles and cobbles in gravel; 5Y4/1; poorly sorted; angular to subangular to subrounded to rounded; 50% basalt, 40% quartz, 10% felsics; mild to strong reaction to acid.
				23.7 26.2					

GENERAL REMARKS:

Boring logged by Westinghouse-Hanford personnel, Drilling contractor - Harrison-Western Company

BORING No. MW-24

Site 1100 Area Consolidation Boring No. MW-24 Desig. MW-24 Page 2 of 2 Pages

SCALES ELEV.	SCALES DEPTH	CORE/SAMPLE NO. SYMBOL	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT CORE REC'VY	SAMPLING & CORING OPERATIONS	WELL	MATL	CLASSIFICATION OF MATERIALS
	30			28.8 31.3					26.4 - 28.0 SAND; 100% sand; 95% coarse to very coarse grained, 5% medium grained; 2.5Y2/0; slightly moist; fairly well sorted; angular to subangular to subrounded; 50% basalt, 40% quartz, 10% felsics and mica. 28.0 - 41.4 SAND; 100% sand; 95% medium to fine grained, 5% very fine grained; 2.5Y3/3; slightly moist; well sorted; subangular to subrounded; 65% quartz, 30% basalt, 5% lithics; no visible reaction to acid.
	35			33.8 35.8					
	40			38.7 40.7					
	45			43.8 45.8					41.4 - 43.8 gravelly SAND; 90% sand, 10% cobbles; sand: coarse to medium coarse to medium grained; 2.5Y2/0; moist (due to rain); moderately sorted; subangular to subrounded; cobbles: subrounded to rounded; 50% basalt, 40% quartz, 10% lithics and felsics; no visible reaction to acid. 43.8 - 46.3 gravelly silty SAND; 25% gravel, 35% silt, 40% sand; dry; 5Y2.5/1; poorly sorted; sand: angular to subangular to subrounded, 55% quartz, 40% basalt, 5% felsics; pebbles: 95% basalt, 5% others; no visible reaction to acid.
	50			48.6 51.1					46.3 - 50.0 silty GRAVEL; 90% gravel, 10% silt; 5Y5/1; dry; moderately sorted; gravel: subangular to subrounded; 95% basalt, 5% other; silt: 85% basalt, 10% quartz, 5% felsics; no visible reaction to acid. 50.0 - 52.4 silty sandy GRAVEL; 80% gravel, 10% sand, 10% silt; 5Y3/1; poorly sorted; dry; angular to subangular to subrounded; 45% quartz, 45% basalt, 10% felsics w/trace of mica; no visible reaction to acid. 52.4 - 57.0 gravelly silty SAND; 25% gravel, 25% silt, 50% sand; 5Y4/1; wet; poorly sorted; angular to subangular; 45% quartz, 45% basalt, 10% felsics; no visible reaction to acid.
	55			53.8 55.8					
	60								57.0 - 59.0 SAND; 95% fine to medium grained sand, 5% gravel; wet; fairly well sorted; subangular to subrounded to rounded; 50% quartz, 35% basalt, 10% felsics, 5% mica; no reaction to acid. 59.0 - 68.0 SAND; 100% sand; 5Y3/1; wet; very well sorted; 60% quartz, 30% basalt, 5% felsics, 5% mica; no reaction to acid.
	65								Bottom of boring @ 68.0 ft.

BORING No. MW-24

U.S. ARMY
CORPS OF ENGINEERS
WALLA WALLA DISTRICT

Site 1100 Area Consolidation Page 1 of 2 Pages

Boring No. MW-25 Desig. MW-25 Diam.(Casing) ____

Co-ordinates N 111250.1 E 593983.1

TEST BORING FIELD LOG

Elevation Top of Boring	404.47 ft M.S.L	Hammer Wt. ____	Boring Started NOV 25 91
Total Overburden Drilled	52.5 Feet	Hammer Drop ____	
Elevation Top of Rock	____ M.S.L	Casing Left ____	Boring Completed ____
Total Rock Drilled	0.0 Feet	Subsurface Water Data ▽ 52.5 ▼ ____	Page ____
Elev. Bottom of Boring	____ M.S.L	Obs. Well ____	
Total Depth of Boring	52.5 Feet	Drilled By:	K. DeHart
Core Recovered ____ %	Boxes ____ No.	Mfg. Des. Drill:	____
Core Recovered ____ Ft: ____	Diam. ____ In.	Inspected By:	____
Soil Samples ____ In. Diam.	10 No.	Classification By:	P. Battuello (ICF)
Soil Samples ____ In. Diam.	____ No.	Classification By:	____

SCALES ELEV.	SCALES DEPTH	CORE/SAMPLE NO. SYMBOL	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT CORE REC'VY	SAMPLING & CORING OPERATIONS	WELL	MATL	CLASSIFICATION OF MATERIALS
									0.0 - 4.5 FILL
	5			5.0 6.0					4.5 - 8.0 sandy GRAVEL; wet (due to rain).
				8.0 10.0					8.0 - 10.5 sandy GRAVEL; dry; contains basalt cobbles to 6 inches.
	10								10.5 - 23.0 SAND; medium to coarse sand; quartz, basalt, and metamorphic grains.
	15			14.0 16.0					
				18.2 20.0					
	20								
				23.0 25.0					23.0 - 33.0 cobbly SAND; medium to coarse grained sand; sand: basalt, quartz, and metamorphic grains; cobbles: metamorphic and basalt composition

GENERAL REMARKS:

Geology logged by ICF for Westinghouse-Hanford, Drilling Contractor - Harrison-Western Company

BORING No. MW-25

Site 1100 Area Consolidation Boring No. MW-25 Desig. MW-25 Page 2 of 2 Pages

SCALES: ELEV.	SCALES: DEPTH	CORE/SAMPLE: NO. SYMBOL	CORE/SAMPLE: SIZE	CORE/SAMPLE: DEPTH RANGE	BLOWS PER FT / CORE REC'VY	SAMPLING & CORING OPERATIONS	WELL	MATL	CLASSIFICATION OF MATERIALS
				28.0 30.0					
	30								
				33.0 35.0					33.0 - 40.0 SAND with cobbles; sand: medium to coarse grained; basalt and quartz grains; cobbles: metamorphic and basalt composition.
	35								
				38.0 40.0					
	40								40.0 - 45.0 sandy GRAVEL; 40% sand, 60% gravel; contains basalt cobbles to 5 inches.
				43.0 45.0					
	45								45.0 - 49.0 sandy silty GRAVEL; 30% sand, 60% gravel, 10% silt; basalt cobbles to 6 inches; moist; capillary fringe(?).
				48.0 50.0					49.0 - 52.5 silty gravelly SAND; coarse grained; 75% sand, 15% gravel, 10% silt; moist.
	50								
									Bottom of boring @ 52.5 ft. Water level measured @ 52.5 ft.

BORING No. MW-25

AERIAL PHOTOS OF 1100-EM-2, 1100-EM-3, AND 1100-IU-1

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93129341335


9312934133 36
1955 AERIAL PHOTO
OF
IU-1 CONTROL CENTER
0
500
1000
1500
2000
SCALE IN FEET

Photo 1

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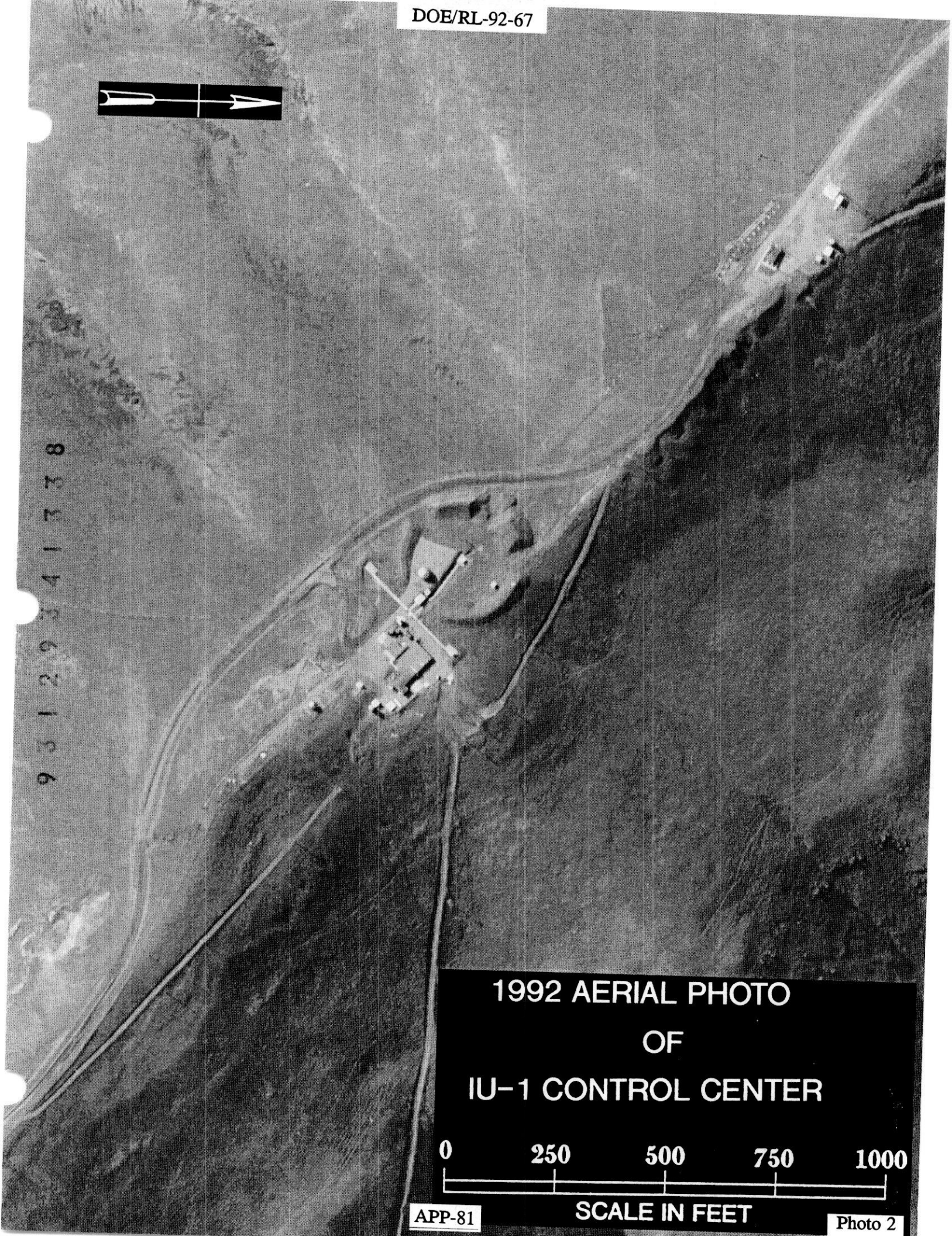
9512634138
1992 AERIAL PHOTO
OF
IU-1 CONTROL CENTER
0
250
500
750
1000
SCALE IN FEET

Photo 2

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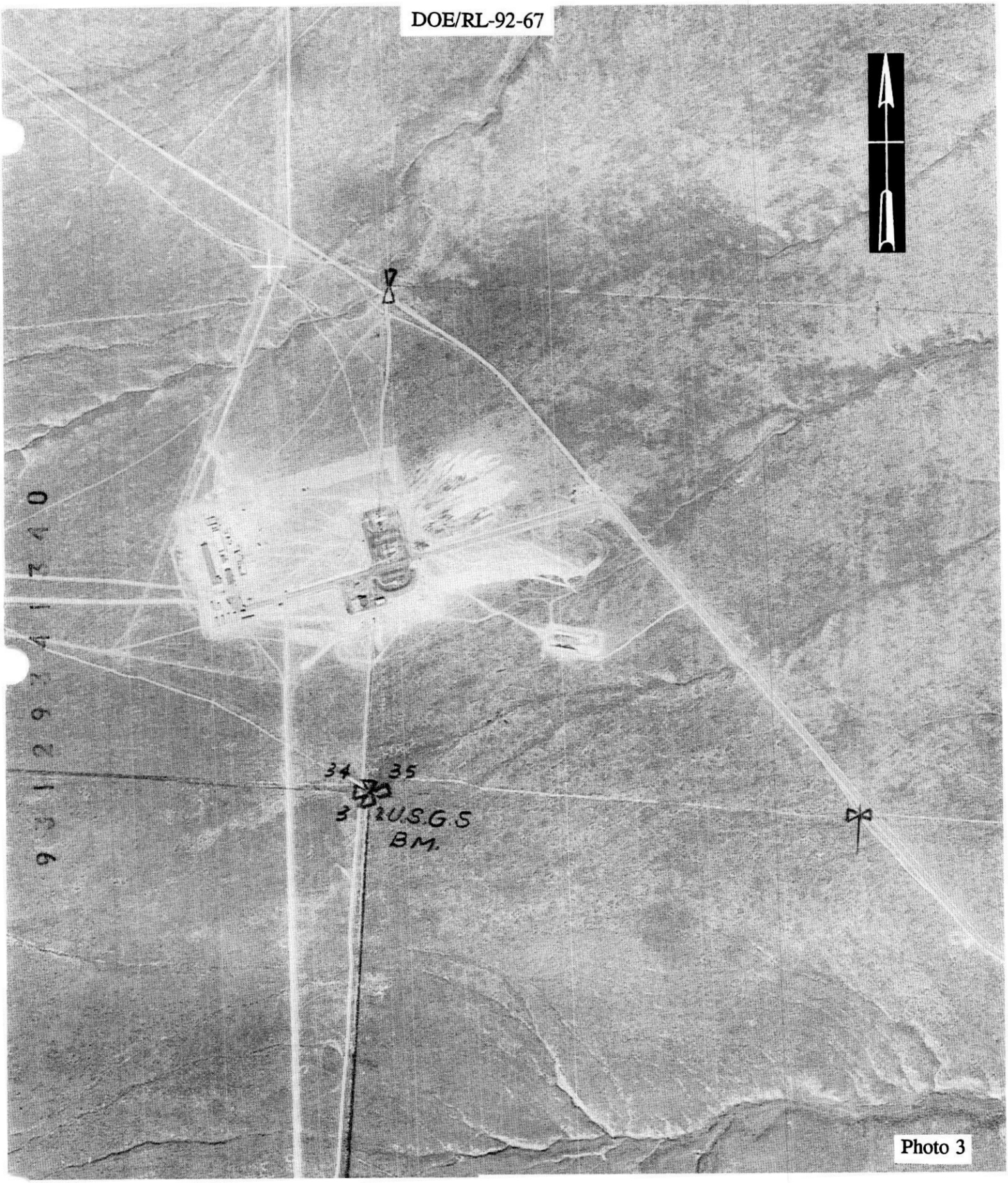

500 1000 1500 2000

SCALE IN FEET

1955 AERIAL PHOTO OF 1100 IU-1 LAUNCH SITE

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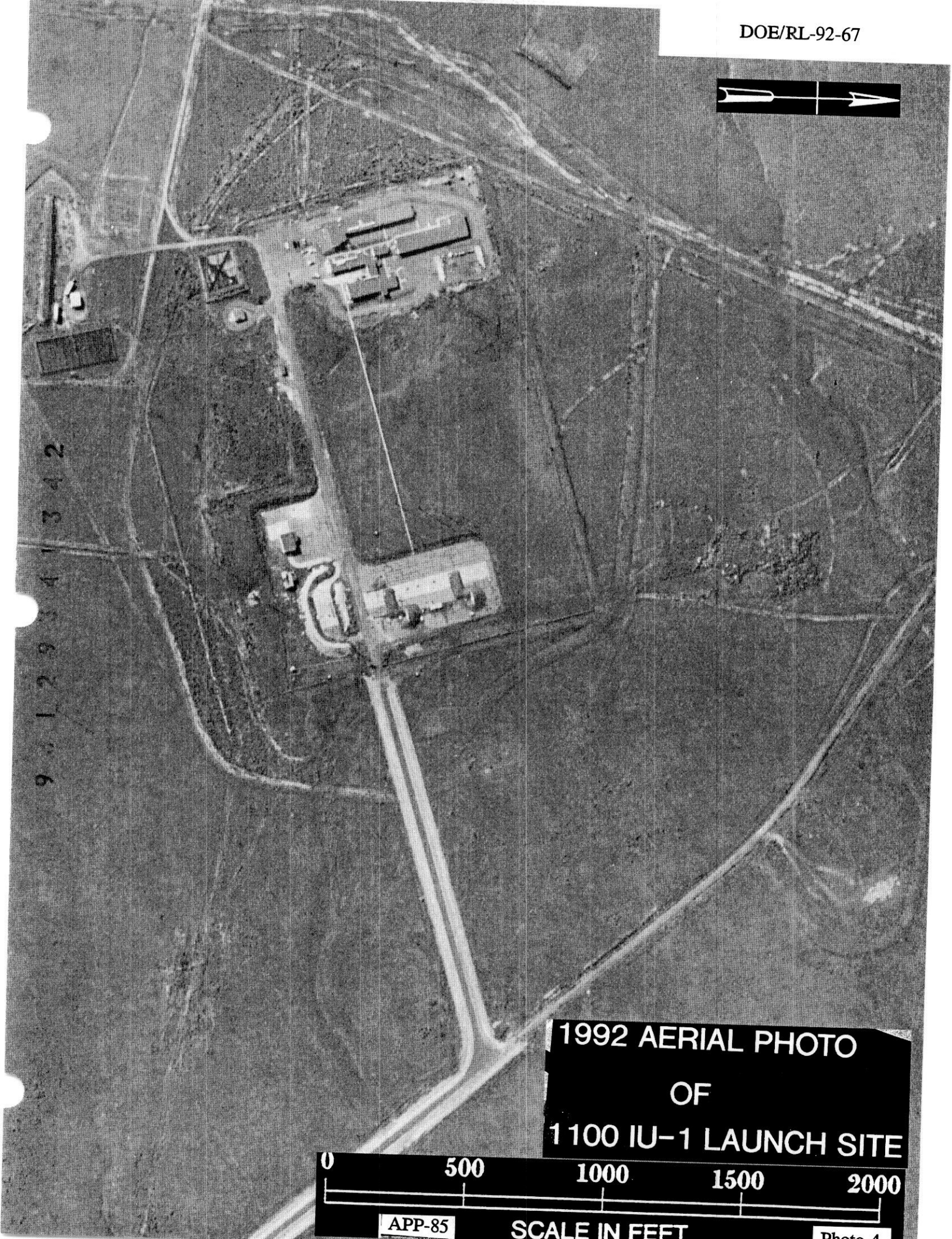
9 1 2 9 4 - 3 4 2
1992 AERIAL PHOTO
OF
1100 IU-1 LAUNCH SITE
0
500
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1500
2000
SCALE IN FEET

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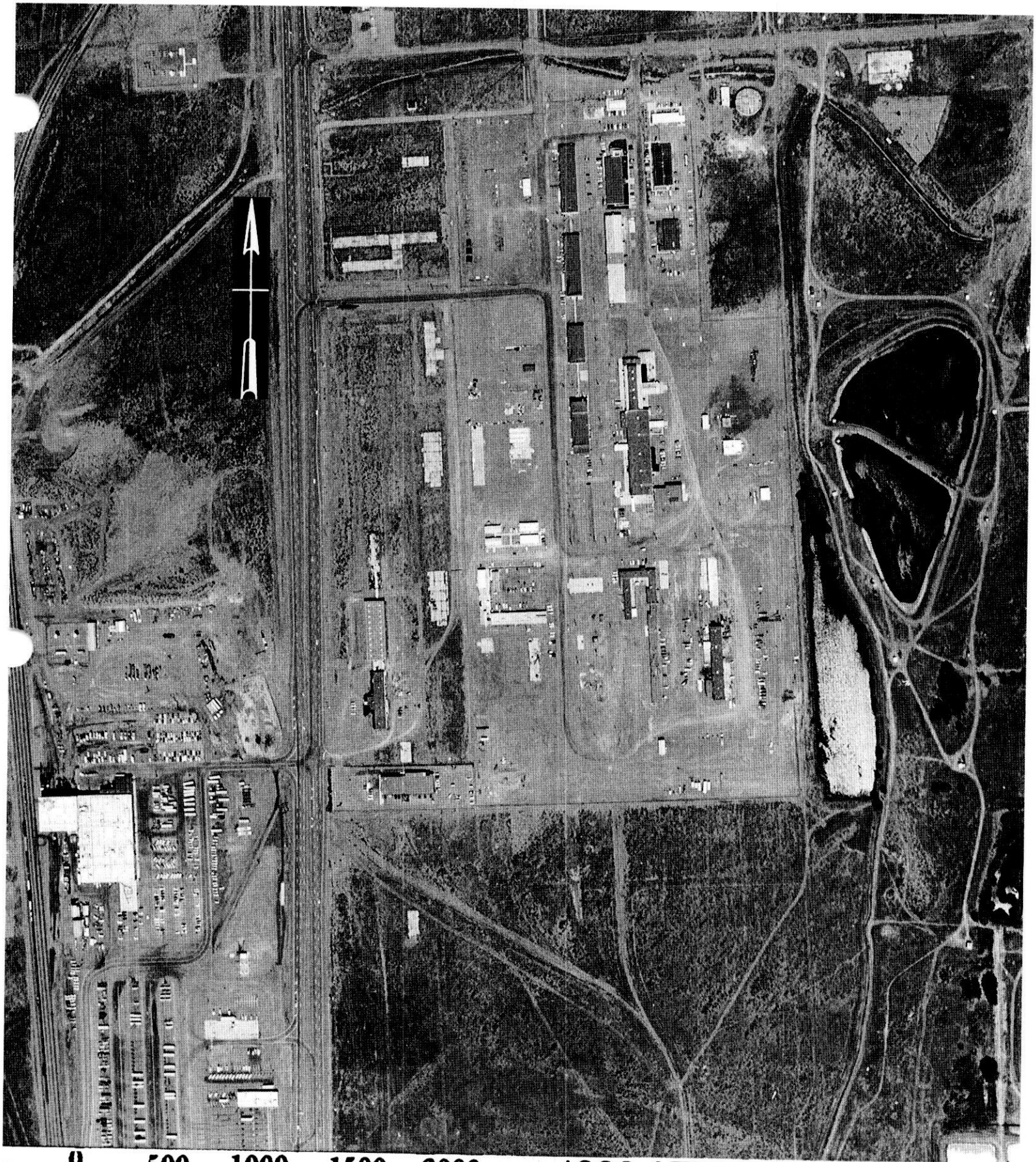

0 500 1000 1500 2000

SCALE IN FEET

1990 AERIAL PHOTO

OF

1100 EM2 & EM3

Photo 5

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1948 AERIAL PHOTO
OF
1100 EM-2

0 250 500 750 1000

SCALE IN FEET

Photo 6


1948 AERIAL PHOTO
OF
1100 EM-2 & EM-3
0
500
1000
1500
2000
SCALE IN FEET

Photo 7