APR 4 1994

0035910

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 604299

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) Restoration Remediation Engineering	4. Related EDT No.: NA
5. Proj./Prog./Dept./Div.: ER	6. Cog. Engr.: R.W. Carpenter	7. Purchase Order No.: NA
8. Originator Remarks: Release to file		9. Equip./Component No.: NA
		10. System/Bldg./Facility: NA
11. Receiver Remarks:		12. Major Assm. Dwg. No.: NA
		13. Permit/Permit Application No.: NA
		14. Required Response Date: 3/28/94

APR 1994 RECEIVED EPIC

9413275.1763

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Impact Level	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-EN-TI-239		0	100-K Area Technnical Baseline Report	NA	1/2	1	

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1/2	1	Cog.Eng. R.W. Carpenter	[signature]		H6-07						
1/2	1	Cog. Mgr. R.D. Fox	[signature]		H6-07						
		QA									
		Safety									
		Env.									
3		Central Files (2)			L8-04						
3		EPIC (2)			H6-08						

18.	19.	20.	21. DOE APPROVAL (if required)
R.W. Carpenter [signature] 3-30-94 Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	R.D. Fox [signature] 3-30-94 Cognizant/Project Engineer's Manager Date	Ltr. No. [] Approved [] Approved w/comments [] Disapproved w/comments

BD-7400-172-2 (07/91) GEF097

BEST AVAILABLE COPY

BD-7400-172-1 (07/

THIS PAGE INTENTIONALLY LEFT BLANK

Date Received: 2/11/94 DS

INFORMATION RELEASE REQUEST

Reference: WHC-CM-3-4

Complete for all Types of Release

Purpose

- [] Speech or Presentation
  - [] Full Paper (Check only one suffix)
  - [] Summary
  - [] Abstract
  - [] Visual Aid
- [] Speakers Bureau
- [] Poster Session
- [] Videotape
- [] Reference
- [X] Technical Report
- [] Thesis or Dissertation
- [] Manual
- [] Brochure/Flier
- [] Software/Database
- [] Controlled Document
- [] Other

ID Number (include revision, volume, etc.): WHC-SD-EN-TI-239, Rev. 0

List attachments.

Date Release Required: 02/22/94

Title: 100-K Area Technical Baseline Report

Unclassified Category: UC-

Impact Level: 4

New or novel (patentable) subject matter? [X] No [] Yes
If "Yes", has disclosure been submitted by WHC or other company?
[] No [] Yes Disclosure No(s).

Information received from others in confidence, such as proprietary data, trade secrets, and/or inventions?
[X] No [] Yes (Identify)

Copyrights? [X] No [] Yes
If "Yes", has written permission been granted?
[] No [] Yes (Attach Permission)

Trademarks?
[X] No [] Yes (Identify)

Complete for Speech or Presentation

Title of Conference or Meeting: NA

Group or Society Sponsoring: NA

Date(s) of Conference or Meeting: NA

City/State: NA

Will proceedings be published? [] Yes [] No

Will material be handed out? [] Yes [] No

Title of Journal: NA

CHECKLIST FOR SIGNATORIES

Review Required per WHC-CM-3-4	Yes	No	Reviewer - Signature Indicates Approval: Name (printed)	Signature	Date
Classification/Unclassified Controlled Nuclear Information	[]	[x]			
Patent - General Counsel	[x]	[]	S W BERGLIN	[signature]	2/11/94
Legal - General Counsel	[x]	[]			
Applied Technology/Export Controlled Information or International Program	[]	[x]			
WHC Program/Project	[x]	[]	J.K. Patterson	[signature]	3/12/94
Communications	[]	[x]			
RL Program/Project	[x]	[]	E.D. Goller	E Goller per telecon	3-6-94
Publication Services	[x]	[]	L.A. Brown	[signature]	2/11/94
Other Program/Project	[]	[x]			

Information conforms to all applicable requirements. The above information is certified to be correct.

	Yes	No
References Available to Intended Audience	[x]	[]
Transmit to DOE-HQ/Office of Scientific and Technical Information	[]	[x]

Author/Requestor (Printed/Signature) Date

R.W. Carpenter [signature] 2-10-94

Intended Audience

[] Internal [] Sponsor [X] External

Responsible Manager (Printed/Signature) Date

R.D. Fox [signature] 2-11-94

INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP

Stamp is required before release. Release is contingent upon resolution of mandatory comments.

APPROVED FOR RELEASE — OFFICIAL DOCUMENT — CW — Date 4/12/94 — by KE

Date Cancelled

Date Disapproved

9413275.1761

THIS PAGE INTENTIONALLY
LEFT BLANK

SUPPORTING DOCUMENT

1. Total Pages 241

2. Title	3. Number	4. Rev No.
100-K Area Technical Baseline Report	WHC-SD-EN-TI-239	0

5. Key Words

history
decontamination
reactor
basins
cooling water

APPROVED FOR PUBLIC RELEASE

KE for ALW 4/18/94

6. Author

Name: R.W. Carpenter

Signature

Organization/Charge Code 8B200/P711B

7. Abstract

Carpenter, R. W., and S. L. Cote', 1994, *100-K Area Technical Baseline Report*, WHC-SD-EN-TI-239, Westinghouse Hanford Company, Richland, Washington.

8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.

PATENT STATUS - This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA.

9. Impact Level NA

10. RELEASE STAMP

OFFICIAL RELEASE (11)
BY WHC
DATE APR 12 1994
Station #12

9413275.1765

THIS PAGE INTENTIONALLY
LEFT BLANK

CONTENTS

CONTENTS (cont)

CONTENTS (cont)

APPENDIXES:

FIGURES:

CONTENTS (cont)

FIGURES (cont):

CONTENTS (cont)

FIGURES (cont):

CONTENTS (cont)

FIGURES (cont):

TABLES:

CONTENTS (cont)

TABLES (cont):

1.0 INTRODUCTION

This document is prepared in support of the 100 Area Environmental Restoration activity at the U.S. Department of Energy's (DOE) Hanford Site near Richland, Washington. It provides a technical baseline of waste sites located at the 100-K Area. The report is based on an environmental investigation undertaken by the Westinghouse Hanford Company (WHC) History Office in support of the Environmental Restoration Engineering Function and on review and evaluation of numerous Hanford Site current and historical reports, drawings, and photographs, supplemented by site inspections and employee interviews. No intrusive field investigation or sampling was conducted. All coordinate locations are approximate locations taken from several different maps and drawings of the 100-K Area. Every effort was made to derive coordinate locations for the center of each facility or waste site, except where noted, using standard measuring devices. It must be noted that the 100-K Area coordinate grid is unique to 100-K Area and is rotated 27^0 09' 59" counterclockwise from the standard Hanford Site Coordinate system of measure. Not all of the wastes sites included in the 100-K Area use this 100-K Area grid and are so noted in the applicable sections. All other units of measure are shown as they appear in reference documents.

The 100-K Area is made up of four operable units: 100-KR-1, 100-KR-2, 100-KR-3, and 100-KR-4. Three of these operable units, 100-KR-1, 100-KR-2, and 100-KR-3, are addressed in this report. They include liquid and solid waste disposal sites in the vicinity of, and related to, the 105-KE and 105-KW Reactors. The fourth operable unit, 100-KR-4, is concerned with groundwater and is not addressed here. This report describes waste sites which include cribs, trenches, pits, french drains, retention basins, solid waste burial grounds, septic tanks, and drain fields. Each waste site is described separately. Photographs are provided where available. A complete list of photographs can be found in Section 11.0.

A comprehensive environmental summary is not provided here but may be found in *Hanford Site National Environmental Policy Act Characterization*, which describes the geology and soils, meteorology, hydrology, land use, population, and air quality of the area (Cushing 1988).

2.0 BACKGROUND

2.1 GENERAL DESCRIPTION OF 100-KE/KW FACILITIES

Nine water-cooled, graphite moderated, plutonium production reactors were constructed by the U.S. Government along the Columbia River at the Hanford Site between 1943 and 1963. All nine are owned by the U.S. Government and are managed by the DOE. The reactors are retired from service and have been declared surplus by DOE; all except N Reactor are available for decommissioning at this time (DOE 1989). The 105-KE and 105-KW Reactors are two of these nine (Figure 2-1).

Figure 2-1. 100-K Area, March 1, 1962.

The 100-KE/KW Area includes the 105-KE and 105-KW Reactor Buildings and their support facilities, to include water treatment facilities, administrative office buildings, laboratories, maintenance shops, and various other buildings and structures.

The area is divided into four operable units: 100-KR-1, 100-KR-2, 100-KR-3, and 100-KR-4. The 100-KR-1, 100-KR-2, and 100-KR-3 are composed of the physical structures, potential source units, and the vadose zone within the boundaries of the 100-K Area. The 100-KR-4 Operable Unit includes releases to the groundwater system, surface water, sediments, and aquatic biota from the 100-K Area. Because the 100-KR-4 Operable Unit is concerned solely with groundwater, it is beyond the scope of this document and is therefore not discussed further.

2.2 AREA HISTORY

Anciently, the area of 100-K adjacent to the Columbia River was used as a hunting and fishing ground for Native Americans. Seven prehistoric sites and a single farmstead have been identified by Pacific Northwest Laboratories (PNL) within or near the 100-K Area. Five of these are remnants of Native American activity in the area and consist of shell, basalt cores, tertiary flakes, fire cracked rock, cobble tools, and evidence of structures used by Native Americans.

Three of these sites are located to the west outside the operable unit boundaries for the 100-K Area. They are identified as sites H3-10, 45BN115, 45BN464, which consist of a farm site and two Native American sites. Two of the remaining sites are of Historical significance, one of which does not yet have a state number assigned to it.

The first of these two sites, 45BN424, "is the most complex archaeological site discovered during survey of the 100 areas." This site contains seven shallow house pits, one of which appears to be a sweat lodge. A long oval depression may have been a long house. Artifacts include hopper bases, mortar bases, and hammer stones. This site also fits the description of a Wanapum village, "where the Washane prophet Smohala held the first dance of the revitalized traditional religion" practiced today by members of the Yakima, Umatilla, Wanapum and Warm Springs tribes. The down stream portion of the site contains older artifacts dating to the earlier Frenchman Springs era.

The second site, currently numbered HT-91-009 is "paved" by fire cracked rock and is unique to the Hanford Site. No other fire cracked rock concentrations of the magnitude at the Hanford Site have ever been documented previously. It is located adjacent to what was known as Coyote Rapids and may have been a fish processing location of the Wanapum tribe. The site is a gravel beach on the river shoreline that apparently was favored because it was easier to keep sand off the fish during processing.

The final site located in the 100-K Area, 45BN423, is located just north of the 100-KE retention basins along the river shoreline and contains cobble tools and other artifacts.

Three remaining prehistoric sites were identified in an earlier survey of the area and are situated to the east between the 100-K and 100-N Areas. These sites are identified as 45BN149, 45BN150, and 45BN151, which are two camp sites and a cemetery. These three sites have been placed on the National Register of Historic Places as the Ryegrass Archaeological District (Cushing 1991).

The area included in and immediately adjacent to the 100-KR-1, 100-KR-2, and 100-KR-3 Operable Units was used for livestock grazing prior to its acquisition by the U.S. Army in January 1943. Irrigated land and two homesteads were located nearby to the west. One homestead is thought to be the home of the maintenance man for the Allard Pumping Plant located upstream of the 100-K Area. Portions of the Hanford Ditch remain intact on the east and west sides of 100-K Area. Without the pumping plant and ditch, the communities of White Bluffs and Hanford probably would not have prospered (DOE-RL 1992a). Only a portion of the second homestead crossed into the 100-K Area operable unit boundaries. No other homesteads are known to have been located within the 100-K Area boundaries (Figure 2-2).

Figure 2-2. Pre-Hanford Farm Site, July 15, 1941.

Some 100-K Area facilities have been deactivated. Parts of the water treatment facilities remain active to provide for facility and reactor fuel storage basin needs. The electrical distribution system, for the most part, remains active.

Boaters and sports fisherman frequent the Columbia River adjacent to the site but are legally prohibited from trespassing.

2.3 REACTOR SITE HISTORY

Construction of the 100-K Area reactors began in September 1952. These two reactors were constructed as part of "Project X," a large Cold War expansion effort at Hanford (Hale 1957b). Their mission was to generate plutonium for explosive devices to be used in the building up of a nuclear deterrent arsenal. The Korean conflict was in full swing and it was feared that China and the Soviet Union would become involved escalating the conflict into a third world war.

The construction of the 1850 megawatt (nameplate design power level) reactors was completed in May 1955, although initial startup began January 1955 for 100-KW, and April 1955 for 100-KE. Construction, from ground breaking to initial operation, took 27 months (DeNeal 1965). This construction was timed to coincide with the completion of the 100-C Reactor Project with the intent of maintaining a capable workforce in the Hanford Area. Construction also included the 2101 Building in the 200 Areas for the machining and warehousing of the graphite to be used as the moderator in the two reactor facilities (Hale 1957b).

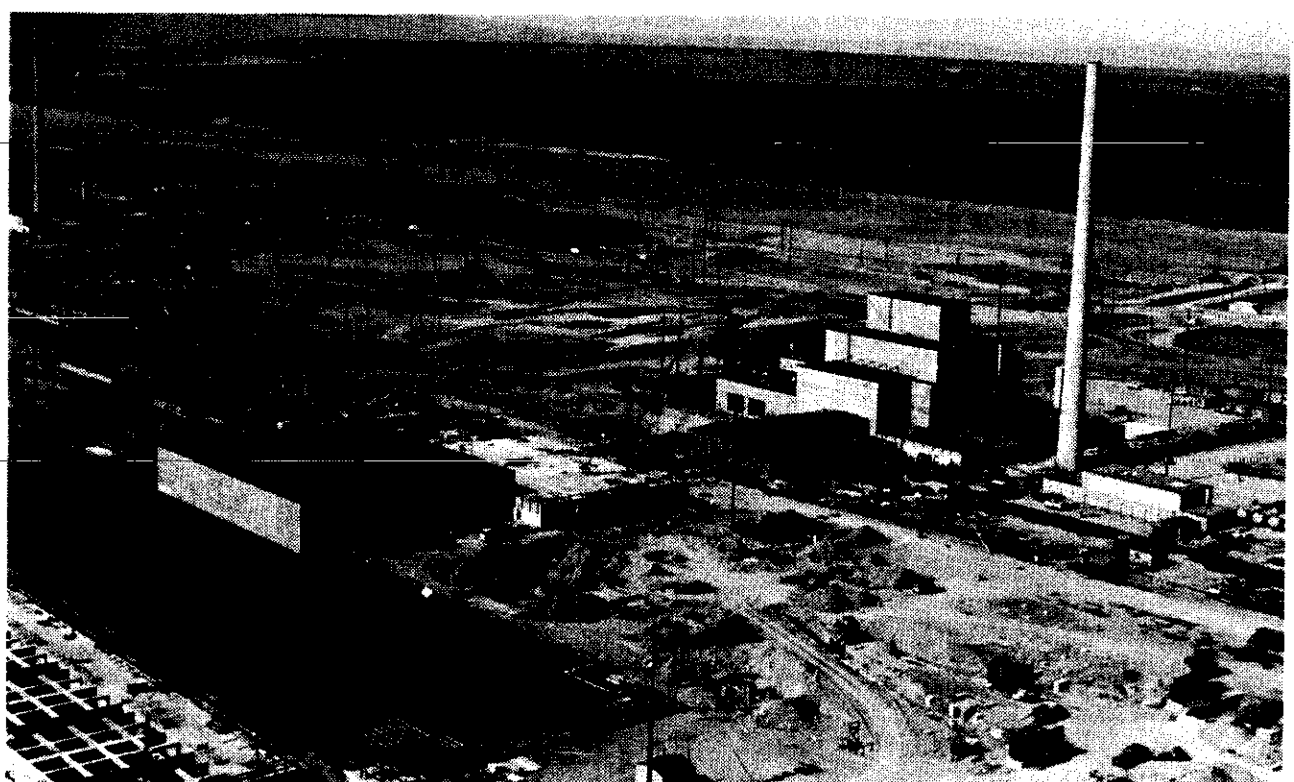
The 100-KE and 100-KW Reactors were the largest of the reactors built as of that date. The design and construction of all 100-K Area facilities "embodied maximum provision for minimum damage and quick recovery from enemy attack", consistent with a minimum increase in cost (Figures 2-3 and 2-4). Features of this design included:

- Separation between the two reactor facilities to minimize the chance that both facilities could be "knocked out at once".
- Interdependent components of each plant are grouped in small areas.
- Alternate sources of power, water, and pumping facilities were separated as far as possible.
- Facilities essential to reactor safety were housed in heavy bomb resistant buildings.
- Additional facilities were designed with frangible walls and roofs.
- Piping and wiring critical to operations was buried belowgrade with additional protection from bombing.
- Water and fuel storage was kept below ground grade.
- All structures were kept as low as possible.
- Control was automated and centralized, reducing to about one fifth the operations personnel required.
- Emergency power generating plants were fired by fuel oil, instead of coal. Reducing fuel storage and handling problems, waste streams, and size of needed facilities (Hale 1957b).

Each reactor contained 3,220 individual process tubes as compared to the 2,004 in previous reactors (100-B, D and F) (Hale 1957b). Because of the increased size of the reactors, there was also additional control facilities. Each reactor contained 20 Horizontal Control Rods, 45 Vertical Safety Rods and Ball 3X Safety Systems. There was also an increase in the number of test facilities or openings into the reactor cores, 16 for each reactor (Miller and Steffes, 1986).

Figure 2-3. 100-K Area During Construction, June 3, 1953.

Figure 2-4. 100-K Area During Construction, March 24, 1954.



Operating initially at 1850 megawatts (thermal) power, 100-KE and -KW operating limits were gradually increased until a limit of 4400 megawatts was authorized in 1961. The 100-K Area reactors were the "workhorses" of the Hanford site in terms of full power operating days, both operated at full power in excess of 5,000 days (14.5-yr for 100-KE and 13.8-yr for 100-KW). Operations continued until deactivation February 1970 for 100-KW and January 1971 for 100-KE. The reactors have remained in deactivated status since that date. However, the fuel storage basins and small portions of both reactor buildings remain active for the storage of irradiated fuels from 100-N Reactor.

The 100-K Area (Figures 2-5 and 2-6) consists of several major buildings including the reactor buildings and numerous structures associated with the treatment and storage of reactor cooling water prior to its use. Most facilities were deactivated with the reactor buildings. A portion of the water treatment facilities at 100-KE remains active to supply for the needs of the still active fuel storage basins at both 100-KE and 100-KW. Some of the remaining facilities are currently used for storage.

The liquid effluents generated as a direct result of reactor operations consisted primarily of reactor cooling water, fuel storage basin water, and decontamination solutions. These effluents are thought to be the most significant wastes in the 100-K Area in terms of potential impact to the groundwater. Tens of millions of liters of this waste were disposed directly to the soil column both intentionally and as a result of leaks in the cooling water effluent system (DOE-RL 1992a).

Figure 2-5. 100-K Area from the Southwest, January 20, 1955.

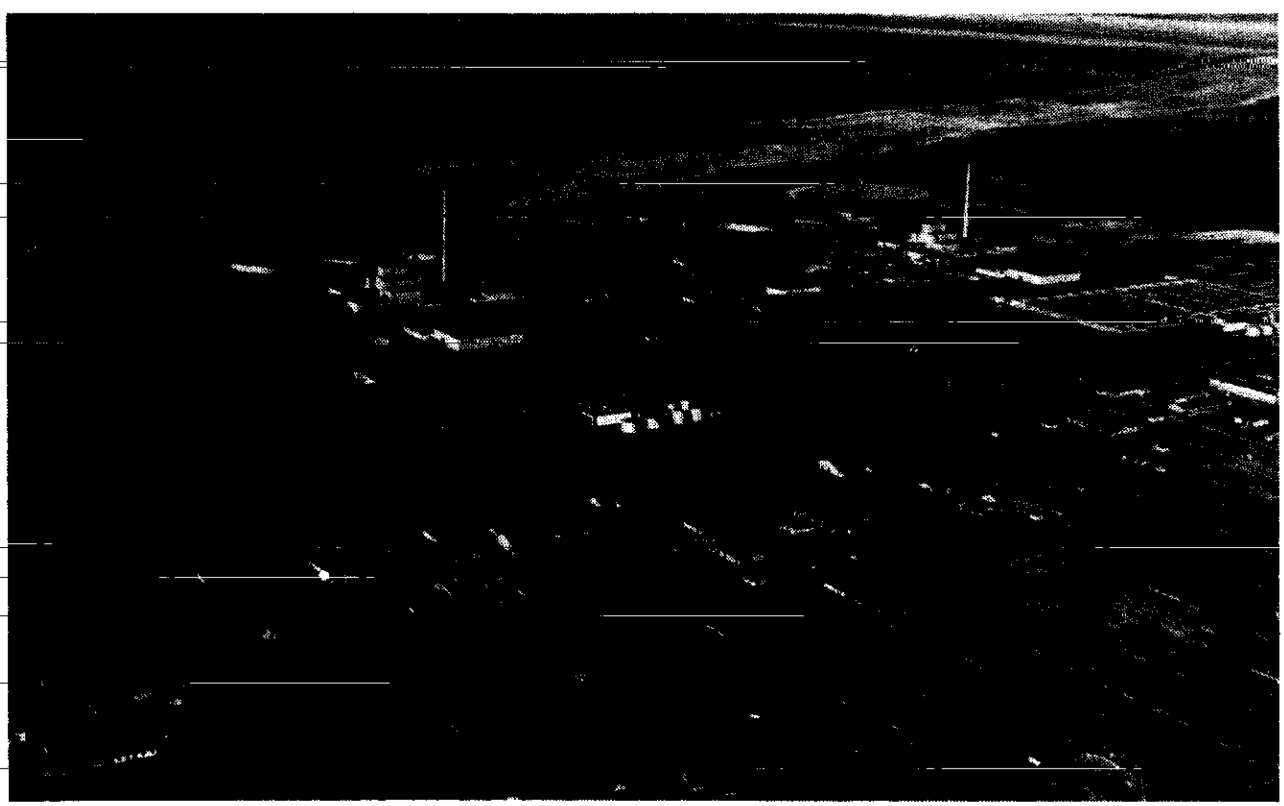
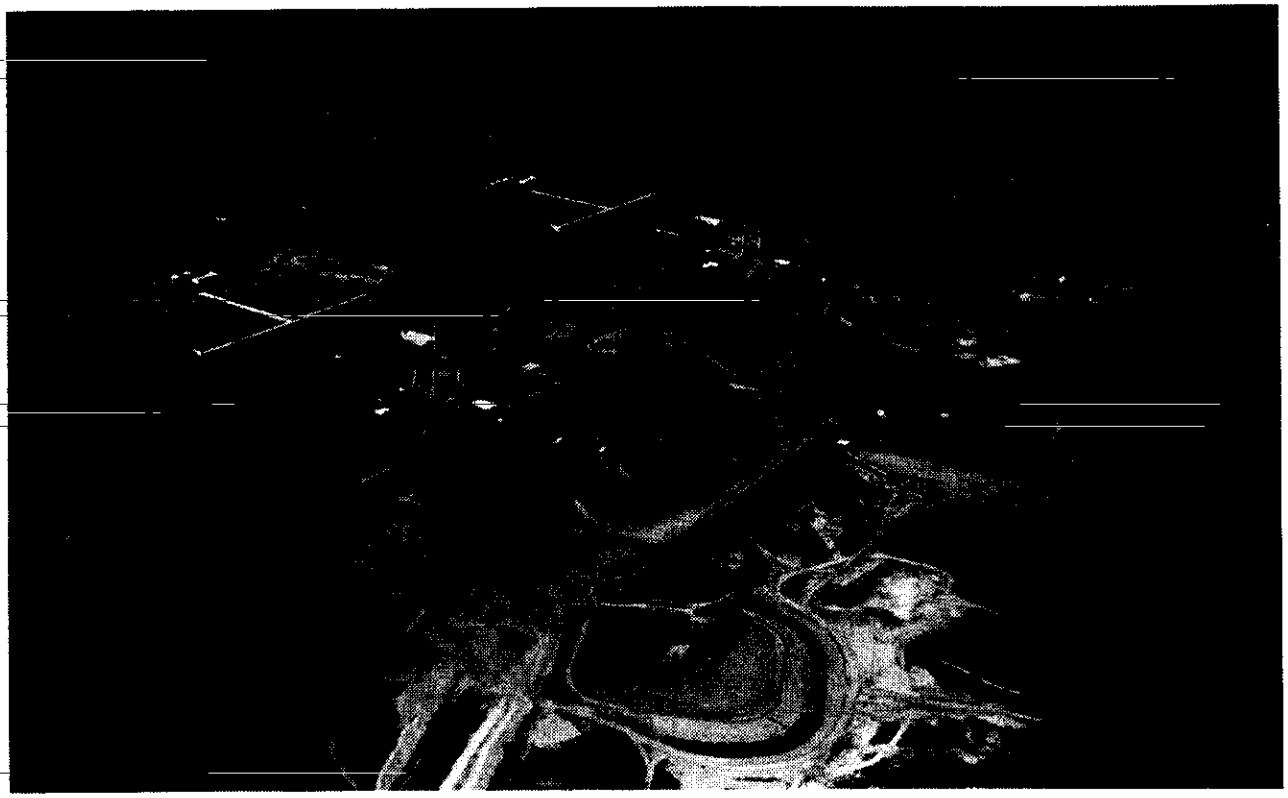


Figure 2-6. 100-K Area Aerial View, June 6, 1955.



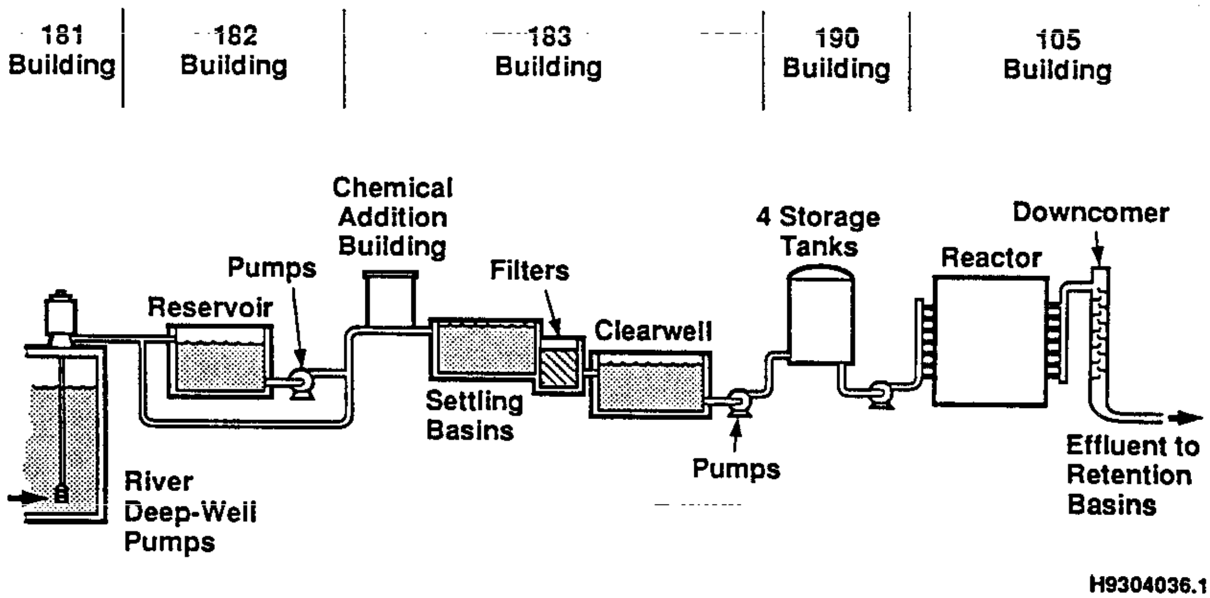
9412275.1782

2.3.1 Reactor Process Liquid Wastes and Cooling Water Effluent

A continuous supply of high-quality cooling water was essential to reactor operations. It prevented reactor core damage from heat generated by the fission reactions. Many of the 100-K Area facilities were part of this cooling water system. At a daily use rate of between 288 million and 4.032 billion gal, this system generated the largest liquid waste volume in the area (Figure 2-7).

Water obtained from the Columbia River was extensively treated before passing through the reactors. Settling, chemical treatment, filtering, and pH management were utilized to purify and prepare the water. It then circulated in a single pass through the reactor process tubes, cooling tubes imbedded in the thermal shield, biological shields, and reactor horizontal control rods. The cooling water exiting the reactors contained radioactive species from the reactors, activated products from impurities in the water, and chemical contaminants added to treat the raw water before use. After exiting the reactors, the cooling water passed through retention basins and was discharged through an outfall structure to the center of the river via large steel pipes embedded in the river bottom.

Figure 2-7. Typical Water Treatment System.



While passing through the reactor cores, the water absorbed thermal energy from the nuclear process and became contaminated with radioisotopes. Sources of contamination included the following:

- The high neutron flux in the reactor cores activated elements in the cooling water, creating species such as ^{41}Ca, ^{51}Cr, and ^{65}Zn. Most of the species were relatively short-lived and have since decayed to negligible levels. Calcium-41 is a notable exception.

- Activation products from the graphite reactor cores, other reactor components, and fuel cladding were picked up by the cooling water. Significant species included tritium, ^{14}C, ^{60}Co, ^{63}Ni, and $^{152/154/155}Eu$.

- Fuel element fission products, such as ^{90}Sr and ^{137}Cs, and transuranics, such as $^{239/240}Pu$, were introduced into the cooling water due to fuel cladding failures.

The concentrations of radionuclides in reactor cooling water were low during normal operations.

Water discharged from the reactors was near boiling. It passed through at a rate of 100,000+ gal/min until 1962 when the flow was increased by 30,000 gal/min for both reactors (DeNeal 1965). Reportedly the flowrate after the upgrade to increase cooling water flow (CGI-883) was about 200,000 gal/min for each reactor facility.

The cooling water was transferred from the reactor buildings through effluent lines to the 116-KE-4 and 116-KW-3 retention basins for cooling and decay of short-lived radionuclides. The average retention time was about 1.5 hr (AEC-GE 1964).

From the retention basins, the water was transferred through large pipes to the 116-K-3 outfall structure and then into 84-in. pipes that discharged at the bottom center of the Columbia River. Shortly after initial operations, in April 1955 these effluent lines began to float and the top surface of the pipe was observed to rise out of the river to about 1.5 ft above the water surface. The lines failed and the reactors were shutdown until repairs could be made in May of that same year.

Overflow from the outfall structures could also discharge directly to the shore of the river through a concrete lined spillway and earth ditch.

Over time, the retention basins and effluent piping developed leaks. Cooling water was released to the area around the basins, lines, and river shore at a rate as high as several thousand liters/minute. Specific information on leak rates from the retention basins is not available, but was estimated to be between 10,000 to 20,000 gpm. During operations water pooled on the ground adjacent to the basins and was noted on several occasions (Dorian and Richards, 1978). Also surface contamination detected around the basins indicates that leakage did occur.

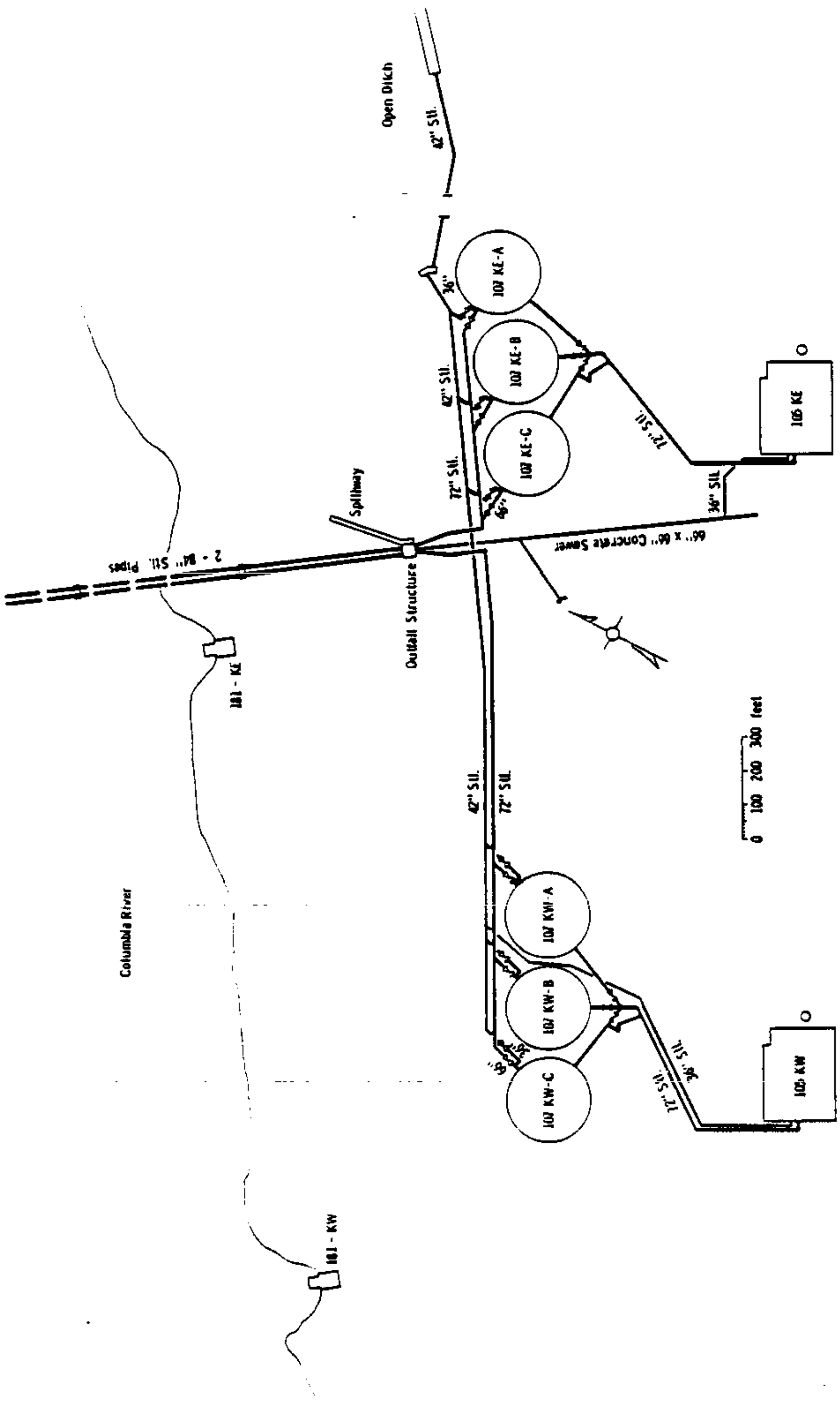
Beginning in 1948, fuel-cladding failures occurred while the fuel elements were in the reactor process tubes. Several hundred such failures occurred over the operational lifetime of the 105-KE and -KW Reactors (DeNeal 1965).

Fuel cladding failures caused the cooling water in the affected process tube to become highly contaminated. Elevated contamination levels were observed in the cooling water exiting the reactor. This contaminated cooling water was initially diverted to the 116-K-1 crib, which was reported to have been used only once because it failed to percolate. The water was then diverted to the 116-K-2 trench beginning in 1955, but leaking valves caused the crib to be filled with water beyond it's replacement in 1955 with the trench.

2.3.2 Fuel Storage Basin Water

Irradiated reactor fuel elements are stored at the bottom of large water filled storage basins pending their shipment to the chemical separation facilities in the 200 Areas (Figure 2-8).

Figure 2-8. 100-K Area Effluent System.



Fuel elements would frequently rupture and, after discharge to the fuel storage basin, be sectioned for examination. These ruptured fuel elements caused the shielding water to become highly contaminated. Newell (1964) describes fuel ruptures and examinations that occurred during 1964 and states that ruptures did occur at 100-KE and 100-KW. It is known that detailed examinations were performed on each ruptured fuel element that could be positively identified (occasionally the ruptured fuel element could not be isolated from the other fuel elements) (Newell 1964). On occasion, fuel elements would rupture or become damaged during handling and storage, causing contamination to the basin shielding water. Experience at other Hanford reactors suggests that the occurrence and inspections of these fuel ruptures almost certainly occurred at both 100-KE and 100-KW basins throughout their operating histories.

A number of irradiated uranium fuel elements were found in both fuel storage basins when sludge was removed in 1975 after reactor operations were terminated. Dorian and Richards (1978) reports that the 105-KW storage basin was cleaned, modified and being used for the storage of irradiated fuels from N Reactor. At the time of the report the 105-KE basin had been cleaned and was in the process of being modified for the same purpose. Both basins were modified to a recirculating cooling system by the utilization of heat exchangers once used to transfer heat from the reactor cooling water elimination system to facility heating. The 105-KE basin has been used to store fuels in open storage containers, while the fuels stored at the 105-KW basin are in sealed containers. Consequently the 105-KE basin is far more radioactively contaminated than the 105-KW basin (DOE-RL 1992b).

2.3.3 Decontamination Solutions

During reactor operations and reactor shutdowns, large quantities of decontamination solutions were routinely used to remove radionuclides from facility equipment and surfaces. Known decontamination solutions included chromic, citric, oxalic, nitric, sulfamic acids, fluoride, and other organic chemicals, including organic solvents, reportedly were used. The majority of these solutions were disposed in the 116-K-2 trench. Detailed descriptions of the known decontamination solution disposal sites are provided in the applicable operable unit section within this document.

Decontamination solutions were occasionally combined with reactor cooling water and discharged to the river. The solutions contained both radionuclide and chemical contaminants. Some of the compounds used in the decontamination solutions, such as oxalate and organic complexants, may potentially have solubilized and transported radionuclides and metals. The quantities of decontamination solutions, as well as other disposal locations, are not known (DOE-RL 1992a).

These solutions were generally disposed in cribs, trenches, and/or french drains in the immediate vicinity of the building where they were used.

2.3.4 Radioactive Sludge and Solid Wastes

Several thousand tons of radioactive sludge were generated during reactor operations and accumulated in pipes in the cooling water effluent system, in the 116-KE-4 and 116-KW-3 retention basins, and in the reactor fuel storage basins. Smaller volumes of sludge also collected in water traps located in the 115-KE and 115-KW Gas Treatment Facilities and in the 117-KE and 117-KW Air Treatment Buildings. The sludge consisted of diatomaceous earth, which was used periodically to scour internal surfaces of the reactor process tubes, and fine particulate matter, which originated from pipe slag, rust, failed fuel elements, graphite powder, dissolved and suspended solids in river water, and other undefined solids. The sludge was contaminated with radionuclides and various chemical contaminants. The total volume of sludge generated during reactor operation is unknown.

The bulk of the sludge accumulated in the 116-KE-4 and 116-KW-3 retention basins and the reactor fuel storage basins. At least once during reactor operations, an unknown quantity of sludge was removed from the retention basins to the 118-K-2 burial ground immediately east of the basins. Additionally, on June 7, 1963, the 107-KE basins became dry during an extended outage. High winds spread contaminated dry sludge within the area and to a considerable extent beyond. Direct readings on contamination found within the area fence indicated a maximum of 300 mrads/hr. The maximum detectable particulate found outside the area fence was 20,000 c/m, the density of particulate contamination ranged from five particles per 100 ft^2 (near the fence) to two particles per 100 ft^2 at the Central Fire Station. No particulate contamination was found beyond the Hanford Project boundaries (Backman 1965).

An approximate 210 million grams (about 1/4 in.) of sludge is estimated to remain in each of the retention basins (Dorian and Richards, 1978).

Most of the radioactive solid wastes generated in the 100-K Area was buried in the 118-K-1 burial grounds. Radioactive solid wastes generally consisted of reactor components, contaminated equipment, tools, and miscellaneous contaminated items (paper, rags, structural concrete, etc.). The main source of these wastes was reactor operations, and the most highly contaminated solid wastes were the reactor components. These included aluminum spacers, lead-cadmium reactor neutron-poison pieces, boron splines, graphite, depleted desiccant, process tubes, and lead. Lesser quantities of gunbarrels, thimbles, control rods, nozzles, pigtails, Zircaloy 2 tubing, and cadmium sheets were also present (Miller and Wahlen, 1987).

Neutron activation of elements in the reactor components caused them to become irradiated. In addition, both the reactor components and other solid objects received surface contamination from contact with radioactive solutions and environments. The predominant radionuclides associated with the reactor components are ^{60}Co and ^{53}Ni.

It is likely that other facilities associated with the 100-KE and 100-KW Reactors and with waste management activities generated radioactive solid wastes. Examples are air filters used in the 115 Gas Recirculation Buildings and the 117 Exhaust Air Filter Buildings, equipment used in connection with the cooling water effluent system, and contaminated dirt removed from near the effluent lines.

The primary disposal area for the 100-K Area was the 118-K-1 burial ground, which is located in the 100-KR-2 Operable Unit.

2.3.5 Reactor Ventilation System and Inert Gas System Wastes

There were two gas systems associated with each of the reactors: (1) the primary ventilation system and (2) the inert gas system (Figure 2-9).

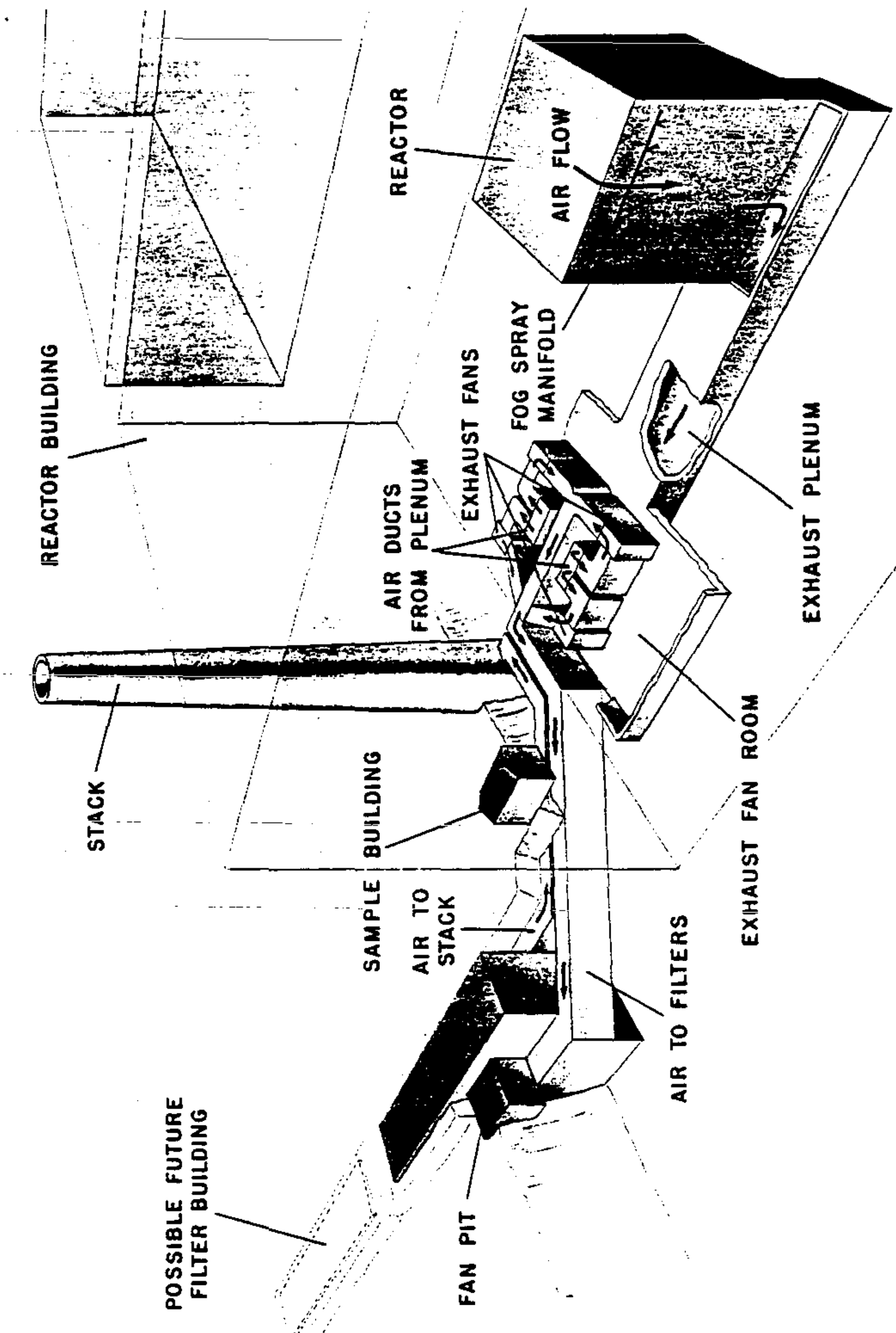
The primary ventilation system circulated fresh air from the staffed areas of the reactor buildings into zones of increasing contamination levels and upward past the reactors to overhead ducts. The ducts carried the air to exhaust fan systems located adjacent to the exhaust stacks.

Air in the reactor buildings became contaminated with radionuclides that were present as radioactive gases, entrained vapors, and particulates generated by the cascade of cooling water in the reactors. These emissions may have resulted in surface contamination in the 100-K Area, as evidenced by the presence of ^{14}C in vegetation. Other radionuclides associated with gaseous emissions include ^{3}H and ^{129}I.

Additionally, two separate incidents at the 100-K Area reactors resulted in the disposition of contaminated particulate matter being released to the environment. The first occurred April 14, 1958. During normal discharge of irradiated fuels at the 105-KE Reactor, a small fraction of a ruptured fuel element apparently burned. Stack samples indicated that 0.05 Ci of filterable material was released. Particulate contamination deposited outside the limited area was about two particles per 100 ft^2, average detectable readings were from 10,000 to 20,000 c/m. A maximum of 250 mrads/hr (uncorrected) was obtained on one particle. The second occurred April 29, 1959. During normal discharge of irradiated fuels at the 105-KW Reactor, a small fraction of a ruptured fuel element apparently burned. Stack samples indicated that 1.30 Ci of filterable material was released. Due to wind factors no particulate contamination was found in the limited area. A few widely dispersed particles were found on the Wahluke Slope northeast of the reactor. Of five particles found, direct readings varied from 3,000 to 60,000 c/m. No particulate contamination was found beyond the Hanford Project boundaries (Backman 1965).

Originally, the ventilation air was released directly from the reactor buildings to the stacks and subsequently to the atmosphere. In 1960, as a result of the previously described incidents, air filtering systems were added to minimize the release of radioactive matter. These filtering systems were placed underground in the 117-KE and 117-KW Buildings just east of the reactor buildings. The exhaust air passed downward through ducts to tunnels leading to the filtering buildings. After filtration, the air was routed back through a second set of tunnels to the exhaust stacks.

Figure 2-9. 100-KE/KW Reactor Confinement Facility Layout.



9413275.1789

Two types of filter banks were used: a high-efficiency particulate absolute (HEPA) bank and a Halogen (activated charcoal) bank. Samples obtained during decommissioning of the 117-K Buildings revealed that the inside surfaces of the concrete-lined tunnels, the equipment, and the wall surfaces of the fan rooms and filter chambers had low-level, surface smearable, radioactive contamination.

None of the ventilation system duct work was external to the reactor building, which is probably the most visible difference between the 100-K Area reactors and earlier production reactors at Hanford.

The 115-KE and 115-KW Gas Recirculating Facilities provided service to each respective reactor. Their purpose was to provide a closed-loop nonreactive gas environment in the graphite cores that would remove moisture and gases from the cores and serve as a heat transfer medium between the cores and the process tubes.

The system also served to detect water leaks within the reactor cores. A mixture of helium and carbon dioxide and later nitrogen, driven at low pressure by a blower system, was circulated through the graphite piles. Filters, gas coolers, blowers, condensers, and silica gel drying towers were located in each building. The systems maintained gas pressure in the reactors at a slightly positive value with respect to the ventilation air so that outside air could not make contact with the graphite cores. When a leak was detected, the gas was routed to the ventilation exhaust systems. The 115-KW Building (Figure 2-10) included a wing (110-KW Building) that was used for the storage and transfer of gases for both reactors.

Figure 2-10. Gas Transfer Station and 110-KW Building, December 1993.

Contamination of the 117-KE and 117-KW Buildings occurred on concrete surfaces, the inside surfaces of ducts, machinery, and filters as indicated by analysis of smear samples taken from these surfaces. The 115-KE and 115-KW Buildings were connected by tunnels to the reactor buildings; the interior of these tunnels was also radioactively contaminated (Dorian and Richards, 1978).

2.4 SANITARY LIQUID WASTES

Sanitary wastes were produced in various 100-K Area buildings equipped with sanitary facilities. These wastes were routed by sewer lines to septic tanks and drain fields. Nonsanitary wastes such as detergents, cleaning compounds, and solvents likely entered these sewer systems. There are no records of radiological wastes being disposed to these systems (DOE-RL 1992a). There are six known septic tank systems located within the 100-K Area. See Sections 5.30 and 6.21 for more information.

2.5 NONRADIOACTIVE LIQUID WASTES

Nonsanitary, nonradioactive liquid chemicals potentially contributed to 100-K Area liquid waste sites. These include hazardous wastes and hazardous substances.

Contamination from liquids (including gasoline, diesel fuel, solvents, and other chemical compounds) would be expected near aboveground and belowground storage tanks and their piping systems, and in areas where these materials were used or stored. Releases could have resulted from leakage, spillage, or disposal. The following activities may have resulted in the generation of nonradioactive liquid wastes and may require further data investigation:

- Water treatment chemicals (alum, sulfuric acid, chlorine, and sodium dichromate) were used and stored near the 183-KE and 183-KW Buildings.

- Wet-type electrical transformers and hydraulic machinery containing oil contaminated with polychlorinated biphenyls (PCB) were used at several locations within the 100-K Area. Fluids contaminated with PCB may have been released or disposed during operation, equipment repair, or decommissioning and demolition activities.

- Demineralizer regeneration, research, and development wastes from the 1706-KE Building were disposed in the 118-K-3 filter crib (WHC 1991). Although this is believed to be erroneous, reportedly these wastes were disposed of in the 116-KE-2 crib (1706-KER crib).

- Boiler water treatment chemicals for the 165-KE and -KW powerhouses included sodium sulfate, tri-sodium phosphate, and chromates. These chemicals were used to treat the boiler water and ended up in the boiler sludge. Disposal methods for this sludge are not known.

- Zeolite water softeners were located in the 165-K Powerhouses and 183-Headhouses where filtered water was treated before use. NaCl (salt) solutions were used to regenerate the zeolite ion exchange beds in the water softener tanks. The salt was delivered in railcar lots to brine pits located adjacent to railroad tracks near facilities. The disposal method of the waste from this process is not known and there is no record of leaks or spills. Process knowledge would indicate that these wastes most likely went to the area process sewer.

- Fuel oil tanks both underground and aboveground were located in the 100-K Area.
- Emergency electrical power for instrumentation in the 105-K Reactor Buildings consisted of two backup systems: a diesel engine generator (750-kw in 105-KW) located in each reactor building and a set of batteries for the Ball 3X systems. The storage tank for the diesel engine was located underground on the east side of the reactor buildings.
- Oils, paints, and solvents were stored and used in the 1706-KE, 1717-K, 190-KE, and 1713-KE and 1713-KW Buildings.
- Automotive repair and service was performed at the 1717-K Building.
- Herbicide use was widespread throughout the 100-K Area. In the 1970's herbicides and ground sterilants were applied by ground and aerial application (DOE-RL 1992a).

The 100-K Area currently has two National Pollution Discharge Elimination System (NPDES) permits in effect under Permit number WA-000374-3. These "outfalls" are designated 003 (181-KE inlet screen backflush) and 004 (116-K-3 outfall). The NPDES discharge monitoring requirements for the 003 outfall are flow and total suspended solids only. Discharges from this outfall have been discontinued due to an inability to comply with the total suspended solids limit since August 1993. The 004 outfall is monitored for flow, temperature, pH, total suspended solids and chlorine. Although it is not required by the NPDES Permit, the 004 outfall is also monitored for radionuclides.

2.6 NONRADIOACTIVE SOLID WASTES

Nonradioactive solid waste generated in the 100-K Area facilities primarily included miscellaneous materials such as paper, trash, pieces of metal, plastic parts, etc. The 128-K-1 burn pit is a site at which combustible wastes were disposed (Stenner et al. 1988).

Other solid wastes consisted of relatively uncontaminated concrete, metal parts, and other materials generated during decommissioning and demolition activities.

Sludge disposal from water treatment facilities, in particular, sulfuric acid sludge is of notable concern. The sludge was drained to french drains and percolation trenches adjacent to the 183-KE and -KW Buildings. In 1971 about 5,443 kg (12,000 lb) of sulfuric acid sludge was removed from percolation trenches. Analysis indicated that approximately 14% of the sludge weight consisted of mercury (a byproduct of sulfuric acid production). Mercury contamination is likely to remain in sludge left at the waste sites (DOE-RL 1992a).

3.0 SOIL AND VEGETATION SAMPLING

Routine environmental surveillance of the 100-K Area is conducted by WHC to evaluate long-term trends in environmental accumulation of radioactivity. Soil and vegetation samples are collected on a regular basis and analyzed for radioisotope content.

Early each summer, soil and vegetation samples are collected and submitted for radioanalysis. The analyses include those radionuclides (i.e., gamma-emitting radionuclides, strontium, uranium, and plutonium isotopes) expected to be found in the areas sampled. The results are compared to regional background levels, which are derived from PNL offsite monitoring data, to determine the difference between contributions from Hanford operations and from natural causes and world-wide fallout. The results are also compared to soil contamination standards developed for use by WHC at the Hanford Site (Schmidt et al. 1991).

3.1 SOIL SAMPLING AT 100-K AREA

Tables 3-1 and 3-2 provide the results of 100-K Area soil and vegetation sampling from 1981 through 1991. Soil samples were taken from the surface. Soil and vegetation sample data, broken down by sample site, is not provided here due to length, but is available in the referenced document.

Table 3-1. Average Radionuclide Concentrations (pCi/g) Detected in the 100-K Area Surface Soil Samples from 1981 to 1991.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239/240}Pu$
1981	8.30 E-01	NR	4.40 E+00	NR	NR
1982	2.60 E+01	NR	8.80 E-01	NR	NR
1983	5.50 E+01	NR	5.30 E+01	NR	NR
1984	3.30 E+01	8.40 E-01	1.20 E+01	9.60 E-04	2.90 E-02
1985	7.40 E-01	2.90 E-01	1.10 E+00	1.40 E-03	3.20 E-02
1986	1.00 E+00	1.80 E-01	1.10 E+00	9.10 E-04	2.30 E-02
1987	1.20 E+00	4.30 E-01	1.30 E+00	2.70 E-03	5.50 E-02
1988	3.90 E-01	2.30 E-01	7.30 E-01	7.10 E-04	2.00 E-02
1989	7.70 E-01	6.30 E-01	7.50 E+00	2.80 E-03	7.80 E-02
1990	2.30 E-01	2.30 E-01	9.70 E-01	6.80 E-04	1.40 E-02
1991	2.70 E-01	1.70 E-01	1.20 E+00	8.60 E-04	2.00 E-02

NR = Not Reported

(Schmidt et al. 1991)

Table 3-2. Average Radionuclide Concentrations (pCi/g) Detected in the 100-K Area Vegetation Samples from 1981 to 1991.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239/240}$Pu
1981	1.20 E+00	NR	1.00 E-01	NR	NR
1982	2.40 E-01	NR	9.70 E-01	NR	NR
1983	1.50 E-01	NR	2.50 E-01	NR	NR
1984	1.80 E-01	1.30 E+00	1.30 E-01	2.90 E-04	6.90 E-04
1985	4.60 E-01	3.90 E-01	1.30 E-01	1.90 E-04	7.10 E-04
1986	2.80 E-01	4.00 E-01	1.50 E+00	2.5 E-04	7.90 E-04
1987	2.30 E-01	1.30 E+00	1.10 E-01	1.90 E-04	2.20 E-04
1988	4.90 E-01	1.20 E+00	1.80 E-01	5.20 E-05	3.80 E-04
1989	3.10 E-01	1.30 E+00	1.60 E-01	1.10 E-04	1.50 E-04
1990	4.50 E-02	8.00 E+00	4.10 E-02	<1.70 E-04	2.50 E-04
1991	6.30 E-02	4.10 E-01	7.60 E-02	5.20 E-05	5.90 E-04

NR = Not reported (Schmidt et al. 1991)

4.0 100-KR-1 OPERABLE UNIT

This section describes the 100-KR-1 Operable Unit, which encompasses the northern portion of the 100-K Area and extends out into the Columbia River, and includes sites that were associated with effluent disposal and the pumping of raw river water from the Columbia River. It includes buildings and facilities, some of which are active and in use today. It encompasses five waste sites, all of which are included in the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989). These include decommissioned facilities, trenches, cribs, and any unplanned release sites.

The relative locations of 100-KR-1, 100-KR-2, and 100-KR-3 are shown in Appendix A. Separate maps specific to each of the 100-K Area Operable Units (100-KR-1, 100-KR-2, and 100-KR-3) also can be found in Appendix A. Additional figures are included to provide clarity for each waste type described.

Table 4-1 identifies the sites for which a PNL Hazard Ranking System (HRS) has been established. Not all of the waste sites located within the 100-KR-1 Operable Unit have had HRS Migration scores applied to them. Each waste site is described separately in Sections 4.1 through 4.5.

Table 4-1. Hazard Ranking System Migration Scores.

Site identification	HRS score
116-K-1	42.32
116-K-2	51.23
116-KE-4	76.91
116-KW-3	76.91

(Stenner et al. 1988)

4.1 116-K-1 (100-K CRIB)

The 116-K-1 crib is an inactive liquid waste site that operated during 1955. The 400 by 400 by 20-ft deep crib is located at 100-K Area coordinates NK5880 WK3660, which is 200 ft northeast of the 100-K Area exclusion area fence (WHC 1991). This crib is also known as the 116-K-1 trench or pond.

The 116-K-1 crib received an estimated 40,000,000 L of contaminated water due to fuel ruptures at both the 105-KE and 105-KW Reactors. It was also used for the disposal of slurry collected in the 107 retention basins (Clukey 1954).

The crib (Figures 4-1 and 4-2) is a structure within a structure with bottom dimensions of 200 by 200 ft. The sides were diked to form top dimensions of 400 by 400 ft. The crib was backfilled with clean fill material and a 1 ft layer of gravel covered the surface. The inner excavation is in a sand-filled excavation 10 ft wide and 10 ft deep, parallel to the inner structure, with a side slope of 4:1. A 16-in. sewer line enters the crib 27 ft below the top grade and a 42-in. drain line enters 20 ft below the top grade. An earthen dike surrounds the crib that begins 7 ft belowgrade to 26 ft abovegrade. The outer surface of the dike is covered by a 2-ft thick layer of riprap from natural grade to about 11 ft abovegrade (Hanford Drawing H-1-25021 and WHC 1991).

The estimated radionuclide inventory, in curies decayed through April 1, 1986, includes the following:

^{60}Co: 2.830E+000	^{154}Eu: 2.110E+000	^{240}Pu: 1.400E-002
^{134}Cs: 1.130E-002	^{155}Eu: 1.070E-001	^{90}Sr: 5.810E-001
^{137}Cs: 1.820E+001	^{238}Pu: 1.310E-002	
^{152}Eu: 6.570E+000	^{239}Pu: 1.260E-001	

(Stenner et al. 1988)

In addition, the hazardous chemical inventory includes 40 kg of sodium dichromate (WHC 1991).

The crib failed shortly after installation and was abandoned. The 116-K-2 trench replaced this crib; however, due to leakage through valves the site received effluent water throughout reactor operations.

Dorian and Richards, 1978, reports the results of soil samples taken from five locations in or near the crib. It further reports the estimated volume of the crib to be 7.2E+06 ft^3 and mass of 4.9E+11 g. The sampling results for the two sample locations from within the trench are provided in Tables 4.2 and 4.3. Table 4.4 depicts the radionuclide content present in the samples taken. A full table is provided in Appendix B and is summarized in Tables 4-2 and 4-3.

Table 4-2. 116-K-1 Beta-gamma and Plutonium-239/240 Concentrations.

Radionuclide	Maximum pCi/g	Average pCi/g
Beta-Gamma	1.70E^{+03}	3.80E^{+02}
$^{239/240}$Pu	4.40E^{+00}	1.20E^{+00}

(Dorian and Richards, 1978)

Figure 4-1. 100-K Crib, September 21, 1953.

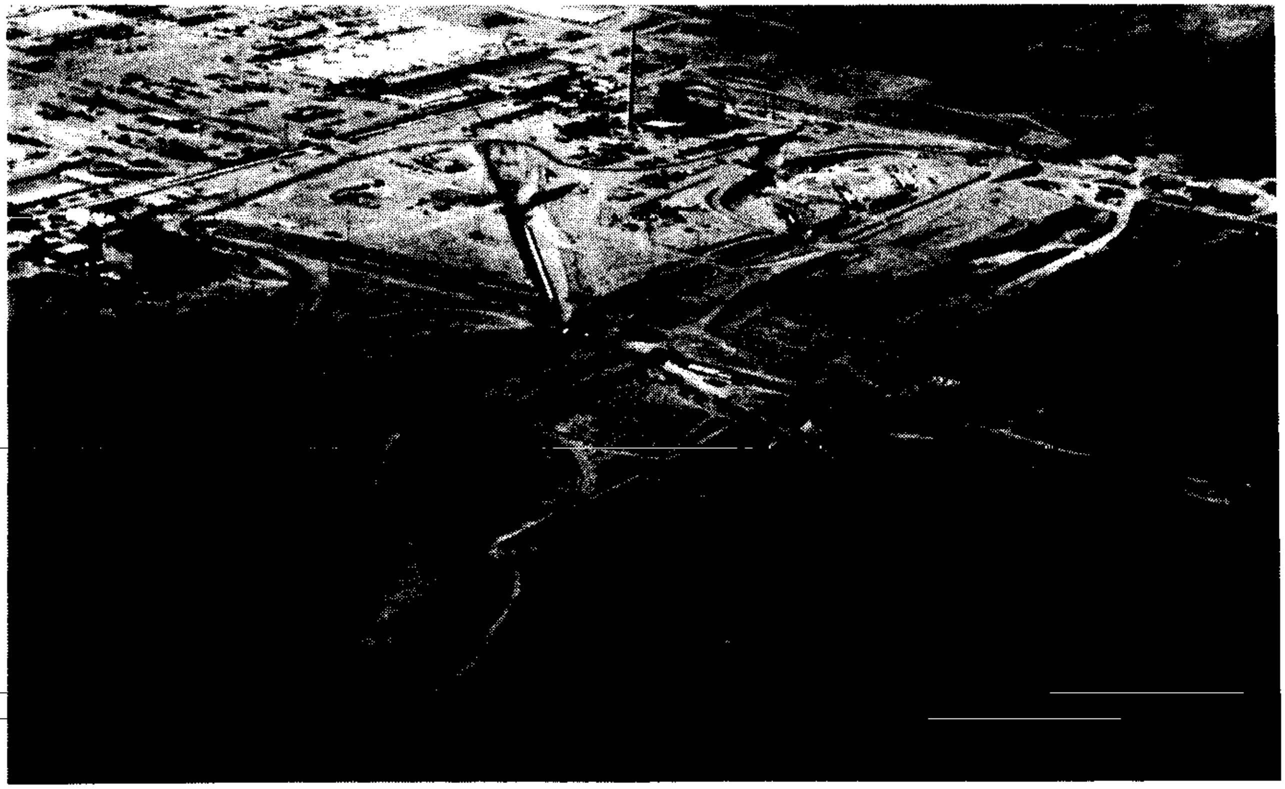


Figure 4-2. 100-K Crib, December 1954.

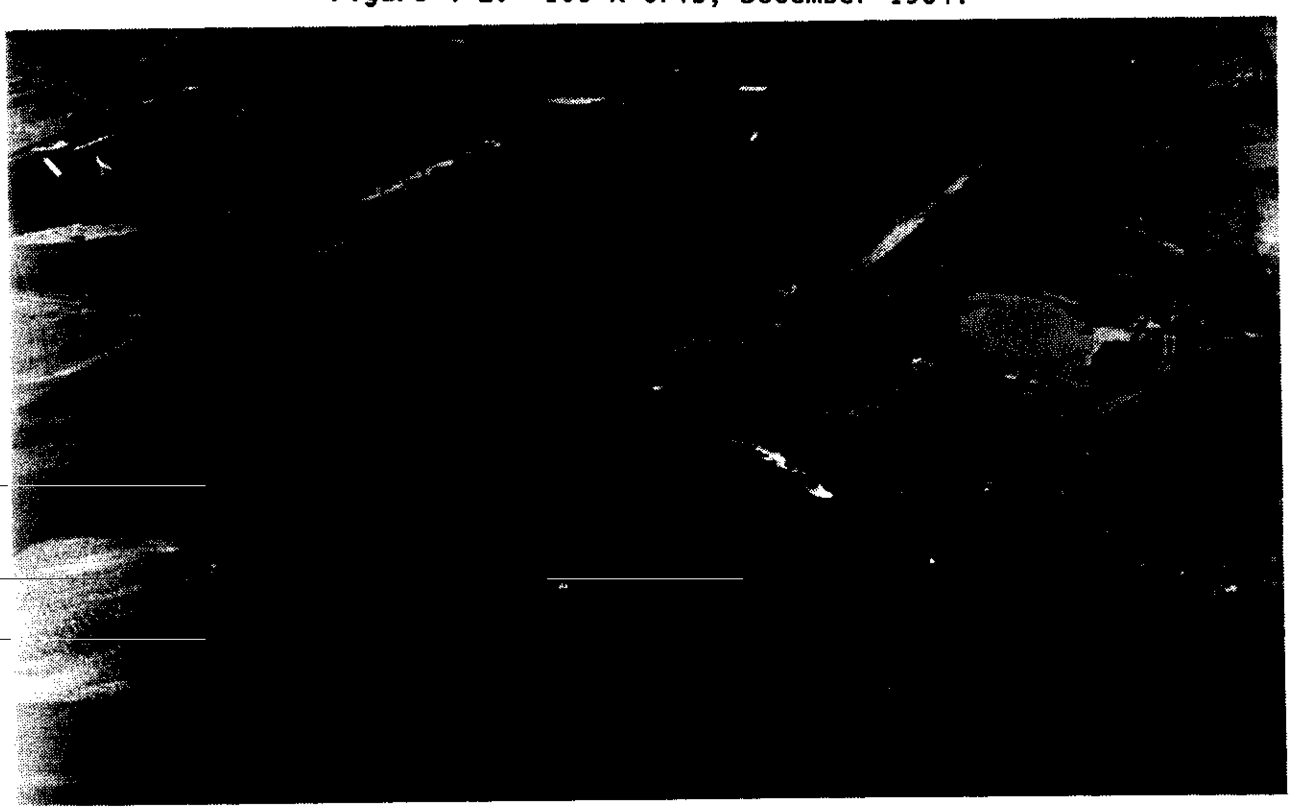


Table 4-3. 116-K-1 Radionuclide Concentrations.

Isotope	Concentration (pCi/g) sample D-0	Concentration (pCi/g) sample D-5	Concentration (pCi/g) sample D-10	Concentration (pCi/g) sample D-16
^{238}Pu	4.80E^{-01}			
$^{239/240}$Pu	4.40E^{+00}			
^{90}Sr	1.00E^{+01}	6.30E^{+00}	7.20E^{+00}	7.90E^{+00}
^{152}Eu	4.20E^{+02}	1.30E^{+02}	3.00E^{-01}	*
^{60}Co	3.10E^{+02}	1.50E^{+02}	3.60E^{-01}	*
^{154}Eu	1.70E^{+02}	5.20E^{+01}	*	*
^{134}Cs	6.40E^{+00}	4.00E^{+00}	*	*
^{137}Cs	7.70E^{+02}	4.40E^{+02}	6.60E^{-01}	*
^{155}Eu	1.40E^{+01}	4.40E^{+00}	1.50E^{-01}	1.80E^{-01}

* = Below detectable limits (Dorian and Richards, 1978)
Blank Space = No analysis performed

Table 4-4. 116-K-1 Radionuclide Concentrations.

Isotope	Concentration (pCi/g) sample E-0	Concentration (pCi/g) sample E-2.5	Concentration (pCi/g) sample E-24
^{238}Pu	*	*	*
$^{239/240}$Pu	2.50E^{-01}	1.80E^{-01}	*
^{90}Sr	2.80E^{+00}	5.90E^{+00}	1.00E^{+00}
^{152}Eu	3.70E^{+01}	1.10E^{+00}	*
^{60}Co	3.00E^{+01}	9.70E^{-01}	*
^{154}Eu	1.73E^{+01}	4.10E^{-01}	*
^{134}Cs	2.30E^{-01}	*	*
^{137}Cs	3.40E^{+01}	5.90E^{-01}	3.80E^{-02}
^{155}Eu	5.70E^{-01}	*	*

* = Below detectable limits (Dorian and Richards, 1978)
Blank Space = No analysis performed

Additional soil sampling was performed in 1987, one sample was taken from the northeast corner of the crib area and the following radionuclides in pCi/g were detected.

^{60}Co: 5.5E-01 ^{90}Sr: 1.4E-01 ^{137}Cs: 8.0E-01 ^{238}Pu: <5.4E-04 $^{239/240}$Pu: 9.2E-03

(Perkins 1988)

According to Heid (1956) the side of the crib was apparently washed out during its first use. The repair of the "wash out" included an aggregate filled trench that surrounds the north, east, and west sides at the base of the aggregate filled drainage ditch that extends northward to the river shoreline. Clukey (1956) indicates that the crib was used for the disposal of basin cleanout slurry from February 1955 to May 1956. Although the crib was taken out of service officially, it continued to receive effluent through leaking valves in the effluent system. The crib was removed completely from use at the time of reactor shutdown in 1971.

This site has a HRS Migration score of 42.32.

The 116-K-1 appears today as a large, vegetation-free, cobble-covered depression within a fenced area posted with "Surface Contamination" warning signs.

4.2 116-K-2 (100-K MILE LONG TRENCH)

The 116-K-2 is an inactive mixed liquid waste site that operated from 1955 to 1971 to receive effluent from the 105-KE and 105-KW Reactors metal storage basin overflow and all contaminated 105 Building floor drains. It runs in an east-west direction parallel to the Columbia River, beginning 450 ft northeast of the north corner of the 100-K exclusion area fence and is located at 100-K Area coordinates NK5670 WK3221. This site is also known as K trench, the 107 trench, and the 116-K-2 effluent trench (WHC 1991).

The 4,000 by 45 by 15-ft-deep trench has a bottom width of 4 ft and spoil piles at the surface on both sides (WHC 1991). It was excavated in 1955 as a replacement for the 116-K-1 crib to percolate contaminated cooling water effluent into the soil column. During operation, the water in the trench was generally 14 to 15 ft deep, varying with inlet flow. The side slope of the trench was gradual resulting in about a 50 ft width at the upper waterline edge. Extending over 4,000 ft in length, the K trench (Figure 4-3) is the largest radioactive liquid waste trench in the 100 Areas (Dorian and Richards, 1978).

The trench received an estimated 300 billion liters of contaminated water from floor drains in the 105-KE and 105-KW Reactors (Stenner et al. 1988). The 100-K Area deactivation logs show that a Minor construction tractor was moved to this trench and buried in April 1972. Also buried in this trench during the same month were all hydride tanks removed from 100-K Area facilities which had been stored in an area north of the exclusion area fence.

Figure 4-3. 100-K Mile Long Trench, April 11, 1955.

Normal flow to the trench included an undetermined amount of 107 basin effluent that leaked through 42-in. butterfly valves in the tank bottoms. This leakage, which occurred prior to 105-KE and 105-KW shutdown in 1970, was estimated at 10,000 to 20,000 gal/min. The valve leakage showed a history of increase until a 1968 valve and tank renovation. Leakage gradually increased again after these repairs. Other periodic flows included low volume, neutralized, dummy decontamination waste, process-cooling water during charge/discharge, about 500 gal/min of metal storage basin flow, approximately 700 gpm of metal storage basin flow during charge/discharge, occasional special disposals, and occasional tanks of process cooling water that was collected after fuel cladding failures (Dorian and Richards, 1978).

The following represents the hazardous chemical inventory for the trench:

Copper Sulfate:	5.00E+002 Kg	Sulfuric Acid:	1.00E+004 Kg
Sodium Dichromate:	3.00E+005 Kg	Sulfamic Acid:	1.00E+004 Kg

(Stenner et al. 1988)

In addition, estimated radionuclide inventory for the trench (in curies) and decayed through April 1, 1986, includes the following:

^{14}C:	9.390E-001 Ci	^{154}Eu:	2.110E+002 Ci	^{239}Pu:	4.500E+000 Ci
^{60}Co:	5.400E+001 Ci	^{155}Eu:	1.070E+001 Ci	^{240}Pu:	5.000E-001 Ci
^{134}Cs:	7.510E-001 Ci	^{3}H:	1.570E+001 Ci	^{90}Sr:	9.000E+000 Ci
^{137}Cs:	1.490E+002 Ci	^{63}Ni:	1.410E+002 Ci	^{235}U:	2.780E-003 Ci
^{152}Eu:	7.230E+002 Ci	^{238}Pu:	1.780E-001Ci	^{238}U:	3.170E-001 Ci

(Stenner et al. 1988)

Another report, summarized in the following tables, profiles the results from soil samples taken from 26 locations in or near the trench. Samples taken from these drill sites indicate "minimal" underground contamination. Maximum contamination levels at the trench were measured at approximately 22 ft belowgrade at the west end of the trench (closest to the reactor) and sloped up to 15 ft belowgrade at the east end. Maximum contamination levels of these sample holes ranged from 1,000 to 12,000 c/m per sample with a Geiger Mueller (GM) probe. Contamination measurable with a GM probe was detected down to 30 ft belowgrade.

Table 4-5 reflects the average and maximum beta-gamma and $^{239/240}Pu$ concentrations detected in the mile-long trench.

Table 4-5. 116-K-2 Beta-gamma and Plutonium-239/240 Concentrations.

Radionuclide	Maximum pCi/g	Average pCi/g
Beta-Gamma	$7.00E^{+04}$	$3.60E^{+04}$
$^{239/240}Pu$	$1.30E^{+02}$	$8.50E^{+00}$

(Dorian and Richards, 1978)

As shown in Table 4-6, trench has an estimated inventory of 2,100 Ci. This trench has the highest radionuclide inventory of all the deactivated 100 Area liquid waste disposal facilities. Europium-152 comprises approximately one-half of the total radionuclide inventory of the trench. The estimated volume of the trench is 8.6×10^7 ft^3 and the mass is 5.9×10^{11} g.

Table 4-6. 116-K-2 Radionuclide Inventory.

Radionuclide	Average pCi/g	Curies
^{238}Pu	3.30E^{-01}	1.90E^{-01}
$^{239/240}$Pu	8.50E^{+00}	5.00
^{90}Sr	1.90E^{+01}	1.10E^{+01}
^{3}H	4.20E^{+01}	2.50E^{+01}
^{152}Eu	1.90E^{+03}	1.10E^{+03}
^{60}Co	2.70E^{+02}	1.60E^{+02}
^{154}Eu	7.00E^{+02}	4.10E^{+02}
^{134}Cs	2.00E^{+01}	1.20E^{+01}
^{137}Cs	3.00E^{+02}	1.80E^{+02}
^{155}Eu	5.80E^{+01}	3.40E^{+01}
U	5.50E^{-01}	3.20E^{-01}
^{14}C*	1.60E^{+00}	9.4E^{-01}
^{63}Ni*	2.60E^{+02}	1.50E^{+02}
Total Ci		2,100

* = Average concentrations (Dorian and Richards, 1978)

The estimated radionuclide inventory in the soil column adjacent to the K trench is less than 50 Ci, which is negligible in comparison to the 2,100 Ci inventory within the trench itself. Table 4.7 reflects this contamination, which was the result of extensive leakage during operations. The volume of the contaminated soils was estimated to be 1.3 X 10^8 ft^3 with a mass of 8.9 X 10^{12}g.

Table 4-7. Radionuclide Inventory Soils Adjacent to 116-K-2. (sheet 1 of 2)

Radionuclide	Average pCi/g	Maximum pCi/g
^{238}Pu	*	*
$^{239/240}$Pu	*	1.90E^{-01}
^{90}Sr	8.60E^{-01}	4.50E^{+00}
^{3}H	3.00E^{+00}	3.90E^{+00}
^{152}EU	2.20E^{-01}	7.90E^{-01}
^{60}Co	4.80E^{-02}	2.90E^{-01}
^{154}Eu	*	1.90E^{-01}

Table 4-7. Radionuclide Inventory Soils Adjacent to 116-K-2. (sheet 2 of 2)

Radionuclide	Average pCi/g	Maximum pCi/g
^{134}Cs	$1.40E^{-02}$	$7.50E^{-02}$
^{137}Cs	$1.20E^{-01}$	$1.10E^{+00}$
^{155}Eu	$1.00E^{-01}$	$3.60E^{-01}$
U	$2.00E^{-01}$	$3.60E^{-01}$

* = Below Detectable Limits (Dorian and Richards, 1978)

A more recent statistical analyses of the radionuclides in surface soils at this site concludes that dose rates in over 99.5% of the trench study area appear to be lower than the mrem/30-day dose rates at Seattle, Spokane, and other Washington communities (Gilbert 1988).

The trench is at a much higher elevation than the area between it and the Columbia River. Consequently, during reactor operations, several washout areas were created along the river side of the trench. The washout areas resulted from extensive seepage through the north side of the trench, causing surface contamination that extended several hundred feet (DOE-RL 1993). This surface contaminated area was covered with "up to a few ft of soil," backfilled to grade during the summer of 1977 and posted with AC-5-40 concrete monuments and "Underground Radioactive Material" warning signs. Earlier, in 1971, the sides and bottom of the trench, except for the influent end, had been covered with a layer of dirt (WHC 1991 and DOE-RL 1992b).

The HRS Migration score assigned to this waste site is 51.23 (Stenner et al. 1988).

The trench appears today as large, cobble-covered area surrounded by concrete markers posted with "Underground Radioactive Materials" warning signs.

4.3 116-K-3 (1904-K OUTFALL)

The 116-K-3 outfall is an inactive liquid waste site that has operated from 1955 to the present. It is located at 100-K Area coordinates NK5650 WK5036, which is near the Columbia River shore just west of the 107-KE retention basins. The 32 by 32 by 30-ft deep (10 ft abovegrade and 20 ft belowgrade) structure was used to discharge reactor effluents and process sewer wastes to the bottom center of the river (about 700 ft from shore) via two 84 in diameter pipes (WHC 1991).

It is an open reinforced concrete water box. The base is solid concrete that serves as an anchor for the 84-in. discharge lines and has 84-in. openings into the top of the east and west discharge lines. These openings allow for process sewer discharges to be introduced into the lines. It includes an open spillway that could also discharge effluents to the river shoreline should the effluent lines become plugged. The spillway is 10 ft wide by 225 ft long and terminates at a earth channel that then ends at the river shoreline and ranges in height from 7 ft 6 in. to 4 ft 6 in. The spillway is now inactive and the outfall is used to discharge process wastes (cooling water and water treatment wastes) to the river and is regulated by a NPDES Permit (WHC 1991).

Original operations of the effluent disposal system employed the use of a "batch" method of cycling the effluents through each of the three 107-KE and 107-KW retention basins. In April 1955, shortly after operations began at the 105-KE Reactor, this method of operation caused the 100-KE outfall line to float and break. Because the two lines are tied together, the floating of the east line also caused the west line to float. The upper surface of the lines were reported to have raised to 1.5 ft above the surface of the river and after about 30 min, sink back into the river. It was observed to repeat this cycle several times before it was decided to shut the reactors down.

Construction of a 250-ft jetty (Figure 4-4) over the pipelines began immediately in an effort to reseat the lines on the river bottom. The lines were inspected and both were found to have been ruptured. The 100-KE line suffered the greatest damage that included an 8-in. tear and deformation of the line. The repair included removal of a 36-ft section near the outfall (Figure 4-5) jacking the pipe, in an attempt to restore roundness and patching the tear with a bolted steel band, wrapping with a strengthening band, and pouring about 240 yd^3 of concrete over the repair. The 100-KW line was not repaired and left as it was with a 1.5-in. tear in the bottom section of the line. Four evenly spaced 6-in. holes were cut in the top of each pipeline just off the end of the new jetty to provide for the release of entrained air to preclude the lines from floating in the future. Additional anchors (Figure 4-6) were placed along the length of the lines to insure adequate anchoring to the river bottom. These anchors consisted of large concrete blocks placed on either side of the lines and tied together by railroad rails over the lines upper surface.

In May 1955, it was decided that the effluent would be diverted to two of the basins in parallel and hold the third tank empty to receive effluent while the two full tanks, in the case of fuel ruptures, were drained to the 116-K-1 crib or 116-K-2 trench. This system further degenerated (about 1960) to only one of the full tanks being drained to the 116-K-2 trench, with the second tank rarely drained to the trench. This system even further degenerated until after 1965 (due to leaking and difficult to operate valves) attempts to crib rupture effluent rarely were successful (Dorian and Richards, 1978).

Figure 4-4. Construction of 250-Feet Jetty, 1955.

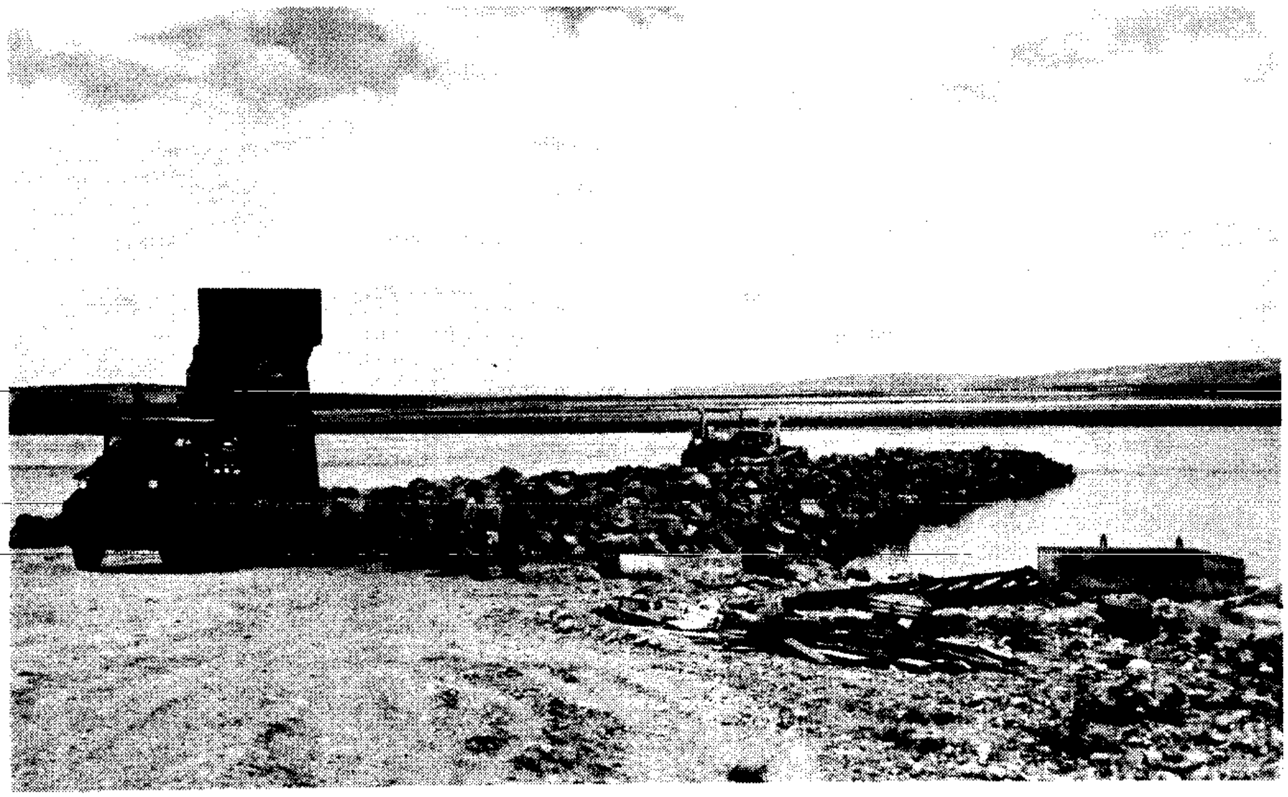
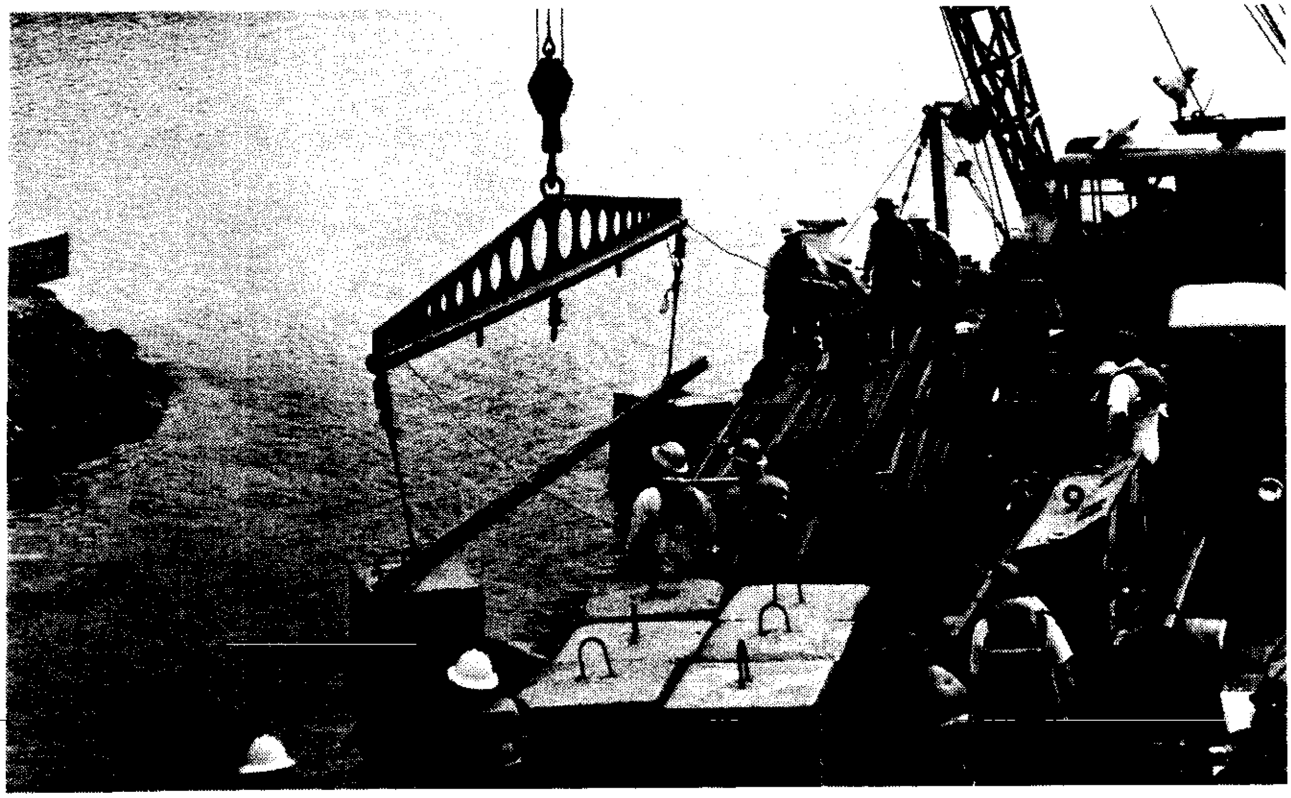


Figure 4-5. Outfall Repair Efforts, 1955.

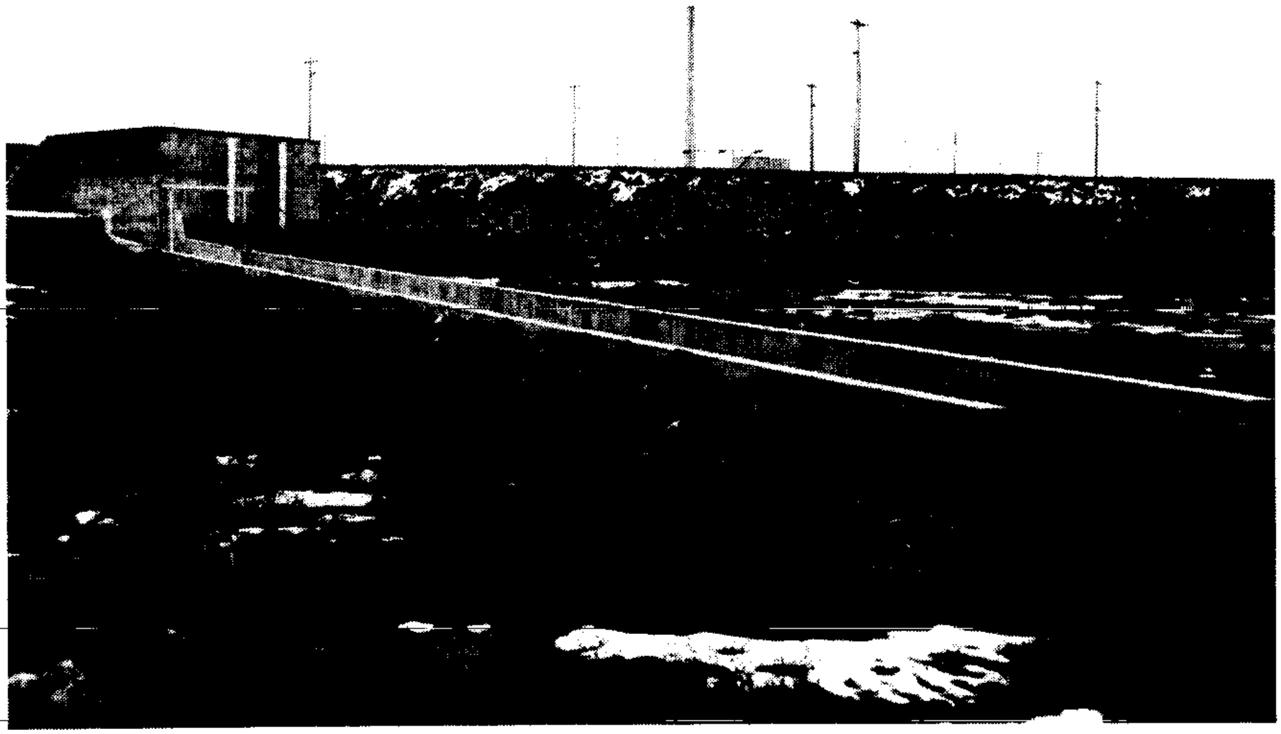
Figure 4-6. Placement of Anchors, 1955.



The radionuclide contamination content is unknown, but is assumed to be low-level contamination (WHC 1991). The best estimate of dose rates associated with the outfall is less than <1 mrem/hr (Bovay Northwest 1991).

The outfall (Figure 4-7) was also used to dispose of process sewer wastes generated in the water treatment facilities for both reactors. These wastes included cleanout sludge from the settling basins, chemicals that may have been flushed to the system either intentionally or as a result of spills, discharges to floor drains in nearly all 100-K Area facilities, nonradioactive cooling water, acid and caustic neutralization pit discharges, and demineralizer regeneration discharges (Hale 1957b).

Figure 4-7. 1904-K Outfall, January 25, 1955.



The outfall appears today much the same as it did during reactor operations. It is still used for the discharge process sewer wastes. The spillway remains inplace but has been back filled beyond the 8 ft security fence around the outfall structure. Although DOE-RL (1992b) reports that the concrete portions of the spillway were removed, the concrete outfall flume walls have not been removed. They have been covered to grade to their termination point. The soil ditch beyond remains open. In the outfall line, just before the river shoreline, are four vent pipes, approximately 8-in. diameter. The riprap continues on out to the river. The openings to the outfall flume overflows have been covered with wooden box frame and wire mesh aviary covers. The outfall is posted with "Surface Contamination" warning signs.

4.4 116-KE-4 (107-KE RETENTION BASINS)

The 116-KE-4 is an inactive mixed liquid waste site that operated from 1955 to 1971 to receive cooling water effluent from the 105-KE Reactor for radioactive decay and thermal cooling prior to release to the Columbia River (Stenner et al. 1988). This site consists of three tanks and is located approximately 500 ft northeast of 105-KE Reactor at 100-K Area coordinates NK5357 WK4268, NK5329 WK4537, and NK5300 WK4805 (WHC 1991).

The open-air tanks were constructed of welded carbon steel plate with 3/8-in. steel bottoms and were mounted on reinforced-concrete foundations. They are 250-ft diameter by 25 ft high and have a capacity of 9 million gallons. Six-inch perforated, corrugated tell-tale pipes, radiating at 45°

from the center of each tank, were laid in treated sand trenches. Each of these collector drains terminates at a sight well outside the tank perimeter. A concrete footing or ringwall, 3 ft deep by 18 in. wide, supports the tank shell, which was made of four steel plate rings (Hale 1957b and WHC 1991).

Contaminated cooling water from the reactor was diverted to any one of the tanks through one of three 72-in. motor operated rubber-lined butterfly valves, which were housed in an underground reinforced concrete valve box. Beyond the valve box, three 72-in. pipes, that are supported aboveground, carried discharge over the rims of their respective basins. The water was discharged onto a chute designed to carry it to the bottom of the basin with minimum inlet turbulence. To assure unrestricted flow during an emergency, an unvalved vertical loop by-pass was provided around one inlet control valve (Hale 1957b).

At the center of each tank was a drainage sump 14 ft in diameter and 8 ft deep. A 66-in. tank drain line, laid in an 8 ft by 10 ft concrete maintenance tunnel under the tank, carried the water from the tank, through a motor operated butterfly valve, to the drain sewer (Figure 4-8). Each basin was equipped with an overflow weir and collection box discharging to the drain sewer beyond the outlet control valve and was capable of handling the maximum possible flows from the reactor (Hale 1957b).

The tanks were designed to operate via a cyclic system whereby one tank would be filling with effluent, a second tank holding the effluent for decay, and the third tank draining either the normal effluent to the river outfall or the effluent containing radioactive contamination to the 116-K-1 crib (Figure 4-4). This batch disposal scheme was regulated by automatic valving. The cycling practice, however, was abandoned shortly after startup of the 105-KE Reactor when this method of operation caused an outfall line to float and break. The lines were reanchored and the flow through the tanks changed. See Section 4.3 for additional information. The effluent was sent to one tank and overflowed to the outfall system (Dorian and Richards, 1978).

During reactor operations, the basins frequently developed leaks. The first indications of large leaks occurred before 1965 when extensive ponding reportedly developed between the basins and the road directly to the north. To circumvent this, 2 to 3 ft of fill was placed in this area. Leakage rates were estimated at 10,000 to 20,000 gal/min. The leak rate from the butterfly valves (that went to an adjacent trench) could have been as high as 5,000 to 10,000 gal/min. Cooling water that leaked from the basins flowed over land and under the road by way of a culvert. Refer to Figure 4-9 for a photograph depicting a leach trench for the 107-K retention basins. Because the basins were less than 1,000 ft from the shoreline, effluent leaked to the Columbia River (DOE-RL 1992b and WHC 1991).

Figure 4-8. 100-KE Underground Drain Lines.

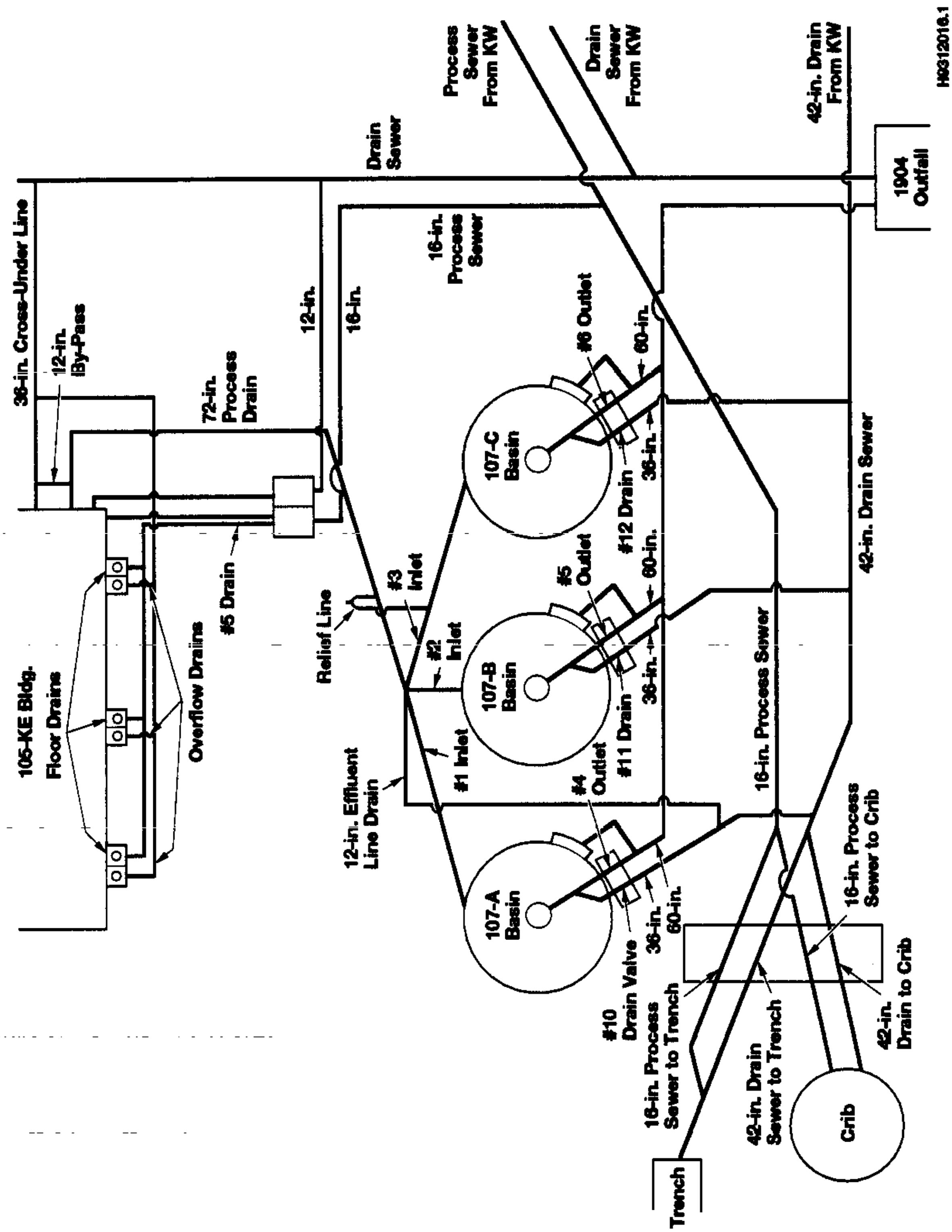


Figure 4-9. 100-K Retention Basin Leach Trench, March 1, 1955.

Sampling in the retention basin area was initiated on November 20 and completed on December 18, 1975. Underground contamination of sample holes drilled along effluent lines and directly outside the retention basin walls is minimal. All underground soil samples taken in this area had GM readings of less than 200 c/m. Counts taken with a scaler installed in a vehicle and radionuclide analyses of selected samples showed occasional slight activity above background for some samples. Radionuclide concentrations of selected samples showed some occasional slight activity above background for some of these samples. Radionuclide concentrations of selected samples from test holes drilled outside the 107-KE retention basin are given in Appendix B.

The 107-KE retention basins (Figure 4-10) have a total radionuclide inventory of 4.9 Ci (Dorian and Richards, 1978). Predominant radionuclides present in the soil column as a result of cooling water leaks and waste disposal are ^{3}H, ^{60}Co, ^{63}Ni, ^{90}Sr, ^{137}Cs, ^{152}Eu, ^{154}Eu, and ^{155}Eu (DOE-RL 1992b). Surface contamination in the general area surrounding the retention basin had direct GM readings from 500 to 1,500 c/m (Dorian and Richards, 1978).

Though radionuclide concentrations are highest in the basin sludge, over 80% of the radioactive inventory of the K basins is contained in contaminated leakage areas adjacent to the basin, which has a total radionuclide inventory of 6.2 Ci, as reflected in Table 4.8. Several soil samples were taken in the area adjacent to the basins within a fenced radiation zone. The total curies calculated were based on surface contamination 0.5 ft deep and underground contamination of 20 ft deep. The soil estimated volume is reported as 1.5×10^{5} ft^{3} and the mass as 1.0×10^{10}g. The estimated underground volume is reported as 6.0×10^{6} ft^{3} and the mass as 4.1×10^{11}g (Dorian and Richards, 1978).

Figure 4-10. 107-KE Retention Basins.

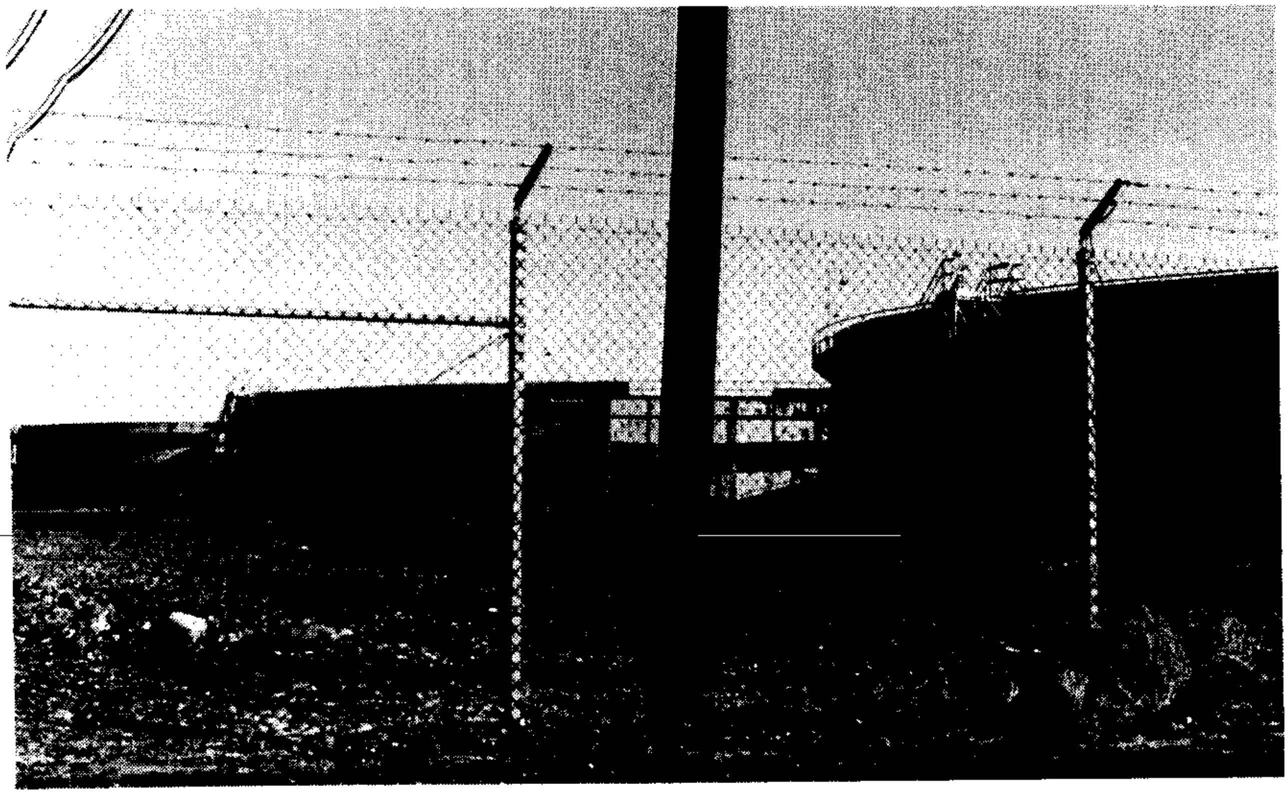


Table 4-8. Contaminated Solid Column Adjacent to the 116-KE-Retention Basins

Radionuclide	Surface contamination average pCi/g	Underground contamination average pCi/g	Curies
^{238}Pu	*	*	0.0
^{238}Pu	$3.0x10^{-2}$	*	$3.0x10^{-4}$
^{90}Sr	$9.5x10^{-1}$	$3.7x10^{-1}$	$1.6x10^{-1}$
^{3}H	$3.1x10^{-1}$	NA(1)	$1.3x10^{-4}$
^{152}Eu	$1.5x10^{1}$	$4.4x10^{0}$	2.0
^{60}Co	$1.3x10^{1}$	$2.5x10^{0}$	1.1
^{154}Eu	$8.1x10^{0}$	$1.6x10^{0}$	$7.4x10^{-1}$
^{134}Cs	$2.5x10^{-2}$	$4.3x10^{-2}$	$1.8x10^{-2}$
^{137}Cs	$8.7x10^{0}$	$3.9x10^{0}$	1.7
^{155}Eu	$2.0x10^{0}$	$7.4x10^{-1}$	$3.2x10^{-1}$
		Total Ci	6.2

(1)Concentration assumed to be equivalent to surface contamination for total curies calculation for ^{3}H.

The floors of the basins are at approximately at ground level. Therefore, no sample holes were drilled through floors of the basins due to the difficulty and expense of providing equipment access into the insides of the basins. The average GM readings of soil samples taken along the bottom of the fill material of the basins is 2,000 c/m. This can be compared to a range of 9,000 to over 30,000 c/m for the average GM readings of the 107 basins in other deactivated 100 Areas (Dorian and Richards, 1978).

Radionuclide concentrations for selected samples taken of the soil fill and sludge inside the basins are given in Appendix B. A summary of the distribution of the radionuclides for the basins is given in Table 4.9.

Table 4-9. Radioactive Inventory for the 116-KE Retention Basins.

Sample area (3 tanks)	Curies
Sludge	0.035
Soil fill less sludge	0.15
Soil adjacent to basin	6.2

(Dorian and Richards, 1978)

Loose scale has dropped off the inside walls of the retention basins (metal tanks) and lies around the base of the inside walls. This scale reads 3000 to 10,000 c/m with a GM probe. Scale at the base of the inlet chutes to the tanks reads up to 90,000 c/m and averages 60,000 c/m. Over 90% of the scale has dropped off of the side walls (Dorian and Richards, 1978).

In 1971, the basins were deactivated, pipe entrances were covered for wildlife control, walls were washed down and backfilled with 2 to 4 ft of soil (DOE-RL 1992b and Stenner et al. 1988). The adjacent Heat Exchanger pads, described in Section 5.4, are surrounded by an 8-ft fence approximately 100 ft by 100 ft^2. Surface contamination was detected up to 1,500 dpm in an area about 10 ft by 10 ft north of the 107-KE. Contamination was removed on December 27, 1989 (WHC 1991).

The HRS Migration score assigned to this waste site is 76.91 (Stenner et al. 1988).

Today, the tanks and piping remain inplace and the site appears much as it did during operations with the exception of large-diameter openings that were cut in late 1993 for decommissioning activities. The south side of the berms around the basins have been excavated out for entry of heavy equipment through the basin walls. Reportedly, efforts are under way to clean and dismantle the retention basins. The material is to be excessed as clean steel or removed to the 200 Areas for burial. The interior of the basins are covered with about 2 ft of fill material and have sagebrush and other natural vegetation growing on the surface. This site is included in a fenced area that also includes the 107-KW retention basins and is posted with "Surface Contamination" warning signs.

4.5 116-KW-3 (107-KW RETENTION BASINS)

The 116-KW-3 retention basins are an inactive liquid waste site that operated from 1954 to 1970. The three 250 ft diameter 26-ft-high tanks are located at 100-K Area coordinates NK5245 WK6190, NK5245 KW6460, NK5245 KW6730, which is north of the 105-KW Reactor Building (WHC 1991). The basins were used for the radioactive decay and thermal cooling of the 105-KW Reactor's effluent water prior to release to the Columbia River via the 1904-K outfall (116-K-3) (See Figure 4-7).

This system consisted of the three carbon steel tanks with steel bottoms. Each tank is set on an 8-in. bed of 3/4-in. stone underlaid with a 2-in. layer of asphalt treated sand. Radiating out from the center at 45°, are 6-in. corrugated perforated tell-tale pipes bedded in treated sand. Each of the tell-tale pipes terminates in a sight well outside a 3-ft deep 18-in. concrete ring wall foundation. At the center of each tank there is a drainage sump 14 ft in diameter and 8 ft deep. A 66-in. drainline is laid in an 8-ft by 10-ft concrete maintenance tunnel under each tank (Hale 1957b).

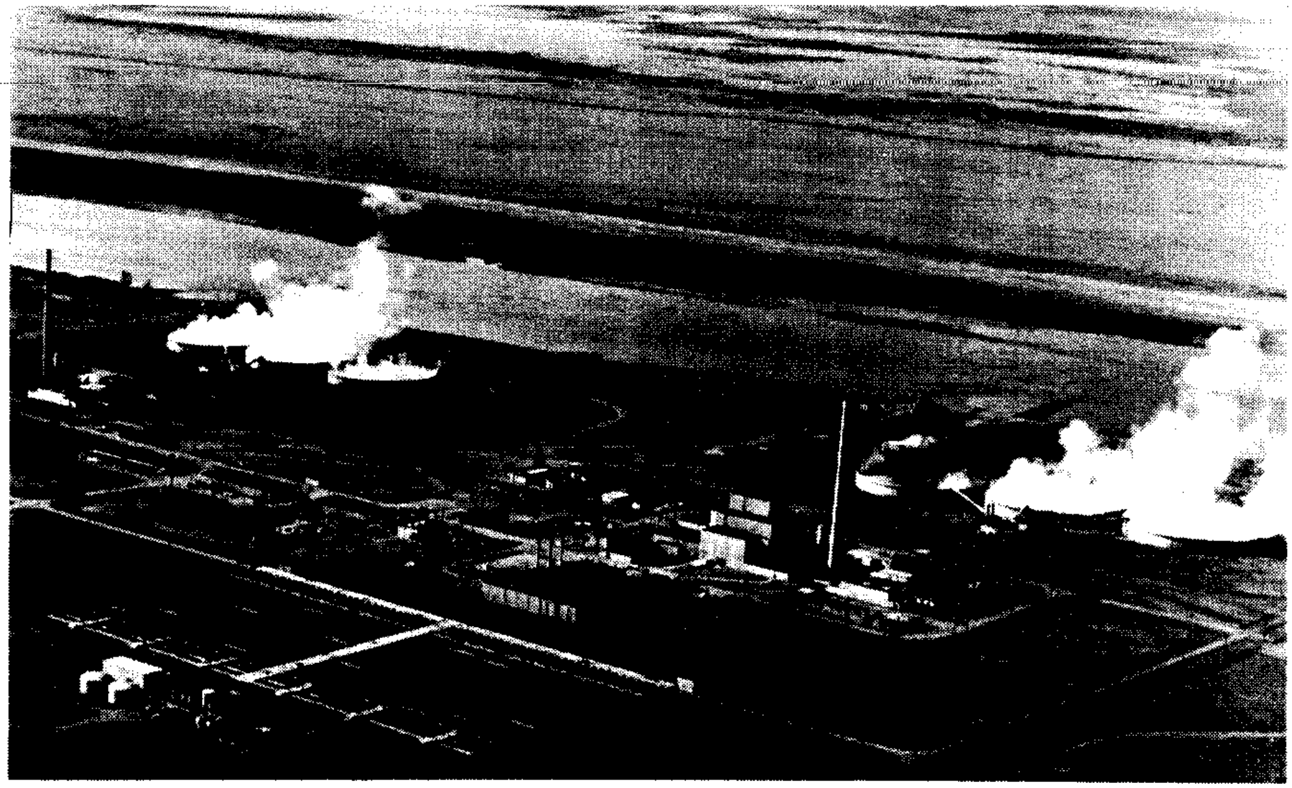
Originally the basins were to be used such that one would be in use, one discharging to the effluent line and to the river or 116-K-1 trench (Figure 4-3), and one remaining empty in a standby mode. The valves used to insure operation in this mode were all automatic. This mode of operation caused large amounts of air to become entrained in the system, causing the outfall piping to float and fail. Subsequential operations were changed to a manual operation mode. This system further deteriorated until efforts to control effluent flow through the basins were rarely successful. By 1959, the basins were used on a flowthrough basis; the cooling effluent entered at the top on one side and exited via the overflow at the top of the other side. This mode of operation was due to difficulty in operating the dump valves (Healy 1959).

The basins (Figure 4-11) over time developed leaks both in the structure and lines leading to and from the basins. These leaks were estimated to be as great as 10,000 to 20,000 gal/min. The first noticeable large leaks caused ponding between the basins and the road to the north of the basins, which was diverted via a metal culvert to an open canal and to the river shoreline (DOE-RL 1992a). Refer to Figure 4-9 for a photograph depicting a leach trench for the 107-K retention basins. The butterfly valves in the lines to the 116-K-2 trench (Figure 4-3) leaked at a rate of 5,000 to 10,000 gal/min (WHC 1991). Concrete was poured over identifiable leaks, the basin walls were washed down, and the basins were backfilled with about 2 ft of clean fill material to stabilize the remaining contaminants and sludge that was left at the time of shutdown of the reactors (Clough 1971).

Eighty percent of the total radionuclide inventory is contained in the soils adjacent to the basins (Stenner et al. 1988). Surface contamination was detected in the area of a culvert pipe (used to divert leakage to the river) that was up to 5,000 dpm. This surface contamination was cleaned up in December, 1989 (WHC 1991).

This waste site has a HRS Migration score of 76.91 (Stenner et al. 1988).

Figure 4-11. 107-KE/KW Retention Basins During Operations, March 1, 1962.



Today, the tanks and piping remain inplace and the site appears much as it did during operations with the exception of large diameter openings that were cut in late 1993 for decommissioning activities. The south side of the berms around the basins have been excavated out for entry of heavy equipment through the basin walls. Reportedly, efforts are under way to clean and dismantle the retention basins. The material is to be excessed as clean steel or removed to the 200 Areas for burial. The interior of the basins are covered with about 2 ft of fill material and have sagebrush and other natural vegetation growing on the surface. This site is included in a fenced area that also includes the 107-KE retention basins and is posted with "Surface Contamination" warning signs.

5.0 100-KR-2 OPERABLE UNIT

This section describes the 100-KR-2 Operable Unit, which encompasses the area to the south of the 100-KR-1 Operable Unit and is bounded on the south by the north boundary of the 100-KR-3 Operable Unit. The eastern boundary is about 1,150 ft east of the 100-K Area fence to include the 118-K-1 burial ground and the 126-K1 borrow pit. It includes the 105-KE and 105-KW Reactors, Electrical Substations (151-KE/KW), and cooling water pump facilities located in the 100-K Area. It encompasses 38 waste sites, 15 of which are included in the Tri-Party Agreement (Ecology et al. 1989). These include decommissioned and active facilities, trenches, cribs, french drains, septic tanks, burial grounds, and unplanned releases.

The relative locations of 100-KR-1, 100-KR-2, and 100-KR-3 are shown in Appendix A. Separate maps specific to each of the 100-K Area Operable Units (100-KR-1, 100-KR-2, and 100-KR-3) can be found in Appendix A (A-2, A-3, and A-4). Additional figures (A-5, A-6, and A-7) are included in Appendix A to provide clarity for each waste type described.

Table 5-1 identifies the sites for which a PNL HRS Migration score has been established; not all of the waste sites located within the 100-KR-2 Operable Unit have had HRS scores applied to them.

Table 5-1. Hazard Ranking System Migration Score.

Waste site number	HRS migration score
116-KE-1	40.09
116-KE-2	49.00
116-KE-3	00.00
116-KW-1	40.09
116-KW-2	0.00
118-K-1	6.08
118-KW-1	6.08
UPR-100-K-1	53.24

(Stenner et al. 1988)

Each waste site is described separately in Sections 5.1 through 5.32.

5.1 116-KE-1 (115-KE CONDENSATE CRIB)

The 116-KE-1 is an inactive low-level liquid waste site that operated from 1955 to 1971 to receive 800,000 L of condensate and other waste from reactor gas purification systems. This site is located approximately 10 ft west of the southeast corner of the 117 Building at 100-K Area coordinates NK4525 WK4376.5 (Hanford Drawing H-1-23207).

The crib measures 6 ft by 6 ft at the bottom, 40 by 40 ft at the top, and is 26 ft deep (Figure 5-1) (DOE-RL 1992b). The distribution system associated with this crib is composed of a 4-in. pipe that leads into an 8-in. corrugated, perforated pipe, 10.5 ft long with two 5.4-ft sections branching off at 45° angles. The bottom is filled with coarse gravel to 1 ft above the bottom and has been backfilled with dirt to grade (Stenner et al. 1988).

Sampling was initiated for this crib on March 17, 1976, and completed on March 31, 1976. Typically, a sample hole was first drilled into the center of a crib. Depending on the radioactivity detected in samples and in situ GM readings taken of the first sample hole, together with the size of the crib, one or several more holes would be drilled along and outside of the facility to estimate the lateral spread of contamination. In situ GM readings taken of the sample holes were also useful in verifying the adequacy of the intervals at which soil samples were collected for laboratory analyses.

The crib has an estimated radioactive inventory of 240 Ci, which is almost entirely from the following low energy beta emitters:

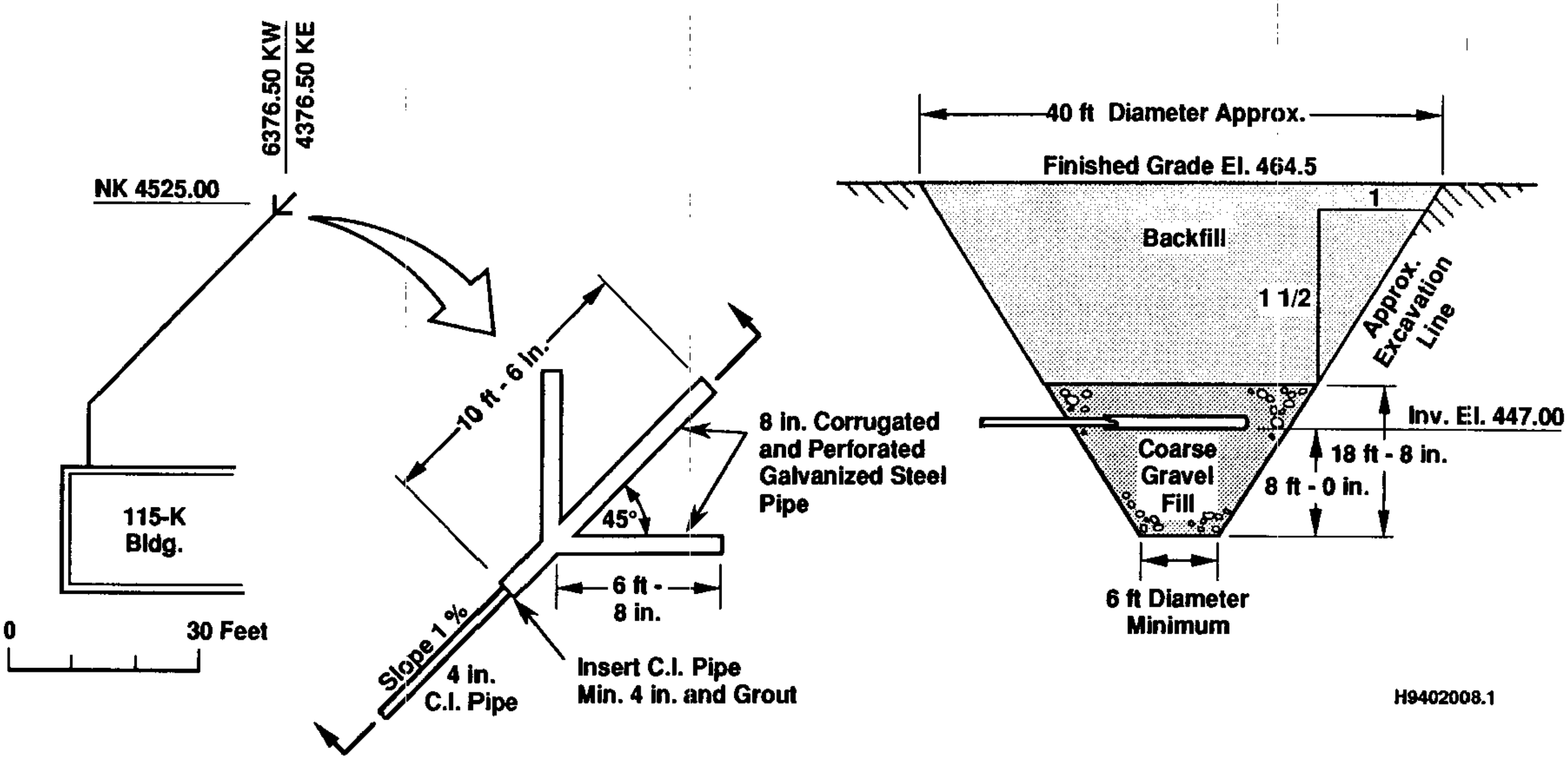
^{14}C: 1.100E+002 Ci ^{3}H: 5.650E+001 Ci.

Beta inventory includes 9.740E-001 Ci. This isotope data has been decayed through April 1, 1986 (Stenner et al. 1988 and DOE-RL 1992b). Beta gamma concentrations within the crib, taken from two sample holes, range from 4.500E+005 to 8.600E+005 pCi/g (Dorian and Richards, 1978).

The HRS Migration score assigned to this waste site is 40.09 (Stenner et al. 1988).

The crib appears today as a gravel parking lot outside 105-KE Reactor.

9413275.1818



115-K Building Crib
Dry Well

Plan at El. 447.0 of 115 Building Drier Condensate Disposal System
Reference Drawing H-1-23207

Figure 5-1. 115-KE/KW Crib.

5.2 116-KE-2 (1706-KER WASTE CRIB)

The 116-KE-2 is an inactive liquid waste site that operated from 1955 to 1971. It is located at 100-K Area coordinates NK4405 WK5055 (WHC 1991), which is 180 ft west of the 1706-KE Building. It was used to receive an estimated 3,000,000 L of liquid wastes from test loops and cleanup columns in the 1706-KER loop. It could also, on an emergency basis, receive contaminated cooling water due to fuel ruptures at the 105-KE Reactor (Heid 1956).

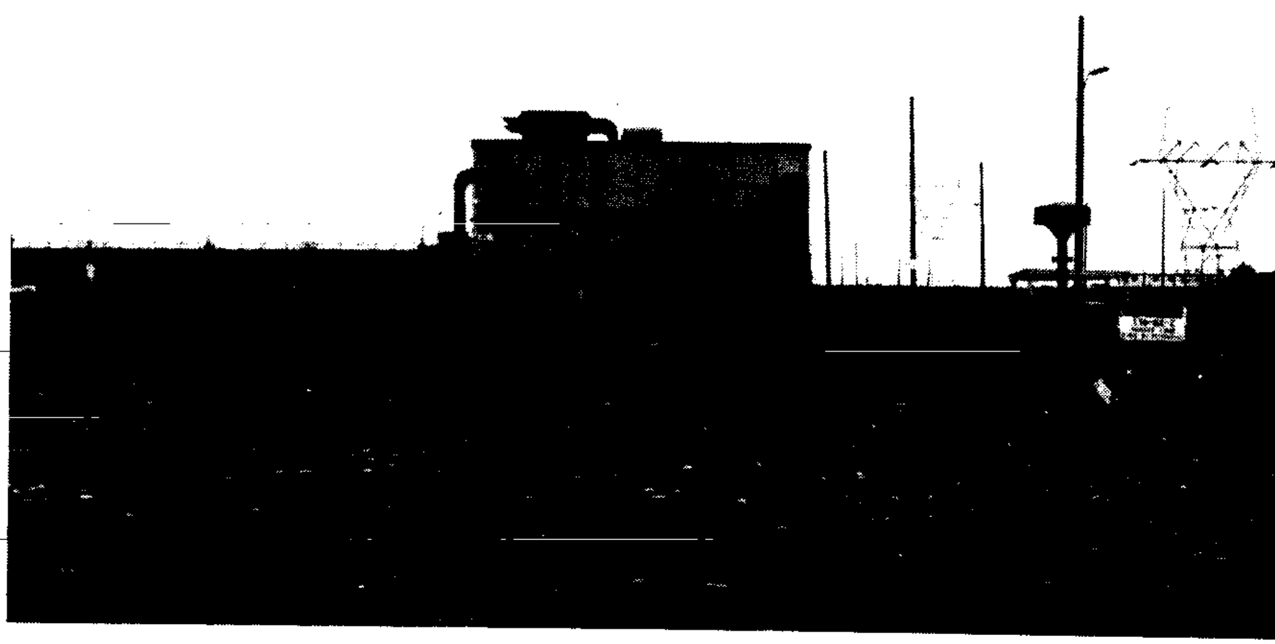
This 16 by 16 by 32-ft-deep wooden crib (Figure 5-2) rests about 3 ft above the excavation bottom. The bottom 10 ft is filled with crushed rock and backfilled with clean fill material. A distribution pipe enters the crib structure 23 ft belowgrade. A 4-in. vent pipe (24 ft long) extends abovegrade 2.4 ft. Two additional pipes penetrate the crib whose purpose is unknown: 1) an 8-in. pipe, which changes to a 10-in. pipe extends from 1 ft below the crib to 2.5 ft abovegrade, and 2) a 4-in. pipe extends from 12 ft below the crib to 2.5 ft abovegrade. The crib is covered by a 4-in-thick concrete slab that is about 33 ft^2 (Hanford Drawing H-1-20365 and WHC 1991).

The estimated radionuclide inventory, in curies decayed through April 1, 1986, includes the following:

^{14}C: 1.200E-001	^{154}Eu: 1.700E-001	^{240}Pu: 1.900E-003
^{60}Co: 1.110E+001	^{155}Eu: 1.520E-002	^{90}Sr: 2.130E+000
^{137}Cs: 6.620E-001	^{3}H: 4.280E-001	^{235}U: 2.000E-005
^{152}Eu: 2.630E-003	^{239}Pu: 1.700E-002	^{238}U: 2.080E-003

(Stenner et al. 1988)

Figure 5-2. 1706-KER Waste Crib.



At the time of sampling, GM readings of 15,000 c/m were detected in samples from 42 ft deep in the sample well. GM readings from 48 ft deep indicated only 500 c/m, indicating that the bulk of the contaminants are bound in the soils at that range of depth. The total curie content was estimated to be 38 Ci with 33 of those being ^{60}Co and the remaining balance being mostly ^{90}Sr.

In addition, the hazardous chemical inventory includes 100,000 kg sodium hydroxide (WHC 1991). Hanford Inactive Site Survey Database (HISS) information includes 1.0E+005 kg sulfuric acid. Former site employees report that depleted ion exchange resins were flushed to this crib and most likely are the largest contributor of radioactive contamination in this waste site.

Dorian and Richards (1978) reports results of soil samples taken from the crib; the estimated volume of the crib was 1.3E+05 ft^3 and with a mass of 8.8E+09 g. The sampling results are provided in Tables 5.2 and 5.3. Table 5.4 depicts the radionuclide content in the samples taken. A full table is provided in Appendix B and is summarized in Tables 5-2 and 5.3.

Table 5-2. 116-K-2 Beta-gamma and Pu-239/240 Concentrations.

Radionuclides	Maximum pCi/g	Average pCi/g
Beta-Gamma	$1.10E^{+04}$	$4.30E^{+03}$
$^{239/240}Pu$	$6.10E^{+00}$	$2.10E^{+00}$

(Dorian and Richards, 1978)

Table 5-3. 116-KE-2 Radionuclide Inventory.

Radionuclide	Average pCi/g	Curies
^{238}Pu	*	0.0
$^{239/240}Pu$	$2.10E^{+00}$	$1.90E^{-02}$
^{90}Sr	$2.90E^{+02}$	2.60
^{3}H	$7.70E^{+01}$	$6.80E^{-01}$
^{152}Eu	$4.50E^{-01}$	$4.00E^{-03}$
^{60}Co	$3.80E^{+03}$	33
^{154}Eu	$3.80E^{+01}$	$3.30E^{-01}$
^{134}Cs	*	0.00
^{137}Cs	$9.10E^{+01}$	$8.00E^{-01}$
^{155}Eu	$5.40E^{+00}$	$4.80E^{-02}$
uranium	$2.40E^{-01}$	$2.10E^{-03}$
^{14}C	$1.40E^{+01}$	$1.20E^{-01}$
Total		38

(Dorian and Richards, 1978)

Table 5-4. 116-KE-2 Radionuclide Concentrations.

Isotope	Concentration (pCi/g) sample A-40	Concentration (pCi/g) sample A-42.5	Concentration (pCi/g) sample A-47.5
^{238}Pu	*	*	*
$^{239/240}$Pu	1.70E^{-01}	6.1E^{+00}	*
^{90}Sr	1.60E^{+02}	6.90E^{+02}	1.60E^{+00}
^{3}H		1.50E^{+01}	4.00E^{+00}
^{152}Eu	*	1.10E^{+00}	2.50E^{-01}
^{60}Co	1.50E^{+03}	9.70E^{+03}	1.50E^{+02}
^{154}Eu	2.20E^{+01}	9.20E^{+01}	8.80E^{-01}
^{134}Cs	*	*	*
^{137}Cs	5.10E^{+01}	2.20E^{+02}	9.90E^{-01}
^{155}Eu	3.30E^{+00}	1.30E^{+01}	*
uranium		2.40E^{-01}	
^{14}C		1.40E^{+01}	

* = Below detectable limits (Dorian and Richards, 1978)
Blank Space = No analysis performed

It is likely that wastes reportedly disposed in the 118-K-3 filter crib were disposed at this site. Hanford drawings and discussions with former site employees do not support the existence of the 118-K-3 crib (see Section 5.33). Hanford Drawings H-1-20365, H-1-23215, and H-1-24926 indicate that 1706-KE/KER drain lines discharged to this site. This site is a Registered Class IV Underground Injection Well.

The HRS Migration score assigned to this site is 49.00.

The 116-KE-2 appears today much as it did during operations. It is a vegetation-free, cobble-covered field surrounded on four sides with signs labeling it as the 116-KE-2 KER crib. The area is posted with cave-in potential warning signs.

5.3 116-KE-3 (105-KE STORAGE BASIN FRENCH DRAIN)

The 116-KE-3 is an inactive low-level liquid waste site that operated from 1955 to 1971 as an overflow weir for subdrainage from the 105-KE storage basin. It is located approximately 75 ft north of the 105-KE Reactor Building at 100-K Area coordinates NK4691 WK4756. It is also referred to as the 105-KE reverse well (Stenner et al. 1988 and WHC 1991).

The site includes a drain field with an 8-in. steel well casing extending downward to a point 10 ft below the mean water table. The bottom 20 ft of the well casing is perforated and embedded in gravel at a depth of about 29 ft. A 4-in. steel test hole pipe extended from the surface to the drain field but is no longer evident on the surface. Site dimensions listed for this waste site are 20-ft diameter by 78 ft deep (WHC 1991 and DOE-RL 1992b).

This drainage system (Figure 5-3) was modified several times to improve the control of contaminated basin water disposal. In the early 1950's, the first modification included the C sump, a concrete collection sump 7.5 by 4.6 by 12 ft deep, that allowed the drainage to be routed to the french drain, the process sewer, or to the 116-KE-1 crib. The system was further modified in 1977 and 1978 to preclude basin discharges from entering the environment. The collection sump was modified to return the water to the basin or transfer it to a 20,000-gal tank installed to receive contaminated waste water. Site and former employees report that the waste tank was never used and the basins have operated as a closed-loop system from the time they began operations as storage basins for N Reactor fuels.

No data have been reported on the radionuclide concentrations for this waste site.

The HRS Migration score assigned to this waste site is 0.00.

This french drain appears today much as it did during operations. The area surrounding the site is cobble covered and posted with "Underground Radioactive Material" warning signs. The mound covering the waste installed in 1977 and 1978 is evident in Figure 5-4.

9413275.1823

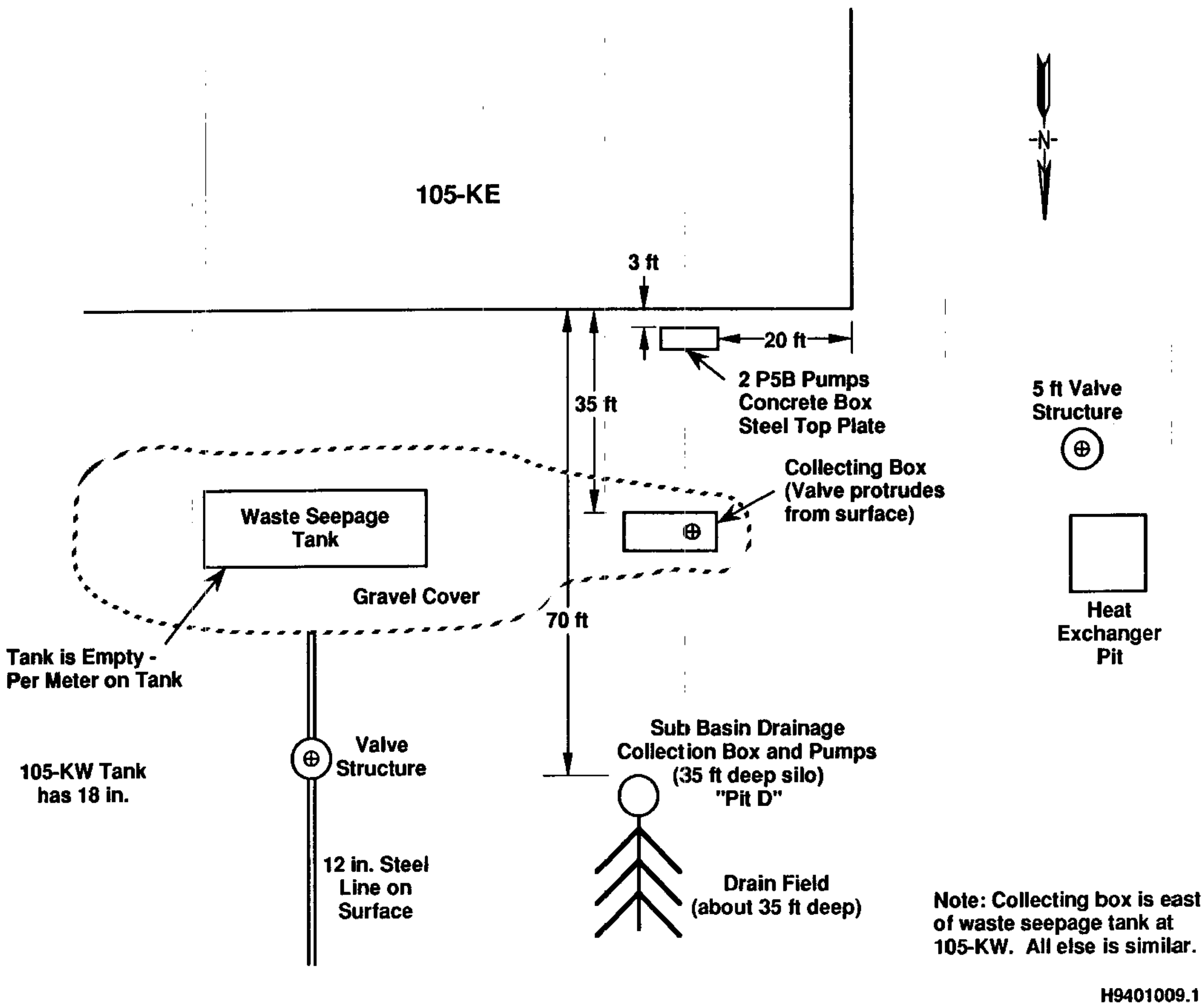
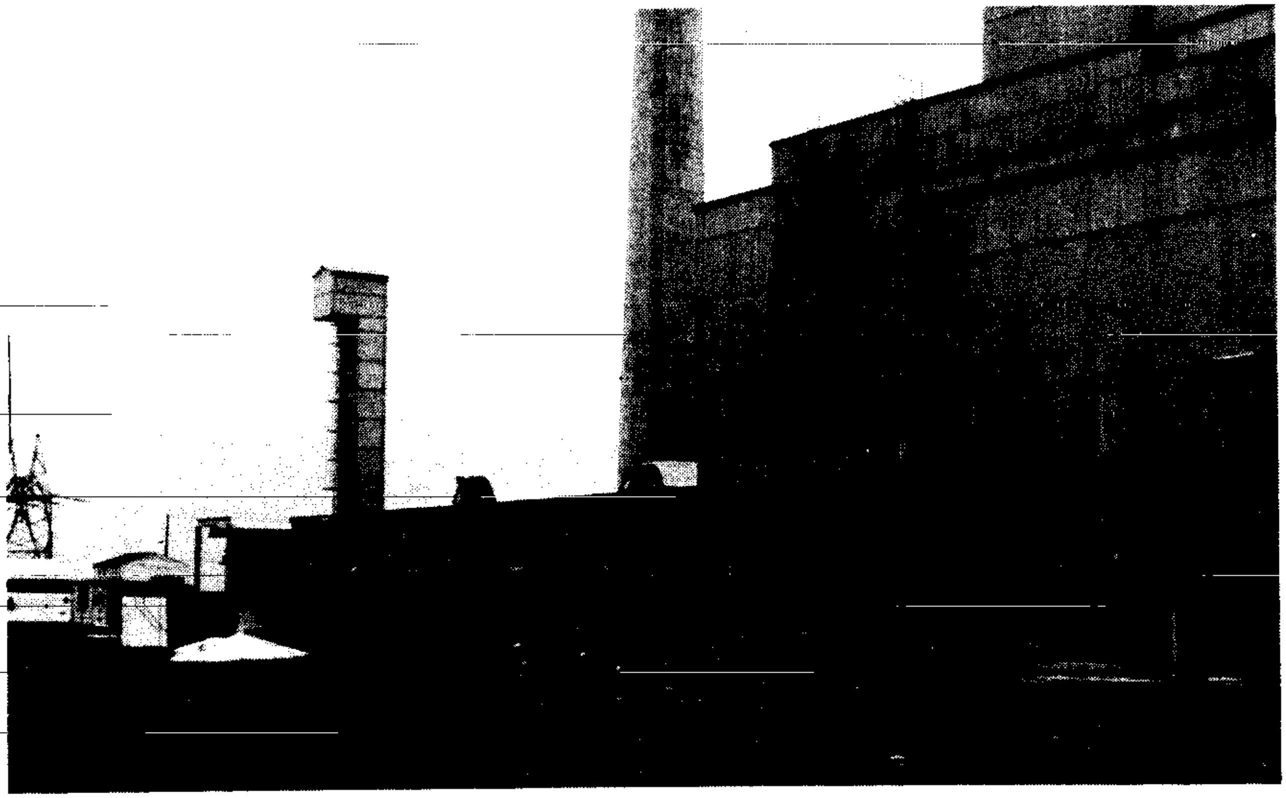


Figure 5-3. 105-KE Sub Basin Drainage System.

Figure 5-4. 105-KE Storage Basin French Drain.



5.4 116-KE-5 (150-KE HEAT RECOVERY STATION)

The 116-KE-5 is an inactive mixed liquid waste site that operated from 1955 to 1971 for purposes of transferring heat from the 105-KE Reactor cooling water effluent. This waste site is located east of the reactor cooling effluent lines near the 107-KE basins at 100-K Area coordinates NK5020 WK4600 (Cramer 1987).

The facility was constructed on a concrete pad (Figure 5-5), had approximately 945 ft^2 of space, and consisted of heat exchangers and associated piping (Cramer 1987 and Kiser 1984). Heat was transferred from the reactor cooling water effluent by an ethylene glycol system (see Section 5.11) and piped to 100-K Area buildings to be used for space heating and to heat storage tank solutions at the 183-K facilities (DOE-RL 1992b).

Trace amounts of radioactive contamination remain on piping. Routine radiation surveys and visual inspections are made.

Today, the 116-KE-5 waste site appears much as it did during operations, except the heat exchangers have been removed and are in use in the 150-KE fuel storage facility (WHC 1991). Disconnected piping remains at the site; the ends have been covered with plywood. The entire station is surrounded by an 8-ft chain-link fence posted with "Surface Contamination" warning signs. Natural vegetation grows in all soil areas within the fenced area.

Figure 5-5. 100-K Area Heat Recovery Station.

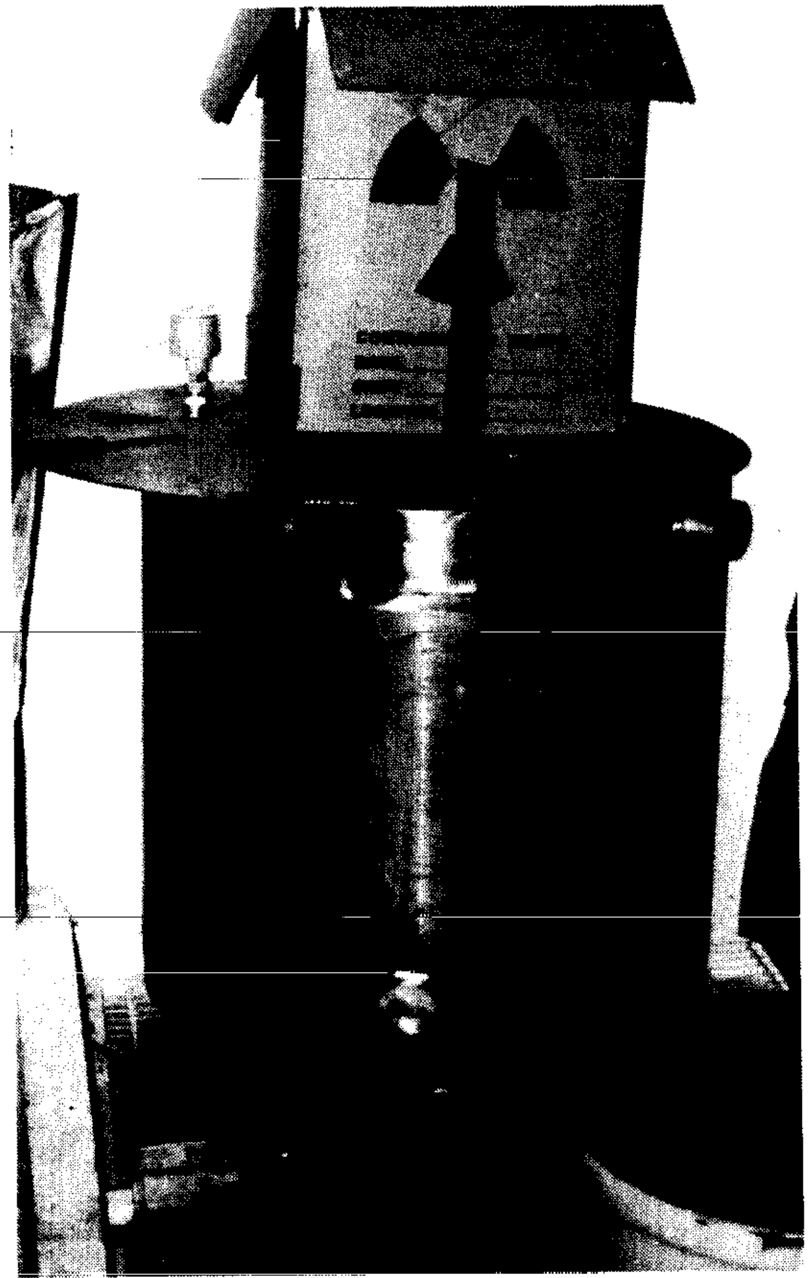
5.5 116-KE-6A (1706-KE CONDENSATE COLLECTION TANK)

The 116-KE-6A is an active mixed liquid waste site located in the 1706-KE Building laboratory at 100-K Area coordinates NK4350 WK4850. This condensate collection tank is part of a system installed in 1984 to treat radioactive mixed wastes generated in the laboratories of the 1706-KE Building. This site is sometimes referred to as the 1706-KE waste treatment system (WHC 1991) (see Sections 5.6, 5.7, and 5.9).

Originally, wastes generated in the 1706-KE Building were transferred from a waste accumulation tank to an ion exchange column and continuously recirculated to remove radionuclides from the water. The water was then disposed in the 100-K process sewer system after analysis for activity (Emory 1994, memo).

In mid 1984, a new system of radioactive waste treatment was initiated that consisted of an evaporation and epoxy encapsulation unit. The new IVRS was attached to the existing radioactive waste treatment system. The system involved transferring wastes that had accumulated in a waste accumulation tank to an ion exchange column and continuously recirculating the waste to remove the ionic constituents from the waste stream. The wastes were then transferred to a heated evaporation tank, allowing the liquid wastes to boil to steam. The intent was to solidify the radioactive waste. The steam was condensed and collected in this 96-gal condensate collection tank (Figure 5-6). Exhaust from the evaporation process was passed through a HEPA filter system prior to discharge (Emory 1994, memo and WHC 1991).

Figure 5-6. 1706-KE Condensate Collection Tank, January 1994.



The IVRS was abandoned in late 1984 after experiencing numerous failures (Emory 1994, memo). In mid 1986, an attempt to revive the unit to serve as a mixed waste treatment system for N Reactor effluents was initiated. However, this resulted in a fire on August 18, 1986, and the subsequent forcible ejection of approximately 30-gal waste material from the treatment unit. The system was permanently shutdown. The ejected waste material was cleaned up and packaged for low-level burial by operations personnel. The area was cleaned to back-ground radiation levels of the immediate vicinity of the system (WHC 1991).

In anticipation of this use, applications for Part B and Part A permits had been initiated. Neither the original radwaste system nor the IVRS are known to have treated hazardous or mixed waste before or during either of the abortive test programs.

A request for withdrawal of the Part A application was submitted to Ecology on January 22, 1989. The DOE responded on August 17, 1989, disapproving withdrawal pending receipt of further justification. In response to their request, a complete history of all materials that went into the system during the time in question has been compiled. Sampling and analysis of all wastes generated during the testing, as well as all components of the system has been conducted to determine if any listed waste was processed through the system. None have thus far been identified. The request for withdrawal will be resubmitted with the above information (Emory 1994, memo).

Today, the tank and piping remain inplace in the basement of the 1706-KER Building. The waste site appears much as it did during operations, although some components have been removed or utilized for other testing within the laboratory.

5.6 116-KE-6B (1706-KE-EVAPORATION TANK)

The 116-KE-6B is an active mixed liquid waste site located in the 1706-KE Building laboratory at 100-K Area coordinates NK4350 WK4850. This evaporation tank is part of a system installed in 1984 to treat radioactive mixed wastes generated in the laboratories of the 1706-KE Building. This site is also known as the 1706-KE waste treatment system (WHC 1991). See also Sections 5.5, 5.7, and 5.8.

Originally, wastes generated in the 1706-KE Building were transferred from a waste accumulation tank to an ion exchange column and continuously recirculated to remove radionuclides from the water. The water was then disposed in the 100-K process sewer system after analysis for activity (Emory 1994, memo).

In mid 1984, a new system of radioactive waste treatment was initiated that consisted of an evaporation and epoxy encapsulation unit. The new IVRS was attached to the existing radioactive waste treatment system. The system involved transferring wastes that had accumulated in the waste accumulation tank to an ion exchange column and continuously recirculating the waste to remove the ionic constituents from the waste stream. The wastes were then transferred to this 30- to 55-gal (steel drum) evaporation tank, which was heated, allowing the liquid wastes to boil to steam (Figure 5-7). The intent was to solidify the radioactive waste. The steam was condensed and collected in a condensate collection tank described in Section 5.5. Exhaust from the evaporation process was passed through a HEPA filter system prior to discharge (Emory 1994, memo and WHC 1991).

Figure 5-7. 1706-KE Evaporation Tank, January 1994.

The IVRS was abandoned in late 1984 after experiencing numerous failures (Emory 1994, memo). In mid 1986, an attempt to revive the unit to serve as a mixed waste treatment system for N Reactor effluents was initiated. This, however, resulted in a fire on August 18, 1986 and the subsequent forcible ejection of approximately 30-gal waste material from the treatment unit. The system was permanently shutdown. The ejected waste material was cleaned up and packaged for low-level burial by operations personnel. The area was cleaned to background radiation levels of the immediate vicinity (WHC 1991).

In anticipation of this use, applications for Part B and Part A permits for waste treatment systems had been initiated. Neither the original radwaste system nor the IVRS are known to have treated hazardous or mixed waste before or during either of the abortive test programs.

A request for withdrawal of the Part A application was submitted to Ecology on January 22, 1989. Ecology responded on August 17, 1989, disapproving withdrawal pending receipt of further justification. In response to their request, a complete history of all materials that went into the system during the time in question has been compiled. Sampling and analysis of all wastes generated during the testing, as well as all components of the system, has been conducted to determine if any listed waste was processed through the system. None have thus far been identified. The request for withdrawal will be resubmitted with the above information (Emory 1994, memo).

Today, the tank and piping remain in place in the basement of the 1706-KER Building. The waste site appears much as it did during operations, although some components have been removed or utilized for other testing.

5.7 116-KE-6C (1706-KE WASTE ACCUMULATION TANK)

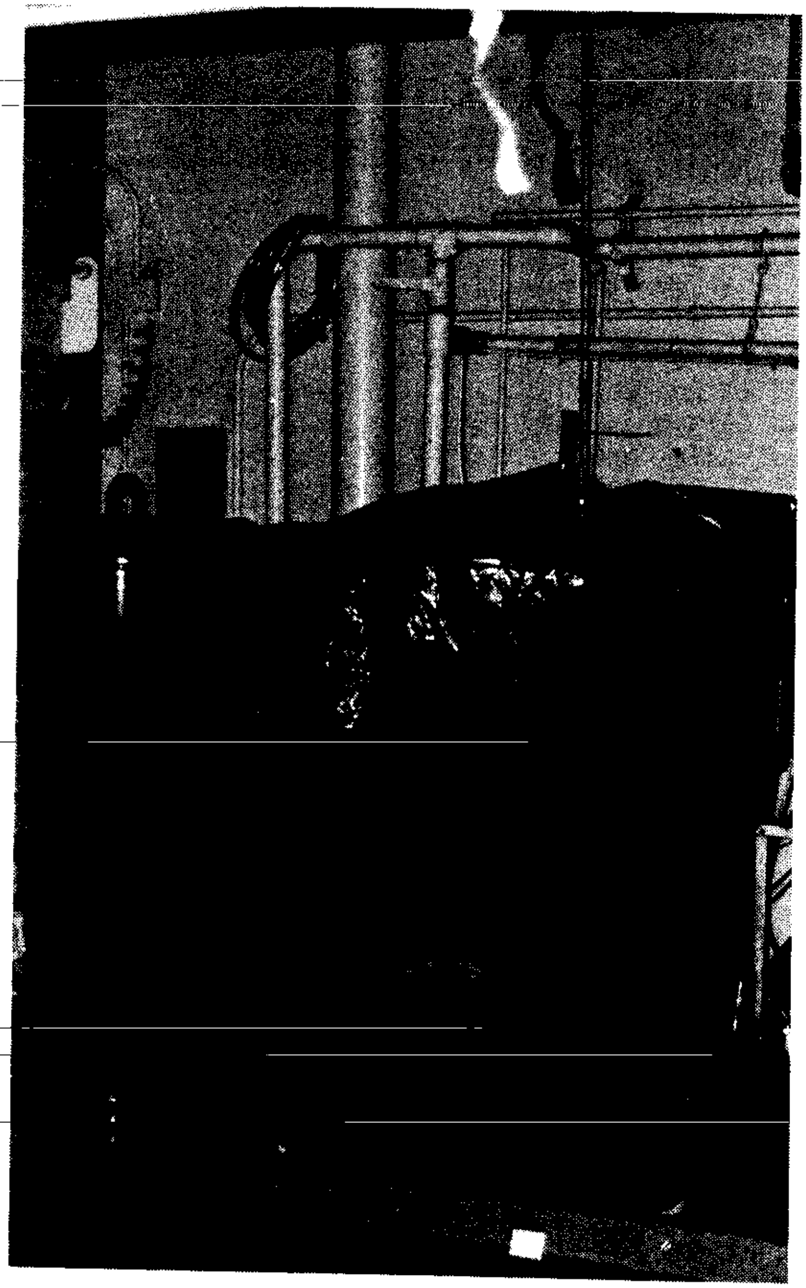
The 116-KE-6C is an active mixed liquid waste site located in the 1706-KE Building laboratory at 100-K Area coordinates NK4350 WK4850. This waste accumulation tank is part of the original system installed prior to 1984 to treat radioactive mixed wastes generated in the laboratories of the 1706-KE Building. This site is also referred to as the 1706-KE waste treatment system (WHC 1991). See also Sections 5.5, 5.6, and 5.7.

Originally, waste that accumulated in this 550-gal tank was recirculated through an ion exchange column to remove radionuclides from the water. The water was then disposed to the 100-K process sewer system after analysis for activity (Emory 1994, memo and WHC 1991) (see Figure 5-8).

In mid 1984, a new system of radioactive waste treatment was initiated that consisted of an evaporation and epoxy encapsulation unit. The new IVRS was attached to the existing radioactive waste treatment system, which incorporated the use of this tank. The system involved transferring wastes that had accumulated in this tank to an ion exchange column and continuously recirculating the waste to remove the ionic constituents from the waste stream. The wastes were then transferred to an evaporation tank that was heated, allowing the liquid wastes to boil to steam. The intent was to solidify the radioactive waste. The steam was condensed and collected in a condensate collection tank. Exhaust from the evaporation process was passed through a HEPA filter prior to discharge (Emory 1994, memo and WHC 1991).

The IVRS was abandoned in late 1984 after experiencing numerous failures (Emory 1994, memo). In mid 1986, an attempt to revive the unit to serve as a mixed waste treatment system for N Reactor effluents was initiated. This, however, resulted in a fire on August 18, 1986 and the subsequent forcible ejection of approximately 30-gal waste material from the treatment unit. The system was permanently shutdown. The ejected waste material was cleaned up and packaged for low-level burial by operations personnel. The area was cleaned to background radiation levels of the immediate vicinity (WHC 1991).

Figure 5-8. 1706-KE Waste Accumulation Tank, January 1994.



In anticipation of this use, applications for Part B and Part A permits for waste treatment systems had been initiated. Neither the original radwaste system nor the IVRS are known to have treated hazardous or mixed waste before or during either of the abortive test programs.

A request for withdrawal of the Part A application was submitted to Ecology on January 22, 1989. Ecology responded on August 17, 1989, disapproving withdrawal pending receipt of further justification. In response to their request, a complete history of all materials that went into the system during the time in question has been compiled. Sampling and analysis of all wastes generated during the testing, as well as all components of the system has been conducted to determine if any listed waste was processed through the system. None have thus far been identified. The request for withdrawal will be resubmitted with the above information (Emory 1994, memo).

Today, the tank and piping remain inplace in the basement of the 1706-KER Building. The waste site appears much as it did during operations, although some components have been removed or utilized for other testing within the laboratory.

5.8 116-KE-6D (1706-KE-ION EXCHANGE COLUMN)

The 116-KE-6D storage tank is an active mixed liquid waste site located in the 1706-KE Building laboratory at 100-K Area coordinates NK4350 WK4850. This ion exchange column is part of a system installed in 1984 to treat radioactive mixed wastes generated in the laboratories of the 1706-KE Building. This site is also referred to as the 1706-KE waste treatment system (WHC 1991). See also Sections 5.5, 5.6, and 5.7.

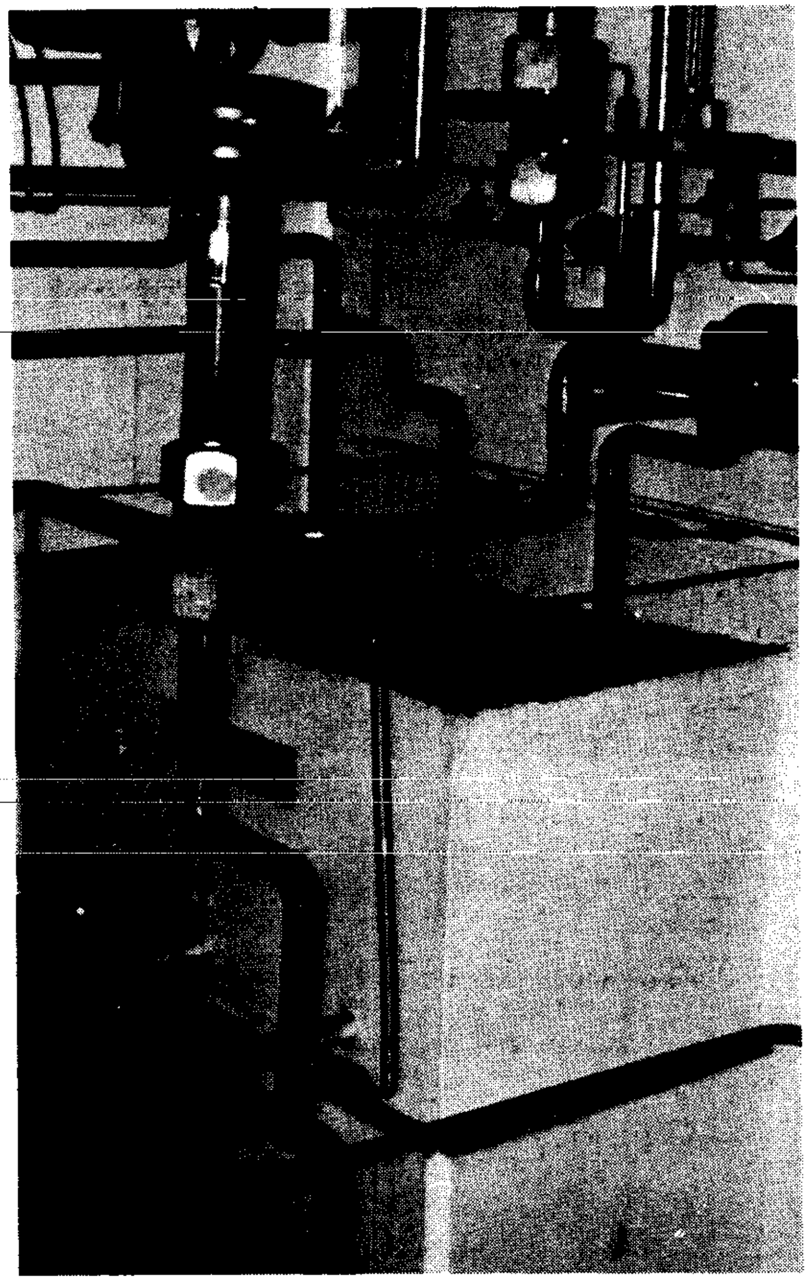
Originally, wastes generated in the 1706-KE Building were transferred from a waste accumulation tank to one of four ion exchange columns located in one of four "cells" in the basement of the 1706-KER Building and continuously recirculated to remove radionuclides from the water. The water was then disposed to the 100-K process sewer system after analysis for activity (Emory 1994, memo).

In mid 1984, a new system of radioactive waste treatment was initiated which consisted of an evaporation and epoxy encapsulation unit. The new IVRS was attached to the existing radioactive waste treatment system. The system involved transferring wastes that had accumulated in the waste accumulation tank to this 5-ft^3 mixed-bed resin ion exchange column (Figure 5-8) that replaced the original ion exchange columns (Figure 5-9) used. The contaminated water was continuously recirculated to remove the ionic constituents from the waste stream. The wastes were then transferred to a heated evaporation tank allowing the liquid wastes to boil to steam. The intent was to solidify the radioactive waste. The steam was condensed and collected in a condensate collection tank. Exhaust from the evaporation process was passed through a HEPA filter system prior to discharge (Emory 1994, memo and WHC 1991).

The IVRS was abandoned in late 1984 after experiencing numerous failures (Emory 1994, memo). In mid 1986, an attempt to revive the unit to serve as a mixed waste treatment system for N Reactor effluents was initiated. This, however, resulted in a fire on August 18, 1986, and the subsequent forcible ejection of approximately 30-gal waste material from the treatment unit. The system was permanently shutdown. The ejected waste material was cleaned up and packaged for low-level burial by operations personnel. The area was cleaned to background radiation levels of the immediate vicinity (WHC 1991).

In anticipation of this use, applications for Part B and Part A permits for waste treatment systems had been initiated. Neither the original radwaste system nor the IVRS are known to have treated hazardous or mixed waste before or during either of the abortive test programs.

Figure 5-9. Original 1706-KE Ion Exchange Column, January 1994.



A request for withdrawal of the Part A application was submitted to Ecology on January 22, 1989. Ecology responded on August 17, 1989, disapproving withdrawal pending receipt of further justification. In response to their request, a complete history of all materials that went into the system during the time in question has been compiled. Sampling and analysis of all wastes generated during the testing, as well as all components of the system has been conducted to determine if any listed waste was processed through the system. None have thus far been identified. The request for withdrawal will be resubmitted with the above information (Emory 1994, memo).

Today the tank and piping remain inplace in the basement of the 1706-KER Building. The waste site appears much as it did during operations, although some components have been removed or utilized for other testing within the laboratory.

5.9 116-KW-1 (115-KW CONDENSATE CRIB)

The 116-KW-1 is an inactive liquid waste site that operated from 1955 to 1971 (Dorian and Richards, 1978). The crib is located at 100-K Area coordinates NK4525 WK6376.5 (Hanford Drawing H-1-23207), which is about 70 ft north of 115-KW and 10 ft west of the southwest corner of the 117-KW Buildings. This 40 by 40 by 26-ft-deep crib received contaminated condensate and waste water from the reactor gas purification systems (WHC 1991) (Section 5.1, Figure 5-1).

The crib consisted of a 4-in. feed pipe, an 8-in. corrugated, perforated pipe 10.5 ft long, and two 6.5-ft sections that branch off at 45° angles. It was filled with coarse gravel to within 0.5 ft of grade and then covered to grade with clean fill material (Stenner et al. 1988). Originally, it was marked by a single square wooden post, however the site has since been covered with asphalt paving (WHC 1991).

The crib received an estimated 800,000 L of waste. The radionuclide inventory in curies decayed through April 1, 1986, includes the following:

^{60}Co:	1.010E-003	^{154}Eu:	8.000E-005	^{238}U:	1.100E-004
^{134}Cs:	4.000E-003	^{155}Eu:	9.500E-004	^{14}C:	1.100E+002
^{137}Cs:	3.640E-003	^{3}H:	8.190E+001	^{90}Sr:	6.220E-003

(Stenner et al. 1988)

Additionally, Dorian and Richards (1978) reports the results of soil samples taken from the crib. They report the volume as 8.0 X 10^3 ft^3 and the mass as 5.4 X 10^8g. Full tables are provided in Appendix B and are summarized in Tables 5-5, 5-6, and 5-7.

Table 5-5. 116-KW-1 Beta-gamma Concentrations.

Radionuclide	Maximum pCi/g	Average pCi/g
Beta-Gamma	$8.60E^{+05}$	$45.50E^{+05}$

(Dorian and Richards, 1978)

Table 5-6. 116-KW-1 Radionuclide Inventory. (sheet 1 of 2)

Radionuclide	Average pCi/g	Curies
^{238}Pu	*	0.00
$^{239/240}Pu$	*	0.00
^{90}Sr	$1.40E^{+01}$	$7.60E^{-03}$
^{3}H	$2.40E^{+05}$	130

Table 5-6. 116-KW-1 Radionuclide Inventory. (sheet 2 of 2)

Radionuclide	Average pCi/g	Curies
^{152}Eu	*	0.00
^{60}Co	$5.60E^{+00}$	$3.00E^{-03}$
^{154}Eu	$2.90E^{-01}$	$1.60E^{-04}$
^{134}Cs	$1.20E^{+00}$	$6.50E^{-04}$
^{137}Cs	$8.10E^{+00}$	$4.40E^{-03}$
^{155}Eu	$5.50E^{+00}$	$3.00E^{-03}$
uranium	$2.10E^{-01}$	$1.10E^{-04}$
^{14}C	$2.10E^{+05}$	110
Total		240

(Dorian and Richards, 1978)

Table 5-7. 116-KW-1 Radionuclide Concentrations.

Isotope	Concentration (pCi/g) sample B-27.5	Concentration (pCi/g) sample B-35
^{238}Pu	*	*
$^{239/240}Pu$	*	*
^{90}Sr	$2.70E^{+01}$	$1.80E^{+00}$
^{3}H	$4.70E^{+05}$	$8.30E^{+03}$
^{152}Eu	*	*
^{60}Co	$3.30E^{+00}$	$7.90E^{+00}$
^{154}Eu	$3.30E^{-01}$	$2.40E^{-01}$
^{134}Cs	$2.40E^{+00}$	$5.30E^{-02}$
^{137}Cs	$6.40E^{+00}$	$9.80E^{+00}$
^{155}Eu	$1.10E^{+01}$	*
uranium	$3.10E^{-01}$	$1.10E^{-01}$
^{14}C	$3.90E^{+05}$	$3.60E^{+04}$

* = Below detectable limits (Dorian and Richards,1978)
Blank Space = No analysis performed

This waste site has an HRS Migration score of 40.09 (Stenner et at. 1988). This site appears today as a gravel parking lot.

5.10 116-KW-2 (105-KW STORAGE BASIN FRENCH DRAIN)

The 116-KW-2 is an inactive liquid waste site that operated from 1955 to 1970 (Stenner et al. 1988). The french drain is located at 100-K Area coordinates NK4691 WK6757. It was used as an overflow weir for subdrainage from the fuels storage basin. It was also known as the 105-KW basin reverse well due to its construction (Hanford Drawing H-1-23207 and WHC 1991).

The french drain consisted of an 8-in. well casing that extends to 10 ft below the mean water table, with the bottom 20 ft of the casing being perforated. It includes a drain field that is 29 ft belowgrade. A 4-in. steel test pipe extended from the drain field to the surface, but is no longer evident at the site (Hanford Drawing H-1-23207 and WHC 1991) (see Figure 5-3).

This drainage system was modified several times to improve the control of contaminated basin water disposal. In the early 1950s, the first modification included the C sump, a concrete collection sump 7.5 by 4.6 by 12-ft-deep, that allowed the drainage to be routed to the french drain, or to the process sewer, or to the 116-KE-1 crib (Hanford Drawing H-1-23207). The system was further modified in 1977-1978 to preclude the basin discharges from entering the environment at all. The collection sump was modified to either return the water to the basin or to transfer it to a 20,000-gal tank installed to receive contaminated waste water (Hanford Drawings H-1-34768 and H-134653). It is a registered Class IV Injection Well (Stenner et al. 1988).

The HRS Migration score assigned to this site is 0.00.

Present and former site employees report that the waste tank was never used and the basins have operated as a closed-loop system from the time they began operations as storage basins for N Reactor fuels.

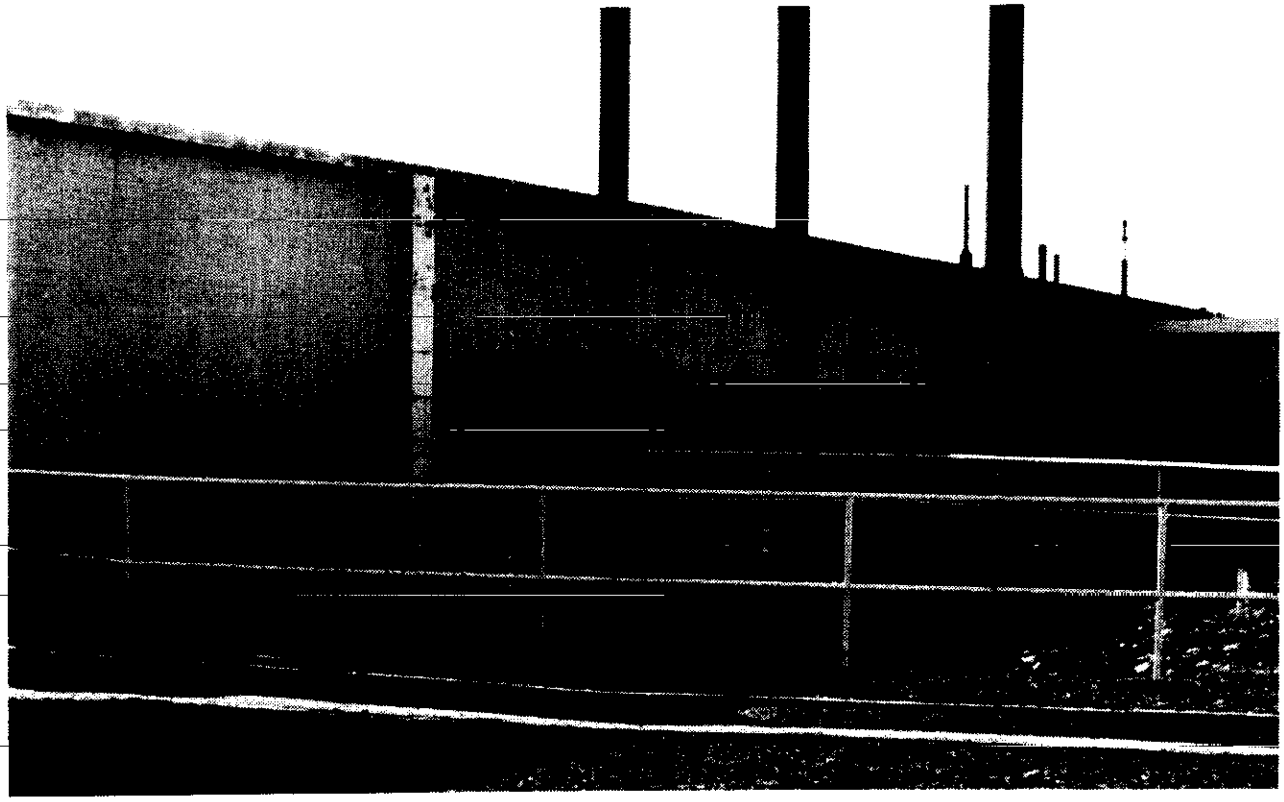
The site appears today as a vegetation-free, cobble-covered area and mound with assorted pipes, valves, and vents extending through its upper surface.

5.11 116-KW-4 (150-KW HEAT RECOVERY STATION)

The 116-KW-4 is an inactive liquid waste site that operated from 1955 to 1970. It is located at 100-K Area coordinates NK5020 WK6540 (WHC 1991), which is east of the reactor cooling effluent lines near the 107-KW retention basins.

"For the first time in the history of the Hanford Project, waste heat from an atomic reactor was used" to heat reactor facilities. The heat exchanger systems (Figure 5-5) were inter-tied to provide for the needs of either or both of the reactor facilities. The heating medium consisted of a 34% ethylene glycol-water solution. The glycol solution was maintained at a "substantially higher pressure" than the cooling water effluent stream to preclude the possibility of reactor cooling water entering the glycol system (Figure 5-10) (Hale 1957b).

Figure 5-10. Glycol Tanks.



The unit consisted of heat exchangers, pumps, and associated piping on a concrete pad (WHC 1991). Trace amounts of contamination remains on the piping, the heat exchangers were removed for use in the 105-KW fuels storage facilities. Routine inspections and surveys are performed at the site.

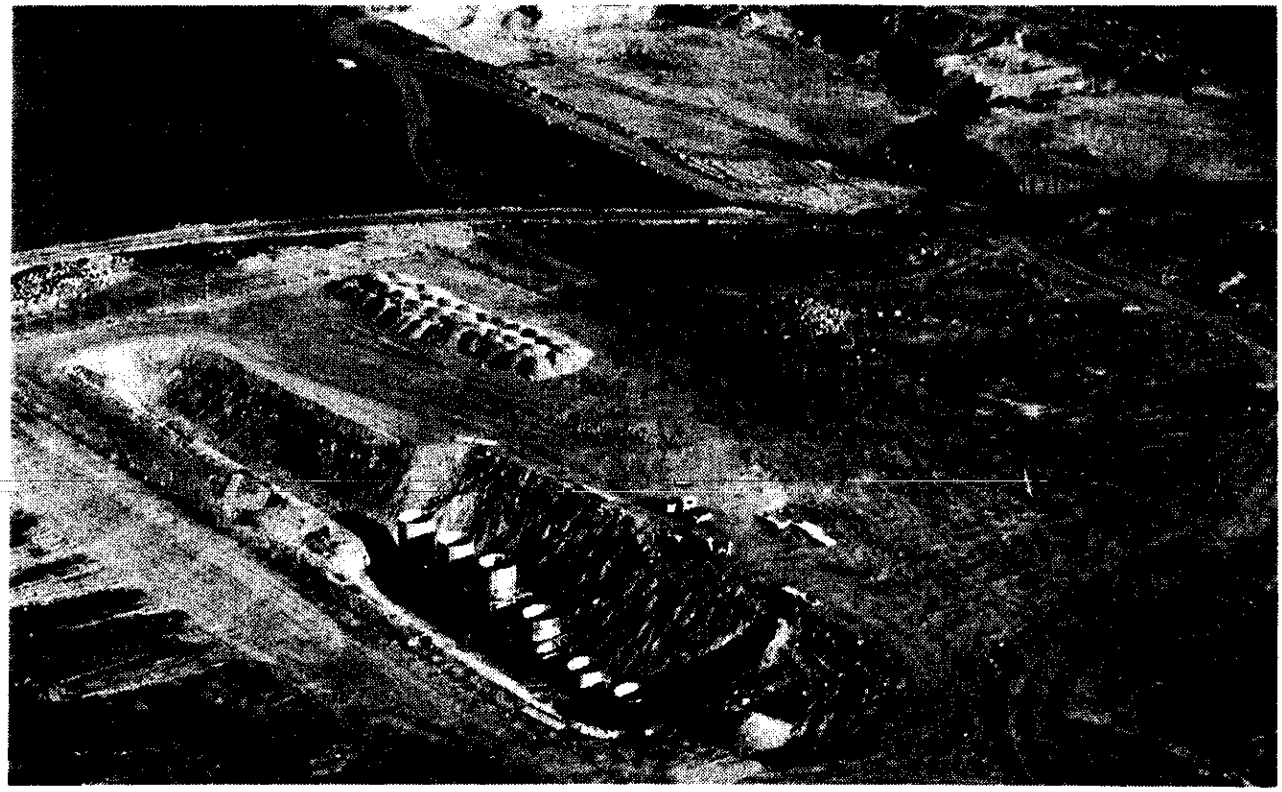
No radionuclide inventory information is available.

The site appears today much as it did during operations except that the heat exchangers have been removed. Disconnected piping remains at the site; the ends have been covered with plywood. The entire station is surrounded by an 8-ft chain-link fence that has been posted with "Surface Contamination" warning signs. Natural vegetation grows in all soil areas within the fenced area.

5.12 118-K-1 (100-K BURIAL GROUND)

The 118-K-1 is an inactive solid waste site that operated from 1953 to 1975 (WHC 1991). The burial ground is located at Hanford coordinates N77375 W66991 (corner), which is just outside the east perimeter fence to the 100-K Area, about 800 ft northeast of the 105-KE Reactor Building. The 1,200 by 600 by 20-ft-deep site was used for the disposal of solid wastes generated in the 100-K Area. It is estimated that this burial ground (Figure 5-11) contains an estimated 10,000 m^3 of solid wastes.

Figure 5-11. 100-K Burial Ground, October 1, 1954.



There was a low-level contaminated waste incinerator located in the southeast corner of the burial ground. The incineration of combustible contaminated wastes was halted in 1960 but had been routine for several years prior to that (WHC 1991).

The incinerator was a prototype and was a natural draft type installed over an ash pit. It was later modified to allow burning in the ash pit. Air was pumped down to the pit bottom through a pipe to improve combustion. This modification allowed the operator to fill the pit with the boxed wastes instead of burning just two or three boxes at a time on the incinerator grating above the pit. The stacks on the incinerator were short and no provision was made to treat the smoke generated by the burning wastes (Dorian and Richards, 1978).

Dorian and Richards (1978) reports that the incinerator was operated until 1971 when the practice was discontinued due to problems in meeting regulations that limited untreated waste burning to 25 lb/d.

The incinerator and its stack were removed and buried in situ adjacent to the silo ash pit. It was covered with clean fill material (several ft of soil) to match the surrounding grade. The remaining portion of the burial ground contains numerous pits, trenches, and silos (Hanford Drawing H-1-12012). There are six silos, each is 25 ft deep by 10 ft diameter, walled with corrugated metal pipe, and equipped with individual covers. They contain both 100-K and 100-N Reactor wastes.

Some 100-N wastes include stainless steel heat exchanger tubing from the 100-N Reactor steam generators. Total miscellaneous metallic wastes from all sources are estimated to be about 300 m^3 (WHC 1991). These metallic wastes consist of an estimated 50 tons of aluminum tubes, 1,140 lb of irradiated stainless steel facilities, 105 tons of aluminum expendables, 74 lb of thermocouples, and 970 lb of aluminum horizontal control rods (Dorian and Richards, 1978). The individual trench and pit dimensions vary greatly (Stenner et al. 1988).

The radionuclide inventory in curies decayed through April 1, 1986 includes the following:

^{14}C:	1.560E+000	^{154}Eu:	8.460E+001	^{240}Pu:	1.380E-002
^{60}Co:	2.289E+003	^{3}H:	7.000E+000	^{125}Sb:	2.500E+001
^{137}Cs:	7.600E+000	^{63}Ni:	3.760E+002	^{90}Sr:	7.600E+000
^{152}Eu:	4.720E+001	^{239}Pu:	2.160E-001		

(Stenner et al. 1988)

Additionally, a surface contaminated area measuring 4 ft by 3 ft had detectable contamination of up to 3,000 dpm. The contamination was removed in December 1989.

This waste site has an HRS Migration score of 6.08 (Stenner et al. 1988).

The site appears today as a vegetation-free, gravel-covered area that is raised approximately 2 ft abovegrade. No official log could be located for this burial ground although burial records for 1971 were found and are included in Appendix D.

5.13 118-K-2 (SLUDGE BURIAL GROUND)

The 118-K-2 burial ground is an inactive solid waste site located east of the 116-KE-4 retention basins.

The burial ground was reportedly used to dispose radioactive sludge from the 116-KE-4 and 116-KW-3 retention basins. No information is currently available on this site (DOE-RL 1992a).

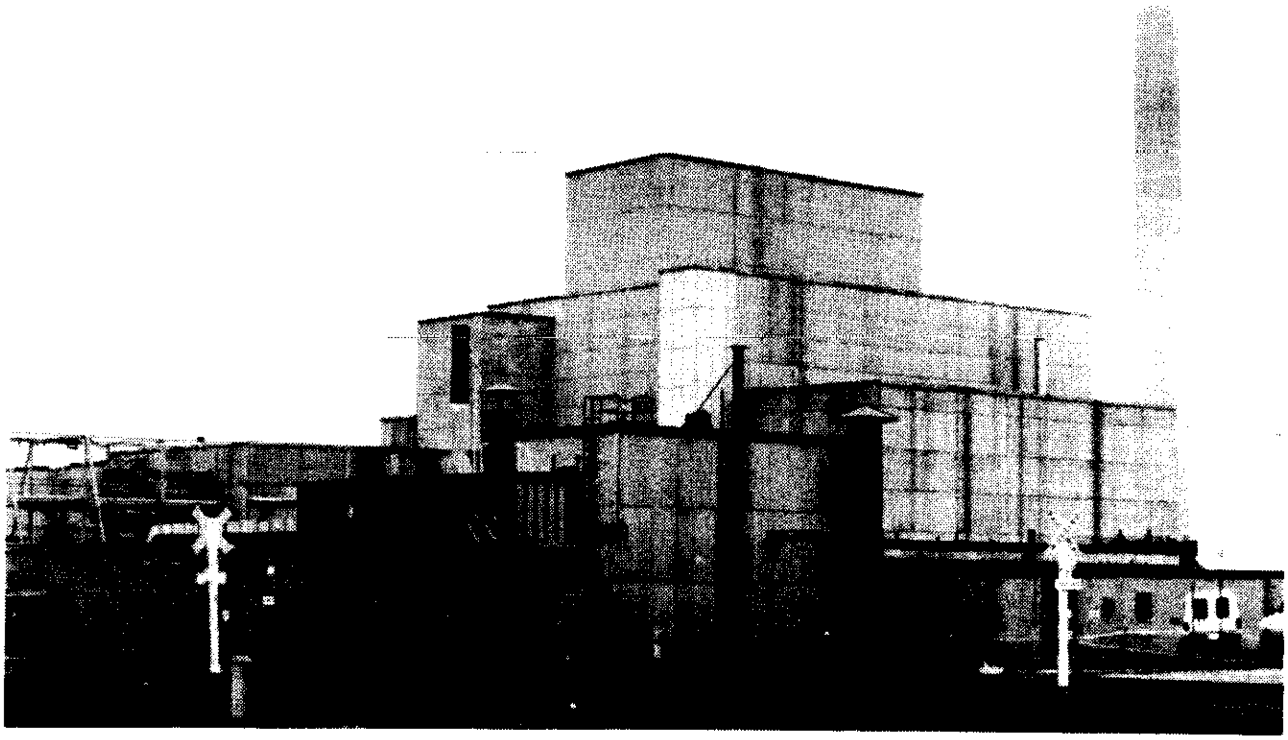
The site appears today as a vegetation-free, cobble-covered area.

5.14 118-KE-1 (105-KE REACTOR BUILDING)

The 118-KE-1 is an inactive mixed solid waste facility that operated from 1955 to 1971. It is located at the east end of the 105-KE/KW exclusion area fence at 100-K Area coordinates NK4520 WK4520. This facility is also referred to as the 105-KE Reactor (WHC 1991) (Figure 5-12).

The reactor building includes the reactor block, the irradiated fuel storage basin, ventilation system, and work areas and contains an estimated 58,000 Ci of radionuclides, 167 tons of lead, and 25,000 ft^3 of asbestos (Cramer 1987 and DOE-RL 1992b).

Figure 5-12. 105-KE Reactor, February 1, 1994.



The reactor block consists of a graphite moderator stack encased in cast-iron thermal shielding and a heavy aggregate concrete biological shield, process tubes, and a safety and control system. The block weighs approximately 11,000 tons and measures 44 ft from front to rear, 53 ft from side to side, and 50 ft from top to bottom. The reactor was sealed within a helium-nitrogen gas atmosphere circulated from the respective 115-K facility. The cover, gas, fuel elements, and control systems were removed at the time of deactivation (DOE-RL 1992b).

The reactor fuel storage basin, which was modified in 1974 and 1975, has a surface area of approximately 1,000 ft^2, a depth of 20 ft and a volume of about 200,000 ft^3. The modification included the addition of a recirculating cooling system partly consisting of the 150-KE heat exchangers. The basin originally provided shielding and cooling for the irradiated fuel during reactor operations (DOE-RL 1992b). The 105-K Area Reactor storage basins were constructed without the concrete columns in the basins. The abovegrade walls are constructed of transite panels instead of concrete block, which should be considered at the time of demolition. The roofs of the basins are reinforced concrete slabs above a heavy steel support structure (Griffin 1987).

There may have been some seepage from the fuel storage basins in which case the soil column under the basins may be contaminated. The soil has not been characterized, but the radionuclide inventory is estimated to be low when compared to the total inventory in the reactor. Routine radiation surveys and visual inspection are performed. Facilities are located within the groundwater monitoring system of the 100 Areas (Cramer 1987).

Following shutdown of the reactor, the fuel basin was cleaned and modified for the storage of irradiated fuel from the 100-N Area (DOE-RL 1992b). Refer to Section 5.29, UPR-100-K-1, 105-KE Reactor Fuel Storage Basin Leak, for a detailed discussion on an unplanned release regarding this basin.

The reactor appears much the same today as it did during operations.

5.15 118-KE-2 (105-KE HORIZONTAL CONTROL ROD STORAGE CAVE)

The 118-KE-2 is an inactive low-level solid waste site that was used from 1955 to 1971 for the temporary storage of radioactive rod tips for radioactive decay pending subsequent disposal (Cramer 1987 and WHC 1991). This waste site is located northeast of the 105-KE Reactor Building at 100-K Area coordinates NK4640 WK4300. This site is also referred to as the 118-KE-2 thimble cave and the 105-KW Reactor (WHC 1991).

The cave was constructed by pouring a concrete slab 60 ft long by 8 ft wide. Two sections of 24-in. pipe (cut in half lengthwise) were laid open side down on the slab. Concrete vertical walls and steel doors were added to the ends of the pipe sections, the walls forming a wing at each end. The pipe sections were then covered with 6 ft of clean fill material forming a 40-ft-long tunnel (Hale 1957a). The berm width after the fill material was added is about 25 ft. The entire structure is abovegrade. Refer to Section 5.17 for a photograph of the 105-KW horizontal control rod storage cave, which is similar.

There are trace amounts of radionuclides contained in this site. The radiation level at the entrance to the cave, which is empty, is 1 mR/h with the door open. Routine radiation monitoring and inspections are performed (Cramer 1987).

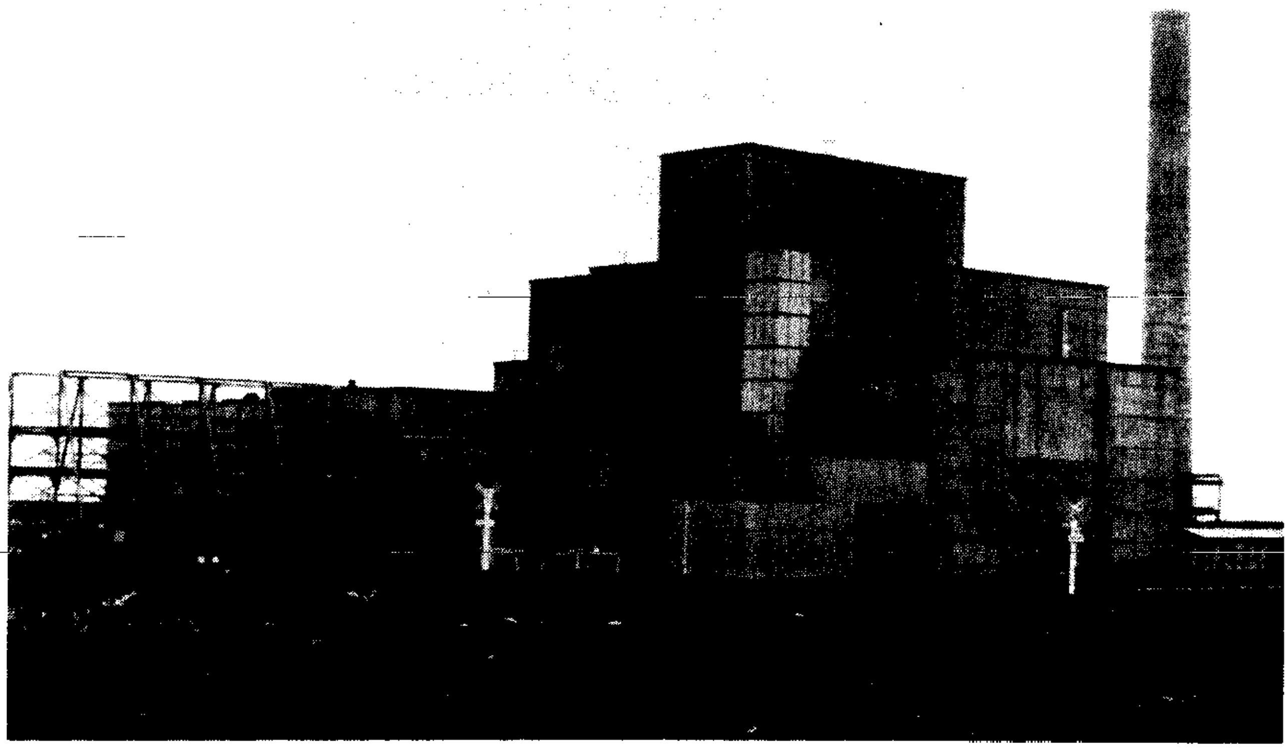
Today, the site appears as a vegetation-free, cobble-covered mound. A concrete berm wall is at each end with a steel access door in the bottom center of each wall that is posted with "Surface Contamination" warning signs. There are two 2-ft-diameter steel pipe french drains located on the north side with steel lids. Both of these drains are gravel filled to grade and are surrounded by yellow wooden barricades and are posted with "Confined Space Entry" warning signs.

5.16 118-KW-1 (105-KW REACTOR BUILDING)

The 118-KW-1 is an inactive solid waste site that operated from 1955 to 1970. The reactor is located at 100-K Area coordinates NK4520 WK6750, which is at the west end of the 100-K exclusion area. It is also known as the 105-KW (WHC 1991).

The reactor building (Figure 5-13) includes the reactor block, the irradiated fuel storage basin, ventilation system, and work areas and contains an estimated 51,000 Ci of radionuclides, 155 tons of lead, and 25,000 ft^3 of asbestos (WHC 1991 and DOE-RL 1992b).

Figure 5-13. 105-KW Reactor, February 1, 1994.



The reactor block consists of a graphite moderator stack encased in cast-iron thermal shielding and a heavy aggregate concrete biological shield, process tubes, and a safety and control system. The block weighs approximately 11,000 tons and measures 44 ft from front to rear, 53 ft from side to side, and 50 ft from top to bottom. The reactor was sealed within a helium-nitrogen gas atmosphere circulated from the respective 115-K facility. The cover, gas, fuel elements and control systems were removed at the time of deactivation (DOE-RL 1992b).

The reactor fuel storage basin, which was modified in 1974 and 1975, has a surface area of approximately 1,000 ft^2, a depth of 20 ft and a volume of about 200,000 ft^3. The modification included the addition of a recirculating cooling system partly consisting of the 150-KW heat exchangers. The basin originally provided shielding and cooling for the irradiated fuel during reactor operations (DOE-RL 1992b). The 105-K Area Reactor storage basins were constructed without the concrete columns in the basins. The abovegrade walls are constructed of transite panels instead of concrete block, which should be considered at the time of demolition. The roofs of the basins are reinforced concrete slabs above a heavy steel support structure (Griffin 1987). Portions of the 105-KW facilities are in use today. The fuel storage basin is currently used for the storage of encapsulated N Reactor fuels, work areas, and office space associated with these operations. Deactivated portions of the facility are maintained by the Deactivation and Decommissioning (D&D) organization.

Upon preparations of the fuel storage basin for use to store N Reactor fuels in 1978, it was discovered that the basin leaked at a rate of 9/gpm (Wahlen 1978). The location of the leaks were determined and repaired prior to use, but it is unknown if the basin leaked prior to being drained and cleaned. It is likely that it did leak and therefore the soils beneath the basin should be considered contaminated upon decommissioning of the facility.

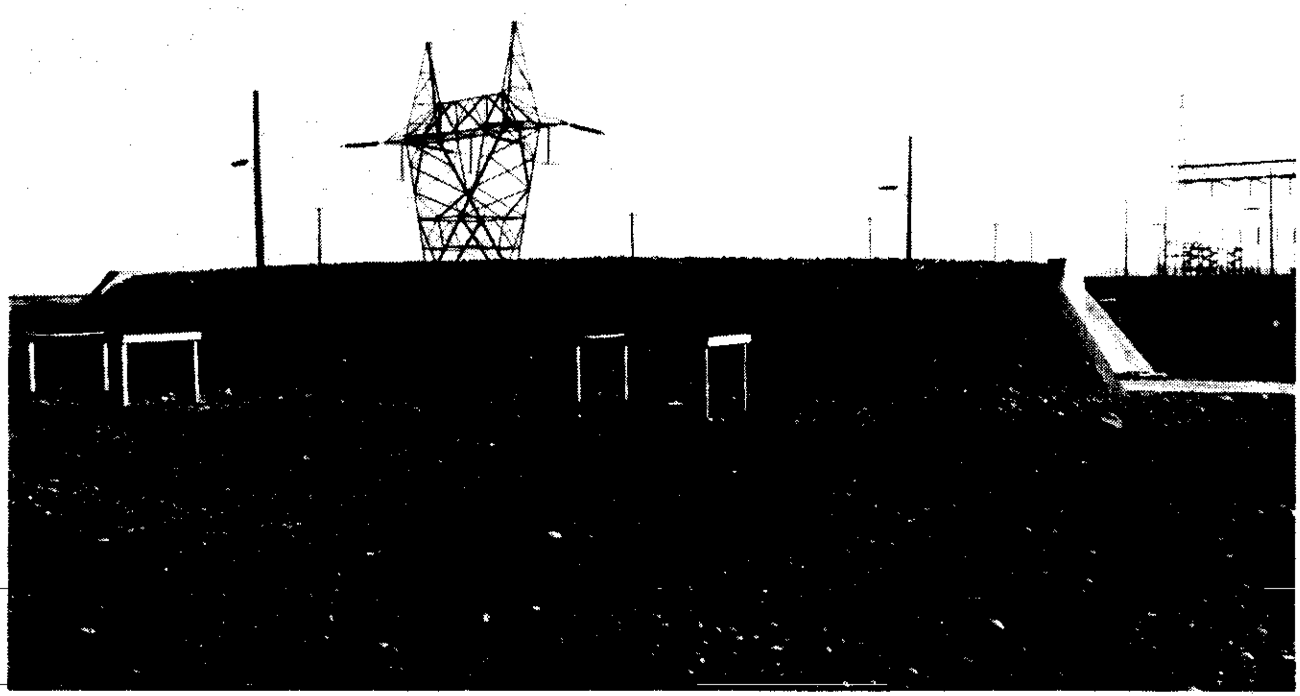
The reactor appears much the same today as it did during operations. A new metal roof was added over the fuel storage area in 1987-1988.

5.17 118-KW-2 (105-KW HORIZONTAL CONTROL ROD STORAGE CAVE)

The 118-KW-2 is an inactive solid waste site that operated from 1955 to 1971. It is located at Hanford coordinates N67100 W80000 (WHC 1991), which is northeast of the 105-KW Building (WHC 1991). It was used for the temporary storage of irradiated and radioactively contaminated horizontal control rods.

The cave (Figure 5-14) was constructed by pouring a concrete slab 60 ft long by 8 ft wide. Two sections of 24-in. pipe cut in half lengthwise were laid open side down on the slab. Concrete vertical walls and steel doors were added to the ends of the pipe sections, the walls forming a wing at each end. The pipe sections were then covered with 6 ft of clean fill material forming a 40-ft-long tunnel (Hale 1957a). The berm width after the fill material was added is about 25 ft and the entire structure is abovegrade. Reportedly the cave contains four rod tips and rod removal tools and components. With the cave door open, a dose rate reading of 50 mR/h is obtained (WHC 1991).

Figure 5-14. 100-K Area Horizontal Control Rod Storage Cave, January 1994.



Today, the site appears as a vegetation-free, cobble-covered mound. A concrete berm wall is at each end with a steel access door in the bottom center of each wall that is posted with "Surface Contamination" warning signs. There are two 2-ft-diameter steel pipe french drains located on the north side with steel lids. Both of these drains are gravel filled to grade and are surrounded by yellow wooden barricades and are posted with "Confined Space Entry" warning signs.

5.18 120-KE-8 (165-KE BRINE PIT)

The 120-KE-8 is an inactive liquid waste site that was used from 1955 to 1971. This site is believed to have been used for product and not as a disposal site. It is located approximately 9 ft north and 11 ft west of the west end of 1705-KE at 100-K Area coordinates NK4184 WK4771 (WHC 1991).

The pit is 16 ft long by 10 ft wide by 10 ft deep. It is a concrete structure with 9 ft belowgrade and 1 ft abovegrade. A hatch-type opening into the structure is located in the center of the roof section. Refer to Figure 5-15 for a photograph of the 165-KW brine pit, which is similar. Just south of the unit is a valve pit 4 ft in diameter and encased with corrugated galvanized pipe. This valve pit contains residue and apparently was part of the brine operation (WHC 1991).

The pit contains salt brine and residue. Salt was off-loaded from rail cars and placed in the pit. Water was then circulated through the pit, and brine was pumped back to the 165-KE powerhouse for further use (WHC 1991).

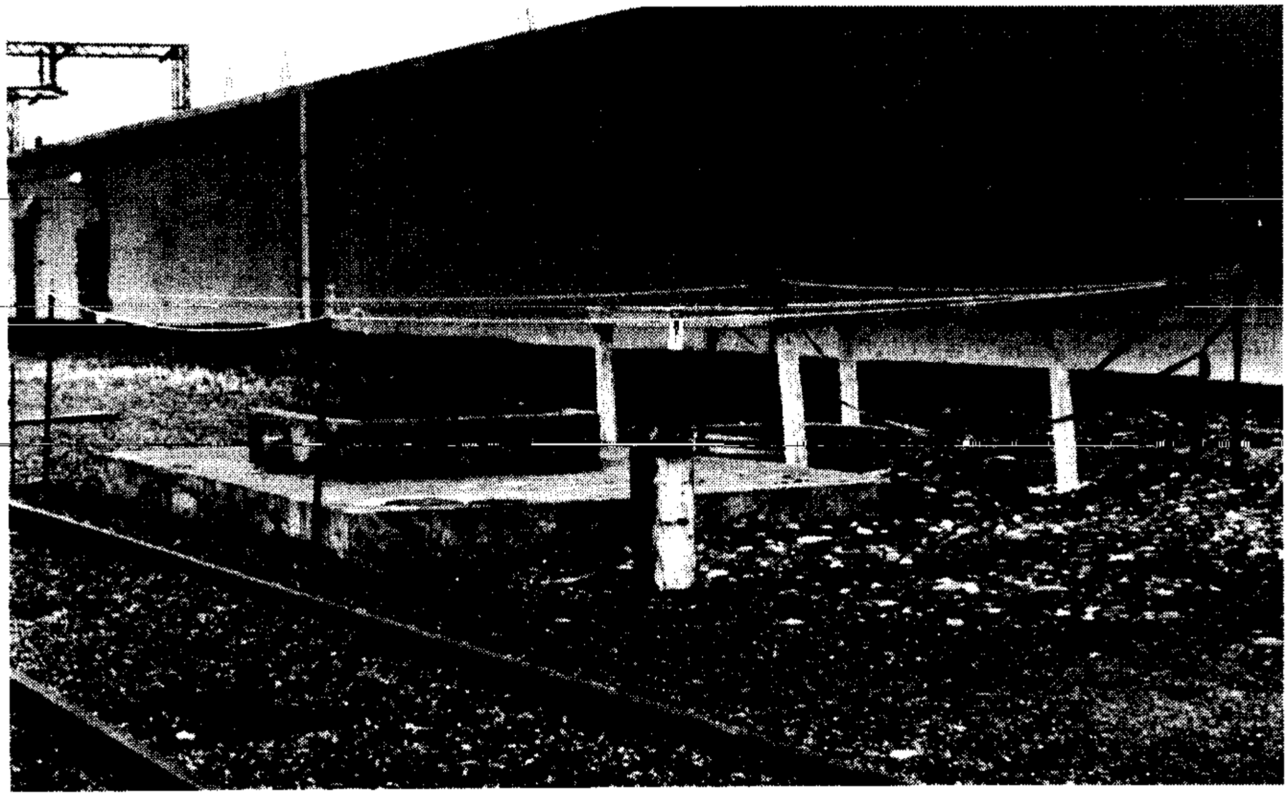
The brine pit today is empty and appears much as it did during operations. It has a wooden cover that is in poor condition. The bottom of the pit has subsided and the floor is broken and appears to have leaked or drained to the soils beneath the pit. The subsidence appears to be approximately 6 to 8 ft across. The pit is surrounded by a light-duty post and yellow rope barricade. The surrounding area is cobble covered.

5.19 120-KW-6 (165-KW BRINE PIT)

The 120-KW-6, brine pit is an inactive liquid waste site that operated from 1955 to 1970. It is located at 100-K Area coordinates NK4168 WK6740, which is about 28 ft north of the west end of the 165-KW Building. It was used to house salt used in the regeneration of ion exchange columns in the water softener system of the powerhouse boilers located in the 165-KW facility (WHC 1991).

It is a 16 by 10 by 10-ft (DOE-RL 1992b) reinforced concrete structure that extends to 9 ft belowgrade and 1 ft abovegrade. The storage capacity of dry salt was 76,700 lb. There is a hatch located in the center of the roof section. A 4-ft-diameter valve pit to the south of the structure is part of the waste unit and was used to transfer brine solutions and water to and from the brine pit. During operations, railcars were of salt off-loaded in the pit and water was circulated through the pit and pumped to the 165-KW powerhouse for use. The pit (Figure 5-15) and valve pit both contain salt and brine residue (WHC 1991).

Figure 5-15. 165-KW Brine Pit, February 1, 1994.



This site appears today much as it did during operations. The wooden cover is in poor condition. The pit is surrounded by a light-duty post and yellow rope barricade.

5.20 126-K-1 (100-K GRAVEL PIT)

The 126-K-1 is an active solid waste site that began operations in the 1950's as a borrow pit and in the 1970's as demolition and inert material landfill. It is located at 100-K Area coordinates NK4250 WK3175, which is about 625 ft east of the 100-K Area perimeter fence and borders the east side of the 118-K-1 burial ground (see Figure 5-11).

The pit was originally used to obtain fill material needed during construction activities in the 100-K Area. Approximately 80% of the pit is unused as a landfill. The remaining 20%, located in the southwest corner and bottom, contains demolition wastes. The wastes on the bottom are covered by about 1 ft of clean fill material.

Wastes deposited in this pit were generated at 100-K, the Near Surface Test Facility (NSTF) at Gable Mountain, and the Exploratory Shaft (ES) site. The wastes consist mostly of concrete, wood, steel pipe, structural steel, conduit and wire. A waste disposal log is maintained by the Inactive Facilities and Maintenance organization (landlord) (WHC 1991). A complete copy of this log is included in Appendix D.

Today, this site appears as a large vegetation-free, gravel-covered pit.

5.21 130-K-1 (1717-K GASOLINE STORAGE TANK)

The 130-K-1 is an inactive liquid waste site that was used from 1955 to 1972 for the storage of gasoline (Cramer 1987). The site is located adjacent to the 1717-K Building at 100-K Area coordinates NK4150 WK5500 (WHC 1991).

The storage tank was emptied and filled with water when the facilities were deactivated (Cramer 1987). It has been reported that soil around the tanks may be contaminated from spillage. Although this tank may represent a substantial source of contamination, no leaks were reported (DOE-RL 1992b). The tank was removed July 18, 1989. No significant contamination of the soil beneath the tank was detected and the site was backfilled with clean fill material to match the surrounding grade.

Today, this waste site appears as a vegetation-free, gravel parking lot.

5.22 130-K-2 (1717-K WASTE OIL STORAGE TANK)

The 130-K-2 is an inactive liquid waste site that operated from 1955 to 1972. The tank site is located at 100-K Area coordinates NK4150 WK5500 (WHC 1991), which is adjacent to the 1717-K Building. It was used to store used motor oil generated during maintenance activities.

Reportedly, this tank was removed July 18, 1989, the same time as the gasoline storage tank (Section 5.21). Sampling at the time indicated that no leakage had occurred above acceptable limits and the site was backfilled with clean fill material.

Today, this site appears as a vegetation-free, gravel parking lot.

5.23 130-KE-1 (105-KE EMERGENCY DIESEL OIL STORAGE TANK)

The 130-KE-1 is an inactive liquid waste site that was used from 1955 to 1971 for storing diesel fuel. It is located adjacent to the 105-KE Reactor ventilation stack at 100-K Area coordinates NK4458 WK4407. This site, which consists of two tanks, is also referred to as 105-KE emergency diesel fuel tank (Cramer 1987 and WHC 1991).

Each tank has a 2,000-gal capacity (Cramer 1987). It has been reported that soil around the tanks may be contaminated from spillage. Although these tanks may represent a substantial source of contamination, no leaks were reported (DOE-RL 1992b). They were removed on October 5, 1992. An account of the removal of these tanks can be found in Appendix D. No oil contamination was found although the insulating material covering the tank exteriors had detectable radioactive contamination and is therefore being treated as radioactive waste. Sampling of the radioactive contamination indicates the contamination is the same as naturally occurring contamination that produces radon in the environment.

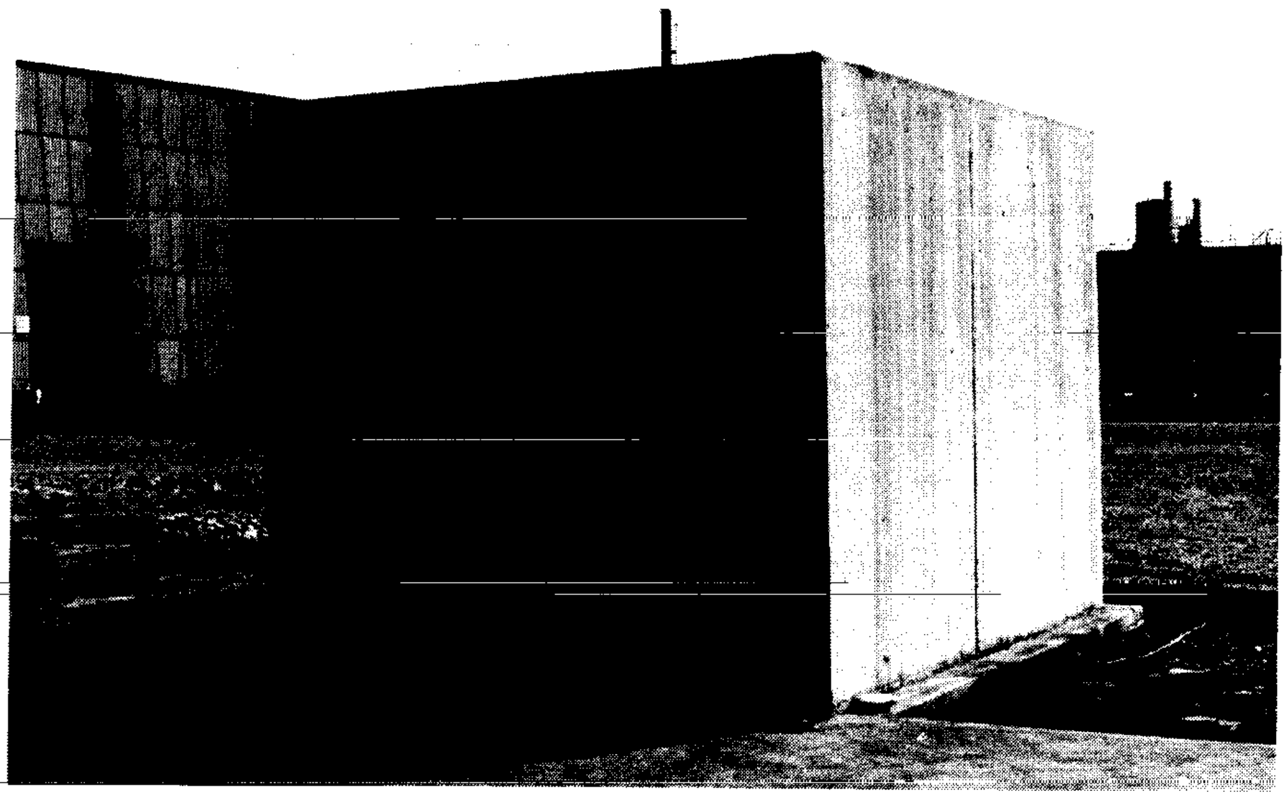
The site was backfilled with clean fill material and covered with gravel to match the surrounding area. Today, it appears as a vegetation-free, gravel parking lot.

5.24 130-KE-2 (166-KE OIL STORAGE TANK)

The 130-KE-2 is an inactive liquid waste site that was used from 1955 to 1971 for the storage of diesel fuel for the 165-KE boilers (Cramer 1987). This site is located adjacent to the 165-KE boilerhouse at 100-K Area coordinates NK4150 WK4870 (WHC 1991)

The tank is an underground reinforced concrete structure 139 ft 6 in. by 93 ft 7 in. by 23 ft 7 in. deep. It is made up of two compartments with a storage capacity of 801,400 gal. There are two day tanks with a capacity of 49,300 gal, one in each compartment (WHC 1961). Between the day tanks is a pump room with a concrete penthouse (Figure 5-16) that has a blast resistant door at ground level. This penthouse provides access to the pump room. The oil was maintained in a fluid state by the use of in tank oil heaters.

Figure 5-16. 166-KE Oil Storage Facility.



The oil was received from railcars where provisions were made to spot up to four railcars. During normal operations oil usage was about 8,000 gal/day (Hale 1957b).

It is unknown if this tank ever leaked. Although, there is about 24 in. of unusable sludge inside the tank and an additional 18 in. of unusable sludge in each of the day tanks, which is below the discharge lines to the tanks (Bovay Northwest 1991 and WHC 1961).

A 2,000-gal oil heel remains in this reinforced concrete tank and is listed as having a possible release potential (WHC 1991).

Today, this waste site appears much as it did during operations. There is a metal oil storage building located at the southwest corner. The entire storage tank is surrounded by a light-duty post and chain barricade that is posted against access to the tank surface.

5.25 132-KE-1 (116-KE REACTOR EXHAUST STACK)

The 132-KE-1 is an inactive low-level solid waste site that was in operation from 1955 to 1971. This site is located on the northeast side of the 105-KE Reactor Building at 100-K Area coordinates NK4500 WK6490 (WHC 1991).

The stack had a total site area of 380 ft^2 with a height of 300 ft and a diameter of 22 ft. It was decontaminated and shortened 125 ft in 1980 to 1981. All debris is contained in the belowground interior portion of the stack (WHC 1991).

Following completion of the confinement project in 1960, the air was diverted via underground reinforced concrete ducts to the 117-KE filter building. After flowing through the filters, the air went through belowgrade concrete ducts into the exhaust stack (WHC 1991).

Dose rates at the base of the reactor stacks prior to decontamination efforts in 1981 were less than 1 mR/hr. General background levels within the bottoms of the stacks were approximately 1,000 c/m with a GM probe with low-level smearable alpha contamination present up to 130 dpm/100 cm^2, and averaged about 30 dpm/100 cm^2. Smearable beta contamination ranged from 100 to 5,000 dpm/100 cm^2 (Dorian and Richards, 1978).

This stack remains intact today as a 175-ft-high concrete stack. The surrounding area is a gravel parking lot.

5.26 132-KW-1 (116-KW REACTOR EXHAUST STACK)

The 132-KW-1 stack, is an inactive solid waste site that operated from 1955 to 1970. It is located adjacent to the northeast side of the 105-KW Building (WHC 1991).

The 300-ft-high stack was shortened 125 ft during 1980-1981. All of the debris generated during the shortening project were deposited to the stack interior. Prior to demolition activities, the stack was decontaminated (WHC 1991).

Prior to 1960, the stack discharged ventilation exhausts directly to the atmosphere. After 1960, ventilation exhausts were first routed by concrete ducts to the 117-KW filter building and then through a second set of concrete ducts to the stack (WHC 1991).

Dose rates at the base of the reactor stacks prior to decontamination efforts in 1981 were less than 1 mR/hr. General background levels within the bottoms of the stacks were approximately 1,000 c/m with a GM probe with low-level smearable alpha contamination present up to 130 dpm/100 cm^2, and averaged about 30 dpm/100 cm^2. Smearable beta contamination ranged from 100 to 5,000 dpm/100 cm^2 (Dorian and Richards, 1978).

This stack remains intact today as a 175-ft-high concrete stack. The surrounding area is a gravel parking lot.

5.27 130-KW-1 (105-KW EMERGENCY DIESEL FUEL TANK)

The 130-KW-1 is an inactive liquid waste site that was used from 1955 to 1970 for the storage of diesel fuel. The site, which consists of two storage tanks, is located adjacent to the 105-KW Reactor ventilation stack.

Each tank had a 2,000-gal capacity. They were removed on October 22, 1992. No leaks were reported to have occurred from these tanks, although during excavation, the site was found to be radioactively contaminated. After the tanks were removed from the pit, they were found to be radioactively contaminated as well. An account of the removal of these tanks can be found in Appendix D. The site was backfilled with clean fill material and covered with gravel to match the surrounding area. There are no analytical data on this site (DOE-RL 1992b).

Today, this waste site appears as a vegetation-free, gravel parking lot.

5.28 130-KW-2 (166-KW OIL STORAGE TANKS)

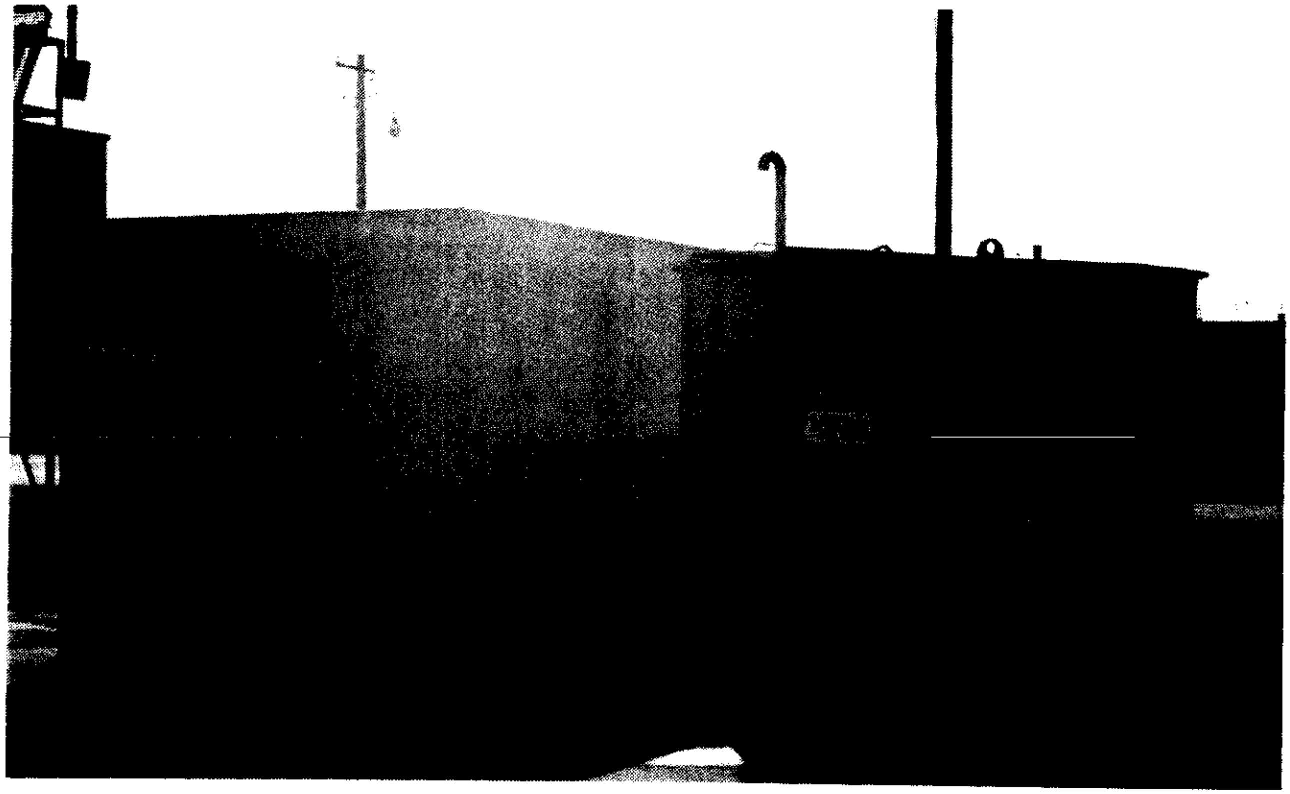
The 130-KW-2 is an inactive nonradioactive liquid waste site that began operation in 1955. It is located adjacent to the 165-KW Building on the west side. The tank was used to store bunker C (No. 6) fuel oil used in the 165-KW powerhouse facilities.

The tank is an underground reinforced concrete structure 139 ft 6 in. by 93 ft 7 in. by 23 ft 7 in. deep, which is made up of two compartments with a storage capacity of 801,400 gal. There are two day tanks with a capacity of 49,300 gal, one in each compartment (WHC 1961). Between the day tanks is a pump room with a concrete penthouse that has a blast resistant door at ground level. This penthouse (Figure 5-17) provides access to the pump room. The oil was maintained in a fluid state by in-tank oil heaters. The oil was received from railcars where provision was made to spot up to four railcars. During normal operations oil usage was about 8,000 gal/day (Hale 1957b).

It is unknown if the tank ever leaked, although there is about 24 in. of unusable sludge in the tank and an additional 18 in. of unusable sludge in each of the day tanks, that is below the discharge lines to the tanks (Bovay Northwest 1991 and WHC 1961).

During August 1973, at least one truck load of oil (1,300 gal) was pumped out of the tank and used by ARHCO Road and Grounds Maintenance as cover for dirt roads. It is unknown if additional oil was used for this purpose, but it was planned to remove an additional eight to 10 truck loads that same year (Maguire 1973 Letter DC-0062). Another letter dated April 1976, indicates that oil was removed by an offsite vendor for recycling (Baker 1976 Letter DC-0091).

Figure 5-17. 166-KW Oil Storage Facility.



The metal oil storage building, once located on the southwest corner of the site, was removed for use elsewhere. The date of removal is unknown.

This site appears today much as it did during operations. It is surrounded by a light-duty post and chain barricade and is posted against access to the tank roof surface.

5.29 UPR-100-K-1 (105-KE REACTOR FUEL STORAGE BASIN LEAK)

The UPR-100-K-1 is a low-level mixed waste site that was first discovered in 1974 when a leak was measured during modification of the 105-KE Reactor fuel storage basin. The modification was being done to install the recirculating cooling system with filters and heat exchangers. This site, which is also known as UN-100-K-1, received fuel storage basin effluent that included debris from fuel cladding failures (DOE-RL 1993 and Roeck 1990).

The 105-KE fuel storage facility was originally constructed with a secondary seepage barrier in the form of an asphalt membrane under the basin floor. This 2-in.-thick membrane was installed under the entire storage basin, except for the pickup chute area, and was designed to collect leakage in perforated pipes that lie on top of the membrane. These pipes drain to a sump. Two automatic pumps were installed in the sump to return any seepage back to the basin (Roeck 1990).

During testing conducted in 1974, a 16-day basin drawdown established a 4 gal/min seepage rate from the basin system. At least 90% of this seepage was thought to be collected by the membrane system and sump. It was decided to install automatic pumps to return this seepage to the basin. The other 10% was assumed to discharge to the soil beneath the basin (Roeck 1990).

In mid February 1977, the leak volume had increased to 13.5 gal/min. Radionuclide concentrations in the basin were decreasing at this time due to the unusually high seepage rate. The increased seepage was determined to have been caused by reduced basin water temperature, which caused concrete contraction to expand existing minor cracks in the basin (Roeck 1990). The leakage was stabilized at about 8 gal/min by raising the water basin temperature and thus partially closing cracks in the basin floor (DOE-RL 1992b). Detailed analysis showed that no radioactivity was being released in liquid effluents from K Area and no water was being collected in the membrane drainage sump, therefore, all of the seepage was assumed to be going to the ground either through or past the membrane (Roeck 1990).

In early 1979, the 105-KE pickup chute area of the 105-KE fuel storage basin had an estimated release to the ground of more than 7.5 gal/min for an unknown period of time (DOE-RL 1993). Eventually, an expansion joint in the floor of the basin discharge chute was isolated by water-tight dams, which reduced leakage to near zero (DOE-RL 1992b).

This waste site has a HRS Migration score of 53.24 (Stenner et al. 1988).

The conclusive disposition of the soil beneath the basin is determined primarily by the plutonium concentration since all other radionuclides will decay to releasable levels within several hundred years. The recommended unrestricted release level by PNL for plutonium in soil is 1 to 10 pCi/gm. The concentration in the sludge from the 105-KE basin before N fuel storage was 3,600 pCi/gm. Based on the level of plutonium in the sludge and the assumed level in the seepage area soil, it was concluded that the soil beneath the 105-KE basin would have to be removed for ultimate disposal. Continued operation of the basin with seepage would not change this conclusion although it could somewhat increase the amount of soil that would have to be removed. This increase in volume would not significantly affect the cost of the ultimate D&D efforts (Roeck 1990).

5.30 1607-K4 (SEPTIC TANK SYSTEMS)

Two septic tanks are located in the 100-KR-2 Operable Unit. Both systems began operation in 1955 and remain active today. They are constructed of reinforced concrete with associated drain fields. The septic tanks are part of a series of localized installations that are not connected to either the process or area waste sewers. Cast-iron pipes were used to conduct wastes to the septic tanks and 6-in. vitrified clay tiles laid with open joints comprised the drain fields (Hale 1957).

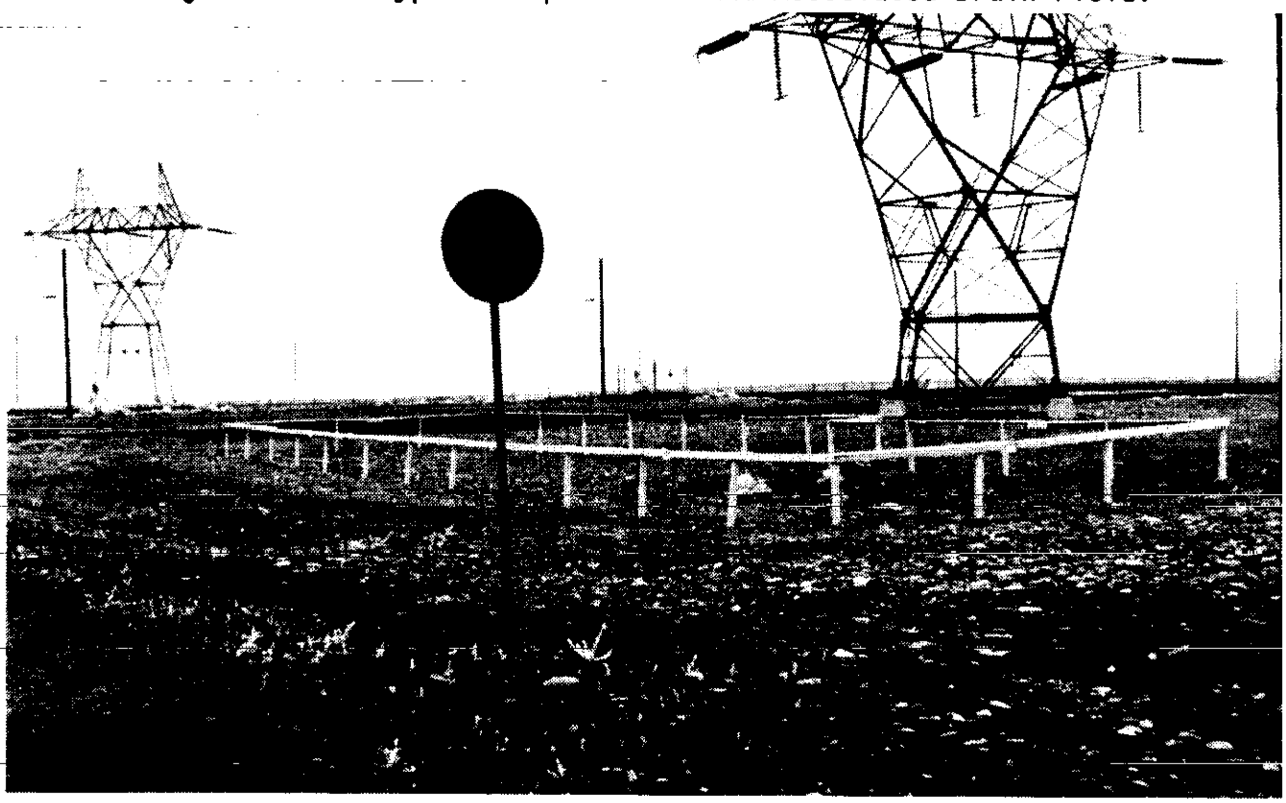
They are not known to have received hazardous or radioactive wastes, although they may have received materials associated with cleaning solvents and materials that were likely used in the facilities they supported.

These septic systems are more completely described in Table 5-8. See Figure 5-18 photograph for a typical 100-K Area septic tank and associated drain field.

Table 5-8. 100-KR-2 Operable Unit Septic Systems.

Septic tank designation	100-K Area location	Comments
1607-K4 and associated drain field	NK4350 WK5690	Supported the 1704-K Office Building and the 1717 Maintenance Shop. The volume of wastes received in this system is unknown (WHC 1991). This septic tank appears today as a vegetation-free, cobble-covered field surrounded by a 4-ft wooden fence.
1607-K6 and associated drain field	NK6110 WK4850	Supported the 105-KW Reactor Building, the 115-KW Gas Recirculation Building, and the 165-KW Powerhouse. The volume of wastes received in this system is unknown (WHC 1991). This septic tank appears today as a vegetation-free, cobble-covered field surrounded by a 4-ft wooden fence.

Figure 5-18. Typical Septic Tank and Associated Drain Field.



5.31 UNDOCUMENTED LIQUID WASTE SITE, WET FISH STUDIES LABORATORY

A laboratory that conducted wet fish studies using effluent cooling water reportedly operated briefly in 1964 and 1965 at 100-K Area. There was a small "wet lab" located in the 1706-KE Building and three small outdoor basins located to the southwest of the laboratory facility.

The laboratory consisted of eight 5-ft-long troughs, which a mixture of raw water and heated effluent water was passed through. The water was diverted from the heat exchanger pit, which is described more fully in Section 5.33, on the 105-KE Reactor discharge pipeline. The laboratory was planned in the event of shutdown of the F Reactor and its laboratory. The outdoor tank facilities (Figure 5-19) also included a temporary metal building that was to be used for storage and as a warehouse that remains at the site to this day (Becker 1990).

Although Becker (1990) states that the fish laboratories were used for a short period, Hanford Drawing H-1-24974-KE and H-1-24997-KE indicate that installation of the project was in 1954 and DOE-RL (1992a) reports that operations began in 1956. It is possible that fish studies were conducted at 100-K Area from that time until 1965 either on an ongoing basis or periodically to supplement experiments conducted at 100-F Area.

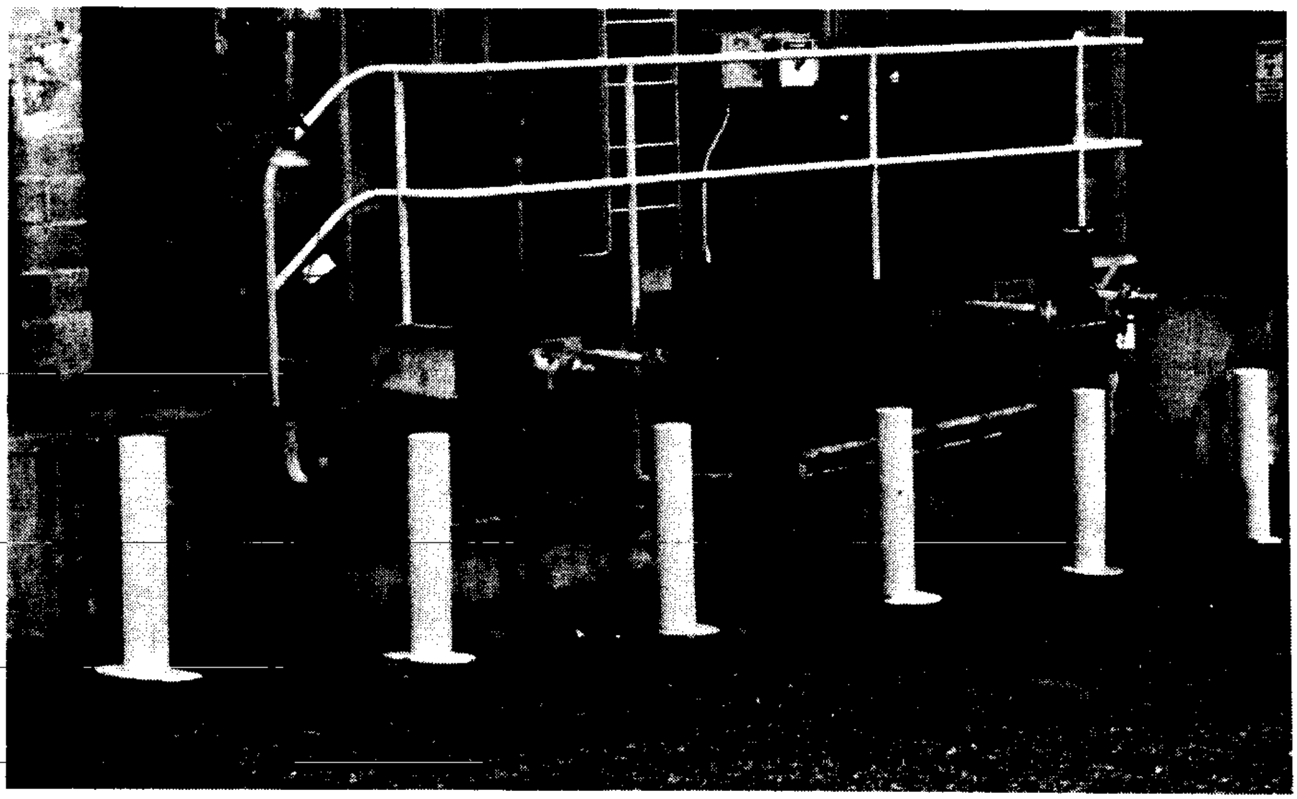
Figure 5-19. Fish Studies Facility - Outside Tanks.

The facilities located within the 1706-KE Building have been completely dismantled and removed. Today, the outside basins remain inplace. They are surrounded by an 8-ft cyclone fence that is posted with "Radiologically Controlled Area" warning signs. The surrounding cobble-covered area has scant sagebrush and vegetation growing on the surface in and around the tanks.

5.32 UNDOCUMENTED FRENCH DRAIN - EAST SIDE OF 1706-KE

In 1962-63, a Chemical Storage Facility was added to the east side of the 1706-KE to store sodium hydroxide and sulfuric acids used for the regeneration of ion exchange columns within the 1706-KE Building. This addition included a small french drain located at grade and centered between the two storage tanks (Figure 5-20).

Figure 5-20. Undocumented French Drain - East Side of 1706-KE.



The drain is constructed of an 18-in. vitrified clay pipe that is 4 ft long and buried vertically in the ground. It extends about 3 in. abovegrade and is filled to grade with crushed limestone (Hanford Drawing H-1-33419). Overflow and drain pipes terminate just above the surface of the limestone fill. It is not known if chemical additions were neutralized before disposal to this drain, although it is assumed that they were not.

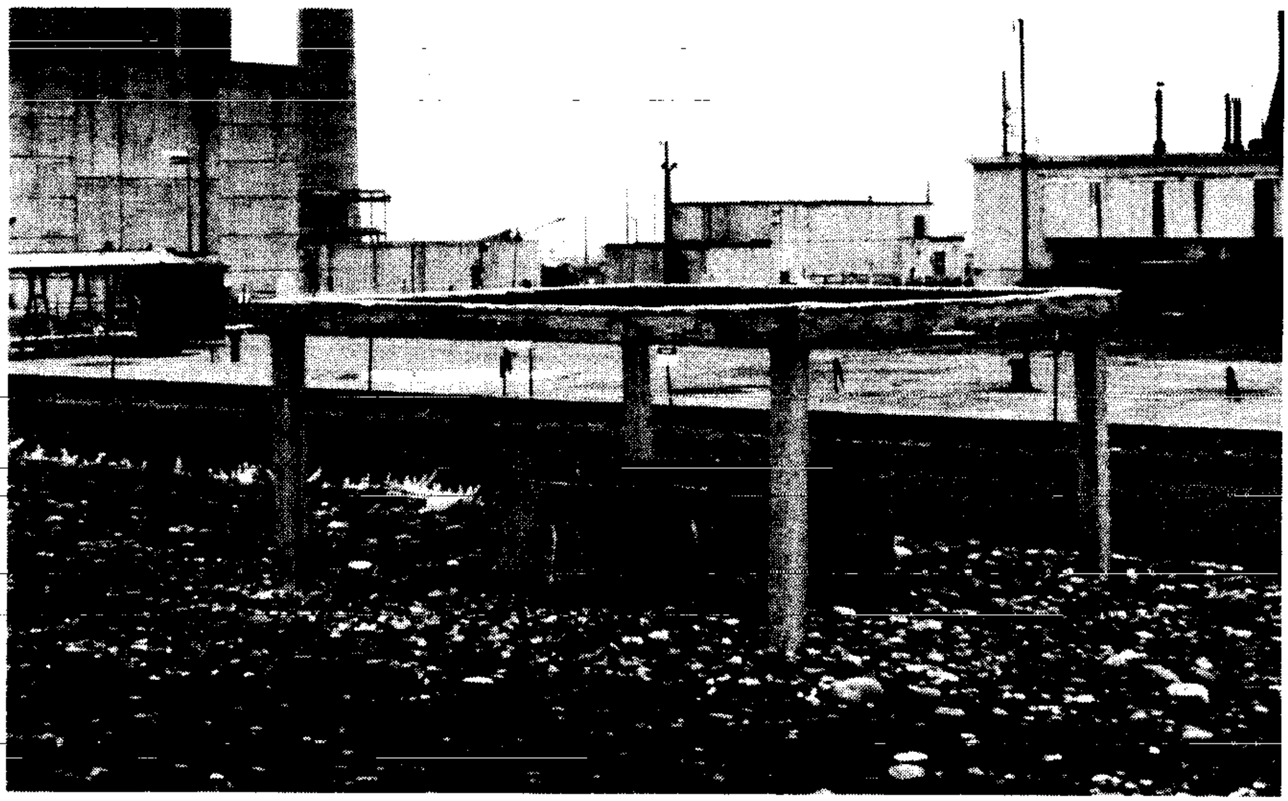
This french drain is located either directly above or near an underground connecting tunnel to the 105-KE Reactor Building. At a point within the tunnel very near the drain a white crystalline material can be seen in cracks of the tunnel ceiling. This crystalline material appears to be dry sodium hydroxide. This would indicate that large volumes of sodium hydroxide and or water have been disposed to this drain. A former site employee reports that on several occasions, small spills did occur during filling operations of the tank facility.

5.33 UNDOCUMENTED LIQUID WASTE SITE (FRENCH DRAIN)

There is a 3- to 4-ft-diameter concrete french drain located on a small rise that is west of the 166-KW oil storage tank facility, across the small access road, and to the rear of the 165/190 Facilities.

The drain (Figure 5-21) extends abovegrade about 1 ft and is filled to grade with course gravel. It is surrounded by a yellow wooden barricade fence and has no other markings of any kind. No other documentation or drawings could be found that identify the purpose of this drain.

Figure 5-21. French Drain - West of the 166-KW Facility, February 1, 1994.



5.34 UNDOCUMENTED LIQUID WASTE SITE (118-K-3 FILTER CRIB)

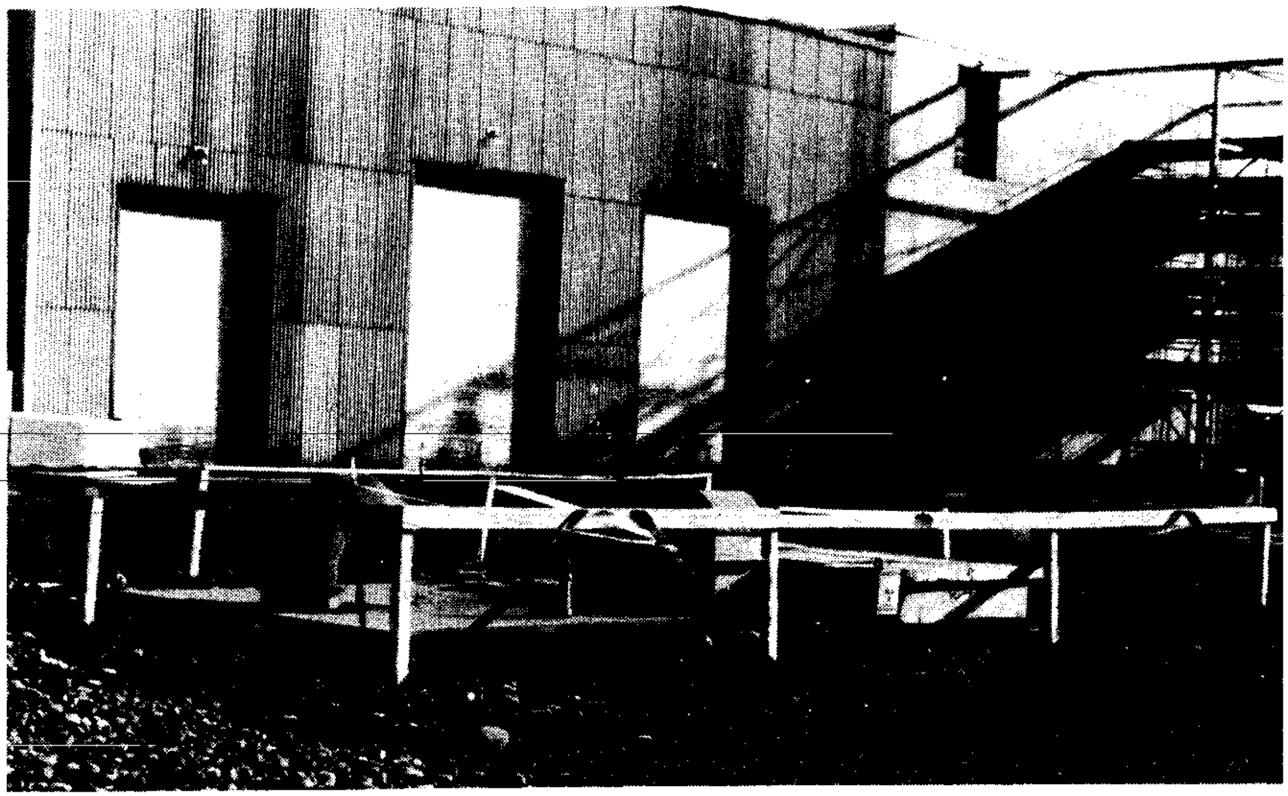
The 118-K-3 filter crib could not be located during field investigations for this report. A fenced, high-voltage power distribution system is located at the site described by DOE-RL (1992a). DOE-RL (1992a) further states that the crib received liquid wastes from the 1705KE/KER Laboratory.

Discussions with present and former site employees, and investigations using Hanford Drawings (H-1-20305, H-1-23215, and H-1-24226), indicate that all cribbed wastes from the 1706-KE/KER facilities were disposed in the 116-KE-2 crib described in Section 5.2. No other documentation could be found to verify the existence of this crib.

5.35 UNDOCUMENTED HEAT EXCHANGER PIT

A heat exchanger pit (Figure 5-22) is located at 100-K Area coordinates NK4640 WK4864 (southeast corner) (Hanford Drawing H-1-23215), which is east of the outdoor fish studies basins. The heat exchanger piping in this concrete-reinforced pit provided the heated effluent to the fish studies laboratory described in Section 5.31.

Figure 5-22. 100-KE Heat Exchanger Pit, January 1994.



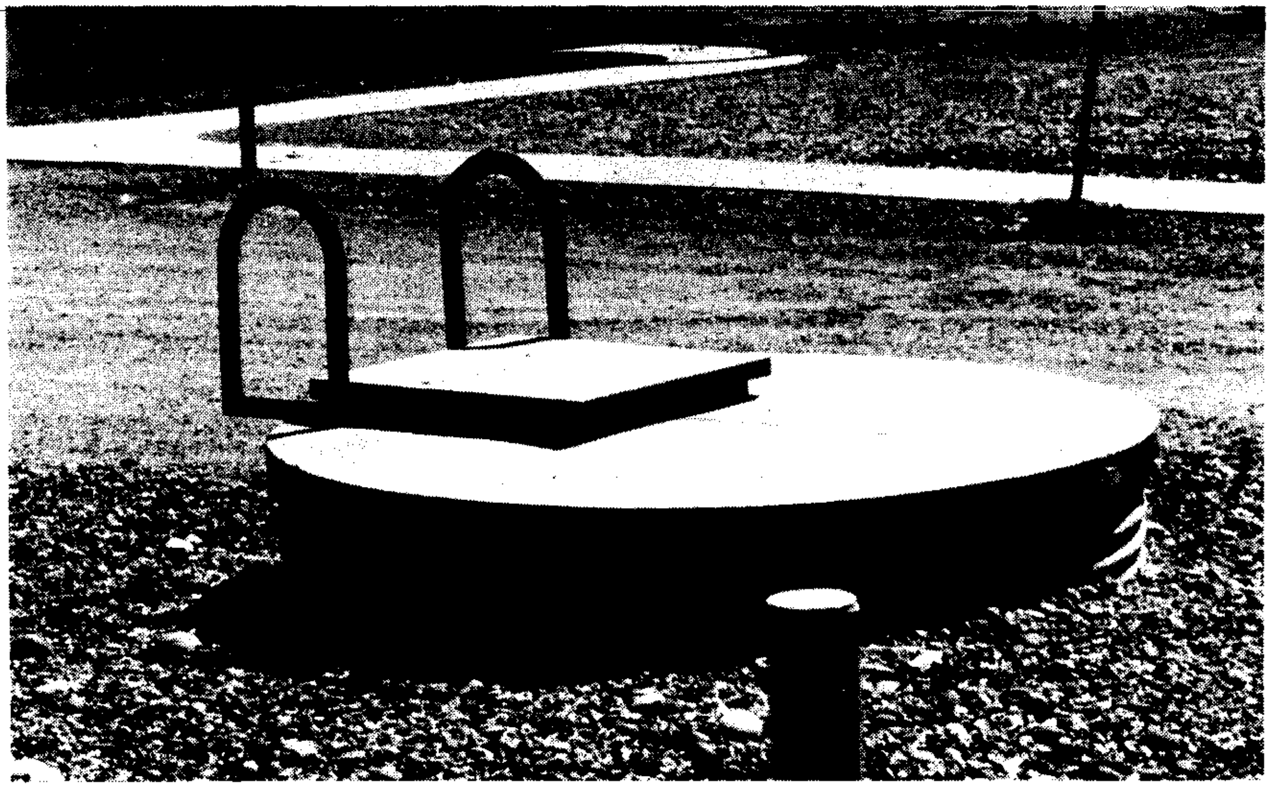
The heat exchangers were part of the reactor recirculation process tube systems controlled from within the 1706-KE facility. Effluent water in the recirculation tubes was cooled by the heat exchangers. Provisions were made for the drainage of these tubes to the reactor effluent system or to supply the needs of the fish studies laboratory.

Today this site appears as a concrete pad, the structure is entirely belowgrade. A 4-ft by 10-ft access hatch is located at the south end. Adjacent to the access hatch, is a square inlet ventilation pipe. At the north end, there is an exhaust vent pipe approximately 24 in. diameter. On the west side of the pad, a 3-in. pipe extends approximately 1 ft above the surface of the pad. It is surrounded by a 16-ft by 24-ft yellow, wooden fence and a light-duty post and chain barricade posted with "Surface Contamination" warning signs.

5.36 UNDOCUMENTED SOLID WASTE SITE (VACUUM PIT)

Located adjacent to the 105-Turco (a trademark of Purex Corporation) pit and just south of the 105-KE stack is a 10-ft-diameter vertically placed culvert pipe that extends to about 30 ft belowgrade (Figure 5-23). In an effort to characterize this waste site, it was opened on January 20, 1994, for the WHC History Department by D&D representatives.

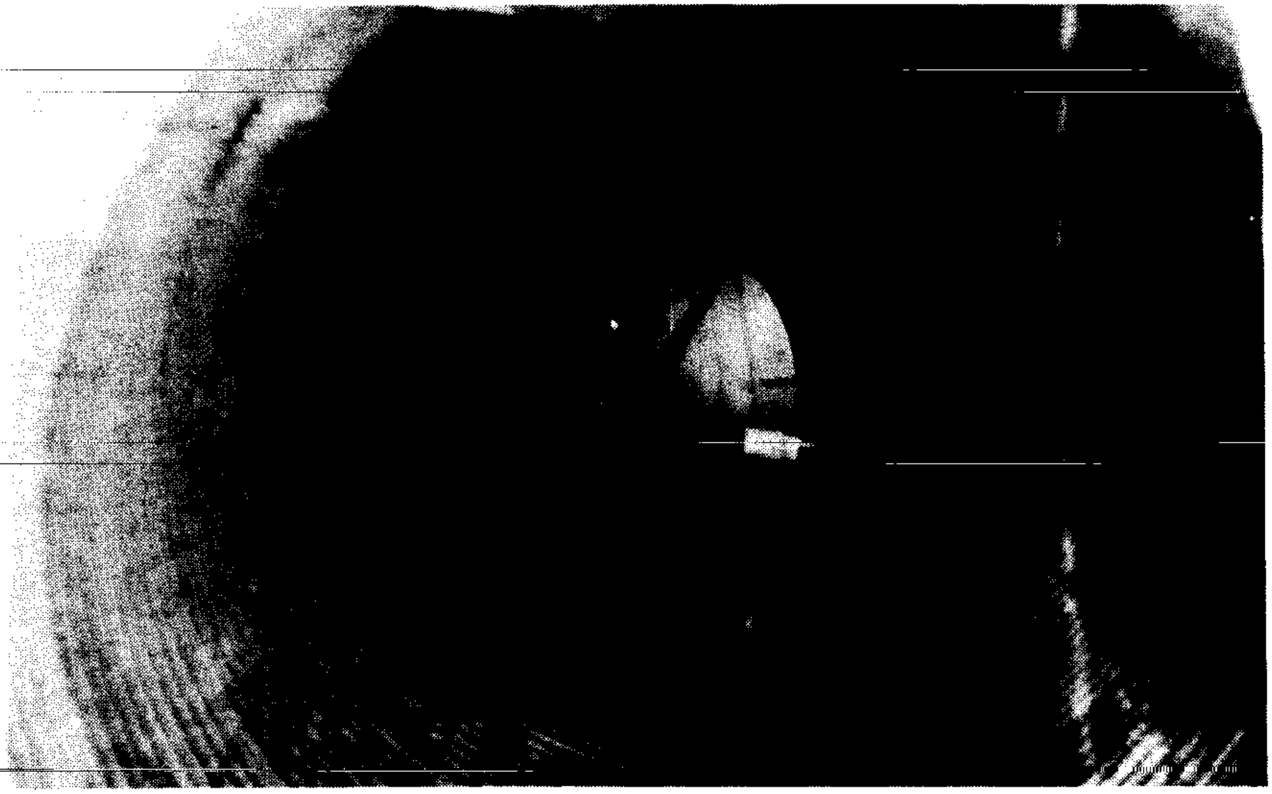
Figure 5-23. Vacuum Pit.



It was found that the pit has a concrete bottom and contains a cyclone separator (Figure 5-24), a vacuum device used to separate solids from the vacuum air stream. Vacuum hoses exit the pit via a small concrete trench with a steel lid located at grade and running due west under the concrete sidewalk and into the Turco pit. The Turco pit is a concrete access pit to the reactor basement and contains a large stainless steel tank. This tank was used to mix Turco decontamination solutions within the reactor facility. Just inside the Turco pit, the vacuum hoses have been cut and sealed with duct tape and radioactive material warning tape.

Site employees report that the cyclone separator was used during maintenance on the reactor core or for the movement of the Ball 3X Safety System balls. The separator was once hooked up to a steam-powered turbine vacuum pump that was removed shortly after shutdown of the 105-KE and 105-KW Reactors to 100-N Area for use. The soils beneath the steam turbine were reported to have been contaminated with radioactive materials and were covered with about 1 ft of gravel. The steam turbine was located adjacent to the 115-KE Building in a small graveled area just west of the facility, between walkways.

Figure 5-24. Interior of Vacuum Pit Showing Cyclone Separator, January 1994.



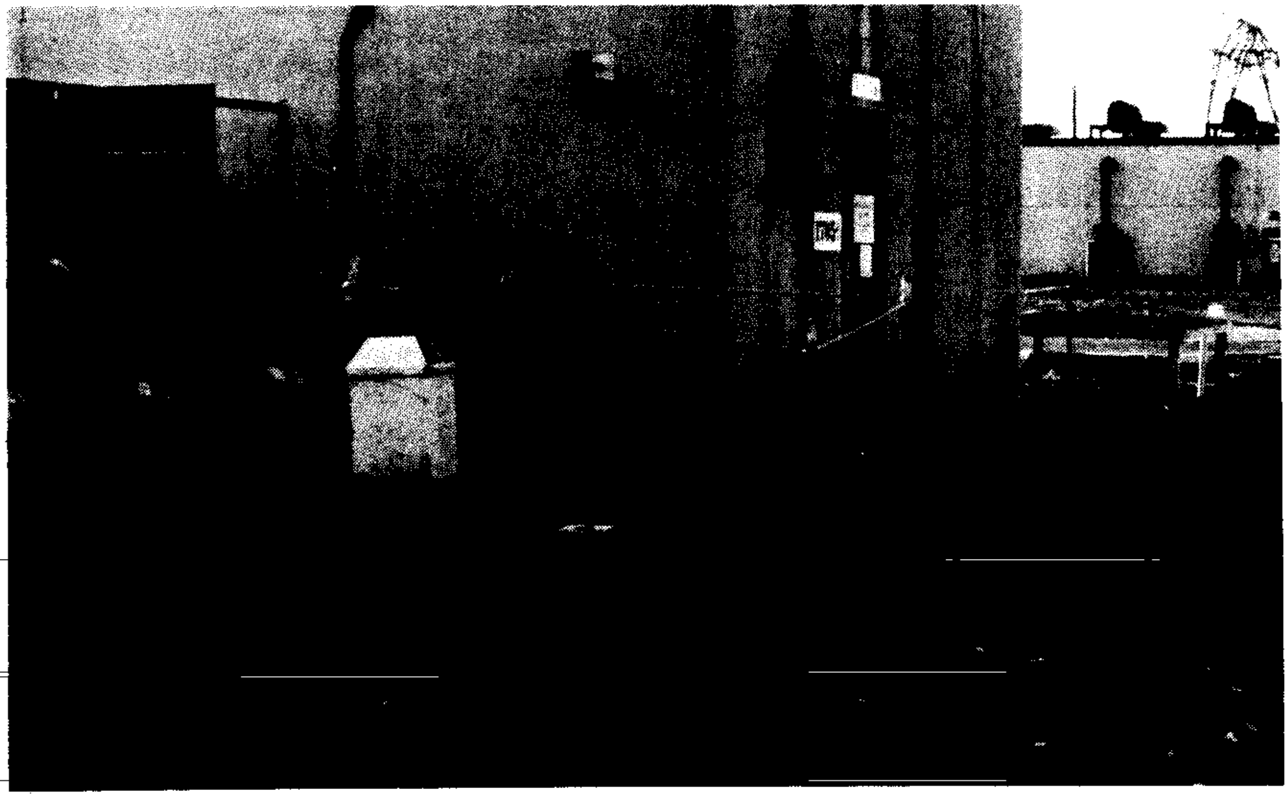
The dose rate at the pit opening was slightly less than 2mr/hr, suggesting a higher dose rate at the pit bottom. It is likely that the pit interior contains surface smearable radioactive contamination, although it is currently posted as a "Radiation Area" and a "Confined Space."

5.37 UNDOCUMENTED FRENCH DRAIN - EAST SIDE OF 1705-KE

There is a 3-ft diameter vitrified clay pipe french drain (Figure 5-25) located just east of the 1705-KE Water Treatment Facility. It is approximately 1 ft above the surrounding grade with a heavy wooden cover.

A thorough search of Hanford drawings and interviews with site employees could not provide a purpose for or use of this french drain. It is surrounded by four light-duty posts and rope barricade and is posted with a "Confined Space" warning sign.

Figure 5-25. Undocumented French Drain - East side of 1705-KE.



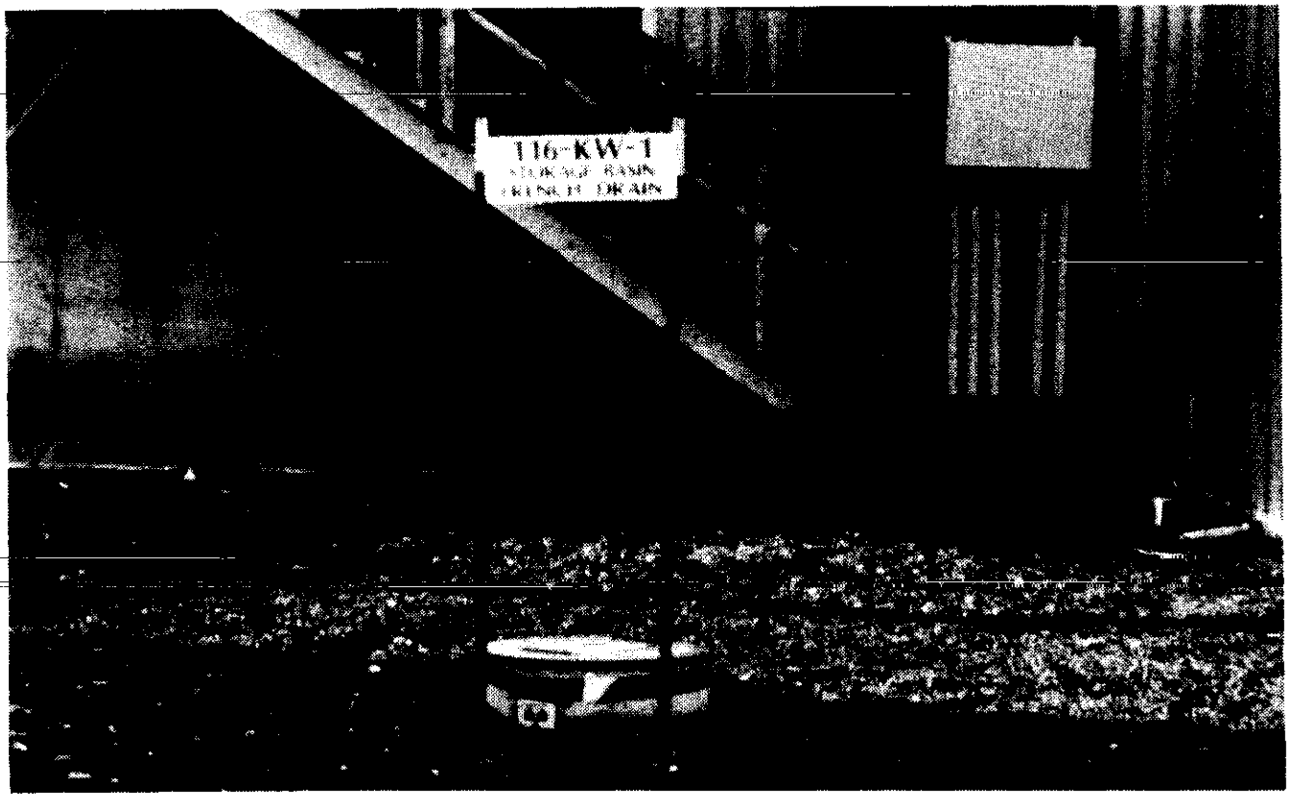
5.38 UNDOCUMENTED FRENCH DRAIN - SOUTH SIDE OF 119-KW

East of the 105-KW Reactor Building, between the stack and the 119-KW Exhaust Air Sample Building, there is a french drain that is erroneously labeled as the 116-KW-1 storage basin french drain.

The french drain (Figure 5-26) reportedly received radioactive contamination sampling effluent from the 119-KW Sample Building, which is contaminated.

Today, this site appears as a 1-ft-diameter concrete french drain that has been painted blue and extends approximately 6 in. above the surrounding grade. It has a metal cover that is posted with "Confined Space" and "Surface Contamination" warning signs.

Figure 5-26. Undocumented French Drain - South Side of 119-KW.



6.0 100-KR-3 OPERABLE UNIT

This section describes the 100-KR-3 Operable Unit, which encompasses the southern-most portion of the 100-K/KR Area. Its northern boundaries are bounded by the 100-KR-2 Operable Unit. The southern boundary is just south of the 100-K Area perimeter fence so as to include the sites of the 1701-K and 1728-K Buildings. The eastern boundary forms an imaginary line from the 100-K Area perimeter fence to the eastern boundary of the 100-KR-2 Operable Unit such that the 128-K-1 Burning pit is included in the 100-KR-3 Operable Unit.

The operable unit encompasses 32 waste sites, 13 are included in the Tri-Party Agreement (Ecology et al. 1989). These sites include the greater part of cooling water treatment facilities for 105-KE and -KW Reactors, burn pits, storage tank facilities, active facilities, and septic tank systems.

The relative locations of 100-KR-1, 100-KR-2, and 100-KR-3 are shown in Appendix A. Separate maps specific to each of the 100-K Area Operable Units (100-KR-1, 100-KR-2, and 100-KR-3) can be found in Appendix A (A-2, A-3, and A-4). Additional figures (A-5, A-6, and A-7) are included in Appendix A to provide clarity for each waste type described.

Table 6-1 identifies the sites for which a PNL HRS Migration score has been established; not all of the waste sites located within the 100-KR-3 Operable Unit have an HRS Migration score.

Table 6-1. Hazard Ranking System Migration Score.

Site identification	HRS score
120-KE-1	42.32
120-KE-2	42.32
120-KE-3	18.51
120-KW-1	40.09
120-KW-2	40.09
128-K-1	0.00

(Stenner et al. 1988)

Each waste site is described separately in Sections 6.1 through 6.31.

6.1 120-KE-1 (183-KE FILTER WASTE FACILITY DRY WELL)

The 120-KE-1 is an inactive nonradioactive liquid waste site that operated from 1955 to 1971 to receive sulfuric acid sludge removed from sulfuric acid storage tanks. It is located at 100-K Area coordinates NK3150 WK4500. This site is also known as the 183-KE filter water facility and 100-KE-1 (WHC 1991).

The dry well was 4 by6 4 by 4 ft deep with a wooden cover (WHC 1991). Refer to Section 6.9 for a photograph of the 183-KW water treatment facility, which is identical to the 183-KE water treatment facility.

Stenner (1988) lists the hazardous chemical inventory for this waste site as 2.200E+002 kg of mercury. The sulfuric acid was contaminated with mercury during the acid manufacturing process (DOE-RL 1992b).

The HRS Migration score assigned to this waste site is 42.32.

During field surveys conducted for this report, this site could not be located. No evidence could be found to support its existence as documented by the WHC 1991 database. Although, this waste site may be one of two other sites are described in Section 6.2 or 6.28.

6.2 120-KE-2 (183-KE FILTER WASTE FACILITY FRENCH DRAIN)

The 120-KE-2 is an inactive nonradioactive liquid waste site that operated from 1955 to 1971 to receive sulfuric acid sludge removed from sulfuric acid storage tanks. This site, which is located at 100-K Area coordinates NK3131.5 WK4814 (Hanford Drawing H-1-25264), is also known as 100-KE-2 (WHC 1991).

This drain is an open bottomed french drain with a depth of 3 ft and a diameter of 3 ft (Stenner et al. 1988). Hanford Drawing H-1-25264 describes this drain as being a 3-ft diameter, 6-ft-long vitrified clay pipe placed vertically in an excavation that was about 13 ft across and 11 ft deep. The bottom 1 ft of the pipe was filled with course rock as was the bottom 5 to 6 ft of the excavation. Refer to Section 6.9 for a photograph of the 183-KW water treatment facility, which is identical to the 183-KE water treatment facility.

The HRS Migration score assigned to this waste site is 42.32.

This waste site appears today as a sand covered mound. The lid appears to have been removed and is laying nearby on the ground.

6.3 120-KE-3 (183-KE FILTER WATER FACILITY TRENCH)

The 120-KE-3 is an inactive liquid waste site that operated from 1955 to 1971 to receive sulfuric acid sludge removed from sulfuric acid storage tanks. This site, located at 100-K Area coordinates NK4500 WK3600, is also known as 100-KE-3 (WHC 1991 and Stenner et al. 1988).

The 40 by 3 by 3-ft-deep trench was lined with sand to allow the sludge-water slurry to drain (Stenner et al. 1988). Refer to Section 6.9 for a photograph of the 183-KW water treatment facility, which is identical to the 183-KE water treatment facility.

Stenner (1988) reports the hazardous chemical inventory disposed in the trench as 700 kg of mercury. The mercury contaminated sludge was later removed by an offsite vendor (DOE-RL 1992b).

The HRS Migration score assigned to this waste site is 18.51.

Today, the trench appears as gravel covered parking lot.

6.4 120-KE-4 (183-KE1 SULFURIC ACID STORAGE TANK)

The 120-KE-4 is an inactive nonradioactive liquid waste site that was used from 1955 to 1971 for the storage of sulfuric acid product (Cramer 1987). This site is located on the southeast corner of the 183-KE headhouse at 100-K Area coordinates NK3131.5 WK4759.5 (Hanford Drawing H-1-25117).

The storage tank was a horizontal, cylindrical-shaped, steel tank supported on concrete saddles with a storage capacity of 10,109 gal (Hale 1957b). This sulfuric acid tank is apparent as shown in Section 6.9 photograph.

The supply pipe from the tank to the point of use inside the 183-KE Building developed a gradual slow leak. Before the leak was detected, an unknown quantity of sulfuric acid leaked into the ground at the northeast corner of 183-KE. Soil in the general area of the leak was neutralized. When the tank was taken out of service, it was drained and neutralized (Cramer 1987).

The site appears today much as it did during operations. The tank has been disconnected from the supply lines and is currently empty.

6.5 120-KE-5 (183-KE2 SULFURIC ACID STORAGE TANK)

The 120-KE-5 is an inactive nonradioactive liquid waste site that was used from 1955 to 1971 for the storage of sulfuric acid product (Cramer 1987). This site is located on the southeast corner of the 183-KE headhouse at 100-K Area coordinates NK3131.5 WK4778.5 (Hanford Drawing H-1-25117).

The storage tank was a horizontal, cylindrical-shaped, steel tank supported on concrete saddles with a storage capacity of 10,109 gal. When it was taken out of service, the tank was drained and neutralized (Cramer 1987 and Hale 1957b). This sulfuric acid tank is apparent as shown in Section 6.9 photograph.

The site today appears much as it did during operations and is currently empty.

6.6 120-KE-6 (183-KE SODIUM DICHROMATE TANK)

The 120-KE-6 is an inactive nonradioactive liquid waste site that was used from 1955 to 1971 for the storage of sodium dichromate (Cramer 1987). This site is located on the east side of the 183-KE Building at 100-K Area coordinates NK3194 WK4704.5 (Hanford Drawing H-1-25117).

The tank was a vertical, cylindrical-shaped, steel storage tank, which was mounted on a concrete base. The 20-ft-high by 19-ft-diameter tank had a storage capacity of 42,000 gal (Hale 1957b).

Sodium dichromate was added to the process water as a corrosion inhibitor. The chemical was metered and proportioned by a single step operation in the headhouse, diluted, and injected into the process water in the process water pumphouse. It was transferred to the storage tank by pumping or by pressurizing the railroad tank cars with compressed air (Hale 1957b).

Although there are no documented releases, there is evidence of residual dichromate in the soil beneath the tank and piping system from an accumulation of many years of unloading and handling of the chemical (Cramer 1987 and Bovay Northwest 1991).

The tank was emptied in 1971 and moved to the 200 Areas for use. The base and associated piping remain inplace at 100-KE Area (Cramer 1987). Figure 6-1 shows the sodium dichromate tank during its use.

Figure 6-1. 100-KE Area with 183-KE Facility in Foreground, March 15, 1956.

Today, the site appears as a barren, circular concrete and soil pad adjacent to the 183-KE Building.

6.7 120-KE-9 (183-KE BRINE PIT)

The 120-KE-9 is an inactive nonradioactive liquid waste site that operated from 1955 to 1971. This site is located approximately 123 ft east of the east end of the 183-KE water filter plant and just north of the railroad spur that serviced 183-KE at 100-K Area coordinates NK3181 WK4820 (Hanford Drawing H-1-25117).

The 23 by 17 by 10-ft-deep pit is an underground concrete structure consisting of five chambers and is apparent as shown in Section 6.13 photograph. The roof of the structure is at ground level with a hatchway into each chamber. Four of the hatchways have wooden covers, and the fifth has a metal cover. The total site area is 391 ft^2 (WHC 1991).

The pit contains salt brine and residue. It is believed to have been used for product material and not for disposal. The salt was used in regenerating water softeners located within the 183-K Building. Minimal sampling was performed and brine samples were analyzed by the Hanford Environmental Health Foundation. Informal review of results by Sitewide Hazardous Waste Engineering Support Unit (SHWES) indicated that the brine and residue may be regulated as dangerous per WAC 173-303 (WHC 1991).

The brine pit appears today as it did during operations. The wooden covers are in poor condition.

6.8 120-KW-1 (183-KW FILTER WATER FACILITY DRY WELL)

The 120-KW-1 dry well is an inactive nonradioactive liquid waste site that operated from 1955 to 1970. The 4 by 4 by 4-ft-deep french drain is located at 100-K Area coordinates NK3180 WK6590 (WHC 1991).

The dry well was used for the disposal of an unknown quantity of sulfuric acid sludge that was removed from the sulfuric acid storage tanks (Stenner et al. 1988). Sampling of the sludge indicated mercury contamination in quantities high enough to designate it as dangerous waste (Bovay Northwest 1991). It is a registered Class IV Underground Injection Well (WHC 1991).

This waste site has a HRS Migration score of 40.09 (Stenner et al. 1988).

During field surveys conducted for this report, this site could not be located. No evidence could be found to support its existence as documented by WHC (1991) database. Although, this waste site may be one of two other sites described in Section 6.9 or 6.28.

6.9 120-KW-2 (183-KW FILTER WATER FACILITY FRENCH DRAIN)

The 120-KW-2 is an inactive nonradioactive liquid waste site that operated from 1955 to 1970 to receive sulfuric acid sludge removed from sulfuric acid storage tanks. It is located at 100-K Area coordinates NK3131.5 WK6522 (Hanford Drawing H-1-25264).

Hanford Drawing H-1-25264 describes this drain as being a 3-ft diameter, 6-ft-long vitrified clay pipe placed vertically in an excavation that was about 13 ft across and 11 ft deep. The bottom 1 ft of the pipe was filled with course rock as was the bottom 5 to 6 ft of the excavation (Figure 6-2).

This unit received a portion of several thousand pounds of sulfuric acid sludge disposed of in the 100-K Area (Bovay Northwest 1991).

It is a registered Class IV Underground Injection Well (WHC 1991).

A HRS Migration score of 40.09 has been assigned to this site (Stenner et al. 1988).

Today, this waste site appears much as it did during operations.

Figure 6-2. 183-KW Water Facility French Drain.

6.10 120-KW-3 (183-KW SULFURIC ACID STORAGE TANK)

The 120-KW-3 is an inactive nonradioactive liquid waste site that operated from 1955 to 1970. The 10,109-gal capacity aboveground tank is located at 100-K Area coordinates NK3131.5 WK6540.5 (Hanford Drawing H-1-25264), which is at the southeast corner of the 183-KW headhouse (WHC 1991). It was used for the storage of product sulfuric acid used in the treatment of process cooling water.

The supply pipe from the storage tank to point of use within the 183-KW facility developed leaks over time. These leaks deposited an unknown quantity of sulfuric acid in the soils between the tank and the building. The tank is now empty and the soil in the area of the known leaks was neutralized (WHC 1991).

There were two 10,109-gal tanks (Figure 6-3), each measuring 9 ft diameter and 20 ft long and two 20,380-gal tanks, each measuring 10-ft diameter and 33 ft long to supply the needs of the water treatment system. The 20,380-gal tanks are further discussed in Section 6.29.

Figure 6-3. 183-KW Water Treatment Facility.

This site appears today much as it did during operations. The supply piping has been disconnected and the tank is empty.

6.11 120-KW-4 (183-KW2 SULFURIC ACID STORAGE TANK)

The 120-KW-4 is an inactive nonradioactive liquid waste site that operated from 1955 to 1970. The 10,109-gal capacity aboveground tank is located at 100-K Area coordinates NK3131.5 WK6521.5 (Hanford Drawing H-1-25264), which is at the southeast corner of the 183-KW headhouse (WHC 1991). It was used for the storage of product sulfuric acid used in the treatment of process cooling water. There are no known or reported leaks of this tank or its piping system.

There were two 10,109-gal tanks (Figure 6-3), each measuring 9 ft diameter and 20 ft long and two 20,380-gal tanks, each measuring 10 ft diameter and 33 ft long to supply the needs of the water treatment system. The 20,380-gal tanks are further discussed in Section 6.29.

This site appears today much as it did during operations. The supply piping has been disconnected and the tank is empty.

6.12 120-KW-5 (183-KW SODIUM DICHROMATE STORAGE TANK)

The 120-KW-5 is an inactive nonradioactive liquid waste site that operated from 1955 to 1971. It was located at 100-K Area coordinates NK3194 WK6588 (Hanford Drawing H-1-25264), which is on the east side of the 183-KW Building. The tank was used for the storage of product sodium dichromate used in the treatment of process cooling water (WHC 1961).

The tank was a vertical, cylindrical-shaped, steel storage tank which was mounted on a concrete base. The 20-ft-high by 19-ft-diameter tank had a storage capacity of 42,000 gal (Hale 1957b).

Sodium dichromate was added to the process water as a corrosion inhibitor. The chemical was metered and proportioned by a single step operation in the headhouse, diluted, and injected into the process water in the process water pumphouse. It was transferred to the storage tank by pumping or by pressurizing the railroad tank cars with compressed air (Hale 1957b).

Although there are no documented releases; there is evidence of residual dichromate in the soil beneath the tank and piping system from an accumulation of many years of unloading and handling of the chemical (Cramer 1987 and Bovay Northwest 1991).

The tank was emptied and removed to the 200 Areas in 1970 for use. The base and associated piping remain inplace (Cramer 1987). Refer to Figure 6-1 for a photograph of the sodium dichromate tank during its use.

The site appears today as a barren, concrete and soil circular pad adjacent to the 183-KW Building.

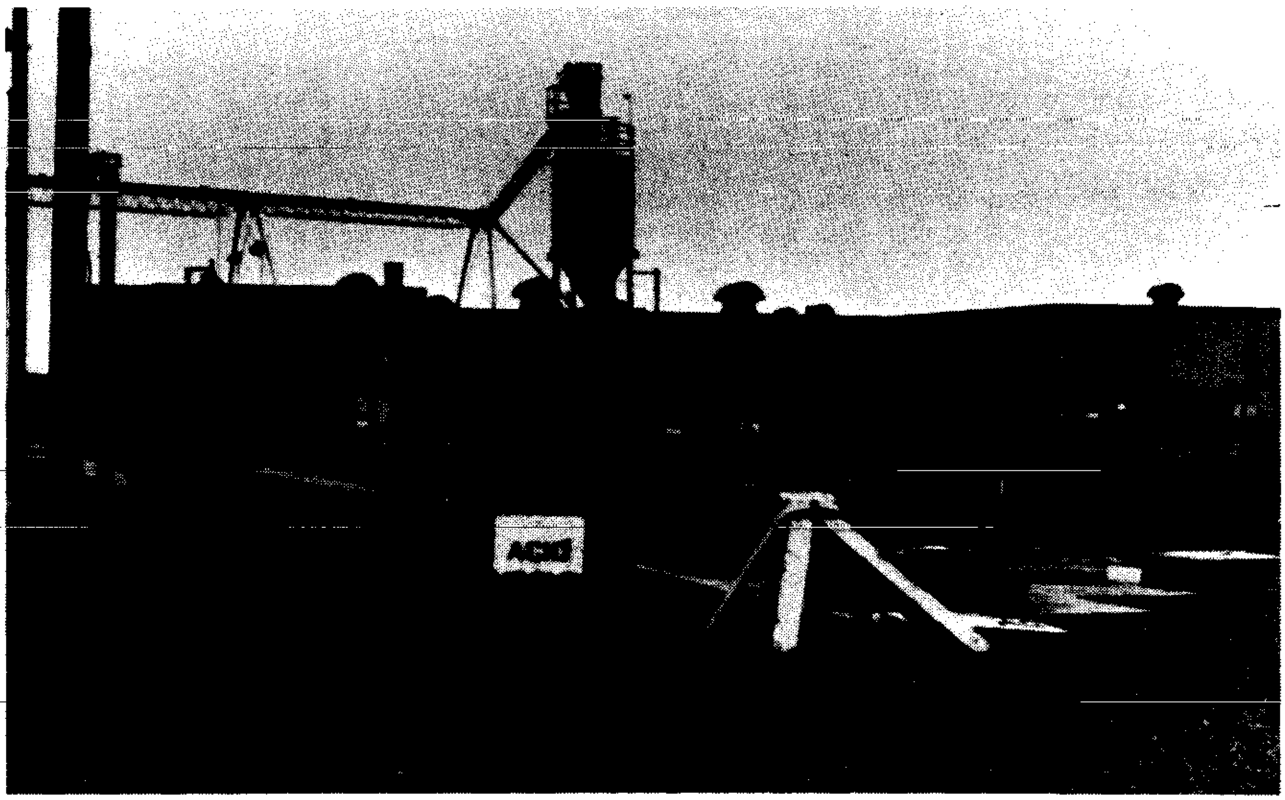
6.13 120-KW-7 (183-KW BRINE PIT)

The 120-KW-7 is an inactive nonradioactive liquid waste site that operated from 1955 to 1970. It is located at 100-K Area coordinates NK3181 WK6480 (Hanford Drawing H-1-25264), which is about 123 ft east of 183-KW water filter plant and just north of the railroad spur to the 183-KW Building (WHC 1991). The 23 by 17 by 10-ft-deep underground reinforced concrete structure was used for storage of salt and brine solutions used to regenerate water softeners (WHC 1991).

The structure, which is apparent in Figure 6-4, contains five chambers, four of which have wooden hatches, the fifth has a metal cover. The roof of the structure is a ground level. Informal review of results by SHWES indicated that the brine and residue may be regulated as dangerous per WAC 173-303 (WHC 1991).

Today, the tanks remain full of salt cake and water. The wooden covers are in poor condition.

Figure 6-4. 183-KW Water Treatment Facility.



6.14 126-KE-2 (183-KE LIQUID ALUM STORAGE TANK NO. 2)

The 120-KE-2 is an inactive nonhazardous/nonradioactive liquid waste site that was used from 1955 to 1971 for the storage of liquid alum (Cramer 1987). This site is located at the 183.1 headhouse (water treatment facility) at 100-K Area coordinates NK3146 WK4587.5 (Hanford Drawing H-1-25117).

The vertical, steel storage tank is cylindrical in shape mounted on a concrete base. It is 40 ft diameter and 20 ft high with a storage capacity of 188,000 gal (UNI-2780). Refer to Figure 6-3.

Alum was used in the water treatment process as a coagulant. Alum feeding and proportioning was a single step operation; suction for the proportioning pump was taken directly from the storage tank and discharge was directly into the raw water line. The alum proportioning pump was paced by the flow of raw water in its 36-in. raw water line and was sized to feed at a maximum rate of 30 ppm at a flow of 32,000 gpm in that line (Hale 1957b).

Today, this waste site appears much as it did during operations.

6.15 126-KE-3 (183-KE LIQUID ALUM STORAGE TANK NO. 1)

The 126-KE-3 is an active nonhazardous/nonradioactive liquid waste site that began operation in 1955 for the storage of liquid alum (Cramer 1987). This site is located at 100-K Area coordinates NK3146 WK4560 (Hanford Drawing H-1-25117).

The vertical, steel storage tank is cylindrical in shape mounted on a concrete base. It is 40 ft diameter and 20 ft high with a storage capacity of 188,000 gal (UNI-2780). See Figure 6-3.

Alum was used in the water treatment process as a coagulant. Alum feeding and proportioning was a single step operation; suction for the proportioning pump was taken directly from the storage tank and discharge was directly into the raw water line. The alum proportioning pump was paced by the flow of raw water in its 36-in. raw water line and was sized to feed at a maximum rate of 30 ppm at a flow of 32,000 gpm in that line (Hale 1957b).

The waste site appears much today as it did during operations. It is still in use for the storage of liquid Alum that is used for water treatment in the 100-K Areas.

6.16 128-K-1 (100-K BURNING PIT)

The 128-K-1 is an inactive solid waste site that operated from 1955 to 1971. The 100 by 100 by 10-ft-deep site is located at 100-K Area coordinates NK3500 WK3500 (WHC 1991). It was used for the disposal of nonradioactive combustible materials such as paint waste, office waste, and chemical solvents (Stenner et al. 1988).

This site has a HRS Migration score of 0.00 (Stenner et al. 1988).

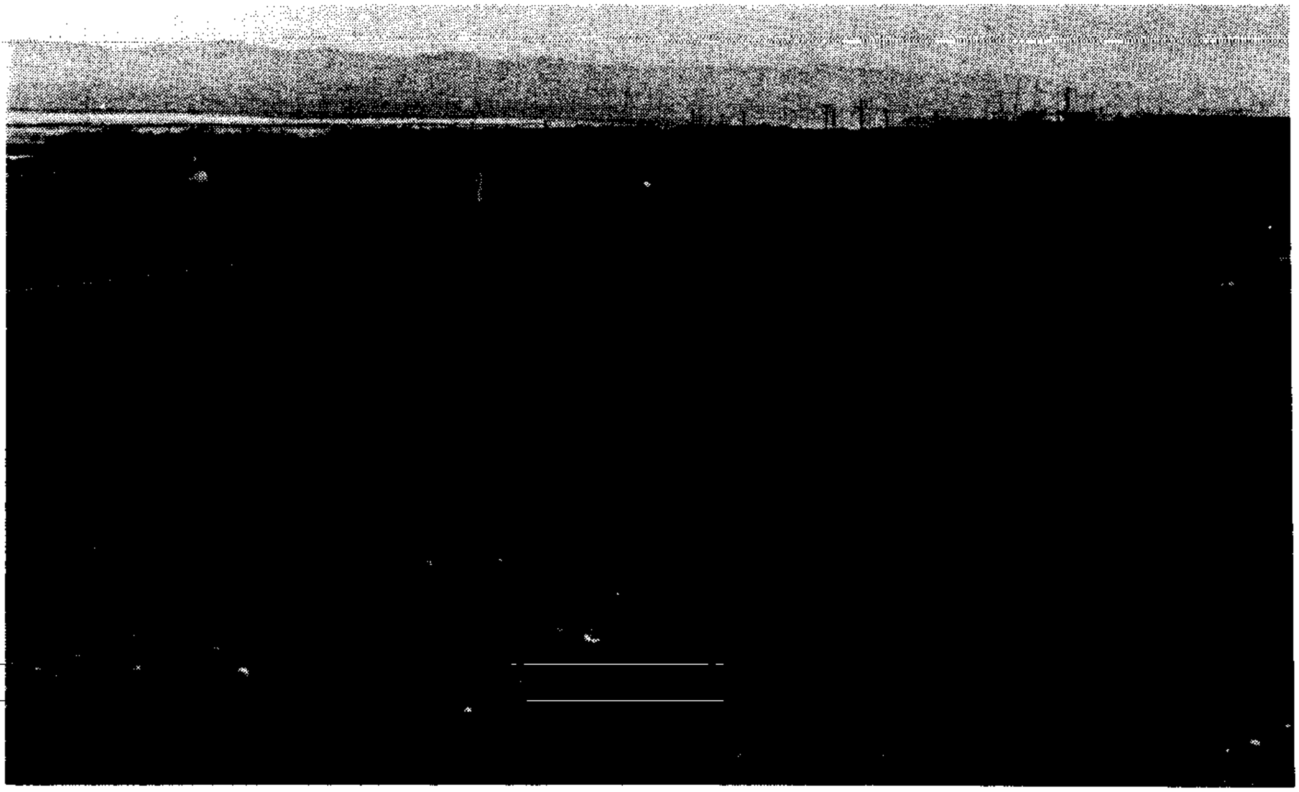
The site has been backfilled to the surrounding grade with clean fill material. Currently, there is a large pile of compacted tumble weeds collected from sites around the 100-K Area near the site.

6.17 128-K-2 (100-K CONSTRUCTION DUMP)

The 128-K-2 is an inactive nonradioactive solid waste site located approximately 1/4 mile southwest of the K Area perimeter fence along the Old Hanford Irrigation Project Canal at 100-K Area coordinates NK5000 WK9000 (WHC 1991).

WHC (1991) cites a total site area of the construction dump (Figure 6-5) as 75,000 ft^2. The 800 by 280-ft burning pit has not been covered with fill.

Figure 6-5. 100-K Construction Dump, January 1994.



A wide variety of trash is exposed on the surface. There is evidence of burning in many places. Most of the material on the surface is scrap metal and glass. Office waste, paint, solvents, laboratory waste have also been found. The area is also covered with nonfriable and friable asbestos (WHC 1991). The construction dump is frequented by area deer. A close observation of Figure 6-6 shows two deer inside the construction dump site boundary.

Figure 6-6. 100-K Construction Dump, January 1994.

Today, the site appears as a large depression covered by natural grasses and vegetation surrounded by a light-duty post and single chain fence. The area is posted with asbestos warning signs.

6.18 130-K-3 (182-K EMERGENCY DIESEL OIL STORAGE TANK)

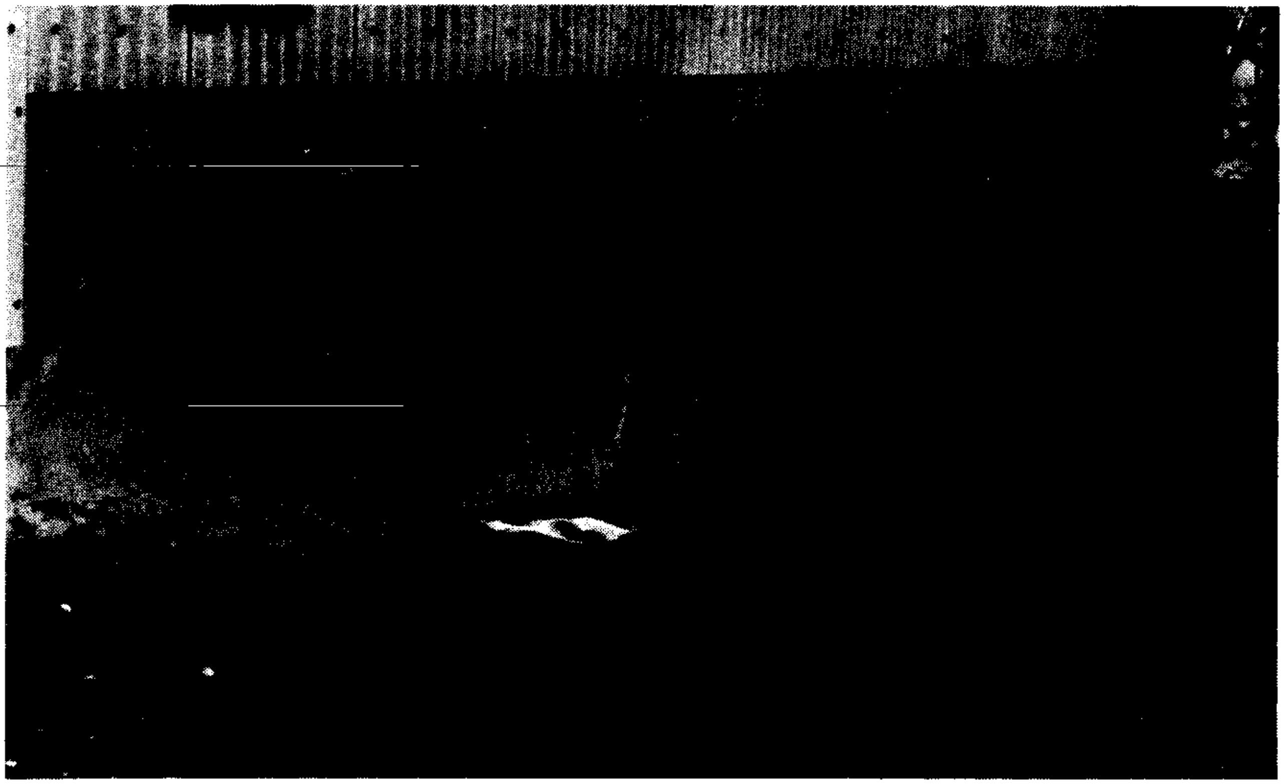
The 130-K-3 tanks are an inactive liquid waste site that operated from 1955 to 1971. They were located at 100-K Area coordinates NK4120 WK5040 (WHC 1991), which is just north of the 182-K Building.

The site consisted of two 6-ft-diameter 33-ft-long underground tanks with a capacity of 17,498 gal. They were used for the storage of diesel fuel used in the operation of three diesel emergency cooling water pumps located in the 182-K Building.

Site employees report that the tanks were removed in 1993 and that the site was backfilled with clean fill material. Evidence at the site confirms that the tanks have been removed.

Currently, the earth berm that covered the tanks is gone and piping through the foundation wall remains exposed. This exposed piping has leaked a small quantity of fuel oil onto absorbent materials and the soil beneath the exposed pipe ends (Figure 6-7).

Figure 6-7. 182-K Emergency Diesel Oil Storage Tank, December 1993.



6.19 600-4 (HOWITZER SITE)

The 600-4 Howitzer site is an inactive solid waste site. It is unknown when the site was operational and it is not identified in the most current information provided to WHC the U.S. Army history files. It is located about 300 yd south of Route 1. The access road to the site leaves Route 1 at a survey mile marker about 1/4 mi west of the railroad crossing between 100-K and 100-B Areas. The remnants of two small water towers are also found at the site.

The site covers an area of about 15 to 20 acres. It includes remnants of a garbage trench, military tent city, and gun emplacements (WHC 1991).

Various types of solid wastes litter much of the area and consist of food containers (cans), ammo crates (confirmed empty), 5-gal oil and gas cans, wooden railroad ties and other wooden debris, and two coal piles (Figure 6-8) about 20 ft diameter. A 5-gal drum was located that is partially buried and the bottom perforated to make a french drain, which was identified by a site employee as a field latrine (WHC 1991).

The site includes earth mounds topped with wooden decks, presumably these structures are lookout platforms that surround the site. One of these lookout platforms, on the south side of the site, is on top of what appears to be soils removed from the trench that transverses the site. This platform indicates that the site was emplaced after the trench was dug and would account for the trench being backfilled at the center of the site.

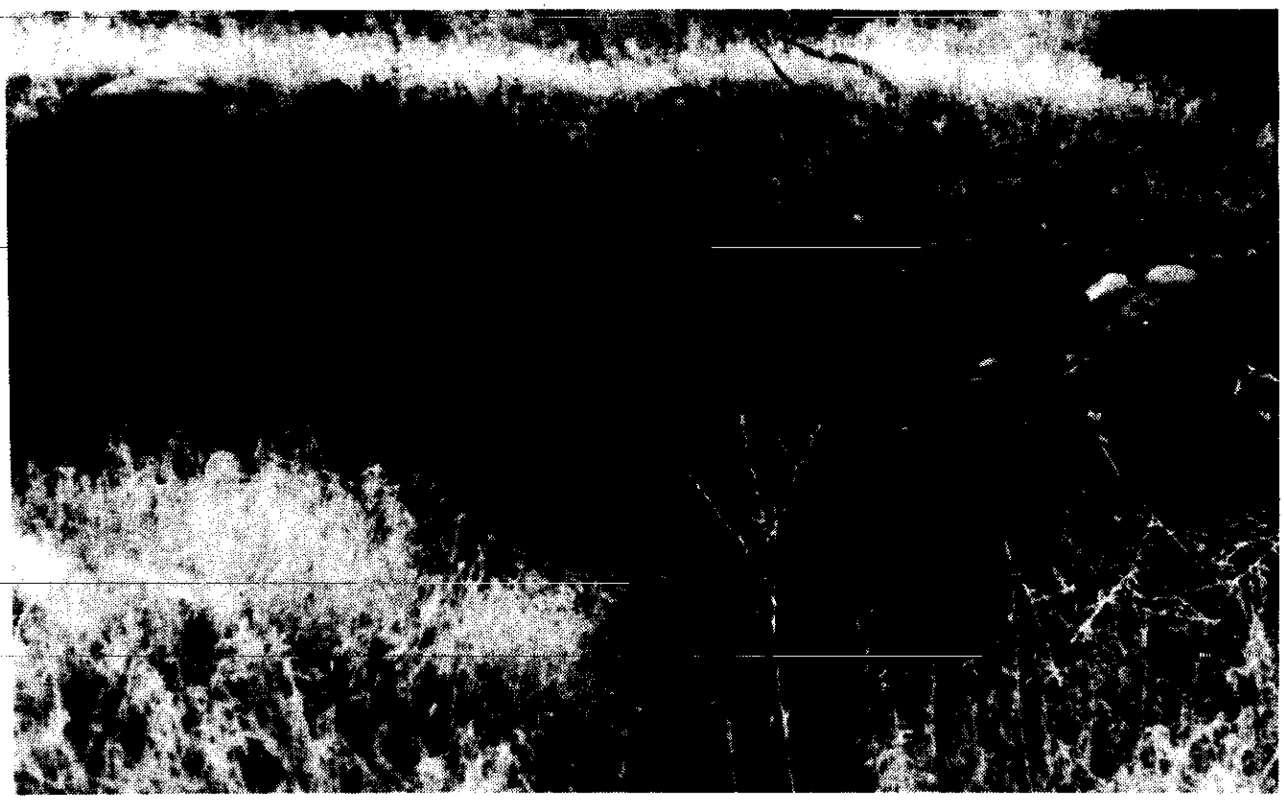
Figure 6-8. Howitzer Site, Coal Pile Area, December, 1993.

There are also at least three large bunkers located within the area. The bunkers are wooden structures with earthen berms surrounding the sides. The wooden roofs, made up of 8-in. by 8-in. beams, have collapsed into the structures (Figure 6-9).

South of the site, off the terrace edge, is a large borrow pit area that includes a wooden loading ramp and garbage dump. Solid wastes evident at the site included food cans, newspaper, wood, metals, tires, glass, dry cell batteries, transite siding materials, and roofing materials.

A newspaper found in the trash material indicated that the site was active in the mid-1950's. A former site employee confirmed the existence of military presence during construction and for a period after operations began at 100-K Area.

Figure 6-9. Howitzer Site, Collapsed Structure, December 1993.



A trench that traverses the site from northwest to southwest may have been a temporary water supply pipeline that ran from the pre-Hanford Allard pumping station to the 200 North Area and the Central Electrical Control Station located at 200 North Area. The entire length of this trench was traced for this report and was found to begin just south of the Allard Pumping Station and terminate at the 200 North Area. Remnants of a pumping station remain at the summit of the Gable Mountain ridge south of 100-K Area. It appears that, for the most part, the pipe was removed from the trench; probably when it was replaced by the export water line that is in use today.

6.20 600-29 (100-K CONSTRUCTION LAYDOWN AREA)

The 600-29 construction area is an inactive solid waste site that operated from 1952 to 1954 (WHC 1991). Some areas appear to have been used much later, such as the enclosure described in this section. It is located at the center of SE 1/4 of Section 6, approximately 1,000 ft south/southwest of the southwest corner of the 100-K Area perimeter fence (WHC 1991).

The 2,000 by 1,000-ft site is about 46 acres and contains an abandoned dumping area, waste burning area, and several rectangular depressions (WHC 1991).

The site was used as the construction laydown area for the construction of 105-KE. Discolored soil and suppressed vegetation indicate that there is potential for hazardous materials in the soils (WHC 1991).

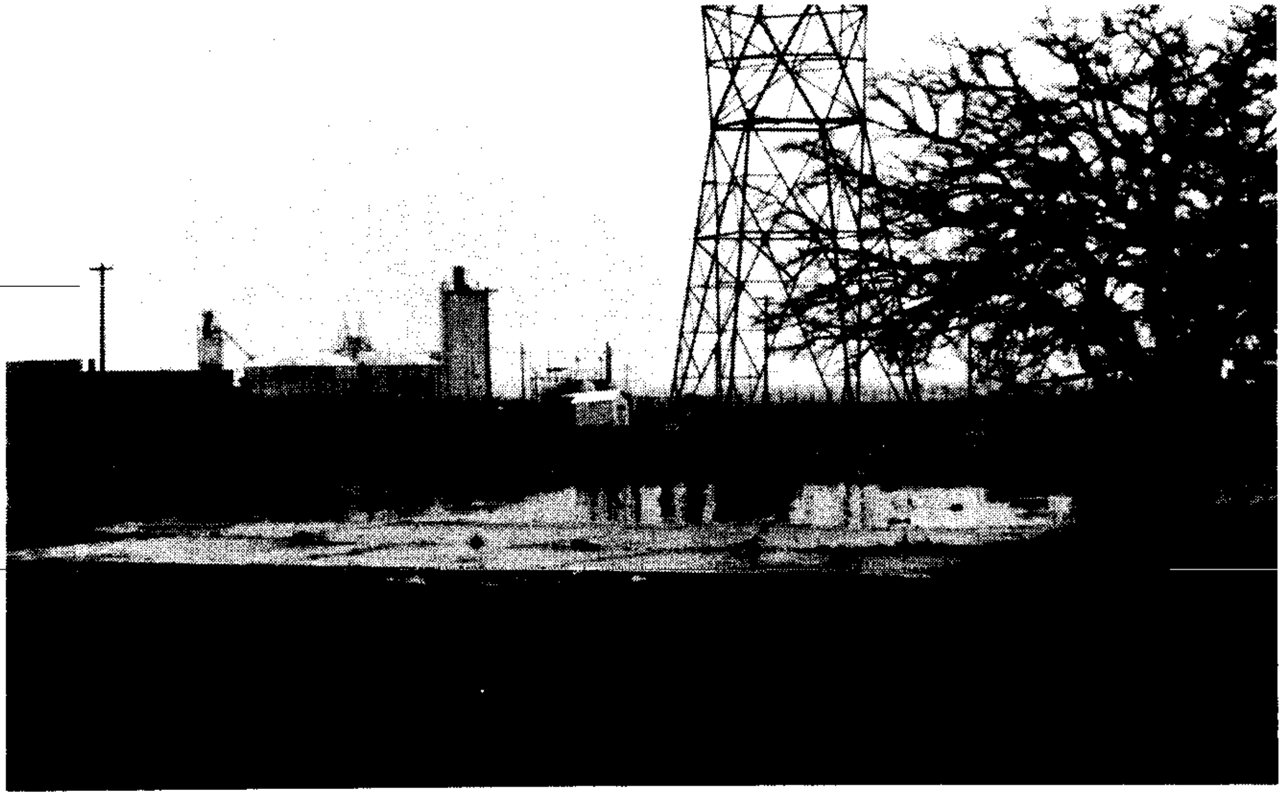
Approximately 100 yd south of the fence, halfway between the road that follows the railroad tracks and small access road that runs parallel to the exclusion area fence, is another area that looks like a burn site or a chemical dumping site. Rubber hoses, rebar, electrical wiring, concrete, and other debris are evident on the surface.

There are at least eight burn spots, approximately 30 ft by 30 ft, in the area. They are easy to distinguish from the surrounding grade as there is no vegetation (Figure 6-10). Some of the stones in these burn areas appear to be contaminated with some sort of chemical that left a yellow-green residue similar to sulfuric acid stains.

South of the perimeter fence, just outside the entrance to 100-K Area to the east, is a concrete foundation and paved area that once was a fire station (Figure 6-11).

Figure 6-10. 100-K Construction Laydown Area Burn Spots, January, 1994.

Figure 6-11. Fire Station Foundation, January 1994.



Approximately 50 yd south of 100-KE, outside the perimeter fence at an area halfway between the 100-K Area access gate and the 183-KE water treatment facility, there is a 2-in. pipe extending a few feet from the surface (Figure 6-12). Earlier photographs (6449-4) show a small structure at the site. It is thought that this pipe is a water supply pipeline.

There is another 2-in. pipe protruding from the surface approximately 150 yd southwest of 183-KW outside the perimeter fence (Figure 6-13). It is also thought to be a water supply pipe. The area is disrupted by heavy equipment and the pipe appears to have been torn out of the ground.

Approximately 100 yd south of 183-KW, outside the perimeter fence, is a construction building foundation and fenced materials enclosure (Figure 6-14).

There is a large pit, approximately 400 yd southeast of the southeast corner of the 100-K Area perimeter fence, that contains demolition wastes. The area is located near a marker, designated as N3000 W8000, surrounded by a small 4 X 4 X 4-ft wooden fence. Figure 6-15 shows this site with the marker in the background.

Figure 6-12. 2-Inch Pipe in Construction Laydown Area, December 1933.

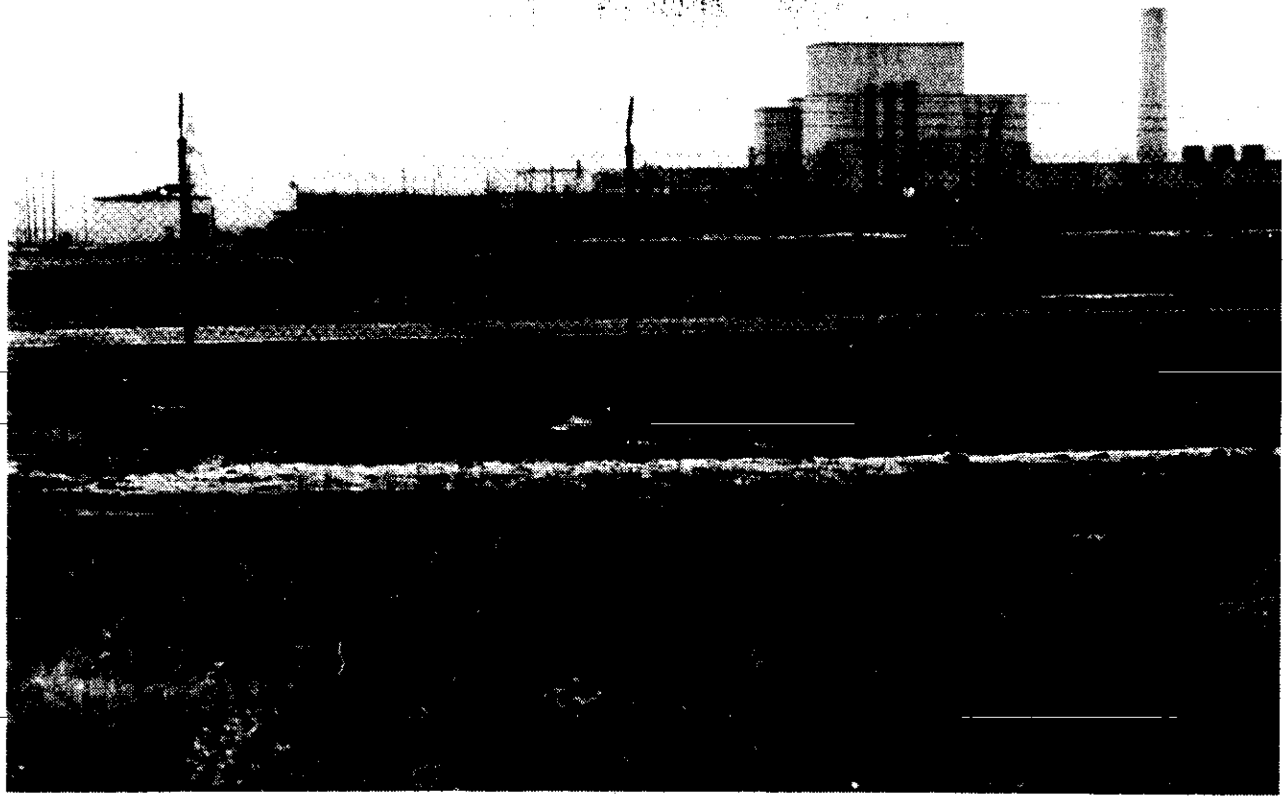


Figure 6-13. Construction Laydown Area Southwest of 183-KW.

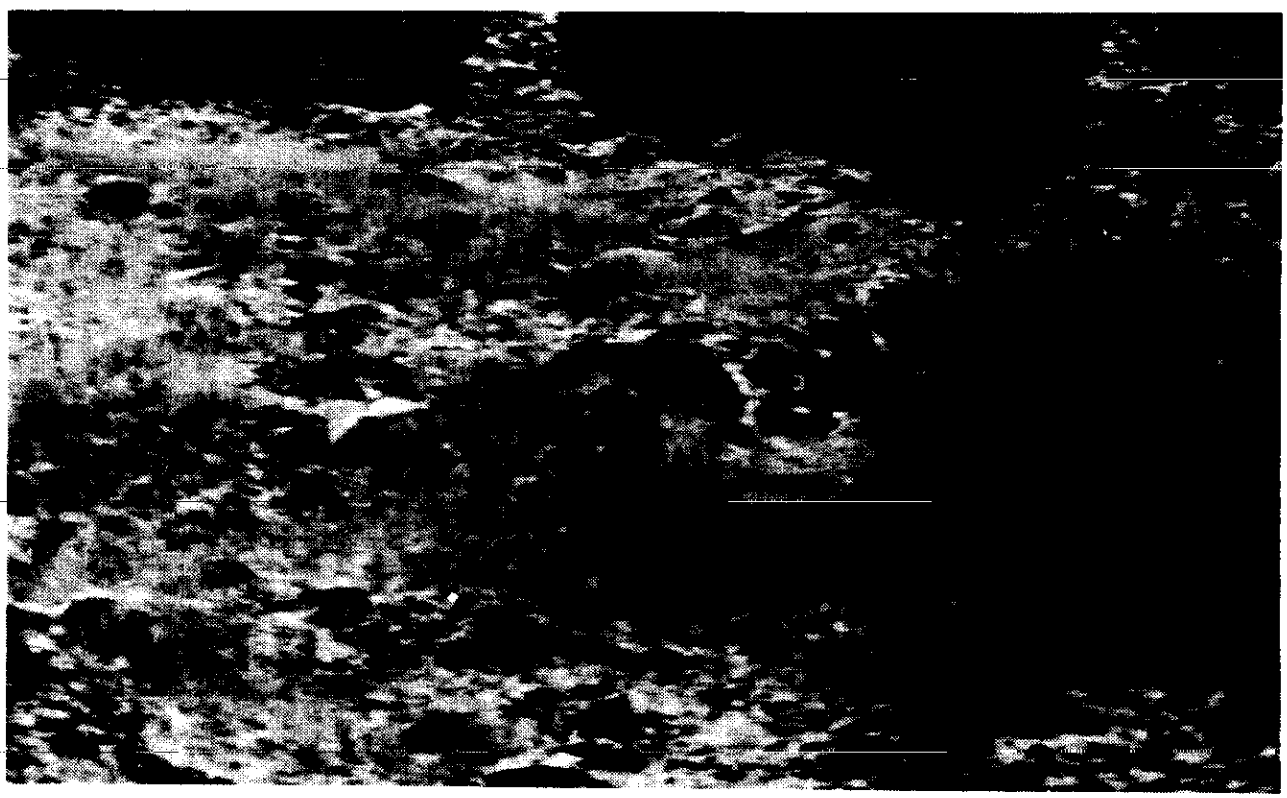


Figure 6-14. Building Foundation and Fenced Materials Enclosure.

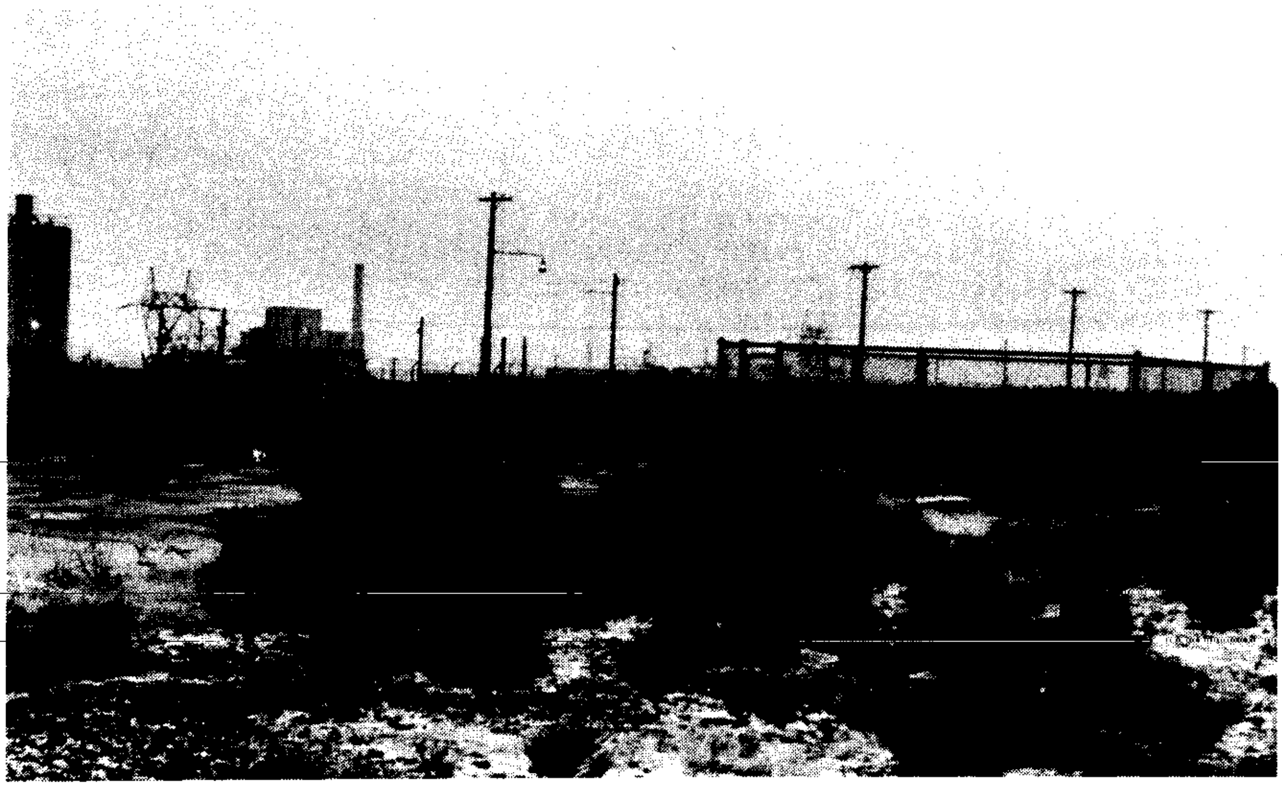


Figure 6-15. Demolition Pit, December 1993.

6.21 1607-K (SEPTIC TANK SYSTEMS)

Four septic tanks are located in the 100-KR-3 Operable Unit. They are both active and inactive systems constructed of reinforced concrete with associated drain fields. Cast iron pipes were used to conduct wastes to the septic tanks and 6-in. vitrified clay tiles laid with open joints comprised the drain fields (Hale 1957b). They are not known to have received hazardous or radioactive wastes, although they may have received materials associated with cleaning solvents and materials that were likely used in the facilities they supported. These septic systems are more completely described in Table 6-2. Refer to Figure 5-18 for a typical photograph.

Table 6-2. 100-KR-3 Operable Unit Septic Systems.

Septic tank designation	Hanford location	Comments
1607-K1 and associated drain field	NK2900 WK5900	Supported 1701-K Badgehouse, 1720-K Patrol Change Room and Offices, and 1721-K Trailer. This active since 1955 system receives an estimated flowrate of 525 gal/d (WHC 1991). This site appears today as a vegetation-free, cobble-covered field surrounded by a 4-ft wooden fence.
1607-K2 and associated drain field	NK3240 WK4780	Supported the 183-KE Water Treatment Plant. This active since 1955 system receives an estimated 350 gal/d (WHC 1991). This site appears today as a vegetation-free, cobble-covered field surrounded by a 4-ft wooden fence.
1607-K3 and associated drain field	NK3208 WK6705	Supported 183-KW Water Treatment Plant. It is currently inactive and operated from 1955 to 1970. The volume of wastes received in this system are unknown (WHC 1991). This site appears today as a vegetation-free, cobble-covered field surrounded by a 4 ft wooden fence.
1607-K5 and associated drain field	NK4400 WK3730	Supported 1706-KER Flow Laboratory, 1706-K Water Treatment Laboratory, 165-KE Powerhouse, 105-KE Reactor Building, and the 115-KE Gas Recirculation System. The estimated flowrate was 700 gal/d (WHC 1991). This site appears today as a vegetation-free, cobble-covered field surrounded by a 4-ft wooden fence.

6.22 UNDOCUMENTED SODIUM SILICATE STORAGE TANK SITE

Two sodium silicate storage tank sites are located at both the 183-KE and -KW water treatment plants. These tanks, which were directly south of the 183 Buildings and adjacent to the sulfuric acid tanks, were located at 100-K Area coordinates NK3131 WK4680 and NK3131 WK4725 at 100-KE and at NK3131 WK6620 and NK3131 WK6605 at 100-KW prior to removal. These 30-ft diameter vertical tanks had a capacity of 104,400 gal each (Hale 1957b and Hanford Drawing H-1-25264).

Sodium silicate was used as an aid in coagulation in raw river water at times of high turbidity. Originally the sodium silicate was purchased and stored in liquid form, later the tanks were removed and it was purchased and stored in bagged dry powder form. The sodium silicate was activated by the addition of sulfuric acid. This mixing was performed in large tanks constructed for the purpose within the 183-Water Treatment Buildings. From the tanks it was metered and injected into the supply headers to the flocculation basins north of the facility. These tanks are apparent in Figure 6-1.

After the storage tanks were removed, the west tank base at both the 183-KE and -KW water treatment plants were converted and reused as a base for the present bauxite storage tower and transfer system.

6.23 UNDOCUMENTED CAUSTIC SODA STORAGE TANK SITE

A caustic soda storage tanks (sodium hydroxide) was situated adjacent to the sodium dichromate tanks, just east of the 183 Buildings in both the 105-KE and 105-KW Reactor areas. Located at 100-K Area coordinates NK3197 WK4742 in the 105-KE Reactor area and at 100-K Area coordinates NK3197 WK6650 in the 105-KW Reactor area, these vertical 25 ft 6 in. diameter aboveground tanks had a capacity of 76,000 gal each (Hale 1957b). Adjacent to the caustic tanks were the neutralization pits described in Section 6.25. These tanks are still apparent in Figure 6-1.

Sodium hydroxide was used to regenerate the ion exchange columns in the water softener system and for maintaining a neutral pH of the reactor cooling water. It was most likely the neutralizing agent for excess or spilled sulfuric acid was also used extensively in the 183 facilities.

Spills may have occurred near the tank and/or piping system may have developed leaks over time. If leaks or spills did occur it is likely that the soils beneath and around the tank base are contaminated with sodium hydroxide.

It is unknown when the tanks were removed or the disposition of the tanks at this time.

6.24 UNDOCUMENTED 100-KW LIQUID ALUM STORAGE TANKS

There are two liquid alum storage tanks located in 100-KW at 100-K Area coordinates NK3146 WK6705 and NK3146 WK6685, which is directly south of the 183-KW Building. The vertical, steel storage tanks are cylindrical in shape mounted on a concrete base. They are 40 ft diameter and 20 ft high with a storage capacity of 188,000 gal each (UNI-2780).

Alum was used in the water treatment process as a coagulant. Alum feeding and proportioning was a single step operation; suction for the proportioning pump was taken directly from the storage tank and discharge was directly into the raw water line. The alum proportioning pump was paced by the flow of raw water in its 36-in. raw water line and was sized to feed at a maximum rate of 30 ppm at a flow of 32,000 gpm (Main 1957).

On October 1, 1979, these tanks began use for the storage of diesel fuels (Goodenow 1979, letter). At some time prior to 1990, the use of the tanks for diesel fuels was discontinued. The tanks were drained and cleaned. In late 1990 or early 1991, the tanks were used for the storage of purge water generated and collected from Hanford Site characterization wells. The tanks were reportedly used for the storage of this purge water for about 2 months until the completion of the modular purge water storage facilities in the 600 Area.

Today, these waste sites appear much as they did during operations.

6.25 UNDOCUMENTED CAUSTIC NEUTRALIZATION PITS

There is a caustic neutralization pit approximately 5 ft southeast of the caustic soda tank in each of the water treatment plants. The 100-K Area coordinates for these pits are NK3184 WK4761 (KE) and NK3184 WK6532 (KW).

These 6-ft 4-in. by 8-ft 4-in. by 3-ft-deep brick-lined concrete boxes with wooden covers drained into the process sewer. Presumably, the pits were used to dispose of overflow and transfer wastes after neutralization to the process sewer system. The pits were constructed in such a way that small volumes of waste chemicals could be held up in a brick-lined compartment for neutralization and then flushed to a larger compartment within the structure, which then drained to the process sewer (Hanford Drawing H-1-25563).

These sites appear today much as they did during operations. The caustic pit at 100-KE has been covered to grade with gravel.

6.26 UNDOCUMENTED ACID NEUTRALIZATION PITS

There is an acid neutralization pit situated approximately 8 ft southwest of the sulfuric acid tank no. 1 in each of the water treatment plants. The 100-K Area coordinates for these pits are NK3131 WK4751.5 in 100-KE and NK3131 WK6548 in 100-KW.

These 8-ft 4-in. by 6-ft 4-in. by 3-ft-deep brick-lined concrete boxes drained into the process sewer. Presumably, the pits were used to dispose of overflow and transfer wastes after neutralization to the process sewer system. The pits were constructed in such a way that small volumes of waste chemicals could be held up in a brick-lined compartment for neutralization and then flushed to a larger compartment within the structure, which then drained to the process sewer (Hanford Drawing H-1-25563).

From the physical description in a letter from J. J. Dorian to B. W. Mathis, dated November 4, 1985, it is apparent that these pits (Figure 6-16) were used for the disposal of sulfuric acid sludge from sulfuric acid tanks located nearby. Sampling performed using the EP Toxicity Test yielded the following:

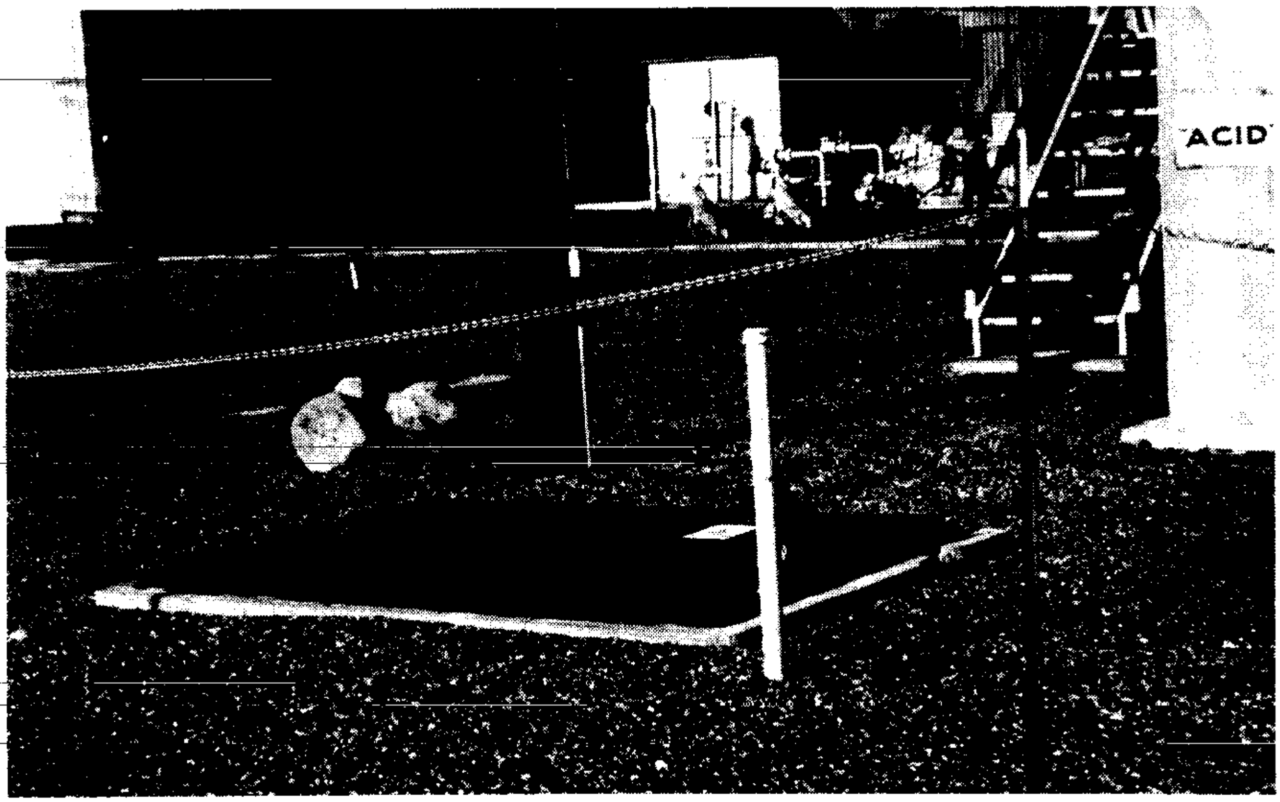
Table 6-3. Concentration of Inorganic Hazardous Materials (ppm)

Sample	As	Ba	Cd	Cr	Pb	Hg	Ag	Se
KE dry-well sludge	0.03	0.99	<0.002	0.03	<0.002	<0.005	<0.01	0.032
KW dry-well sludge	0.005	13.8	<0.002	0.03	0.026	0.387	0.05	0.010

(Dorian 1985 Letter DC-0131)

Today, these pits appear much as they did during operations. They are posted with "Confined Space" and "Caution, Acid" warning signs. The wooden covers are in poor condition.

Figure 6-16. Undocumented 100-KW Acid Neutralization Pit.



6.27 UNDOCUMENTED ACID NEUTRALIZATION PITS

There is an acid neutralization pit located adjacent to the west outside wall of the 183 Buildings and just north of the Chlorine Storage Buildings at each of the 183-KE and -KW water treatment plants.

These 8-ft 4-in. by 6-ft 4-in. brick-lined concrete boxes drained into the process sewer and were used to dispose of overflow and transfer wastes from a nearby sulfuric acid storage tank system located on the roof of the 183 Buildings. The pits were deeper than the other acid neutralization pits located near the sulfuric acid tanks. They appeared to be about 5 ft deep and backfilled with crushed limestone to neutralize acid additions.

The drain pipes entered the pit about 2 ft belowgrade and emptied into a 3-ft-diameter vitrified clay pipe, placed vertically in the limestone chips, and filled with limestone chips. It appears that the vitrified clay pipe was either cut or intentionally broken at the top to allow acid solutions to overflow to the interior of the pit.

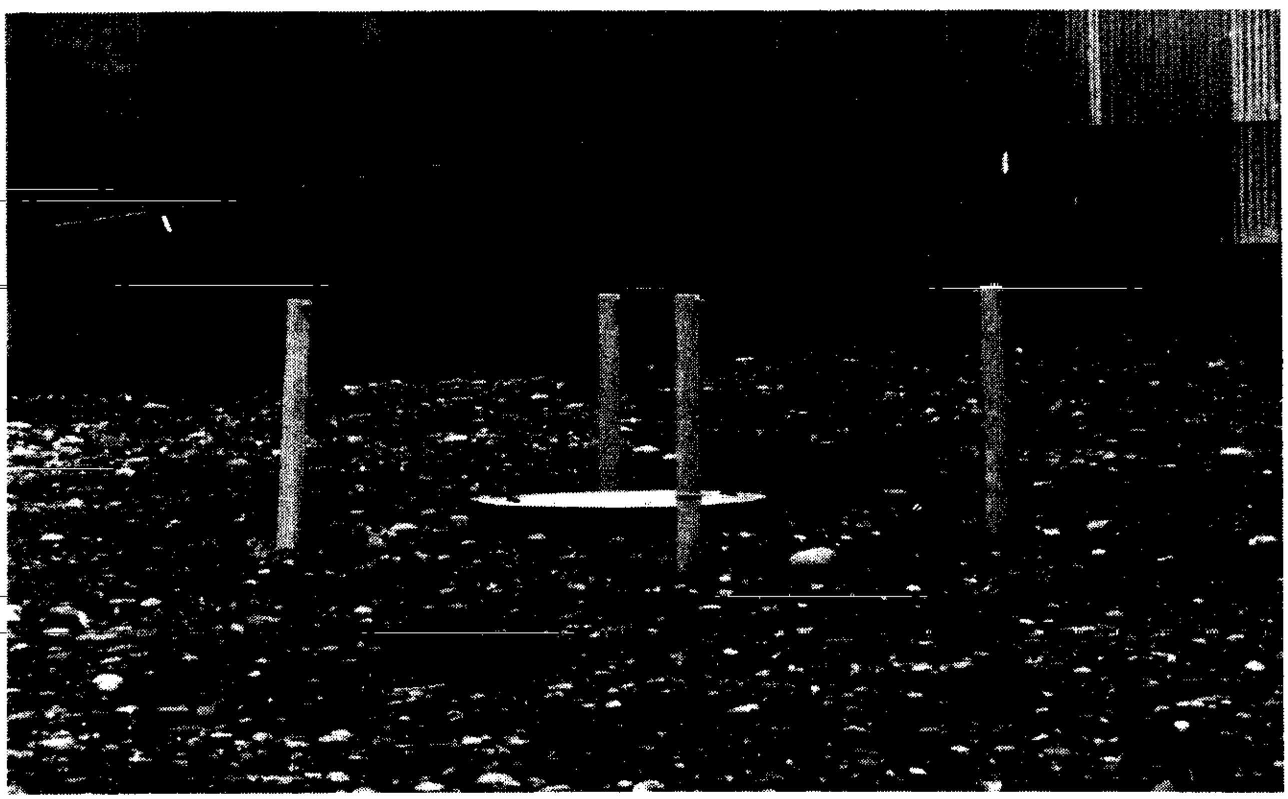
These pits appear today much as they did during operations. The wooden covers are in poor condition.

6.28 UNDOCUMENTED ACID NEUTRALIZATION PITS AND DRY WELLS

Hanford Drawing H-1-71837 indicates that a new french drain was installed at both 183-KE and 183-KW Buildings in 1970. Both of these french drains were to be located directly west of the alum storage tanks and south of the southwest corner of the chlorine storage buildings.

They were constructed by excavating a pit 15 ft deep with a bottom dimension of about 5 ft diameter. About 7 ft of 3- to 5-in. aggregate was backfilled into the pit and a 30-in. diameter, 8-ft-long vitrified clay pipe was placed vertically in the center of the excavation. An additional 4 ft of aggregate was placed around the pipe exterior and about 5 ft of limestone chips added to the pipe interior. A 2-in. schedule 80 PVC pipe enters through the side 3-ft 6-in. belowgrade. This pipe is an overflow and drain line for the day use acid tank located on the roof of the 183 facilities. The pit was then backfilled to grade with clean fill material. Each drain has a 1/4-in. steel plate cover that has four 1-in. vent holes (Figure 6-17).

Figure 6-17. Acid Neutralization Pit Overflow French Drain.



The french drain is apparent at the 183-KE site, but there is no evidence of the drain at the 183-KW site.

6.29 UNDOCUMENTED SULFURIC ACID TANKS

There were two additional sulfuric acid tanks at each of the 183-KE and -KW water treatment plants that were located adjacent and to the east of the original tanks.

These tanks were 10 ft diameter and 33 ft long. The storage capacity of each tank was 20,380 gal. Refer to Figure 6-3.

The french drain described in Sections 6.2 and 6.9 of this report was located between the two sets of acid storage tanks. It is not known when the tanks were installed, but they appear in photographs taken in March, 1962. It is also unknown when the tanks were removed or their disposition. The tank bases and piping remains inplace at both 183 facilities.

6.30 UNDOCUMENTED BAUXITE TANKS

A Bauxite storage (Figures 6-18 and 6-19) tank was constructed on the site of each of the former number 1 sodium silicate tanks at 100-K Area coordinates NK3131 WK4680 in 100-KE and NK3131 WK6620 in 100-KW (H-1-25117).

Bauxite Tanks During Construction and Operation in 1966.

Figure 6-18. Bauxite Tank, August 25, 1966.

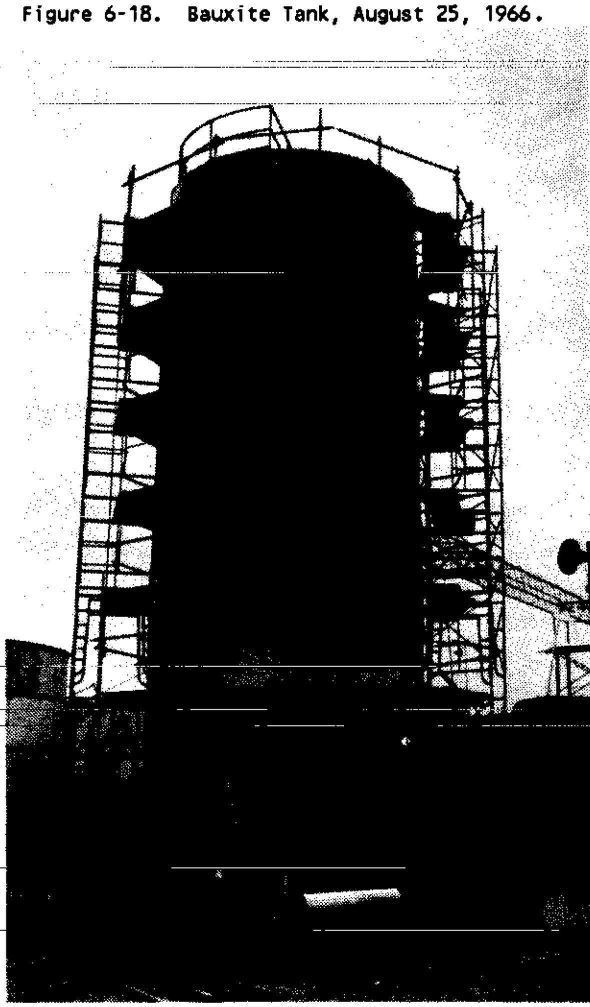
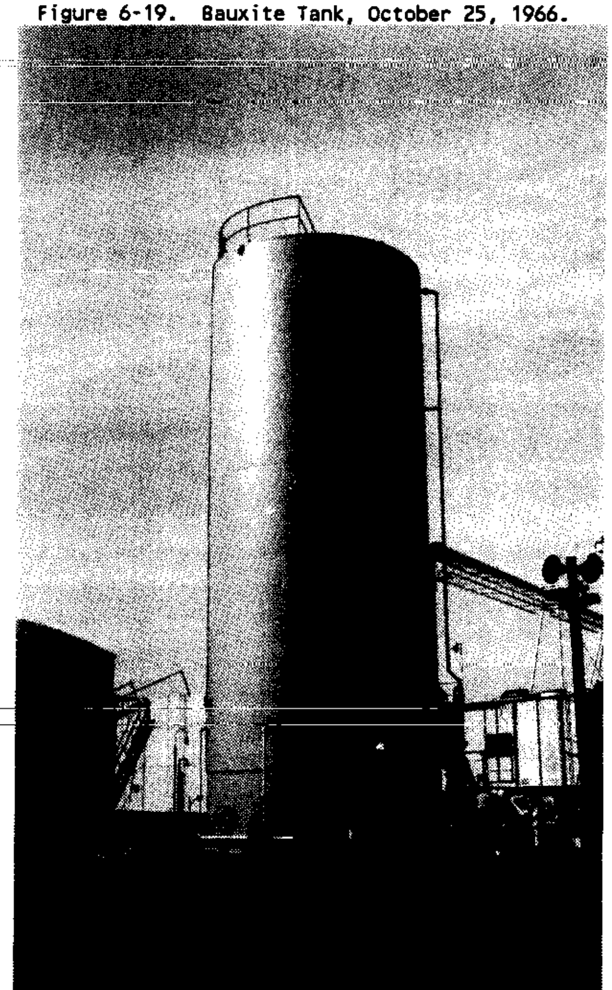


Figure 6-19. Bauxite Tank, October 25, 1966.



The tanks appear today as they did during operations. They appear to have been emptied, although dry bauxite powder can be seen through a plexiglass cover indicating that no additional clean-up was performed.

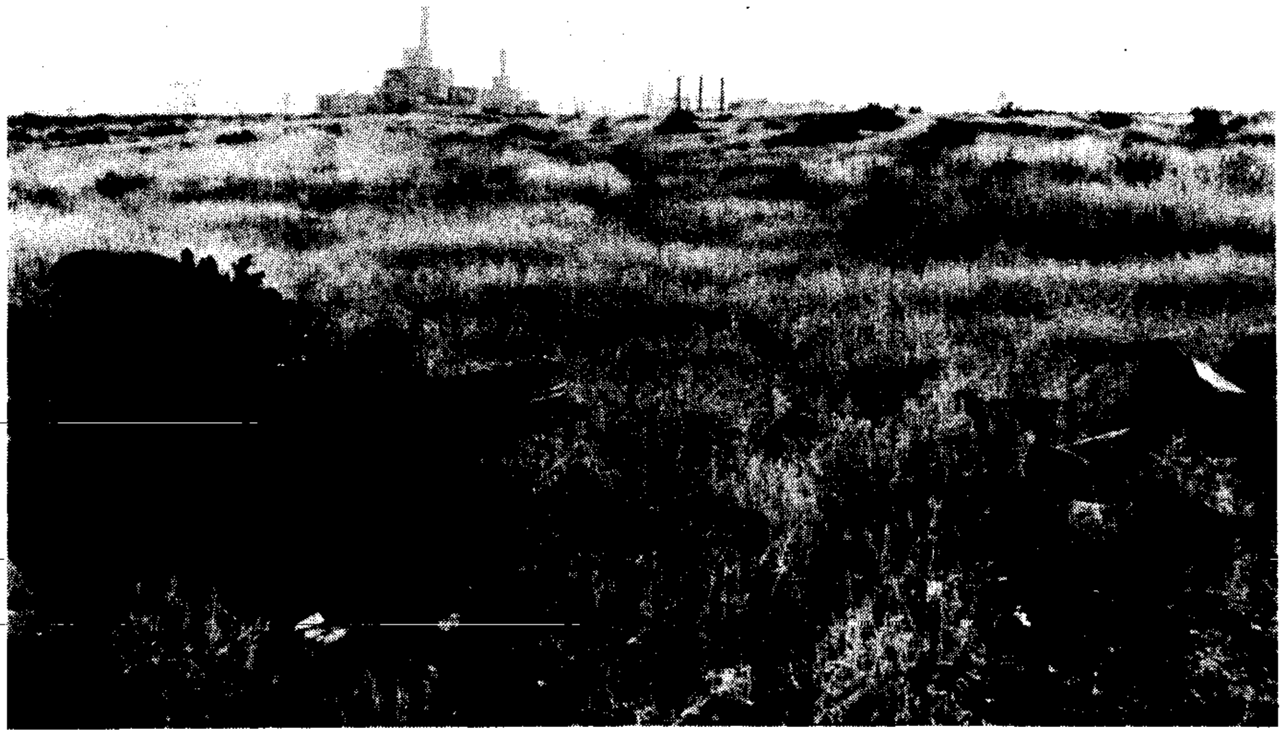
6.31 UNDOCUMENTED SOLID WASTE SITE (PAVED AREA AND COLLAPSED STRUCTURE)

A large asphalt, paved area is located to the west of the 100-K Area, near the Allard Pumping Station and to the south of the 128-K-2 (100-K Construction Dump).

Adjacent to and to the east of this paved area is a collapsed wooden structure (Figure 6-20). The purpose of the paved area and the wooden structure is unknown at this time. A little further to the east, about 50 yd, is a farm waste dump (Figure 6-21).

Figure 6-20. Undocumented Paved Area and Collapsed Structure, December 1993.

Figure 6-21. Undocumented Farm Waste Site - West of 100-K Area.

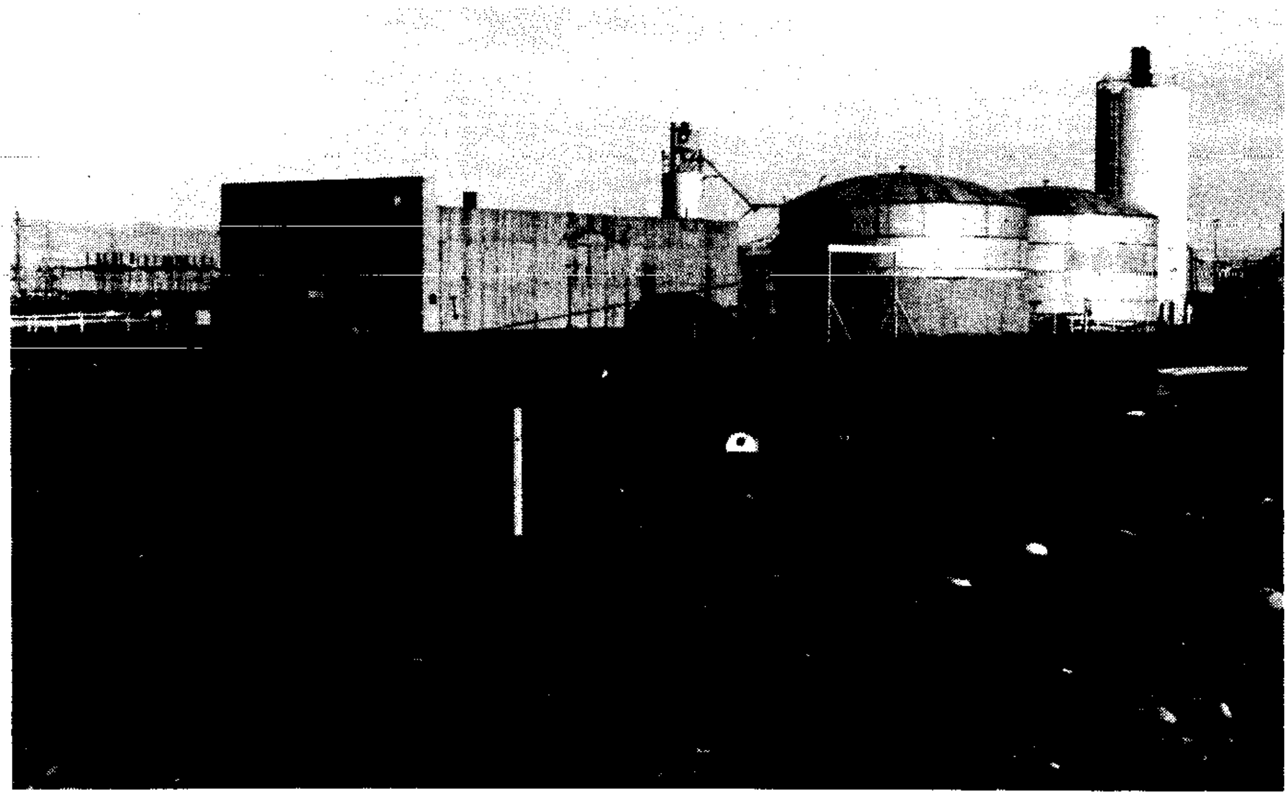


6.32 UNDOCUMENTED SOLID WASTE SITE - WEST OF 183-KE WATER TREATMENT FACILITY

In the early 1980's, a large open area west of the 183-KE water treatment facility, between the road and the railroad tracks to the 183-KE facility, was used as a sandblasting site for cleaning excess steel components removed from the 183-KE settling basins prior to being sold as scrap metal.

As a result of this sandblasting, an area approximately 50 yd by 30 yd is covered with red garnet sandblasting material (Figure 6-22).

Figure 6-22. Undocumented Solid Waste Site - Sandblasting Area.



7.0 OTHER 100-K AREA BUILDINGS, FACILITIES, AND STRUCTURES

Table 7-1 provides descriptions of 100-K Area buildings, facilities, and structures not previously mentioned in this document. Some of these facilities may be important from a waste standpoint. Mobile office trailers and other temporary construction buildings have not been included.

Table 7-1. Other 100-K Buildings, Facilities, and Structures. (sheet 1 of 3)

Facility	Comments
110-KE and 110-KW	GAS STORAGE FACILITY. These facilities are outdoor gas storage areas consisting of a number of 24 ft diameter X 80 ft long, high-pressure helium tanks, and four large diameter tanks used for CO_2. The gas storage facility was served by a railroad spur and had equipment for transferring gas at high pressure. The 110 facilities were the receiving and storage areas at the 115 Buildings for the reactor graphite cooling media gas.
115-KE and 115-KW	GAS RECIRCULATION BUILDING. These buildings are 20 ft abovegrade, 20 ft belowgrade, 113 ft in length, and 34 ft wide. The building walls are constructed of concrete block and reinforced concrete. The roof is constructed with precast concrete slabs with composition surface. The equipment is inplace, such as the gas dryer towers, heaters/coolers, condensers, filters, pumps, silica-gel drying beds, heating and ventilation systems, piping and duct work. The 115-KW Building includes a bay that contains the spindle type helium storage tanks as well as a gas unloading room. Both buildings are contaminated.
117-KE and 117-KW	EXHAUST FILTER BUILDING. These buildings are below-grade bermed (earth and gunite) structures with large steel hatch covers that serve as the roof. Walls are constructed of reinforced concrete with earth and gunite bermed barrier. The roofs are steel frame with large steel hatch covers. The buildings are each 8 ft abovegrade, 27 ft belowgrade, 57 ft in length and 37 ft in width. The equipment remains inplace in a deactivated status and the buildings are contaminated.
119-KE and 119-KW	EXHAUST AIR SAMPLE BUILDING. These buildings are small pre-engineered metal buildings placed on concrete slab floor foundations. The equipment has been removed.
165-KE and 165-KW	POWER BUILDING. These buildings are both single-story concrete structures with reinforced concrete floors, walls, and poured roofs with built-up asphalt and gravel surfacing. They each consisted of three parts: (1) the pumproom and valve pit with steel grating floor providing work areas; (2) the electrical area consisting of two concrete floors; and (3) the oil fired steam plant and control room. They each have approximately 52,800 ft^2 of space. 165-KE status: A portion of the equipment in 165-KE is in service. The remainder of the building is in standby status. 165-KW status: Boardman Naval Depot has removed air compressors and receivers in 165-KW. Most of the asbestos lagging has been removed. Cleanup of the remaining asbestos and of asbestos already removed remains to be completed.
166-KE and 166-KW AND AKE	OIL STORAGE FACILITY. These buildings each consist of two underground concrete storage bunkers that are 44 ft wide by 116 ft long by 21 ft deep having a nominal capacity of 800,000 gal, two day tanks of 49,300 gal capacity each, and a pumproom. The equipment is in use for the 100-N Area reserve Bunker C oil storage.
167-K	CROSSTIE TUNNEL BUILDING. This facility measures 10 ft by 10 ft and was a concrete structure that is the midway ventilation and entry shaft for the 100-KE/KW crosstie tunnel and was used as such.

Table 7-1. Other 100-K Buildings, Facilities, and Structures. (sheet 2 of 3)

Facility	Comments
181-KE and 181-KW	RIVER PUMPHOUSE. These structures are open air, reinforced 62 ft X 72 ft concrete pads at ground level with sub-surface pump wells. Electrically driven deep well pumps are mounted on the pad and are controlled remotely from the 165-KE Building control room. Each structure includes a guard tower. 181-KE status: Two submersible pumps are in use for water supply to the 105-KE and 105-KW fuel storage facilities. The balance of the equipment has been deactivated. 181-KW status: One submersible pump is maintained in an operable status as a backup pump for the emergency raw water supply.
182-K	EMERGENCY WATER RESERVOIR AND PUMPHOUSE. This facility, totaling approximately 2,610 ft^2, is a steel frame structure with concrete foundation and floors, transite walls, and roof of insulated steel decking with built-up tar and gravel surfacing. The building houses diesel engine driven pumping gear and associated equipment for emergency reactor cooling. Water could be pumped from either the 100-KE or -KW clearwells to either of the reactors.
190-KE and 190-KW	PROCESS WATER PUMPHOUSE: These structures are single-story buildings with concrete basements, reinforced concrete floors, and structural steel and corrugated transite walls. The roofs are corrugated cement transite on steel girders with 2-in. foam glass insulation and asphalt gravel built-up surface. Both buildings have approximately 47,634 ft^2 of space and housed process and service water pumps, and ventilation equipment. 190-KE status: This pump station was used as a shop. The service water pumps are in operation. The balance of the equipment has been removed and excessed. A new roof was installed in 1982. 190-KW status: The equipment has been deactivated. Six oil pumps and two oil centrifuges were removed.
1701-K	BADGEHOUSE. This unoccupied facility is a single-story concrete and steel frame structure with corrugated transite walls, concrete foundation and floor, and flat pre-fabricated cement board roof with built-up asphalt and gravel surfacing. This facility adjoins the 1720-K Building and shares a common wall.
1701-KA	BADGEHOUSE. This facility is a single-story concrete and steel frame structure with concrete block walls and a concrete foundation. It was refurbished in April 1983, for a Rockwell Patrol Badgehouse for the 100-K exclusion area entrance.
1705-KE	PILOT PLANT: This is a concrete block structure that is attached to 165-KE. It has approximately 552 ft^2 of space and is in a deactivated status.
1706-KE	REACTOR LOOP CORROSION TESTING FACILITY: This building is a concrete and steel frame structure located at the southwest corner of the 105-KE Reactor. It is 100 ft long (east-west), 56 ft wide and 16 ft high for an approximate square footage of 11,200. The structure has corrugated transite siding, and concrete floors. The ground floor walls are concrete block and the upper levels are of transite siding. There is a flat roof with built-up asphalt and gravel surfacing over cement board and 1/4-in. steel plate. It has a full basement with half sub-basement. Demineralized water from this facility supplies 105-KE and -KW fuel storage basins. A new roof was installed in 1980. Portions of this building are contaminated.
1706-KEL	COOLANT SYSTEM DEVELOPMENT LABORATORY: This structure, located at the southwest corner of the 105-KE Reactor, is a 2,700 ft^2 laboratory building that adjoins the 1706-KER Building. Laboratory equipment is in service. The building was rented to PNL prior to use by UNC Chemical and Waste Treatment Technology and is contaminated.
1706-KER	REACTOR LOOP CORROSION TESTING FACILITY: This facility, located adjacent to the west wall of the 105-KE Reactor, is a single-story concrete and steel frame structure with approximately 11,555 ft^2 of space. It has corrugated transite siding, concrete floors, and a flat roof with built-up asphalt and gravel surfacing over cement board and 1/4-in. steel plate. The building contains four shielded cells belowgrade, each housing the water treatment, heat exchanger, pumping, and remote instrument equipment for each of the four in-reactor loops. The facility is being used in support of N Reactor Operations and is contaminated.

Table 7-1. Other 100-K Buildings, Facilities, and Structures. (sheet 3 of 3)

Facility	Comments
1713-KER and 1713 KW	WAREHOUSE: These structures are each 800 ft^2 sheetmetal "butler" buildings with concrete floors and footings. 1713-KER status: This building has miscellaneous equipment stored in it and is in fair condition. 1713-KW status: This building is used as an oil house and is in good condition.
1714 KE and 1714 KW	OIL STORAGE FACILITY: This structure is a 192 ft^2 sheetmetal "butler" building on a concrete foundation. 1714-KE status: The building is being used for storage and a work area. 1714-KW status: The building is used for electrical equipment storage.
1717-K	MAINTENANCE SHOP. This facility is a single-story concrete and steel frame structure with corrugated transite siding, a concrete foundation and floor, and a flat pre-fabricated Cemesto roof. The roof is built-up asphalt and gravel surfacing. It has approximately 10,800 ft^2 of space.
1720-K	ADMINISTRATIVE OFFICE. This facility is a single-story concrete and steel frame structure with corrugated transite siding and a concrete foundation and floor. It has a Cemesto braid on concrete slab roof with built-up asphalt and gravel surfacing. This building has approximately 6,200 ft^2 of space and shares a common wall with the 1701-K Badgehouse. Portions of this building were occupied by Rockwell (GTE) for the telephone exchange and for the vidaguard. The building provided office and laboratory space for several UNC Nuclear Industries organizations.
1908-KE	IODINE MONITORING: This building is a 144-ft^2 building of corrugated transite. It currently contains instruments and sampling systems for recording flow, temperature, and collecting samples at the 004 outfall.

(Kiser 1984, Kiser 1988 and AEC-CE 1964)

8.0 REFERENCES

AEC-GE, 1964, *Catalog of Hanford Buildings and Facilities - 100 Areas*, TRAC-0375, AEC-GE Study Group for the Economic Development of Richland, Richland, Washington.

Backman, G. E., 1965, *Summary of Environmental Contamination Incidents at Hanford, 1958 - 1964*, HW-84619, General Electric Company, Richland, Washington.

Becker, C. D., 1990, *Aquatic Bioenvironmental Studies: The Hanford Experience 1944-84*, PNL, Richland, Washington.

Bovay, 1991, *100-K Area Draft Technical Baseline Report*, Bovay Northwest, Inc., Richland, Washington.

Clough, R. G. Jr., 1971, *Reactor Plant Deactivation History 100-KE and K Plant*, DUN-7661, Douglas United Nuclear, Inc., Richland, Washington.

Clukey, H. V., 1954, *Tabulation of Radioactive Liquid Waste Disposal Facilities*, HW-33305, General Electric Company, Richland, Washington.

Clukey, H. V., 1956, *Tabulation of Radioactive Liquid Waste Disposal Facilities*, HW-43121, General Electric Company, Richland, Washington.

Cramer, K. H., 1987, *Hanford Site Waste Management Units Report*, Westinghouse Hanford Company, Richland, Washington.

Cushing, C. E., 1988, *Hanford Site National Environmental Policy Act (NEPA)*, PNL-6415, Rev. 0, Pacific Northwest Laboratory, Richland, Washington.

Cushing, C. E., 1991, *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Rev. 4, Pacific Northwest Laboratory, Richland, Washington.

DeNeal, D. L., 1965, *Historical Events - Single Pass Reactors and Fuels Fabrication*, RL-REA-2247, U.S. Department of Energy-Richland Operations Office, Richland, Washington.

DOE, 1989, *Decommissioning of Eight Surplus Production Reactors at the Hanford Site*, DOE/EIS - 0119D, U.S. Department of Energy, Washington D.C.

DOE-RL, 1992a, *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-KR-1 Operable Unit, Hanford Site, Richland, Washington*, DOE/RL 90-20, Rev. 0, U. S. Department of Energy - Richland Operations Office, Richland Washington.

DOE-RL, 1992b, *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-KR-3 Operable Unit, Hanford Site, Richland, Washington*, DOE/RL-90-21, Rev. 0, U.S. Department of Energy - Richland Operations Office, Richland Washington.

DOE-RL, 1993, *Hanford Site Waste Management Units Report*, DOE/RL-88-30, Rev. 3, U.S. Department of Energy-Richland Operations Office, Richland, Washington.

Dorian, J. J. and V. R. Richards, 1978, *Radiological Characterization of Retired 100 Areas*, UNI-946, United Nuclear Industries, Richland, Washington.

Ecology, EPA, and DOE, 1989 et seq, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Olympia, Washington.

Gilbert, R. O. and W. J. Klover, 1988, *Statistical Analyses of Insitu and Soil-Sample Measurements For Radionuclides in Surface Soil Near the 116-K-2 Trench*, PNL-6579, Pacific Northwest Laboratory, Richland, Washington.

Griffin, P. W., 1987, *Decommissioning Conceptual Study In Situ Decommissioning Of Eight 105 Reactor Buildings in the 100 Areas*, UNI-2898, Rev. 0, United Nuclear Industries, Richland, Washington.

Hale, G. R., 1957a, *Completion Report Project CA-512 Volume I 100-K Reactor Plants*, HW-24800-103, General Electric Company, Richland, Washington.

Hale, G. R., 1957b, *Completion Report Project CA-512 Volume II 100-K Water Plants*, HW-24800-103 Vol. II, General Electric Company, Richland, Washington.

Healy, J. W., 1959, *Direct Disposal of Reactor Effluent*, HW-60529, General Electric Company, Richland, Washington.

Heid, K. R., 1956, *Unconfined Underground Radioactive Waste and Contamination 100 Areas*, HW-46715, General Electric Company, Richland, Washington.

Kiser, S. K., 1984, *100 Deactivated Area Pictorial Review*, UNI-2780, United Nuclear Industries, Inc., Richland, Washington.

Kiser, S. K., 1988, *Hanford Surplus Facilities Programs Facilities Listings and Descriptions*, WHC-SP-0331, Westinghouse Hanford Company, Richland, Washington.

Miller, R. L. and R. K. Wahlen, 1987, *Estimates of Solid Waste Buried in 100 Area Burial Grounds*, WHC-EP-0087, Westinghouse Hanford Company, Richland, Washington.

Miller, R. L. and J. M. Steffes, 1986, *Fuel Storage Basins Cleanup and Stabilization Project Report*, UNI-3958, United Nuclear Industries, Richland, Washington.

Newell, L. J., 1964, *Slug Rupture Reports - 1964*, HW-80764, General Electric Company, Richland, Washington.

Perkins, C. J., 1988, *Westinghouse Hanford Company Environmental Surveillance Annual Report - 100 Areas: Calendar Year 1987*, WHC-EP-0161, Westinghouse Hanford Company, Richland, Washington.

Roeck, F. V., 1990, *Environmental Impact of KE Basin Operation*, WHC MR-0170, Richland, Washington.

Stenner, R. D., K. H. Cramer, D. A. Lamar, 1988, *Hazard Ranking System Evaluation of CERCLA Inactive Waste Sites at Hanford Volume 1, 2, 3*, PNL-6456, Pacific Northwest Laboratory, Richland, Washington.

WHC, 1961, *100-K Power Operations Manual*, Copy #6, Westinghouse Hanford Company, Richland, Washington.

WHC, 1991, *WIDS Database Field Descriptions and Data*, WHC-MR-0056 Rev. 1, Westinghouse Hanford Company, Richland, Washington.

9.0 BIBLIOGRAPHY

Chatters, J. C., H. A. Gard, and P. E. Minthorn, 1992, *Fiscal Year 1991 Report on Archaeological Surveys of the 100 Areas, Hanford Site, Washington*, PNL-8143, Pacific Northwest Laboratory, Richland, Washington.

Clough, R. G. Jr., 1971, *Reactor Deactivation History 100-KE and K Plant*, DUN-7661, Douglas United Nuclear Company, Richland, Washington.

Copeland, H. C., 1964, *Reactor Plant Deactivation General Radiation Investigation*, RL-REA-21, General Electric Company, Richland Washington.

DeNeal, D. L., 1970, *Historical Events - Single Pass Reactors and Fuels Fabrication*, DUN-6888, Douglas United Nuclear Company, Richland, Washington.

Egge, R. G., 1991, *Annual Surveillance and Maintenance Report for the Retired Hanford Site Facilities*, WHC-EP-0535, Westinghouse Hanford Company, Richland, Washington.

Eliason, J. R. and B. F. Hajek, 1967, *Ground Disposal of Reactor Coolant Effluent*, BNWL-CC-1352, Pacific Northwest Laboratories, Richland, Washington.

ERDA, 1975, *Waste Management Operations Hanford Reservation, Richland, Washington*, ERDA-1538, U.S. Energy Research and Development Administration, Washington, D.C.

Gano, K. A. and J. A. Hall, 1987, *Designation Numbers for UNC Controlled Waste Sites in the 100 Areas*, UNI-4433, UNC Nuclear Industries, Richland, Washington.

Gerber, M. S., 1993, *Manhattan Project Buildings and Facilities at the Hanford Site: A Construction History*, WHC-MR-0425, Westinghouse Hanford Company, Richland, Washington.

Hamilton, M. K., 1989, *Soil Characterization, memo to R. C. Roos*, CO 14234, Hanford Environmental Health Foundation, Richland, Washington.

HAPO, 1963, *Hazards Summary Report Volume 2 Process Control and Technical Data Six Oldest Hanford Production Reactors*, vol. 2, HW-74094, Hanford Atomic Products Operation, Richland, Washington.

HAPO, 1967 *Official Hanford Atomic Products Operation Building List. Specification Number HW-5000*, HW-5000, Hanford Atomic Products Operations, Richland, Washington.

Healy, J. W., 1951, *Radioactivity of Hanford Reactor Cooling Effluent Water*, HW-23177-DEL, General Electric Company, Richland, Washington.

Jacques, I. D., 1987, *UNC Environmental Surveillance Report for the 100 Areas - FY 1986*, UNI-4065, United Nuclear Industries, Richland, Washington.

Miller, L and Steffes (editors), 1987, *Radionuclide Inventory and Source Terms for the Surplus Production Reactors at Hanford*, UNI-3714 Rev. 1, United Nuclear Industries, Richland, Washington.

Owen, F. E., 1966, *Special Effluent Sampling and Analysis Program*, DUN-1213, Douglas United Nuclear, Richland, Washington.

PNL, 1975, *Resource Book - Decommissioning of Contaminated Facilities At Hanford*, PNL-MA-588, Pacific Northwest Laboratory, Richland, Washington.

PNL, 1991, *Resource Book - Decommissioning of Contaminated Facilities at Hanford*, PNL-7008, vols. 1-3, Pacific Northwest Laboratory, Richland, Washington.

Roos, R. C., 1989, *Underground Storage Tank Removal Soil Characterization, Logbook*, WHC-N-270, Westinghouse Hanford Company, Richland, Washington.

Schmidt, J. W., A. R. Johnson, S. M. McKinney, C. J. Perkins, C. R. Webb, 1991, *Westinghouse Hanford Company Environmental Surveillance Annual Report, CY 1991*, WHC-EP-0573, Westinghouse Hanford Company, Richland, Washington.

Selby, J. M. and J. K. Soldat, 1958, *Summary of Environmental Contamination Incidents at Hanford 1952-1957*, HW-54636, Hanford Atomic Products Operation, Richland, Washington.

Stankovich, M. T., 1992, *Summary Report Source Data Compilation for 100-K Operable Units*, WHC-SD-EN-DP-032, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Szulinski, M. J., 1972, *Preliminary Problem Definition Decommissioning the Hanford Site*, ARH-2164, Atlantic Richfield Hanford, Richland, Washington.

Trumble, R. E., 1956, *Hazards Summary Report - Projects CG-558 and CG-600 Reactor Plant Modifications Volume 2, Appendixes*, HW-44708 vol. 2, General Electric Company, Richland, Washington.

Wahlen, R. K., 1991, *Summary of the Hanford Site Decontamination, Decommissioning, and Cleanup FY 1974 through FY 1990*, WHC-EP-0478, Westinghouse Hanford Company, Richland, Washington.

DRAWINGS:

Drawing Number	Description
M-1600-K, Sheet 1	Topographic Map, 100-K Area
M-1600-K, Sheet 2	Topographic Map, 100-K Area
H-1-19811	Civil Plan Outside Lines - Water Supply and Drain
H-1-20211	Area Layout - Roads, Railroads, and Walkways
H-1-20380	Waste Crib Plans, Sections and Details
H-1-20531	Retention Basin Foundation Repair
H-1-20919	Storage Basin Area - Sub-Basin Drainage Sections
H-1-23221	105-KE Collecting Box - Architectural, Structural and Piping
H-1-23222	105-K Buildings - Process Drainage System
H-1-23695	Master Drawing List
H-1-24425	Replacement Tile Fields - 100-K Area
H-1-24918	Heat Exchanger Piping Arrangement & Details
H-1-25073	Outfall Structure Excavation Plan and Details
H-1-25074	Drainage Sewer Plan
H-1-25076	Drainage Sewer Profiles - East
H-1-25078	Process Sewer Outfall Plan Profile and Details
H-1-25080	Sanitary Systems, Sheet 2
H-1-25190	Plant Layout
H-1-25220	Clearwells Conc - Lime Storage Area
H-1-25251	Basins Flocculation Area Plan
H-1-25331	Retention Basins Under Drain and Sub-Grade Treatment
H-1-25368	Sanitary Systems - 1500 Gallon Septic Tank
H-1-25472	Headhouse - Caustic Soda and Dichromate System - Details
H-1-25529	Retention Areas and Process Sewer
H-1-25562	Headhouse Plumbing and Drainage, Sheet 3
H-1-25654	Heating and Ventilating Control Building, Sheet 1
H-1-25659	Control Building - Glycol Storage and Piping
H-1-34161	100-K Solid Waste Burial Grounds
H-1-34432	Piping Arrangement Monitoring Building
H-1-34653	Civil Plot Plan - Waste Storage Tank and Sumps C and D
H-1-34654	Structural Pump Gallery and Catch Tank Plans and Details
H-1-34658	Structural Chute Area Canister Storage Plans and Details
H-1-34768	Civil Plot Plan - Waste Storage Tank and Sumps C and D
H-1-70413	Oil Storage Buildings
H-1-71798	Drainage Ditch
H-1-71837	Sulfuric Acid Storage - Isometric and Details

10.0 HANFORD DRAWINGS REFERENCED IN TEXT

Drawing Number	Description
H-1-12012	100-K Area Burial Ground
H-1-23215	105-KE Area Outside Pipelines, Sewers, Roads and Railroads
H-1-20365	Plot Plan 1706-KER
H-1-23207	100-K Areas Outside Lines - Details and Sections
H-1-24974	Drainage and Process Piping Lines Outside Building
H-1-24976	Drainage and Process Piping Lines Outside Building
H-1-24997	Fish Pond and Aquatic Biolaboratory Instrument Piping Arrgt and Details
H-1-25021	Crib Area Excavating and Grading
H-1-25117	Headhouse - First Floor Plan
H-1-25264	Headhouse Conc Yard Foundations Plan
H-1-25563	Headhouse Plumbing and Drainage, Sheet 4
H-1-33419	Chemical Storage Facility Structural Plan and Details

11.0 TABLE OF PHOTOGRAPHS AND FIGURES USED. (sheet 1 of 3)

Figure	Photo No.	Photograph Description
2-1	6449-4	100-K Area. March 1, 1962.
2-2	91111101-35	100-K Area Pre-Hanford Farm Site. July 15, 1941.
2-3	1787	100-K Area During Construction. June 3, 1953.
2-4	02595	100-K Area During Construction. March 24, 1954.
2-5	3113	100-K Area From the Southwest. January 20, 1955.
2-6	3373	100-K Area Aerial View. June 6, 1955.
2-7	Graphic	Typical Water Treatment System.
2-8	Graphic	100-K Area Reactor Effluent System
2-9	Graphic	Typical Confinement Facility Layout (HW-74095, Vol. 3).
2-10	94010833-20	110-KW Building and Gas Transfer Station. December 1993.
4-1	0658	100-K Crib. September 21, 1953.
4-2	3185	100-K Crib. December 1954.
4-3	3347	100-K Mile Long Trench. April 11, 1955.
4-4	GE12128-1	1904-K Outfall Construction of 250-ft Jetty. 1955.
4-5	GE12873-66	1904-K Outfall Repair Efforts. 1955.
4-6	GE12873-58	1904-K Outfall Placement of Anchors. 1955.
4-7	3307	1904-K Outfall. January 25, 1955.
4-8	Graphic	100-KE Underground Drain Lines.
4-9	3342	100-K Retention Basin Leach Trench. March 1, 1955.
4-10	122440-31	107-KE Retention Basins.
4-11	6449-5	107-KE and -KW Retention Basins During Operations. March 1, 1962.
5-1	Graphic	115-K Building Crib (redrawn for clarity from Drawing H-1-23207).
5-2	94011170-1	1706-KER Waste Crib. December 1993.
5-3	Graphic	105-K Sub Basin Drainage System (drawn from sketch by Dick Winship, former site employee).
5-4	94011170-50	105-KE Storage Basin French Drain. December 1993.
5-5	94010833-21	100-K Area Heat Recovery Station. December 1993.
5-6	94010833-24	1706-KE Condensate Collection Tank. January 1994.
5-7	94010833-25	1706-KE Evaporation Tank. January 1994.
5-8	94010833-26	1706-KE Waste Accumulation Tank. January 1994.

11.0 TABLE OF PHOTOGRAPHS AND FIGURES USED. (sheet 2 of 3)

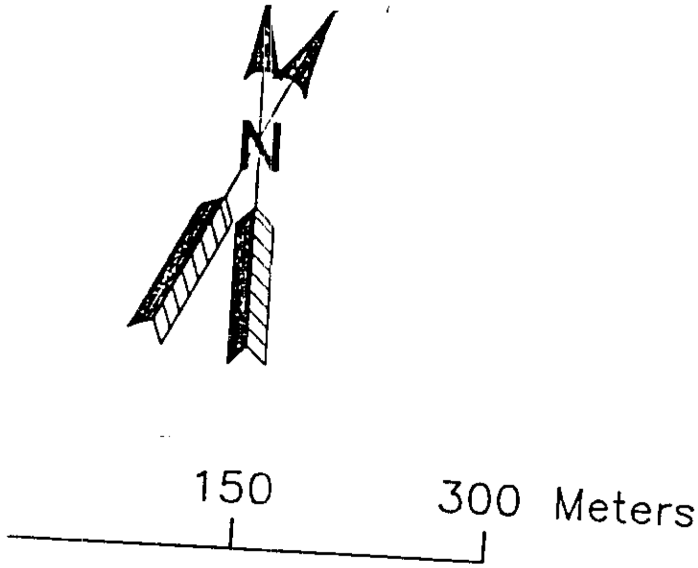
Figure	Photo No.	Photograph Description
5-9	94010833-23	Original 1706-KE Ion Exchange Column. January 1994.
5-10	94010833-13	100-K Glycol Tanks. December, 1993.
5-11	3056	100-K Burial Ground. October 1, 1954.
5-12	94020021-10	105-KE Reactor. February 1, 1994.
5-13	94020021-6	105-KW Reactor. February 1, 1994.
5-14	94010833-12	100-K Area Horizontal Control Rod Storage Cave. January 1994.
5-15	94020021-8	120-KW-6 (165-KW Brine Pit). February 1, 1994.
5-16	83G195-90	166-KE-Oil Storage Facility.
5-17	83G195-52	166-KW Oil Storage Facility.
5-18	94020021-9	Typical Septic Tank and Associated Drain Field.
5-19	94011170-50	Fish Laboratory - Outside Tanks. January, 1994.
5-20	94020021-3	Undocumented French Drain, East Side of 1706-KE. December, 1993.
5-21	94020021-7	Undocumented French Drain, West of the 166-KW Oil Storage Tank Facility. February 1, 1994.
5-22	94010833-15	100-KE Heat Exchanger Pit. January, 1994.
5-23	122440-413	Vacuum Pit.
5-24	94011094-1	Interior of Vacuum Pit Showing Cyclone Separator. January 1994.
5-25	94010833-14	Undocumented French Drain, East Side of 1705-KE. January 1994.
5-26	94010833-19	Undocumented French Drain, South Side of 119-KW. January 1994.
6-1	3749	100-KE Area With 183-KE Facility During Operations in Foreground. March 15, 1956.
6-2	94011170-45	120-KW-2 (183-KW Waste Facility French Drain). December 1993.
6-3	94011170-43	183-KW Water Treatment Facility. December 1993.
6-4	94011170-44	183-KW Water Treatment Facility With Brine Pit and Tank Bases. December 1993.
6-5	94010833-7	100-K Construction Dump Site. January 1994.
6-6	94010833-6	100-K Construction Dump Site. January 1994.
6-7	94010833-17	182-K Emergency Diesel Oil Storage Tank. December 1993.
6-8	94011170-42	Howitzer Site, Coal Pile Area. December 1993.
6-9	94011170-26	Howitzer Site, Collapsed Structure. December 1993.
6-10	94010833-8	100-K Construction Laydown Area Burn Spots. Photograph taken January, 1994.

11.0 TABLE OF PHOTOGRAPHS AND FIGURES USED. (sheet 3 of 3)

Figure	Photo No.	Photograph Description
6-11	94011170-18	Fire Station Foundation. Photo taken January, 1994.
6-12	94011170-22	Demolition Pit. Photo taken December, 1993.
6-13	94011170-17	2-Inch Pipe in Construction Laydown Area. Photo taken December, 1993.
6-14	94011170-21	Construction Laydown Area Southwest of 183-KW. Photograph taken January, 1994.
6-15	94011170-19	Building Foundation and Fenced Materials Enclosure. Photograph taken December 1993.
6-16	94010833-9	Undocumented 100-KW Acid Neutralization Pit.
6-17	94011170-46	Acid Neutralization Pit Overflow French Drain.
6-18	7163	Bauxite Tank During Construction. Photograph taken August 25, 1966.
6-19	7463	100-K Area Bauxite Tank, October 25, 1966.
6-20	94011170-24	Undocumented Paved Area and Collapsed Structure. Photo taken December, 1993.
6-21	94011170-25	Undocumented Farm Waste Site West of 100-K. Photo taken December, 1993.
6-22	94010833-11	Sandblasting Area, West of the 183-KW Facility. January 1994.

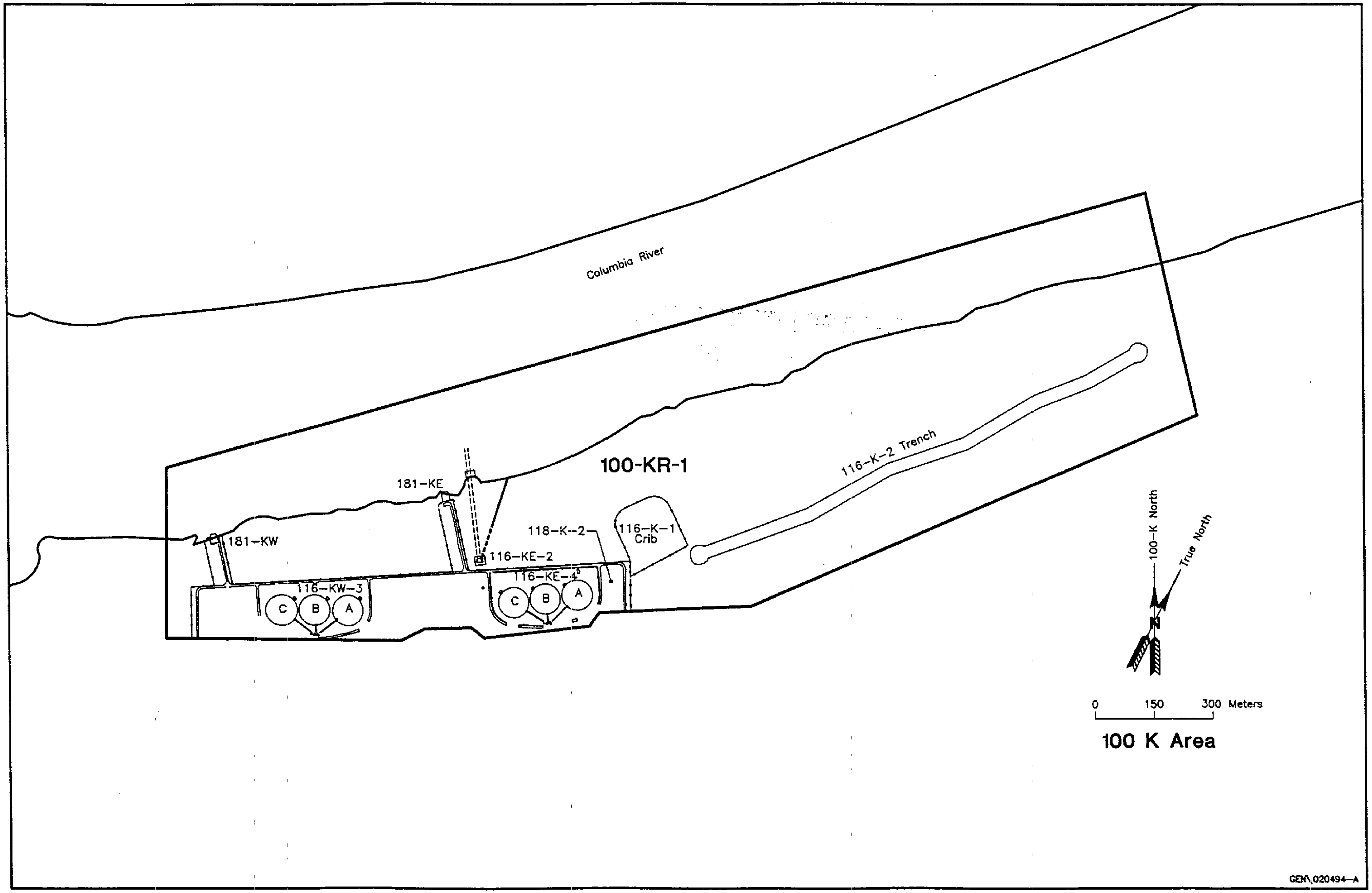
APPENDIX A

MAPS

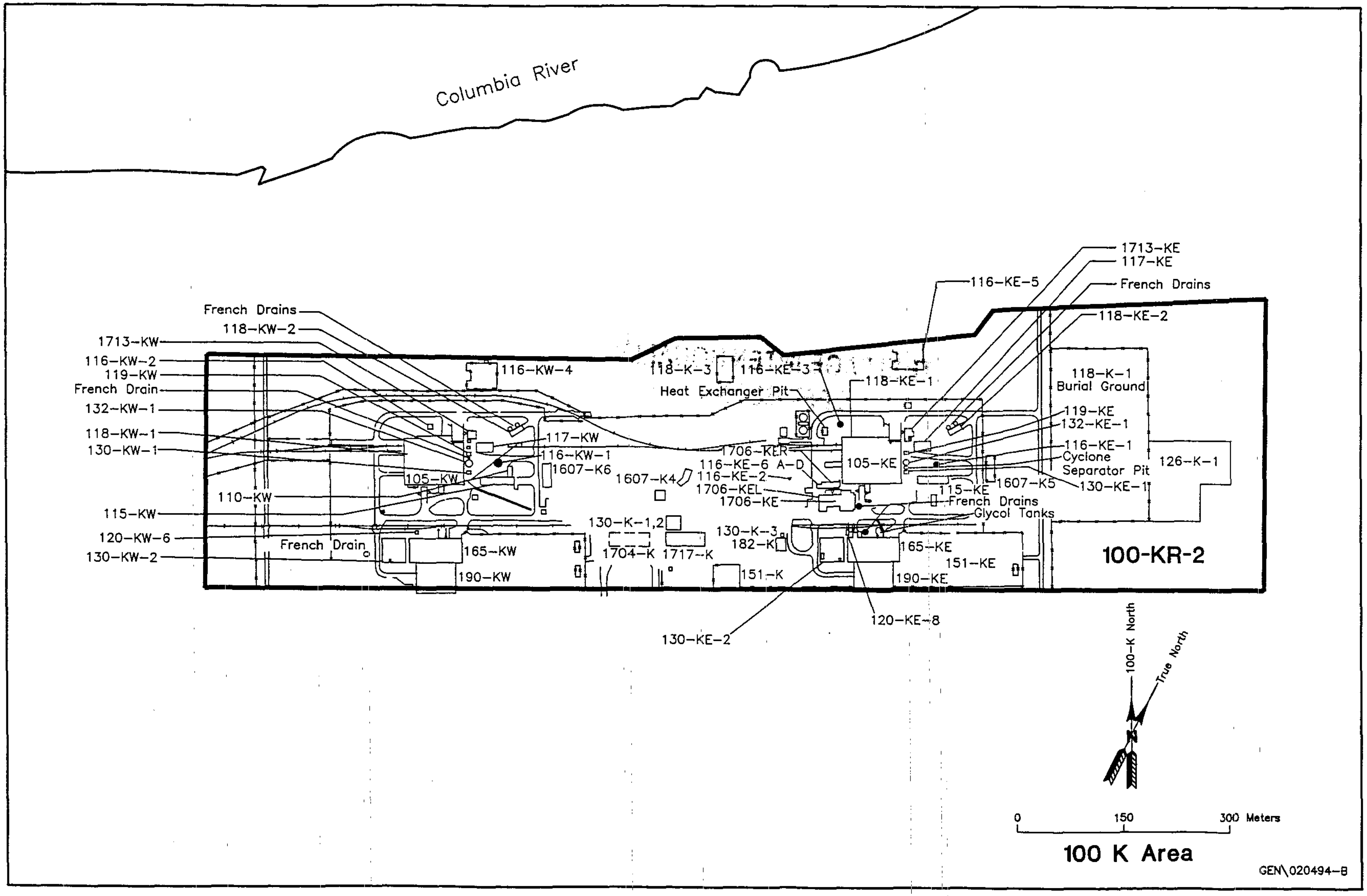


100 K Area

GEN\020194-A

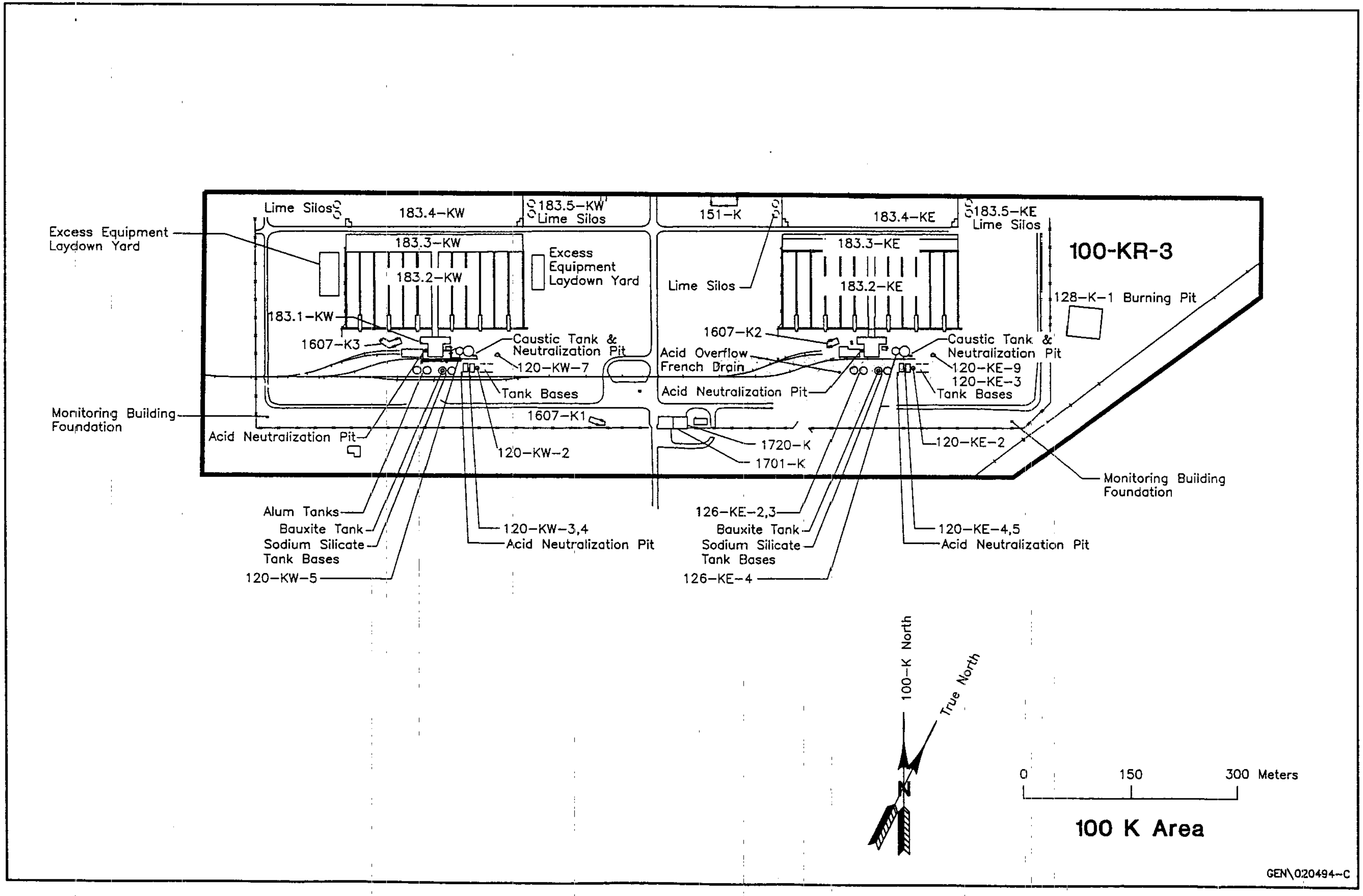

Columbia River
100-KR-1
181-KE
181-KW
118-K-2
116-K-1
Crib
116-KE-2
116-KE-4
116-KW-3
C
B
A
116-K-2 Trench
100-K North
True North
N
0
150
300 Meters
100 K Area
GEN\020494-A

THIS PAGE INTENTIONALLY
LEFT BLANK

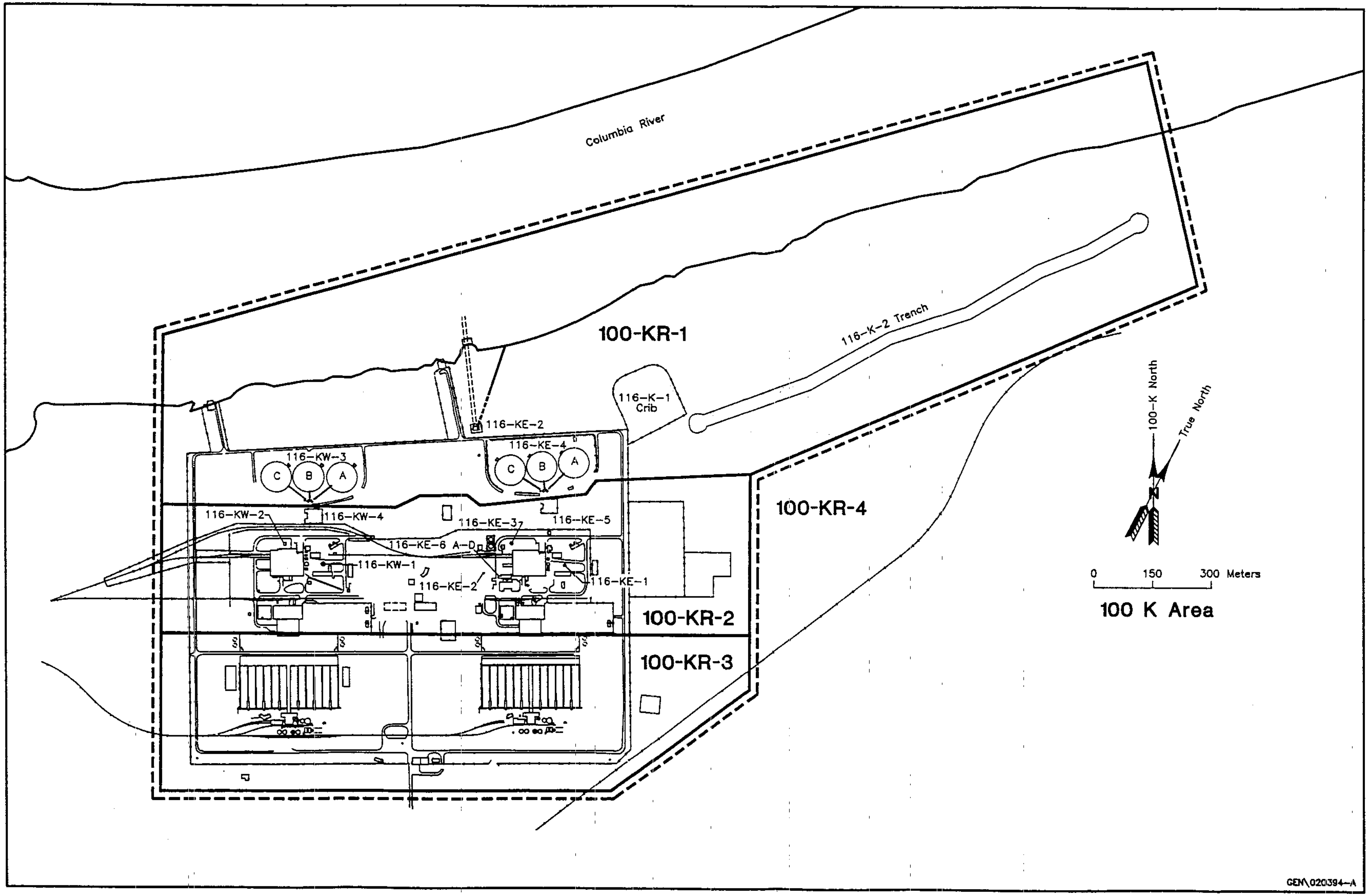


Columbia River
1713-KE
117-KE
116-KE-5
French Drains
118-KE-2
French Drains
118-KW-2
1713-KW
116-KW-2
119-KW
French Drain
132-KW-1
118-KW-1
130-KW-1
116-KW-4
117-KW
116-KW-1
1607-K6
105-KW
110-KW
115-KW
120-KW-6
130-KW-2
French Drain
165-KW
190-KW
118-K-3
116-KE-3
118-KE-1
Heat Exchanger Pit
1706-KER
116-KE-6 A-D
116-KE-2
1706-KEL
1706-KE
1607-K4
130-K-1,2
1704-K
1717-K
151-K
130-K-3
182-K
105-KE
118-K-1
Burial Ground
119-KE
132-KE-1
116-KE-1
Cyclone
Separator Pit
130-KE-1
126-K-1
1607-K5
115-KE
French Drains
Glycol Tanks
165-KE
151-KE
190-KE
100-KR-2
120-KE-8
130-KE-2
100-K North
True North
0
150
300 Meters
100 K Area
GEN\020494-B

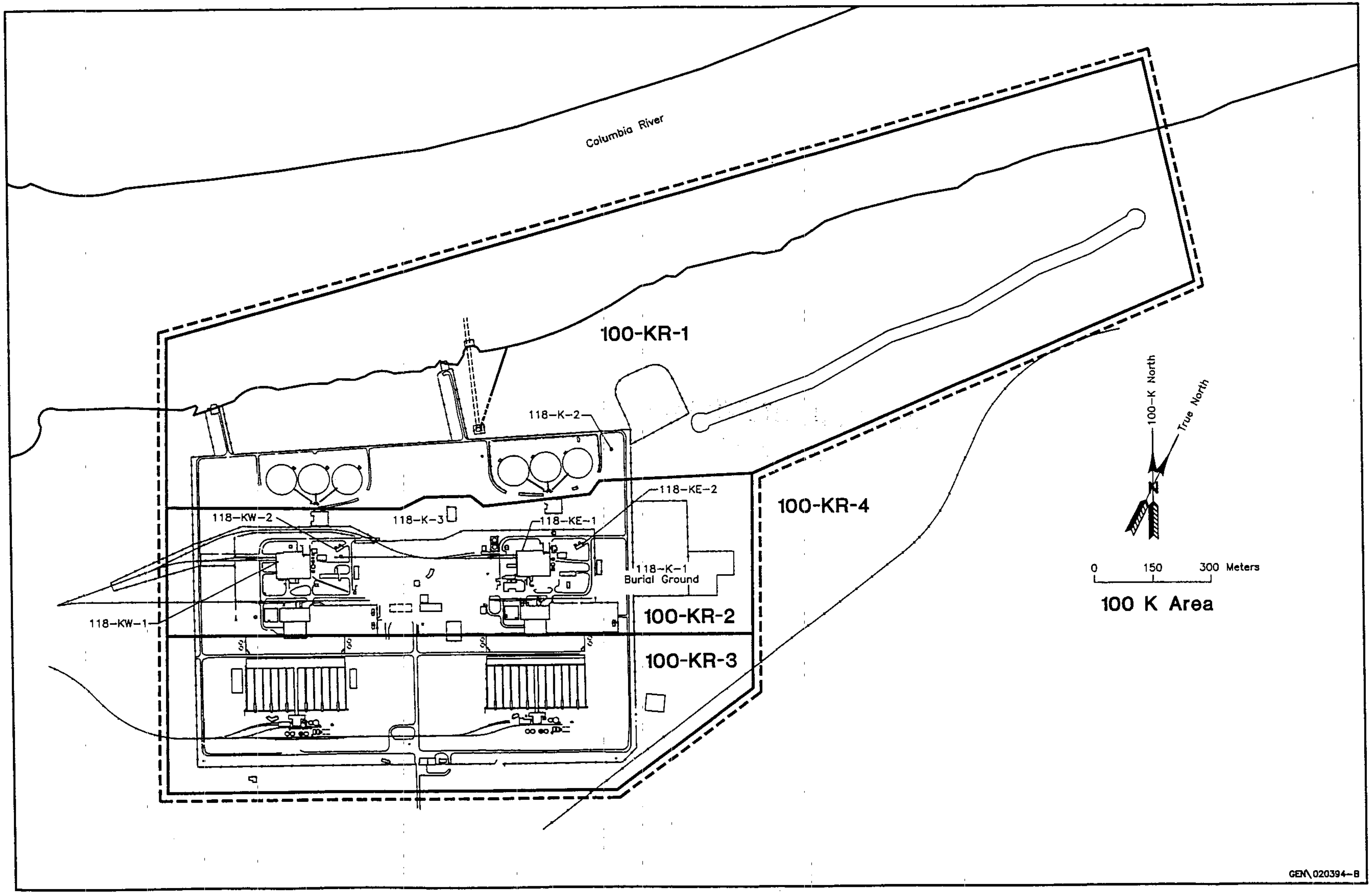
THIS PAGE INTENTIONALLY
LEFT BLANK


Lime Silos
183.4-KW
183.5-KW
Lime Silos
151-K
183.4-KE
183.5-KE
Lime Silos
Excess Equipment
Laydown Yard
183.3-KW
183.2-KW
Excess
Equipment
Laydown Yard
Lime Silos
183.3-KE
183.2-KE
100-KR-3
128-K-1 Burning Pit
183.1-KW
1607-K3
1607-K2
Caustic Tank &
Neutralization Pit
120-KW-7
Acid Overflow
French Drain
Caustic Tank &
Neutralization Pit
120-KE-9
120-KE-3
Tank Bases
Tank Bases
Acid Neutralization Pit
Monitoring Building
Foundation
1607-K1
Acid Neutralization Pit
120-KW-2
1720-K
1701-K
120-KE-2
Monitoring Building
Foundation
Alum Tanks
Bauxite Tank
Sodium Silicate
Tank Bases
120-KW-5
120-KW-3,4
Acid Neutralization Pit
126-KE-2,3
Bauxite Tank
Sodium Silicate
Tank Bases
126-KE-4
120-KE-4,5
Acid Neutralization Pit
100-K North
True North
N
0
150
300 Meters
100 K Area
GEN\020494-C

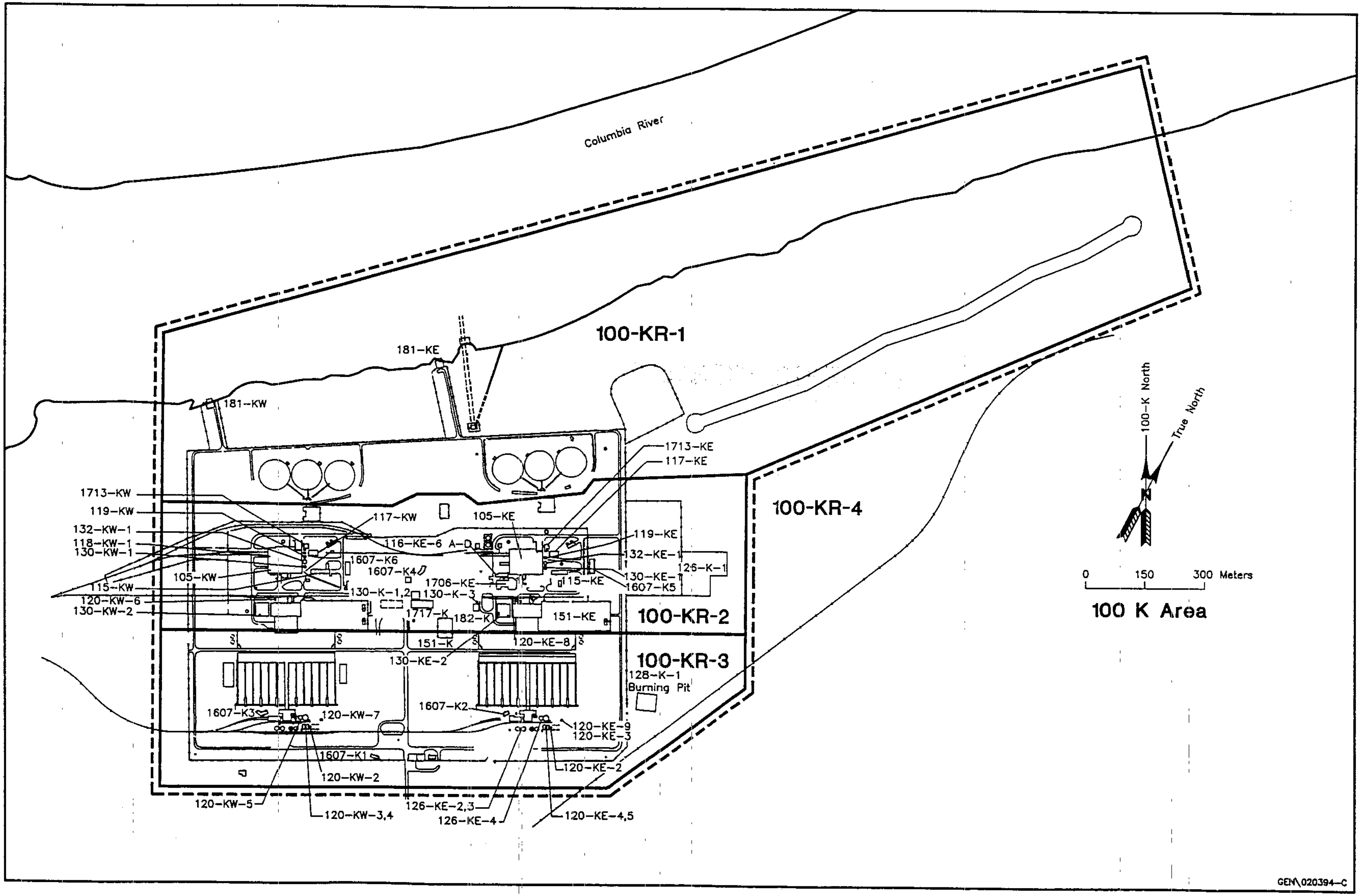
THIS PAGE INTENTIONALLY
LEFT BLANK


Columbia River
100-KR-1
116-K-2 Trench
116-K-1 Crib
116-KE-2
116-KE-4
116-KW-3
C
B
A
116-KW-2
116-KW-4
116-KE-3
116-KE-5
116-KE-6 A-D
116-KW-1
116-KE-2
116-KE-1
100-KR-4
100-KR-2
100-KR-3
100-K North
True North
0 150 300 Meters
100 K Area
GEN\020394-A

THIS PAGE INTENTIONALLY
LEFT BLANK


Columbia River
100-KR-1
100-KR-2
100-KR-3
100-KR-4
118-K-2
118-KE-2
118-KW-2
118-K-3
118-KE-1
118-K-1
Burial Ground
118-KW-1
100-K North
True North
0
150
300 Meters
100 K Area
GEN\020394-B

THIS PAGE INTENTIONALLY
LEFT BLANK



Columbia River
100-KR-1
100-KR-2
100-KR-3
100-KR-4
181-KE
181-KW
1713-KE
117-KE
1713-KW
119-KW
132-KW-1
118-KW-1
130-KW-1
115-KW
105-KW
120-KW-6
130-KW-2
117-KW
105-KE
116-KE-6 A-D
119-KE
132-KE-1
126-K-1
130-KE-1
1607-K5
115-KE
1607-K6
1607-K4
1706-KE
130-K-1,2
130-K-3
1717-K
182-K
151-KE
151-K
120-KE-8
130-KE-2
128-K-1
Burning Pit
1607-K3
120-KW-7
1607-K2
120-KE-9
120-KE-3
1607-K1
120-KW-2
120-KE-2
120-KW-5
120-KW-3,4
126-KE-2,3
126-KE-4
120-KE-4,5
100-K North
True North
0 150 300 Meters
100 K Area
GEN\020394-C

THIS PAGE INTENTIONALLY
LEFT BLANK

APPENDIX B

RADIONUCLIDE INVENTORY TABLES

THIS PAGE INTENTIONALLY
LEFT BLANK

REFERENCE

Dorian, J. J. and V. R. Richards, 1978, *Radiological Characterization of Retired 100 Areas*, UNI-946, United Nuclear Industries, Richland, Washington.

TABLE 2.7-36

116-K-1

100-K-CRIB

Sample No.	Pu-238	Pu-239/240	Sr-90	H-3	P-11/Scaler c/m	Eu-152	Co-60	Eu-154	Cs-134	Cs-137	Eu-155	U
						Concentration (pCi/g)						
116-K-1 100-K CRIB												
A 0			*		<200/5	*	*	*	*	*	*	
5			$9.1x10^{-2}$		<200/20	*	$1.5x10^{-1}$	*	*	$1.7x10^{-1}$	*	$2.2x10^{-1}$
15			$5.6x10^{-1}$		<200/Bkg	$9.7x10^{-1}$	$6.4x10^{-1}$	$6.4x10^{-1}$	$4.5x10^{-2}$	*	*	
B 5			$3.7x10^{-2}$		<200/30	*	$5.8x10^{-2}$	*	*	$3.9x10^{-2}$	*	
15			$2.5x10^{-2}$		<200/10	*	*	*	*	*	*	
25	*	$3.2x10^{-3}$	*		<200/30	*	$5.4x10^{-2}$	*	*	$4.5x10^{-2}$	*	$1.4x10^{-1}$
C 0	*	*	$1.3x10^{-1}$		<200/25	$4.3x10^{-1}$	$9.1x10^{-1}$	$2.4x10^{-1}$	*	$6.5x10^{-1}$	$1.6x10^{-1}$	$1.1x10^{-1}$
15			$2.9x10^{-2}$		<200/20	*	*	*	*	$4.6x10^{-2}$	$1.7x10^{-1}$	
25			$2.6x10^{-2}$		<200/5	*	*	*	$3.3x10^{-2}$	$5.2x10^{-2}$	*	
D 0	$4.8x10^{-1}$	$4.4x10^{0}$	$1.0x10^{1}$		2,500	$4.2x10^{2}$	$3.1x10^{2}$	$1.7x10^{2}$	$6.4x10^{0}$	$7.7x10^{2}$	$1.4x10^{1}$	
5			$6.3x10^{0}$		1,000	$1.3x10^{2}$	$1.5x10^{2}$	$5.2x10^{1}$	$4.0x10^{0}$	$4.4x10^{2}$	$4.4x10^{0}$	
10			$7.2x10^{0}$		<200/90	$3.0x10^{-1}$	$3.6x10^{-1}$	*	*	$6.6x10^{-1}$	$1.5x10^{-1}$	
16			$7.9x10^{0}$		<200/30	*	*	*	*	*	$1.8x10^{-1}$	
E 0	*	$2.5x10^{-1}$	$2.8x10^{0}$		300	$3.7x10^{1}$	$3.0x10^{1}$	$1.3x10^{1}$	$2.3x10^{-1}$	$3.4x10^{1}$	$5.7x10^{-1}$	
2-1/2	*	$1.8x10^{-1}$	$5.9x10^{0}$		<200/40	$1.1x10^{0}$	$9.7x10^{-1}$	$4.1x10^{-1}$	*	$5.9x10^{-1}$	*	
24	*	*	$1.0x10^{0}$		<200/Bkg.	*	*	*	*	$3.8x10^{-2}$	*	

TABLE 2.7-39

116-K-1

100-K CRIB

Potentially Contaminated Soil Column

Volume = 300' x 300' x 20' = 1.8×10^6 ft^3

Mass = 1.2×10^{11}g

Radionuclide	Ave. pCi/g	Curies
Pu-238	1.2×10^{-1}	1.4×10^{-2}
Pu-239/240	1.2×10^{0}	1.4×10^{-1}
Sr-90	5.9×10^{0}	7.1×10^{-1}
Eu-152	8.4×10^{1}	10
Co-60	7.0×10^{1}	8.4
Eu-154	3.4×10^{1}	4.1
Cs-134	1.5×10^{0}	1.8×10^{-1}
Cs-137	1.8×10^{2}	22
Eu-155	2.8×10^{0}	3.4×10^{-1}

Total Curies = 46

TABLE 2.7-40

CONTAMINATED SOIL COLUMN ADJACENT TO 116-K-1 CRIB

Potentially Contaminated Soil Column

Description - Includes area 100' from east and west sides of crib, 200' from north end, and 0' from south end.

Volume = 600' x 600' x 20' = 7.2×10^6 ft^3

Mass = 4.9×10^{11}g

Radionuclide	Ave. pCi/g	Curies
Pu-238	*	0.0
Pu-239/240	1.6×10^{-3}	7.8×10^{-4}
Sr-90	1.0×10^{-1}	4.9×10^{-2}
Eu-152	1.6×10^{-1}	7.8×10^{-2}
Co-60	2.0×10^{-1}	9.8×10^{-2}
Eu-154	9.8×10^{-2}	4.8×10^{-2}
Cs-134	8.7×10^{-3}	4.3×10^{-3}
Cs-137	1.1×10^{-1}	5.4×10^{-2}
Eu-155	3.7×10^{-2}	1.8×10^{-2}
U	1.6×10^{-1}	7.8×10^{-2}

Total Curies = 4.3×10^{-1}

TABLE 2.7-26

107-KE RETENTION BASIN

SAMPLE HOLES DRILLED OUTSIDE OF BASIN

Concentration (pCi/g)

Sample No.	Pu-238	Pu-239/240	Sr-90	H-3	P-11/Scaler c/m	Eu-152	Co-60	Eu-154	Cs-134	Cs-137	Eu-155
C 0	*	*	$3.9x10^{-1}$		<200/70	$1.2x10^{1}$	$5.5x10^{0}$	$5.2x10^{0}$	*	$5.2x10^{-1}$	$4.7x10^{-1}$
D 0	*	*	$1.2x10^{0}$		<200/80	$1.4x10^{1}$	$8.8x10^{0}$	$5.2x10^{0}$	*	$2.4x10^{1}$	$1.3x10^{0}$
E 5	*	*	$3.0x10^{-1}$		<200/50	$2.3x10^{1}$	$1.2x10^{1}$	$7.8x10^{0}$	$2.0x10^{-1}$	$1.3x10^{0}$	$2.7x10^{0}$
F 0	*	*	$8.8x10^{-1}$		<200/40	$9.4x10^{0}$	$7.9x10^{0}$	$4.3x10^{0}$	*	$3.9x10^{0}$	$6.0x10^{-1}$
5	*	*	$4.5x10^{-1}$		<200/30	$3.5x10^{0}$	$3.3x10^{0}$	$1.3x10^{0}$	*	$2.3x10^{0}$	$1.4x10^{-1}$
G 15			$1.2x10^{-1}$		<200/25	$3.6x10^{-1}$	$1.4x10^{-1}$	*	*	$3.7x10^{-2}$	$2.0x10^{-1}$
H 0	*	*	$4.4x10^{-1}$	*	<200/50	$2.5x10^{1}$	$8.4x10^{0}$	$8.3x10^{0}$	*	$1.4x10^{0}$	$2.1x10^{0}$
5			$4.3x10^{-1}$		<200/25	$1.9x10^{0}$	$8.6x10^{-1}$	$8.1x10^{-1}$	*	$4.1x10^{-1}$	$2.7x10^{-1}$
I 0	*	*	$2.8x10^{-1}$	$5.3x10^{-1}$	<200/30	$5.5x10^{0}$	$6.5x10^{-1}$	$2.0x10^{0}$	$8.2x10^{-2}$	$1.9x10^{-1}$	$4.6x10^{-1}$
J 0	*	*	$1.6x10^{0}$	$1.3x10^{0}$	<200/100	$2.9x10^{1}$	$1.7x10^{1}$	$1.2x10^{1}$	*	$3.6x10^{0}$	$6.8x10^{-1}$
15			$1.8x10^{-1}$		<200/15	$1.1x10^{-1}$	$1.0x10^{-1}$	*	*	$3.4x10^{-2}$	$1.1x10^{-1}$
K 0	*	*	$7.4x10^{-1}$		<200/25	$5.9x10^{0}$	$2.7x10^{0}$	$2.4x10^{0}$	$6.9x10^{-2}$	$7.4x10^{-1}$	$1.5x10^{0}$
L 0	*	*	$3.2x10^{-1}$	*	<200/30	$2.2x10^{0}$	$3.7x10^{-1}$	$9.6x10^{-1}$	$6.8x10^{-2}$	$3.4x10^{-1}$	$2.8x10^{-1}$
M 1	*	*	$4.3x10^{-1}$		400	$2.8x10^{1}$	$3.3x10^{1}$	$1.1x10^{1}$	*	$9.2x10^{0}$	$1.1x10^{1}$
0	*	$2.1x10^{-1}$	$2.3x10^{0}$	*	400	$6.2x10^{1}$	$4.1x10^{1}$	$2.5x10^{1}$	$5.2x10^{-2}$	$4.0x10^{1}$	$1.3x10^{0}$
20	*	*	$1.1x10^{0}$		<200/50	$1.3x10^{0}$	$6.6x10^{-1}$	$1.1x10^{0}$	$1.0x10^{-1}$	$2.3x10^{1}$	$7.5x10^{-1}$
N 0	*	$1.2x10^{-1}$	$1.9x10^{0}$	*	<200/60	$3.8x10^{1}$	$1.3x10^{1}$	$1.3x10^{1}$	*	$1.2x10^{1}$	$2.2x10^{0}$
15			$1.8x10^{-2}$		<200/30	$5.6x10^{-1}$	$2.3x10^{-1}$	$2.0x10^{-1}$	*	$1.5x10^{-1}$	$1.0x10^{0}$

TABLE 2.7-28

107-KE RETENTION BASIN

SAMPLING OF BASIN FILL

Concentration (pCi/g)

Sample No.	Pu-238	Pu-239/240	Sr-90	H-3	P-11/Scaler c/m	Eu-152	Co-60	Eu-154	Cs-134	Cs-137	Eu-155	U	Ni-63
AA 0	*	*	6.7×10^{-2}		<200/40	6.9×10^{-1}	1.1×10^{0}	4.9×10^{-1}	9.7×10^{-2}	1.6×10^{-1}	1.6×10^{0}		
AA 3	*	1.9×10^{-1}	6.0×10^{0}	2.1×10^{0}	<200/160	6.6×10^{1}	2.0×10^{1}	2.4×10^{1}	*	1.6×10^{0}	5.3×10^{0}		
AB 0			7.6×10^{-2}		<200/20	4.2×10^{0}	1.8×10^{-1}	1.3×10^{0}	3.1×10^{-2}	1.3×10^{-1}	3.4×10^{-1}		
AB 2	*	1.8×10^{-1}	6.9×10^{-1}	7.6×10^{-1}	<200/200	1.0×10^{2}	8.4×10^{0}	3.7×10^{1}	*	1.9×10^{-1}	4.4×10^{0}		
BA 1			1.6×10^{-1}		<200/30	3.4×10^{-1}	1.2×10^{-1}	*	8.8×10^{-2}	1.4×10^{-1}	1.7×10^{0}		
BA 1-1/2	6.2×10^{-1}	4.6×10^{0}	1.6×10^{-1}	*	<200/150	6.5×10^{1}	8.0×10^{0}	3.2×10^{1}	7.3×10^{-1}	1.7×10^{0}	1.5×10^{1}		
BB 1-1/2	*	*	1.9×10^{-1}	*	<200/150	6.4×10^{1}	5.2×10^{0}	2.5×10^{1}	*	3.3×10^{-1}	3.9×10^{0}		
CA 0	*	*	3.7×10^{-2}		<200/20	1.6×10^{0}	1.4×10^{-1}	8.5×10^{-1}	*	1.4×10^{-1}	1.6×10^{0}		
CA 2	*	9.8×10^{-1}	1.3×10^{1}	6.0×10^{0}	800	1.8×10^{2}	1.8×10^{2}	7.7×10^{1}	*	6.2×10^{0}	1.1×10^{1}		
CB 0			3.6×10^{-2}		400	1.2×10^{1}	3.9×10^{-1}	4.8×10^{0}	*	9.4×10^{-2}	1.5×10^{0}		
CB 1	*	*	3.2×10^{-1}		400	3.5×10^{0}	2.6×10^{0}	2.3×10^{0}	*	7.8×10^{-2}	6.3×10^{-1}		
CB 2			9.2×10^{-2}		<200/20	3.8×10^{0}	3.8×10^{0}	2.7×10^{0}	*	1.5×10^{-1}	2.7×10^{0}		
CB 2-1/2	*	1.1×10^{0}	7.9×10^{0}	1.7×10^{1}	5,000	6.4×10^{2}	1.2×10^{3}	5.8×10^{2}	1.3×10^{1}	2.7×10^{1}	2.7×10^{2}	4.2×10^{-2}	6.1×10^{2}
Scale from bottom of inlet chute 107-KE	9.4×10^{-1}	1.2×10^{1}	4.8×10^{0}	1.1×10^{2}		5.0×10^{4}	7.7×10^{3}	1.7×10^{4}	1.8×10^{2}	7.9×10^{3}		1.6×10^{0}	

TABLE 2.7-30

107-KE RETENTION BASIN FILL

BASIN SLUDGE

Ave. Depth = 1/4"   Mass = 2.1 x 10^8g

Concentrations (pCi/g)

Sample No.	Pu-238	Pu-239/240	Sr-90	H-3	Eu-152	Co-60	Eu-154	Cs-134	Cs-137	Eu-155	U	Ni-63	C-14
AA 3	*	1.9×10^{-1}	6.0×10^{0}	2.1×10^{0}	6.6×10^{1}	2.0×10^{1}	2.4×10^{1}	*	1.6×10^{0}	5.3×10^{0}			
AB 2	*	1.8×10^{-1}	6.9×10^{-1}	7.6×10^{-1}	1.0×10^{2}	8.4×10^{0}	3.7×10^{1}	*	1.9×10^{-1}	4.4×10^{0}			
BA 1-1/2	6.2×10^{-1}	4.6×10^{0}	1.6×10^{-1}	*	6.5×10^{1}	8.0×10^{0}	3.2×10^{1}	7.3×10^{-1}	1.7×10^{0}	1.5×10^{1}			
BB 1-1/2	*	*	1.9×10^{-1}	*	6.4×10^{1}	5.2×10^{0}	2.5×10^{1}	*	3.3×10^{-1}	3.9×10^{0}			
CA 2	*	9.8×10^{-1}	1.3×10^{1}	6.0×10^{0}	1.8×10^{2}	1.8×10^{2}	7.7×10^{1}	*	6.2×10^{0}	1.1×10^{1}			
CB 2-1/2	*	1.1×10^{0}	7.9×10^{0}	1.7×10^{1}	6.4×10^{2}	1.2×10^{3}	5.8×10^{2}	1.3×10^{1}	2.7×10^{1}	2.7×10^{2}	4.2×10^{2}	6.1×10^{2}	
Ave. pCi/g	1.0×10^{-1}	1.2	4.7	4.3	1.9×10^{2}	2.4×10^{2}	1.3×10^{2}	6.9	6.2	5.2×10^{1}	4.2×10^{2}	6.1×10^{2}	
Curies	2.1×10^{-5}	2.4×10^{-4}	9.9×10^{-4}	9.0×10^{-4}	4.0×10^{-2}	5.0×10^{-2}	2.7×10^{-2}	1.5×10^{-3}	1.3×10^{-3}	1.1×10^{-2}	8.8×10^{-2}	1.3×10^{-1}	

Total Curies in Sludge = .35

TABLE 2.7-31

107-KE RETENTION BASIN FILL
BASIN FILL (EXCLUDING SLUDGE)
Ave. Depth = 2'   Mass = 2.0 x 10^{10}g
Ave. Concentrations (pCi/g)

Sample Hole	Pu-238	Pu-239/240	Sr-90	H-3	Eu-152	Co-60	Eu-154	Cs-134	Cs-137	Eu-155	U	Ni-63	C-14
AA	*	*	$6.7x10^{-2}$		$6.9x10^{-1}$	$1.1x10^{0}$	$4.9x10^{-1}$	$9.7x10^{-2}$	$1.6x10^{-1}$	$1.6x10^{0}$			
AB			$7.6x10^{-2}$		$4.2x10^{0}$	$1.8x10^{-1}$	$1.3x10^{0}$	$3.1x10^{-2}$	$1.3x10^{-1}$	$3.4x10^{-1}$			
BA			$1.6x10^{-1}$		$3.4x10^{-1}$	$1.2x10^{-1}$	*	$8.8x10^{-2}$	$1.4x10^{-1}$	$1.7x10^{0}$			
BB	No samples analyzed.												
CA	*	*	$3.7x10^{-2}$		$1.6x10^{0}$	$1.4x10^{-1}$	$8.5x10^{-1}$	*	$1.4x10^{-1}$	$1.6x10^{0}$			
CB			$3.6x10^{-2}$		$1.2x10^{1}$	$3.9x10^{-1}$	$4.8x10^{0}$		$9.4x10^{-2}$	$1.5x10^{0}$			
Ave. pCi/g	*	*	$7.5x10^{-2}$		$3.8x10^{0}$	$3.5x10^{-1}$	$1.5x10^{0}$	$5.4x10^{-2}$	$1.3x10^{-1}$	$1.4x10^{0}$			
Curies	0.0	0.0	$1.5x10^{-3}$		$7.6x10^{-2}$	$7.0x10^{-3}$	$3.0x10^{-2}$	$1.1x10^{-3}$	$2.6x10^{-3}$	$2.8x10^{-2}$			

Total Curies in Fill Less Sludge = .15
Sludge = .35
Total Curies in Basin Fill = .5

TABLE 2.7-37

116-K-2

K-TRENCH

SAMPLE HOLES DRILLED ALONG TRENCH

Sample No.	Pu-238	Pu-239/240	Sr-90	H-3	P-11/Scaler c/m	Eu-152	Co-60	Eu-154	Cs-134	Cs-137	Ni-63	Eu-155	U	C-14
	Concentration (pCi/g)													
A 5	3.1×10^{-1}	7.6×10^{0}	2.5×10^{1}		1,500	*	*	*	*	*				
2A 5	*	*			<200/30	9.7×10^{-1}	2.4×10^{-1}	2.5×10^{-1}	*	1.1×10^{-1}		*		
15	2.4×10^{-1}	2.1×10^{0}	1.8×10^{1}	1.5×10^{1}	1,000	5.8×10^{2}	1.8×10^{2}	1.7×10^{2}	1.3×10^{0}	1.1×10^{2}		9.3×10^{0}	2.5×10^{-1}	
20	*	3.0×10^{-1}	5.7×10^{0}		<200/100	4.9×10^{0}	8.6×10^{-1}	9.3×10^{-1}	*	2.6×10^{1}		5.2×10^{-1}		
B 0	1.9×10^{-1}	2.5×10^{0}	6.2×10^{0}	2.7×10^{2}	1,500	6.0×10^{2}	2.7×10^{2}	2.5×10^{2}	5.6×10^{0}	1.2×10^{2}		6.5×10^{1}	3.1×10^{-1}	
5	*	*	1.6×10^{0}		<200/15	2.2×10^{-1}	1.0×10^{-1}	*	*	*		*		
10	*	*	2.7×10^{-1}		<200/25	3.4×10^{0}	1.5×10^{0}	1.1×10^{0}	*	5.9×10^{-1}		1.4×10^{-1}	2.4×10^{-1}	
C 15	4.0×10^{0}	1.3×10^{2}	2.3×10^{2}	1.4×10^{1}	12,000	4.4×10^{4}	1.3×10^{3}	1.7×10^{4}	5.3×10^{2}	4.8×10^{2}	5.1×10^{3}	9.5×10^{2}	2.1×10^{0}	3.2×10^{1}
17-1/2	2.8×10^{-1}	1.1×10^{1}	4.4×10^{1}		2,000	5.8×10^{2}	3.1×10^{2}	1.4×10^{2}	2.8×10^{0}	4.5×10^{2}		3.7×10^{0}		
20	*	1.6×10^{0}	1.4×10^{1}		400	1.6×10^{2}	9.9×10^{1}	6.1×10^{1}	9.7×10^{-1}	5.7×10^{1}		1.3×10^{1}		
25	3.0×10^{-1}	4.9×10^{0}	3.7×10^{1}		2,500	1.2×10^{3}	2.7×10^{2}	4.5×10^{2}	2.3×10^{0}	2.3×10^{2}		5.7×10^{1}		
28	*	5.4×10^{-1}	1.4×10^{1}		600	1.4×10^{2}	5.0×10^{1}	4.7×10^{1}	5.5×10^{-1}	6.5×10^{1}		2.1×10^{1}		
D 5	1.4×10^{-2}	1.2×10^{-1}	6.8×10^{-1}		<200/10	6.6×10^{0}	4.6×10^{0}	2.8×10^{0}	6.7×10^{-2}	2.8×10^{0}		3.8×10^{-1}		
15	4.3×10^{-1}	1.3×10^{1}	5.7×10^{1}	2.7×10^{1}	2,000	1.6×10^{3}	7.3×10^{2}	6.6×10^{2}	2.1×10^{1}	3.9×10^{2}		1.8×10^{2}	4.1×10^{-1}	
20	*	8.1×10^{0}	1.1×10^{1}		300	1.5×10^{1}	4.1×10^{0}	7.7×10^{-1}	8.6×10^{-2}	7.2×10^{0}		9.3×10^{-1}		
28	*	*	6.3×10^{0}		<200/10	9.0×10^{-1}	3.3×10^{-1}	*	*	2.5×10^{-1}		*		
E 0	*	*	4.8×10^{-1}		<200/40	2.9×10^{0}	2.2×10^{2}	1.5×10^{0}	*	1.2×10^{0}		2.8×10^{-1}		
12	1.2×10^{0}	2.1×10^{1}	3.0×10^{1}	8.1×10^{1}	5,000	2.2×10^{3}	7.4×10^{2}	7.4×10^{2}	2.8×10^{1}	9.2×10^{2}		2.3×10^{2}	5.5×10^{-1}	
16	3.0×10^{-1}	4.0×10^{0}	6.7×10^{0}		900	3.5×10^{2}	1.1×10^{2}	1.2×10^{2}	1.1×10^{0}	1.9×10^{2}		4.0×10^{0}		
20	*	3.7×10^{-1}	4.4×10^{0}		250	2.9×10^{1}	3.8×10^{1}	1.1×10^{1}	6.5×10^{-1}	6.9×10^{1}		*		
25	*	2.6×10^{-1}	6.2×10^{0}		<200/50	6.9×10^{0}	4.6×10^{0}	2.0×10^{0}	1.3×10^{-1}	1.3×10^{1}		9.6×10^{-1}		
F 0	*	2.0×10^{-1}	2.3×10^{-1}		<200/80	4.7×10^{0}	2.5×10^{0}	*	*	1.6×10^{0}		*		
12	*	2.0×10^{0}	4.7×10^{0}	2.2×10^{0}	800	2.8×10^{2}	1.8×10^{2}	8.2×10^{1}	9.0×10^{-1}	3.4×10^{2}		5.6×10^{0}	2.6×10^{-1}	
20	*	6.1×10^{-1}	7.4×10^{0}		<200/100	5.8×10^{1}	4.1×10^{1}	1.8×10^{1}	5.3×10^{-1}	1.7×10^{2}		8.2×10^{-1}		
G 0	1.6×10^{-2}	*	7.6×10^{-2}		<200/55	*	1.5×10^{-1}	*	6.2×10^{-2}	6.4×10^{-1}		2.7×10^{-1}		

TABLE 2.7-37 (Cont'd)

116-K-2

K-TRENCH

SAMPLE HOLES DRILLED ALONG TRENCH (Cont'd)

Sample No.	Pu-238	Pu-239/240	Sr-90	H-3	P-11/Scaler c/m	Eu-152	Co-60	Eu-154	Cs-134	Cs-137	Ni-63	Eu-155	U	C-14
	Concentration (pCi/g)													
3G 19	3.7×10^{-1}	7.1×10^{0}	1.5×10^{1}	5.5×10^{1}	1,500	1.1×10^{3}	5.0×10^{2}	3.4×10^{2}	3.4×10^{0}	7.1×10^{2}		2.6×10^{1}	5.8×10^{-1}	
25	*	2.4×10^{0}	4.8×10^{0}		650	2.8×10^{2}	1.3×10^{2}	1.1×10^{2}	9.0×10^{0}	6.2×10^{2}		2.9×10^{1}		
29	*	7.8×10^{-1}	4.2×10^{0}		500	9.3×10^{1}	7.2×10^{1}	3.2×10^{1}	1.1×10^{0}	1.0×10^{2}		5.5×10^{0}		
H 0	*	*	3.3×10^{-1}		<200/85	7.8×10^{0}	5.1×10^{0}	4.0×10^{0}	1.7×10^{-1}	3.1×10^{0}		1.0×10^{0}		
13	2.1×10^{0}	2.8×10^{1}	2.0×10^{1}	2.5×10^{1}	2,000	1.7×10^{3}	5.4×10^{2}	5.3×10^{2}	1.7×10^{1}	7.2×10^{2}		1.9×10^{2}	7.1×10^{-1}	
15	*	4.2×10^{0}	7.6×10^{0}		500	8.7×10^{1}	4.8×10^{1}	2.9×10^{1}	2.9×10^{-1}	9.3×10^{1}		1.1×10^{0}		
18	*	9.4×10^{-1}	1.6×10^{0}		400	1.2×10^{2}	1.2×10^{2}	3.9×10^{1}	1.6×10^{0}	1.2×10^{2}		6.3×10^{0}		
21	*	*	1.9×10^{0}		<200/15	5.8×10^{-1}	7.8×10^{-1}	4.4×10^{-1}	*	8.2×10^{0}		3.1×10^{-1}		
I 15	*	*	3.5×10^{-2}		<200/20	2.7×10^{-1}	9.0×10^{-2}	*	*	1.5×10^{-1}		8.8×10^{-2}		
17	8.7×10^{-1}	2.0×10^{1}	3.3×10^{1}	1.3×10^{2}	3,000	3.0×10^{3}	8.4×10^{2}	9.9×10^{2}	1.1×10^{1}	9.5×10^{2}		3.8×10^{1}	1.2×10^{-1}	
19	*	*	3.0×10^{0}		500	2.9×10^{1}	2.1×10^{2}	1.1×10^{1}	*	*		3.6×10^{-1}		
23	*	*	3.4×10^{0}		<200/20	3.3×10^{0}	2.0×10^{0}	1.4×10^{0}	4.2×10^{-2}	1.7×10^{0}		3.1×10^{-1}		
K 0	*	*	3.5×10^{-2}		<200/40	*	*	*	*	7.1×10^{-2}		2.0×10^{-1}		
22	6.4×10^{-1}	1.3×10^{1}	1.9×10^{1}	9.1×10^{1}	3,000	3.8×10^{3}	2.2×10^{3}	1.4×10^{3}	1.5×10^{1}	3.0×10^{3}		1.4×10^{2}	4.5×10^{-1}	
27	9.0×10^{-2}	1.4×10^{0}	2.6×10^{0}		1,000	2.2×10^{2}	1.7×10^{2}	8.3×10^{1}	1.0×10^{0}	1.0×10^{2}		1.1×10^{1}		
30	*	1.9×10^{-1}	2.0×10^{0}		<200	6.1×10^{0}	4.4×10^{1}	*	*	2.6×10^{0}		*		
L 0	*	*	2.1×10^{-1}		<200/30	*	*	3.1×10^{-1}	4.9×10^{-2}	*		1.2×10^{-1}		
17	*	1.1×10^{0}	3.5×10^{0}	2.2×10^{1}	<200/130	2.3×10^{1}	1.1×10^{2}	1.2×10^{1}	1.7×10^{-1}	2.4×10^{1}		3.7×10^{0}	4.2×10^{-1}	
M 0	*	3.6×10^{-1}	5.5×10^{-2}		<200/40	*	1.4×10^{-1}	5.6×10^{-1}	*	1.3×10^{-1}		*		
17	*	*	1.3×10^{0}	2.8×10^{0}	<200/150	4.0×10^{-1}	1.1×10^{-1}	*	4.7×10^{-2}	5.7×10^{-2}		1.8×10^{-1}	1.9×10^{-1}	
20	*	6.3×10^{-1}	9.3×10^{-1}		<200/25	3.7×10^{-1}	9.3×10^{-2}	4.4×10^{-1}	*	2.9×10^{-2}		*		

UNI-946

TABLE 2.7-38

116-K-2

K-TRENCH

SAMPLE HOLES DRILLED OUTSIDE OF TRENCH

Sample No.		Pu-238	Pu-239/240	Sr-90	H-3	P-11/Scaler c/m	Eu-152	Co-60	Eu-154	Cs-134	Cs-137	Eu-155	U
		Concentration (pCi/g)											
N	10	*	*	*	5.7×10^{-1}	<200/10	4.0×10^{-1}	8.2×10^{-2}	*	*	7.3×10^{-2}	*	1.9×10^{-1}
P	5	*	*	5.5×10^{-2}	2.9×10^{0}	<200/20	7.9×10^{-1}	2.9×10^{-1}	*	7.5×10^{-2}	1.8×10^{-1}	3.6×10^{-1}	2.6×10^{-1}
	15	*	*	2.2×10^{-2}		<200/10	*	*	*	*	4.0×10^{-2}	2.5×10^{-1}	
	30	*	*	5.8×10^{-1}		<200/10	*	*	1.9×10^{-1}	*	*	5.8×10^{-2}	
Q	0	*	*	3.1×10^{-1}		<200/25	5.1×10^{0}	1.9×10^{0}	1.9×10^{0}	*	8.8×10^{-1}	3.5×10^{-1}	
	20	*	*	*	1.0×10^{0}	<200/10	1.7×10^{-1}	7.8×10^{-2}	*	7.0×10^{-2}	5.6×10^{-2}	*	3.0×10^{-1}
R	5	*	*	2.5×10^{-1}	9.1×10^{-1}	<200/25	5.6×10^{-1}	1.0×10^{-1}	*	4.9×10^{-2}	7.8×10^{-1}	*	3.6×10^{-1}
	15	*	*	*		<200/10	2.3×10^{-1}	7.2×10^{-2}	*	*	3.9×10^{-2}	*	
S	0	*	*	4.6×10^{-1}	1.0×10^{0}	<200/25	2.1×10^{-1}	5.1×10^{-2}	*	*	*	2.0×10^{-1}	2.2×10^{-1}
	18	*	*	1.6×10^{-1}		<200/10	*	*	*	4.0×10^{-2}	3.6×10^{-2}	1.8×10^{-1}	
T	15	*	1.9×10^{-1}	1.6×10^{-1}	1.7×10^{0}	<200/10	5.7×10^{-1}	*	*	5.3×10^{-2}	*	*	1.6×10^{-1}
U	0	*	*	9.7×10^{-2}	5.5×10^{-1}	<200/20	*	5.1×10^{-2}	*	*	6.9×10^{-2}	*	2.7×10^{-1}
V	0-1	*	*	2.0×10^{0}	2.7×10^{-1}	250	1.6×10^{1}	3.5×10^{0}	5.9×10^{0}	5.1×10^{-2}	2.8×10^{0}	4.9×10^{-1}	1.7×10^{-1}
	0-2	*	*	2.2×10^{0}	2.3×10^{0}	600	1.3×10^{2}	6.1×10^{1}	5.3×10^{1}	2.1×10^{0}	9.7×10^{1}	1.5×10^{1}	2.8×10^{-1}
	5	*	*	1.9×10^{0}		<200/15	4.7×10^{-1}	1.4×10^{-1}	*	*	3.5×10^{-2}	1.5×10^{-1}	
	15	*	*	6.7×10^{-1}		<200/20	3.1×10^{-1}	5.8×10^{-2}	*	*	*	*	
Y	0	*	*	2.1×10^{-1}	1.9×10^{0}	<200/25	*	1.2×10^{-1}	*	3.3×10^{-2}	5.4×10^{-1}	*	2.1×10^{-1}
	15	*	*	1.9×10^{0}		<200/20	*	*	*	*	*	*	
	25	*	*	2.8×10^{0}		<200/10	3.1×10^{-1}	1.1×10^{-1}	*	*	1.1×10^{0}	2.2×10^{-1}	
Z	0	*	*	7.0×10^{-1}		<200/20	1.3×10^{0}	1.3×10^{0}	1.2×10^{0}	5.0×10^{-2}	6.5×10^{-1}	*	
	20	*	*	4.5×10^{0}		<200/30	*	4.3×10^{-2}	*	*	*	3.4×10^{-1}	1.3×10^{-1}
	25	*	*	4.2×10^{0}		<200/15	*	*	*	*	*	2.8×10^{-1}	
AA	18	*	*	5.1×10^{-1}	*	<200/20	*	*	*	*	*	*	1.2×10^{-1}
BB	20	*	*	2.2×10^{-2}	2.4×10^{0}	<200/10	*	*	*	*	*	*	1.5×10^{-1}
CC	15	*	*	3.1×10^{-1}	3.9×10^{0}	<200/10	*	*	*	*	6.8×10^{-2}	*	1.8×10^{-1}
	20	*	*	2.6×10^{-2}	1.4×10^{1}	<200/15	7.2×10^{-1}	*	*	*	8.4×10^{-2}	*	1.2×10^{-1}

V 0-1 surface sample from cleared area around sample hole.
V 0-2 surface sample from outside cleared area.

TABLE 2.7-41

116-K-2

K-TRENCH

Potentially Contaminated Soil Column

Volume = 4300' x 100' x 20' = 8.6×10^{7} ft^{3}

Mass = 5.9×10^{11}g

Radionuclide	Ave. pCi/g	Curies
Pu-238	$3.3x10^{-1}$	$1.9x10^{-1}$
Pu-239/240	$8.5x10^{0}$	5.0
Sr-90	$1.9x10^{1}$	$1.1x10^{1}$
H-3	$4.2x10^{1}$	$2.5x10^{1}$
Eu-152	$1.9x10^{3}$	$1.1x10^{3}$
Co-60	$2.7x10^{2}$	$1.6x10^{2}$
Eu-154	$7.0x10^{2}$	$4.1x10^{2}$
Cs-134	$2.0x10^{1}$	$1.2x10^{1}$
Cs-137	$3.0x10^{2}$	$1.8x10^{2}$
Eu-155	$5.8x10^{1}$	$3.4x10^{1}$
U	$5.5x10^{-1}$	$3.2x10^{-1}$
C-14*	$1.6x10^{0}$	$9.4x10^{-1}$
Ni-63*	$2.6x10^{2}$	$1.5x10^{2}$
		Total Curies = 2100

*Ave. Ni-63 & C-14 concentrations established by adjusting the results of sample C-15 by the ratio of ave. gamma concentration in trench to gamma concentration sample C-15.

Did not attempt to calculate three small areas of surface contamination which are now covered with 2 to 3' of added cover.

TABLE 2.7-38 (Cont'd)

116-K-2

K-TRENCH

SAMPLE HOLES DRILLED OUTSIDE OF TRENCH (Cont'd)

Concentration (pCi/g)

Sample No.	Pu-238	Pu-239/240	Sr-90	H-3	P-11/Scaler c/m	Eu-152	Co-60	Eu-154	Cs-134	Cs-137	Eu-155	U
DD 0	*	*	$2.7x10^{-1}$	$8.5x10^{-1}$	<200/20	$1.5x10^{0}$	$1.6x10^{0}$	$3.3x10^{-1}$	*	$9.3x10^{-1}$	*	$3.1x10^{-1}$
10	*	*	*		<200/15	*	*	*	*	$5.8x10^{-2}$	$3.3x10^{-1}$	
20	*	*	$2.8x10^{-2}$		<200/5	*	$3.5x10^{-2}$	*	*	$2.7x10^{-2}$	*	

TABLE 2.7-42

UNDERGROUND SOIL COLUMN ADJACENT TO 116-K-2 TRENCH

Potentially Contaminated Soil Column

Volume = 5,000' x 1,000' x 25' = 1.3×10^{8} ft^{3}

Mass = 8.9×10^{12}g

Radionuclide	Ave. pCi/g	Max. pCi/g
Pu-238	*	*
Pu-239/240	*	1.9×10^{-1}
Sr-90	8.6×10^{-1}	4.5×10^{0}
H-3	3.0×10^{0}	3.9×10^{0}
Eu-152	2.2×10^{-1}	7.9×10^{-1}
Co-60	4.8×10^{-2}	2.9×10^{-1}
Eu-154	*	1.9×10^{-1}
Cs-134	1.4×10^{-2}	7.5×10^{-2}
Cs-137	1.2×10^{-1}	1.1×10^{0}
Eu-155	1.0×10^{-1}	3.6×10^{-1}
U	2.0×10^{-1}	3.6×10^{-1}

Table 3.4-12

116-KW-1

115-KW CRIB

Potentially Contaminated Soil Column

Volume = 20' x 20' x 20' = $8.0 \times 10^3 ft^3$

Mass = $5.4 \times 10^8 g$

Radionuclide	Ave. pCi/g	Curies
Pu-238	*	0.0
Pu-239/240	*	0.0
Sr-90	1.4×10^{1}	7.6×10^{-3}
H-3	2.4×10^{5}	130
Eu-152	*	0.0
Co-60	5.6×10^{0}	3.0×10^{-3}
Eu-154	2.9×10^{-1}	1.6×10^{-4}
Cs-134	1.2×10^{0}	6.5×10^{-4}
Cs-137	8.1×10^{0}	4.4×10^{-3}
Eu-155	5.5×10^{0}	3.0×10^{-3}
U	2.1×10^{-1}	1.1×10^{-4}
C-14	2.1×10^{5}	110
	Total Curies =	240

9413275.1930

TABLE 2.7-27

107-KW RETENTION BASIN

SAMPLE HOLES DRILLED OUTSIDE OF BASIN

						Concentration (pCi/g)					
Sample No.	Pu-238	Pu-239/240	Sr-90	H-3	P-11/Scaler c/m	Eu-152	Co-60	Eu-154	Cs-134	Cs-137	Eu-155
B 0	*	*	$6.9x10^{-1}$	$4.9x10^{-1}$	<200/50	$2.0x10^{1}$	$1.1x10^{1}$	$1.0x10^{1}$	$5.0x10^{-1}$	$2.0x10^{0}$	$4.3x10^{0}$
25	*	*	$2.6x10^{-1}$		<200/25	*	*	*	*	$4.3x10^{-2}$	*
C 0	*	*	$2.1x10^{-1}$	*	<200/50	$1.5x10^{1}$	$2.4x10^{0}$	$4.3x10^{0}$	*	$5.3x10^{-1}$	$9.6x10^{-1}$
20			*		<200/30	*	*	*	*	*	*
D 0	*	*	$6.9x10^{-1}$	*	<200/80	$2.2x10^{1}$	$1.2x10^{1}$	$1.1x10^{1}$	$2.1x10^{-1}$	$3.8x10^{0}$	$4.5x10^{0}$
10			$1.8x10^{-1}$		<200/25	$2.2x10^{0}$	$1.0x10^{0}$	$5.1x10^{-1}$	$4.1x10^{-2}$	$7.6x10^{-1}$	$2.8x10^{-1}$
E 0	*	$3.5x10^{-1}$	$1.4x10^{-1}$	$4.3x10^{-1}$	<200/40	$6.8x10^{0}$	$3.6x10^{0}$	$3.2x10^{0}$	$5.9x10^{-2}$	$2.0x10^{0}$	$1.3x10^{0}$
20			*		<200/20	$4.8x10^{-1}$	$4.1x10^{-2}$	*	*	*	*
F 0	*	*	$3.0x10^{-2}$		<200/40	$3.5x10^{0}$	$2.6x10^{0}$	$4.3x10^{0}$	$5.9x10^{-2}$	$3.7x10^{-1}$	$1.5x10^{0}$
15			*		<200/15	*	$3.7x10^{-2}$	*	*	*	$1.7x10^{-1}$
G 0	*	*	$4.0x10^{-1}$	*	<200/50	$1.1x10^{1}$	$6.0x10^{0}$	$4.9x10^{0}$	*	$1.1x10^{0}$	$1.8x10^{0}$
8			$5.4x10^{-2}$		<200/30	$1.1x10^{0}$	$4.8x10^{-1}$	$7.0x10^{-1}$	*	$1.6x10^{-1}$	$2.9x10^{-1}$
H 0	*	*	$9.8x10^{-1}$	*	<200/50	$6.3x10^{0}$	$1.1x10^{1}$	$1.3x10^{1}$	$1.5x10^{-1}$	$2.8x10^{0}$	$6.9x10^{0}$
20			$3.9x10^{-2}$		<200/25	*	$4.4x10^{-2}$	*	$4.3x10^{-2}$	*	$1.0x10^{-1}$
I 0	*	*	$1.3x10^{-1}$		<200/25	$3.4x10^{0}$	$1.2x10^{0}$	$1.3x10^{0}$	*	$7.3x10^{-1}$	$2.8x10^{-1}$
J 0	*	$1.4x10^{-1}$	$1.5x10^{0}$	*	<200/60	$2.1x10^{1}$	$8.9x10^{0}$	$6.4x10^{0}$	*	$3.1x10^{0}$	$2.7x10^{-1}$
K 01	*	*	$1.8x10^{0}$		5,000	$8.1x10^{2}$	$1.0x10^{1}$	$1.8x10^{2}$	$1.9x10^{0}$	$6.9x10^{0}$	$5.7x10^{2}$
0	*	$1.0x10^{-1}$	$1.9x10^{0}$	*	<200/50	$1.6x10^{1}$	$7.6x10^{0}$	$7.1x10^{0}$	$2.5x10^{-1}$	$5.3x10^{0}$	$2.3x10^{0}$
L 01	*	$5.2x10^{-1}$	$7.8x10^{0}$	$4.3x10^{-1}$	600	$1.3x10^{2}$	$5.0x10^{1}$	$3.3x10^{1}$	*	$2.8x10^{1}$	$2.6x10^{2}$
0	*	$2.3x10^{-1}$	$2.7x10^{0}$	$1.1x10^{0}$	<200/140	$5.4x10^{1}$	$2.2x10^{1}$	$1.8x10^{1}$	*	$1.5x10^{1}$	$1.2x10^{0}$
M 0	*	$3.2x10^{0}$	$3.8x10^{1}$	$7.8x10^{0}$	800	$5.6x10^{2}$	$2.6x10^{2}$	$2.4x10^{2}$	$3.9x10^{0}$	$2.4x10^{2}$	$2.4x10^{1}$
N 0			$1.1x10^{0}$		<200/15	$1.3x10^{0}$	$3.6x10^{-1}$	$3.0x10^{-1}$	*	$2.6x10^{0}$	$1.2x10^{-1}$
15	*	*	$1.1x10^{0}$	$3.2x10^{1}$	<200/25	$9.4x10^{-1}$	$2.1x10^{-1}$	$2.1x10^{-1}$	*	$4.3x10^{0}$	$1.7x10^{-1}$

TABLE 2.7-29

107-KW RETENTION BASIN

SAMPLING OF BASIN FILL

Concentration (pCi/g)

Sample No.		Pu-238	Pu-239/240	Sr-90	H-3	P-11/Scaler c/m	Eu-152	Co-60	Eu-154	Cs-134	Cs-137	Eu-155	Ni-63
AA	1-1/2	*	*	$1.8x10^{-2}$	$5.7x10^{0}$	200	$1.1x10^{1}$	$2.3x10^{1}$	$6.1x10^{0}$	$1.3x10^{-1}$	$3.0x10^{-1}$	$2.1x10^{0}$	
	2	*	$2.1x10^{-1}$	$2.9x10^{-1}$	$5.5x10^{-1}$	5,000	$5.6x10^{2}$	$1.3x10^{3}$	$3.4x10^{2}$	$8.2x10^{0}$	$8.8x10^{0}$	$5.0x10^{1}$	$8.8x10^{2}$
AB	1			*		<200/40	$2.7x10^{0}$	$1.8x10^{0}$	$1.4x10^{0}$	$4.6x10^{-2}$	$7.0x10^{-2}$	$5.4x10^{-1}$	
	2	*	$4.3x10^{-1}$	$1.8x10^{-1}$	$1.5x10^{0}$	1,000	$2.1x10^{2}$	$1.9x10^{2}$	$3.9x10^{1}$	*	$9.7x10^{-1}$	$3.5x10^{2}$	
BA	1-1/2	*	*	$9.2x10^{-1}$		<200/60	$5.4x10^{0}$	$1.4x10^{1}$	$7.2x10^{-1}$	*	$1.9x10^{-1}$	$4.0x10^{-1}$	
	2	*	$8.3x10^{0}$	$7.9x10^{1}$	$1.7x10^{0}$	3,000	$6.7x10^{2}$	$5.3x10^{2}$	$2.0x10^{2}$	*	$3.0x10^{1}$	$1.6x10^{1}$	
BB	1-1/2			*		<200/40	$1.5x10^{0}$	$1.1x10^{0}$	$6.5x10^{-1}$	*	$1.5x10^{-1}$	*	
	2	*	$1.2x10^{0}$	$3.3x10^{0}$	$1.3x10^{0}$	3,000	$5.3x10^{2}$	$9.0x10^{2}$	$1.1x10^{2}$	*	$4.1x10^{0}$	$2.8x10^{1}$	
CA	1-1/2	*	$6.7x10^{-1}$	$1.2x10^{0}$	$6.0x10^{-1}$	600	$1.3x10^{2}$	$9.9x10^{1}$	$1.3x10^{2}$	*	$7.3x10^{-1}$	*	
CB	2	*	$1.1x10^{0}$	$1.2x10^{1}$			$1.1x10^{3}$	$1.0x10^{3}$	$6.6x10^{2}$	$5.3x10^{0}$	$1.8x10^{1}$	$3.6x10^{2}$	

THIS PAGE INTENTIONALLY
LEFT BLANK

APPENDIX C

INTERNAL CORRESPONDENCE

INTERNAL CORRESPONDENCE CONTENTS

August 29, 1973

A. R. Maguire

J. T. Baker

MANAGEMENT REPORT - AUGUST, 1973
REACTOR PLANT SERVICES

GENERAL BUSINESS

B. Items With Commission Involvement

On Friday, August 3, 1973, L. F. Perkins of AEC-RL and representatives of Holiday Inns and the Red Lion Motor Inn toured the 183-H clearwells and the 1717-H Building. These visitors were interested in the possible use of the clearwells for growing mushrooms. This was their second visit to 100-H Area to look at these facilities. Their first visit was in June of 1973.

On August 9, 1973, Bob Buslach conducted a tour of the 190-DR Annex cranes and the 190-B Annex crane for John Ash - UNI Property Specialist, R. H. Devine - AEC-RL Property Branch, and Bill Ganassin - a representative from E. G. & G. Contractors in Las Vegas, Nevada. Mr. Ganassin is interested in the use of the cranes from these two buildings at an AEC installation in Las Vegas. On August 27 and 29, 1973, Bob conducted additional tours of the 190-DR and 190-B Annex Buildings for John Ash, R. H. Devine and Bill Lampson of Lampson Crane Service in Kennewick, Washington. Mr. Lampson is preparing an estimate of what he will charge Las Vegas AEC's contractor, E. G. & G., to remove and ship three 20-ton cranes and two air compressors to Las Vegas.

On August 24, 1973, we received a request from P. W. Gottschalk, AEC-RL Production & Waste Management Programs Division, for an estimate of costs to reactivate and operate the six boilers and turbo-generators at 100-K Area to supply electricity for BPA. The following "ball park" cost information was supplied to AEC-RL on the same date:

Reactivate The 3 Boilers and 3,500 KW Turbo-Generators at KE (1 to 2 months)	$ 30,000
Reactivate The 3 Boilers and 3,500 KW Turbo-Generators at KW (6 months)	86,000
Manpower Cost to Operate Turbo-Generators at KE	14,000/mo.
Oil Cost	130,000/mo.

University, and Clifford Diemond - a consultant with BPA. These gentlemen were interested in the various electrical distribution facilities available in 100-K Area for possible use in conducting tests.

Bob Moles of BNW's Corrosion Research & Engineering Section informed me this month that they have received a contract from KAPL to make corrosion studies on steam generators, and they would like to use the east end of the 1717-K Building to conduct these tests. Mr. Moles stated that the equipment would be ready to move into the 1717-K Building in October of 1973, and the tests would run from three to six months. He is planning to install electric heaters in this building and will require approximately 200 gpm water supply for this testing program.

E. Deactivated Areas

I attended a meeting in 100-N Area conducted by Tony Prudich on August 8, 1973, to discuss UNI's program for the conservation of energy.

I met with Charlie Harrison on August 10 and Jack Miller on August 16, 1973, to review data they are preparing on costs to modify and operate the 105-KE, 105-KW, 105-B and 105-C Storage Basins for use to store irradiated metal from N Reactor for the next three years.

One truck load (1,300 gallons) of Bunker C fuel oil was pumped from the 166-KW west storage basin for transfer to 100-N Area on August 20, 1973. A sample of the oil taken from this load indicated it contained 4.9 percent water, and N Power claimed that they cannot burn oil with this much water in it. Since this oil was already loaded in the truck, I arranged with ARHCO Road & Grounds Maintenance to take the load and try it as cover for dirt roads. ARHCO found this oil was suitable for use on roads, and they would like to get another eight or ten truck loads this summer for their road work. In checking with our Financial people (M. L. Lawler), I was informed that we do not have sufficient funds in our reserve account to dispose of the oil we now have stored in 100-K Area. Since we can dispose of some of this oil at no additional cost to UNI, for use on the roads, I would like to get rid of as much as possible this summer. Marie Lawler has suggested that we request approval from AEC-RL to use the money we have in the reserve account to get rid of this oil.

ARHCO Road & Grounds Maintenance has worked only one week this month in the deactivated areas cleaning up tumbleweeds. They claim they have higher priority jobs but still plan to continue with this work. We have been utilizing our Truck Driver, Power Operator and the two YOE summer employees (during the first two weeks) in cleaning up the tumbleweeds in the basins at 183-C and 190-B and in the various radiation zones in the 100-B, 100-D and 100-K Areas.

UNITED NUCLEAR INDUSTRIES, INC. WHC-SD-EN-TI-239, Rev. 0

DISTRIBUTION:

DL DeNeal
JE Lyttle
File
LB

DATE August 4, 1978

TO A. P. Vinther

FROM R. K. Wahlen

SUBJECT MONTHLY REPORT - JULY

Listed below are items that have been accomplished during the past month by Plant Services, Deactivation & Surveillance personnel in the Retired and Standby Areas.

Maintenance and Surveillance of Standby & Retired Facilities

1. Site Cleanup of Deactivated Reactor Areas

Objective

The objective of this program is to reduce the potential radiation and industrial hazards in the retired areas within the limits of available funds.

Summary

The D-DR, F & H Areas are included in the Site Cleanup Program. Initially funds were made available in 1974 for cleanup of H Area. Funds became available this year for cleanup of D Area and additional cleanup at F, H and 200 Areas. This work is currently in progress.

Accomplishments & Status

Demolition work on the 181-F Building started May 1, 1978 and was completed on June 26, 1978.

Demolition work on the 181-H Building started on July 6, 1978 as scheduled. The rip-rap aprons and a portion of concrete pump well walls have been demolished and are being covered with earth and rock as outlined in the Army Corps of Engineers permit No. 071-OYB-2-004153 to blend in with the adjacent river bank.

54-3000-175 (3-73)

the ceilings of all rooms. This work was started this month and the analysis have been completed.

3. <u>Irradiated Fuel Storage - 105-KE & KW</u>

The 105-KE & KW storage basins were selected as storage areas for irradiated fuel from 105-N. Funds were made available for modifications to the 105-KE basin in 1974.

Modifications have been completed at 105-KE, except for installing the sand filters. Funds for installation of the sand filters became available this year. This work is currently in progress.

Funds for modification of the 105-KW storage basin became available in 1977. This work is currently in progress and is expected to be completed in July, 1978.

<u>Accomplishments & Status</u>

The ion exchange system has been approved for beneficial use. Minor exceptions on the ATP needed to be completed before final acceptance of the system. Eight ion tanks have been run to the original control limit of 30R. Three additional tanks were run to the new control limit of 60R and three other ion tanks have been placed in service. Eleven ion tanks were transferred from the sand filter concrete shield to a temporary storage made up of thirty-inch thick concrete blocks.

Work continued on installation of the sand filter and associated piping and equipment.

Storage basin leak rate at 105-KE is 7 gallons-per-minute.

Delivery date of the shipping cask to dispose of the depleted ion tanks was delayed 3 months and is now scheduled for September, 1978.

<u>105-KW</u>

The 105-KW was filled with demineralized water and leak tested. The leak rate was determined to be approximately 9 gallons-per-minute. The basin area was checked and rechecked for leaks using acoustic leak detectors by EXXON personnel. One definite indication of leakage was noted at the northwest basin drain valve and another slight indication in the discharge chute floor area. The drain was filled with concrete and sealed prior to the application of the basin floor and wall sealer. Preparations are being made to empty the basin and repair the leaks.

UNITED NUCLEAR INDUSTRIES, INC.

DISTRIBUTION:

JL Goodenow
File

DATE April 13, 1976

TO H. F. Tew

FROM J. T. Baker

SUBJECT PREVENTION, CONTROL AND ABATEMENT OF AIR AND WATER POLLUTION FOR THE DEACTIVATED 100 AREA FACILITIES

Reference: Letter on above subject from T. E. Dabrowski, dated March 31, 1976.

9413275.1939

Activities Accomplished

I. KW Storage Basin

Work on removal of the radioactive sludge and debris from the 105-KW Fuel Storage Basin is in progress. All solid debris has been removed and buried in the 200 Area burial grounds and work on removal and burial of the sludge is now in progress and is scheduled to be completed by July 1, 1976. Cost to date for this work is $75,000 and estimated expenditures to complete the work is $50,000.

II. Miscellaneous Projects

The oil was removed from the 166-KE & KW storage bunkers, 166-KW day storage tanks, 190-C, 190-B & 190-D Annex pump reserviors and from the HCR hydraulic system at 105-B, to eliminate the potential of oil leakage from these locations. The vendor removed the oil from these tanks and paid ERDA-RL $8,250 for the oil.

The 105-KE & KW Building sewer drain lines in the No. 1 electrical equipment rooms adjacent to the transformers containing polychlorinated byphenyl (PCB) oil were plugged to prevent this oil from entering the Columbia River, in case of transformer oil leak, at a cost of $300. A weekly surveillance check has been set up for all transformers in the deactivated areas containing this type oil to be visually checked for any indication of oil leaks.

The asbestos lagging on the 181-KE pumps and discharge lines was repaired and resurfaced to eliminate release of loose asbestos to the environs at a cost of $12,000.

Solid soil sterilant was applied to any established contaminated areas that required additional earth cover this past year to eliminate weed growth and possible uptake of burial contamination by deeply rooted weeds. Total cost expended was $5,000.

III. Planned Actions for the Next Calendar Year to Improve Pollution Control in the Deactivated Areas as Listed Below:

Repair and resurface the lagging on the 181-KW pumps and discharge lines. Estimated cost $16,800.

Removal and disposal of radioactive sludge and debris from the 105-D and DR storage basin floors. Estimated cost $200,000.

Application of soil sterilant to all established contaminated areas to eliminate weed growth. Estimated cost $25,000.

Cover 107-C retention basin walls with an adhesive to fix loose contamination. Estimated cost $40,000.

Additional earth cover to the B-C basins to contain loose contamination. Estimated cost $20,000.

J. T. Baker
J. T. Baker, Manager
Reactor Plant Services

JTB:skk

UNITED NUC INDUSTRIES, INC.

WHC-SD-EN-TI-239, Rev. 0

DISTRIBUTION:

JJ Bombino
File/LB

DATE October 8, 1979

TO Roy E. Dunn

FROM J. L. Goodenow

SUBJECT SITE SURVEILLANCE & DECOMMISSIONING ACTIVITIES REPORT OCTOBER 1, 1979 THROUGH OCTOBER 8, 1979

Fuel Storage Basins

Continued program on emptying, preparing and changing ion tanks at both KE and KW.

Alum Tanks --183-KW

Tanks were put into use and diesel deliveries started on October 1, 1979 and will continue until tanks are full.

Site Cleanup

J. A. Jones began moving in heavy equipment for the demolition of 183-C sedimentation basin. Dirt fill has been removed to 2 feet below grade. A crane and heavy ball have been moved in to facilitate knocking down the south wall of 183-C.

141-C

The interior of 141-C has been stripped of all equipment. The floors are ready for painting to fix any smearable contamination, before interior wallboard and insulation can be removed. Material burial is continuing as scheduling permits.

Project H-529 Cyclone Fence Around Hazardous Contaminated Areas

Work continued this week on installation of cyclone fence posts around the 107-D/DR retention basins. D and DR basin fencing has been 85% completed on October 8, 1979.

Roy E. Dunn
Page 2
October 8, 1979

Surveillance and Maintenance

Work continued on painting the exterior doors and trim on 182-K Building.

All routine radiological surveys are being completed on an overtime basis on the 4-12 shift due to insufficient radiation monitors to cover other jobs.

Sale of Surplus Equipment

Adams Dismantling Company continued salvage work on 184-D Building.

Donald E. Trail, successful bidder of the 1719-B Building, continued dismantling and salvage work.

John Moore, successful bidder on the 1716-B and 1707-AB Buildings, started dismantling and salvage work.

Art Manuel, successful bidder of the 1715-B Building, continued dismantling and salvage work.

Everett Morris, successful bidder on the 1707-B Building, started dismantling and salvage work.

D&D Engineering

No field projects active this report period. Final FY 1979 project reports and FY 1980 flow charts were prepared.

Overtime

There were 59.0 hours of overtime used this week in Site Surveillance and Decommissioning. SS&D Operations used 3.0 for a total of 498.5 hours. N Area used 56.0 hours for a total of 1367.7 hours of overtime. The total overtime used to date is 1866.2 hours.

J. L. Goodenow

J. L. Goodenow, Specialist
Deactivated Plant Surveillance

JLG:skk

K.11.9

DC-0131

UNC — WHC-SD-EN-TI-239, Rev. 0

A UNC RESOURCES Company
P.O. Box 490
Richland, Washington 99352
Telephone 509/376-7411

RECEIVED NOV 5 1985 M. A. MIHALIC

JUL 20 1989

Memorandum

To: B. W. Mathis

Date: November 4, 1985

From: J. J. Dorian

Subject: REMOVAL OF SULFURIC ACID SLUDGE FROM THE 183 KW/KE FACILITIES

9113275.1914

The purpose of this letter and the attached report is to inform you of the results of EP Toxicity Tests conducted on acid sludge collected from the 183 KW/KE Filtered Water Facilities. I also wish to apprise you of the significance of these findings in order that you may better prepare future decommissioning plans.

The EP Toxicity Tests indicate that acid sludge at the 183 KE/KW facilities contains hazardous inorganic materials. The dry-well at 183 KW contains high enough concentrations of mercury to classify the waste as Dangerous Waste as designated by Washington State Department of Ecology Dangerous Waste Regulations (WAC 173 - 303).

At the present time Battelle is collecting information that will be used to identify the extent of hazardous waste disposal on the Hanford Site. Areas that contain Dangerous and Extremely Hazardous Wastes could be classified as CERCLA sites. A site that has been identified as a CERCLA site would then have to be "cleaned up" or stabilized according to the Dangerous Waste Regulations.

According to the results of the EP Toxicity Tests sited in this report, the acid storage area outside of 183 KW would be designated as a CERCLA site. Although the 183 KE samples were below Dangerous Waste limits, with further characterization it is possible that 183 KE could be designated as a CERCLA site as well.

The report also contains information on the source of acid sludge and recommended actions for cleaning up the sites. It is anticipated that if the waste is characterized as it is removed, much of it will not be designated as Dangerous Waste and therefore will be easier and less costly to dispose of.

Clean-up of the 183 KW/KE facilities should be included in your long range decommissioning plans and money appropriated as necessary. Depending upon which lab is chosen to conduct the EP Toxicity Tests, the sampling and analysis efforts described in the attached report would cost about $10K.

copies: J.F. Beckstrom
E.W. Powers

file K1.11

UNC

B. W. Mathis
Page 2
November 4, 1985

Although site-wide remedial action is not required until about 1990 (DOE Order 5480.14), it may be prudent to begin to characterize and clean up small problem areas such as these within the next fiscal year. This could help avoid future money and scheduling problems. It is to our advantage to take care of small problem areas before they become a big issue.

IDJ
IDJ:tlk

Attachment

cc: PNL
TJ McLaughlin

UNC

JA Adams	ID Jacques-2
DF Brendel	RJ Kobelski
LE Denton	MA Mihalic
LP Diediker	BA Rathbone
GW Duffield	VR Richards
KA Gano	EA Weakley
EM Greager	JJD:file/lb
JA Hall	

9413275.1946

REMOVAL OF SULFURIC ACID SLUDGE FROM THE 183 KW/KE FACILITIES

1.0 Sulfuric Acid Sludge Contains Hazardous Materials

Two dry-wells and two french-drains at the 183 KW/KE Filtered Water Facilities contain several thousand pounds of sulfuric acid sludge. The sludge is residue that was removed from sulfuric acid storage tanks in the late 1960's and early 1970's. Extraction Procedure (EP) Toxicity Tests conducted on samples from the dry-wells and drains indicate the presence of several hazardous wastes. The concentrations of mercury in the 183 KW dry-well sludge are high enough to classify the sludge as Dangerous Waste (DW). The sludge samples also contain lesser amounts of barium, chromium, lead, and selenium.

9413275.1946

2.0 The Sludge Should Be Removed

Since at least a portion of the acid sludge may be classified as Dangerous Waste, it should be removed from the dry-wells and french-drains. The following actions should be taken when removing and handling the acid sludge waste.

- Sludge from each dry-well and french-drain should be removed and put into separate 55-gallon waste drums. This is estimated to total about six drums at approximately 900 pounds of waste each.
- Three representative samples should be collected from each drum during loading. The samples will be analyzed for EP Toxicity.
- The brick liners from each of the dry-wells should be removed, cleaned, and collected in waste drums. Residue from the cleaned bricks should be packaged with the sludge waste from the same dry-well.
- Portions of three bricks from each waste drum are to be collected and analyzed for EP Toxicity.
- Collect three samples of the subsoil beneath each of the dry-wells and french-drains after the sludge has been removed. The soil samples will be analyzed for EP Toxicity.
- Samples from the 183 KE Acid Sludge Disposal Trench should be tested for EP Toxicity. The samples should be taken at several depths from 3 holes dug into the trench sediments.
- All sampling and analyses should be coordinated through Environmental Protection subsection.

5.0 The Source of the Sludge

Alum is used in the production of filtered water for reactor use. The alum for the K Reactors was made at the 183 KW/KE Filtered Water Facilities (see Attachment B) by combining sulfuric acid with bauxite ore. Four sulfuric acid tanks (2 with 10,880 gallon capacity and 2 with 20,360 gallon capacity) were used at each of the 183 facilities to store the sulfuric acid. From 1968 to 1971 commercial grade sulfuric acid was obtained from the Bunker Hill Company in Kellogg, Idaho. During this time it was noticed that a heavy precipitate would accumulate in the bottom of the tanks. The sludge was periodically flushed from each tank into nearby drains and dry-wells.

When the K Reactors were shut down the excess sulfuric acid stored at 183 KE was tested for use at N Reactor. Mercury was detected in the acid in the form of a white precipitate (presumed to be mercuric chloride, $HgCl_2$, or mercuric sulfate, $HgSO_4$). The discovery triggered additional sampling. Mercury concentrations in the tank sludge were determined to be approximately 14% by weight.

The acid was removed from the tanks leaving about 11,000 pounds of sludge in the bottom of the tanks. This amount of sludge would have contained about 1,500 pounds of mercury.

The sludge was washed into a drainage trench dug near the 183 KE facility. The trench was about 40 feet long, 3 feet wide, and 2 to 3 feet deep. The trench was lined with sand and the sludge-water slurry was allowed to drain. The location of the acid sludge disposal trench has been identified by E. A. Weakley and is shown on Attachment B.

The sludge was later loaded into 55 gallon drums and sold to a local salvage dealer, Wayne Petty of West Richland. The trench was then backfilled to grade.

In conversations with Doyle C. Petty of Kennewick, Wayne Petty's surviving brother, he recalled seeing 14 or 15 drums of the sludge at Wayne Petty's residence in West Richland. Based on the 1971 density determination of the sludge (1.92 g/cc) and an average drum volume of 50 gallons, approximately 12,000 pounds of sludge would have been removed from the Hanford Site by Wayne Petty. This number correlates well with the referenced calculations conducted by G. W. Wells. This would lead to the conclusion that most of the acid sludge was removed by Wayne Petty. The small amounts of sludge in the 183 KE/KW dry-wells and drains are probably left over amounts that were removed from the tanks during operation.

Doyle Petty indicated that he and his brother were never able to recover metallic mercury from the acid sludge. It is not known where the drums of sludge are at this time.

6.0 References

1. Wells, G. W., Environmental Evaluation for Disposal of Mercury-Salts, Douglas United Nuclear, Inc., no date shown.

2. F. T. Hara to E. A. Weakley, "Sludge From Sulfuric Acid Tanks," letter dated July 19, 1971.

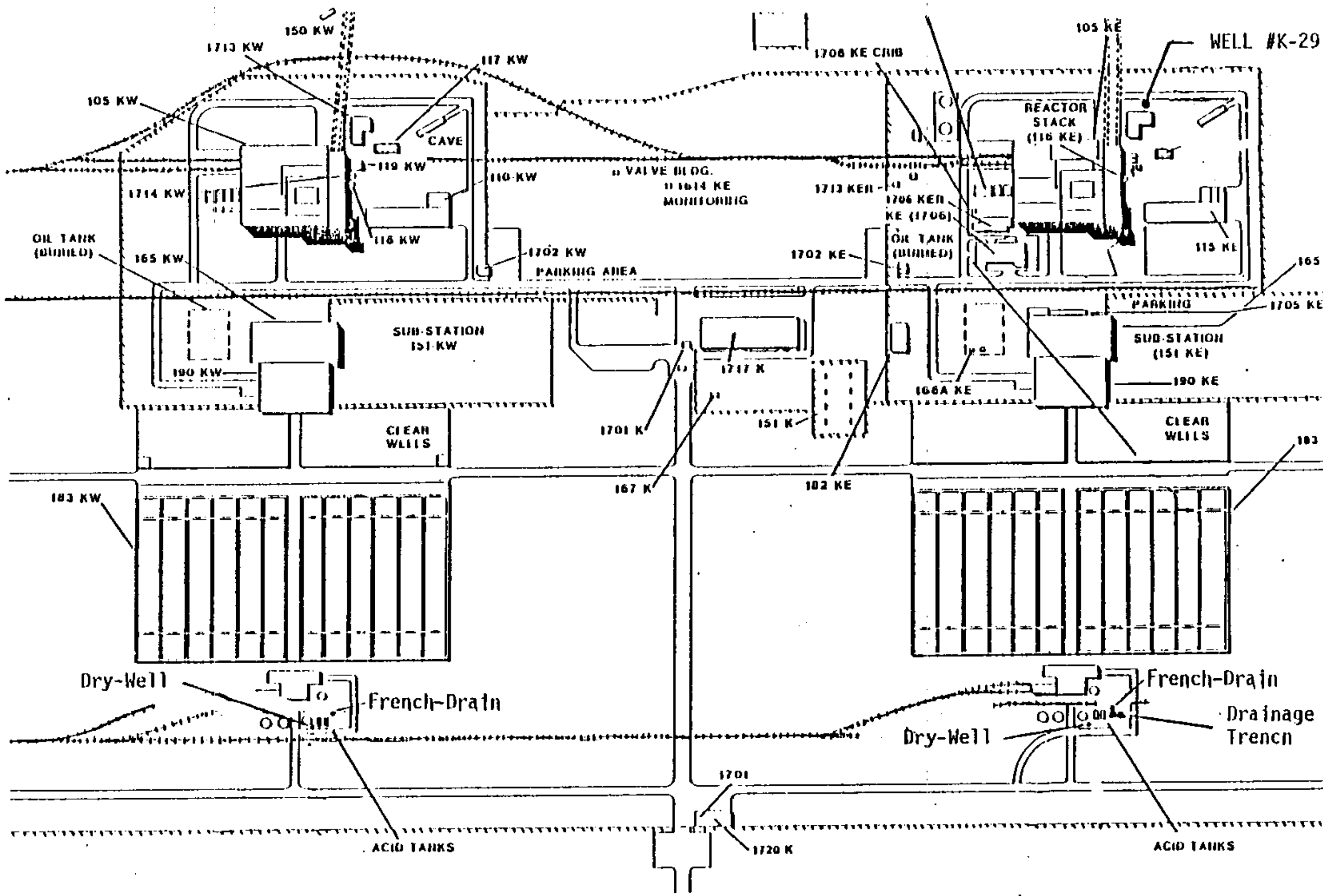
3. O. C. Schroeder to O. J. Elgert, "Removal of Mercury-Bearing Sludge from KE Sulfuric Acid Tanks," letter dated August 24, 1971.

9113275.1917

ATTACHMENT A

Concentrations of Inorganic Hazardous Materials (ppm)
Using the EP Toxixity Test

Sample	As	Ba	Cd	Cr	Pb	Hg	Ag	Se
K.W. dry-well sludge	0.005	13.8	<0.002	0.03	0.026	0.387	0.05	0.010
K.W. french drain sludge	<0.05	2.97	<0.002	0.29	0.83	<0.005	0.07	0.50
K.W. soil under old tank	0.03	6.23	<0.003	0.02	<0.002	<0.005	0.02	<0.002
K.E. dry-well sludge	0.03	0.99	<0.002	0.03	<0.002	<0.005	<0.01	0.032
K.E. french drain sludge	0.01	22.0	<0.002	0.05	<0.002	<0.005	0.09	0.025
K.E. soil near french drain	0.005	0.81	<0.002	<0.01	<0.002	<0.005	0.04	0.005
Dangerous Waste Limits	5.0	100.0	1.0	5.0	5.0	0.2	5.0	1.0



Location of Acid Sludge Disposal Trench, French-Drains, and Dry-Wells at 183 KW/KE Filtered Water Facilities.

Industrial Safety should be consulted before the sludge is removed in order to insure that workers are properly protected from the hazardous materials. Also all disposal arrangements should be made through the Radiological Services subsection. Radiological Services serves as the UNC contact to Rockwell Hanford, the designated handler of Hanford Site hazardous waste.

3.0 EP Toxicity Test Results

Sludge samples were collected from the KW/KE facilities on July 12, 1985. Samples of approximately 100 grams were taken from each of the dry-wells and french-drains located near the sulfuric acid storage areas. Acid residue observed in the soil under the acid tanks was also sampled. The soil and sludge samples were delivered to Hanford Environmental Health Foundation (HEHF) for analysis of the inorganic hazardous materials specified in the Environmental Protection Agency (EPA) EP Toxicity Test. The EP Toxicity Test uses chemical extraction with acetic acid as a basis for determining the portion of the materials that would leach from the waste and be available for human uptake. The results are shown in Attachment A.

4.0 Ground Water Sample Results

A one-liter ground water sample was also collected from well K-29, located near 105-KE (see Attachment B). The well sample was analyzed for mercury, lead, and cadmium concentrations. The results of the analysis are shown below.

	Mercury(ppb)	Lead(ppb)	Cadmium(ppb)
K-29 Well Sample	<.5	<2	<.5
Drinking Water Standard	2	50	10

The concentrations are well below Washington State Drinking Water Standards. The metal-salt components of the acid sludge are not soluble in water. With the limited annual rainfall in this region and the protected location of the sludge, it is unlikely that appreciable amounts of the hazardous materials would be carried to the water table.

Waste Management Unit: 1706-KE, Waste Treatment System

Review date: January 17, 1994

The 1706KE Treatment Storage and Disposal (TSD) facility was originally installed to treat radioactive waste from the 1706KE laboratory. It consisted of an evaporation and epoxy encapsulation unit (IVRS) which was attached to an existing radwaste treatment system. The existing system consisted of a 600 gallon accumulation tank which recirculated through an ion exchange column to remove radionuclides from the water, which was then disposed of to the 100K outfall after analysis for activity.

In mid 1984 the IVRS unit was installed to replace the ion exchange column and shake down tests performed. The unit experienced numerous failures and was abandoned in late 1984, before completion of the testing program. In mid 1986 an attempt to reactivate the IVRS to serve as a mixed waste treatment system for N Reactor effluents, resulted in a near fire and it was permanently shut down.

In anticipation of this use, applications for Part B and Part A permits had been initiated. Neither the original radwaste system nor the IVRS are known to have treated hazardous or mixed waste before or during either of the abortive test programs.

A request for withdrawal of the Part A application was submitted to the Department of Ecology on January 22, 1989. Ecology responded on August 17,1989 disapproving withdrawal pending receipt of further justification. In response to their request, a complete history of all materials that went into the system during the time in question has been compiled. Sampling and analysis of all wastes generated during the testing, as well as all components of the system has been conducted to determine if any listed waste was processed through the IVRS. None has been identified. The request for withdrawal will be resubmitted with the above information.

BLAIR B. EMORY Date
Waste Unit Manager

THIS PAGE INTENTIONALLY
LEFT BLANK

APPENDIX D

DISPOSAL LOGS

KW Burial Record

	Date	material	Sorted By	max Portable LRM MR/hr Reading	max Cask Reading	Load #
	4-23-71	Tubing Stringer Wire Dummies	A	6.0 on 10×10^-10		1
		Tubing	C	3.0 on 10×10^-9		
		dummies	C	1.3 on 10×10^-9		
		dummies	C	2.0 on 10×10^-10	5R at 4'	
	4-23-71	Tubing wire dummies	C	20R	3½R at 3'	2
	4-23-71	Trash	A	2.0 on 3×10^-10	70 mr	3
	4-23-71	Cut Tubing	A	30R	6R at 4'	4
	4-23-71	Stringer wire	A	20R	6R at 4'	5
	~~4-23-71~~	~~Stringer wire~~	~~A~~	~~20R~~		

9113275.1959

105-KE Burial Record

Date	Type of Material	Bucket position	Tested by Initials	Max Portable LRM MR/Hr reading	Max Beckman MR/Hr reading	Max each ? Reading MR/Hr at 3'
~~1/?/71~~	~~Al Tube~~		~~E.B.~~	~~200 MR~~	~~3.0-10x10^-11~~	
1/71	Zirk Dummies		E.B-H.S.		3.8-3x10^-9	
1/71	Zirk		E-B-H-S		3.0-3x10^-10	1R
[illegible]	Al Tube		EB-HS	500 MR	4.0-3x10^-10	2.5R@3'
71	Dummies Zirc, Al Tube		EB HS	180 MR	6.0-10x10^-11	
71	Test Hole Dummies [illegible] line		EB HS	[illegible]00 MR	5.0-3x10^-[illegible]	[illegible] MR
[illegible]	Test Hole [illegible]		E.B.H.S	3R	6.0 10x10^-10	500 MR
[illegible]	Zirc [illegible]		EB HS	2R	3.4-3x10^-9	
[illegible]	D[illegible]		EB HS	250	3.0 3x10^-10	
[illegible]	Al Tube		EB HS	800	3.5-10x10^-10	
[illegible]	Trash		EB HS	900	2.0 3x10^-10	5R-3'
[illegible]	Al Tube [illegible]		EB-HS	600	2.5-3x10^-10	120 MR[illegible]
[illegible]	[illegible]		EB HS	30R	2.8-3x10^-[illegible]	5R@4'
[illegible]	Al Tube [illegible]		EB HS	400 [illegible]	1.5-3x[illegible]	5R@[illegible]
				30R	3.3 [illegible]	5R
[illegible]	Al Tube [illegible]		HS EB	300 MR	2.0 3x10^-10	
[illegible]	[illegible]			40R	5.0 [illegible]	1R@3'
	[illegible]			50R	7.0 10x10^-9	5R@4'
[illegible]	Al Tube [illegible]		HS EB	400 MR	9.0 10x10	
	[illegible]			150 [illegible]	3.0 3x10	20R@3
	[illegible]			3R	2.0 [illegible]	
[illegible]	[illegible]			10R	2.4 10x10^-9	1R@3'

105 KE Burial Record

Date	Type of Material	Bucket Position	Sorted by Shift Date + Initial	Max. Portable -RM mr/hr reading	Max. Beckman mr/hr reading	Max Cutie CP Fission mr/hr at 3 feet
[illegible]	[illegible]	Tech. Pit	[illegible]	10 R	$8.5 \cdot 10^{3}$	
[illegible]	1 Pc. [illegible]			[illegible]	[illegible]	5R @ 4'
	1 [illegible]	[illegible] 83 [illegible]		[illegible]	2.2 10^{3}	
	1 [illegible]			[illegible]	2.4 10^{3}	
	[illegible]			[illegible] R	6.0 10^{3}	
	1 Pc. [illegible]			3 [illegible]	3.2 10^{3}	4R @ 3'
	1 [illegible]			[illegible]	3 [illegible] 10^{3}	
	1 Pc. [illegible]				3.2 10^{3}	2R @ 3'

9413275.1956

BEST AVAILABLE COPY

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — Gravel Pit East of 100K Build g
2. Date of Request — 10-09-85
3. Person Requesting Permission — Dale Clarke -JAJ
   Address and Telephone — 3-3300 100N
4. Person authorizing disposal — [illegible signature]
5. Date of disposal — 10-09-85 + 10-10-85
6. Material to be disposed of — dirt, rocks, Concrete, asph
7. Volume of material — 90 cubic yards
8. Origination of material — 1704K trailer site -100K

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos: ____________

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — Gravel Pit East of 100K Bu
2. Date of Request — 10-7-86
3. Person Requesting Permission — Gayland Swanson
   Address and Telephone — Junkie
4. Person authorizing disposal — Dan Riley
5. Date of disposal — 10-7-86
6. Material to be disposed of — insulators from power lines
7. Volume of material — 16 cubic yards
8. Origination of material — power lines

Does material contain nonfriable asbestos? YES ____ NO X

If YES, volume of nonfriable asbestos: ____

9413275.1959

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site: Gravel Pit E. of 100K bur gr
2. Date of Request: 2-3-87
3. Person Requesting Permission: Dan Riley
   Address and Telephone: 100K 3-3666
4. Person authorizing disposal: Dan Riley
5. Date of disposal: 2-3-87
6. Material to be disposed of: Concrete
7. Volume of material: 3 cubic yds
8. Origination of material: 100K.

Does material contain nonfriable asbestos? YES ___ NO X

If YES, volume of nonfriable asbestos: ___

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100K Gravel Pit
2. Date of Request — 2-26-87
3. Person Requesting Permission — Dan Riley
   Address and Telephone — 3364
4. Person authorizing disposal — Dan Riley
5. Date of disposal — 2-26-87
6. Material to be disposed of — 7- Concrete Curbs.
7. Volume of material — 1 Cubic yd.
8. Origination of material — 1720 K

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos: ____________

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required.

1. Disposal site 100K Gravel Pit
2. Date of Request 3-17-87
3. Person Requesting Permission Shollenberger
Address and Telephone 3-3811
4. Person authorizing disposal Dan Riley
5. Date of disposal 3-17-87
6. Material to be disposed of Tile & wood
7. Volume of material 8 Cu. yds.
8. Origination of material MVK

Does material contain nonfriable asbestos? YES ___ NO X

If YES, volume of nonfriable asbestos: __________

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100K Pit (GRAVEL)
2. Date of Request — 4-15-88
3. Person Requesting Permission — Chuck Haggerty
   Address and Telephone — GABLE Mt 3-5572
4. Person authorizing disposal — Dan Riley RK 4/15/88
5. Date of disposal — ~~4-15-88~~
6. Material to be disposed of — Conduit, wire, ducting
7. Volume of material — 12 cu. yds.
8. Origination of material — Gable Mt

Does material contain nonfriable asbestos? YES ___ NO X

If YES, volume of nonfriable asbestos: ______

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100-K GRAVEL P.
2. Date of Request — 4/15/88
3. Person Requesting Permission — DALE HERLING
   Address and Telephone — GABLE MT. 3-5882
4. Person authorizing disposal — R.H. GRIFFIN
5. Date of disposal — 4/18 THRU 4/22/88
6. Material to be disposed of — CONCRETE, WOOD, S[illegible] CONDUIT RUBBLE
7. Volume of material — 89 YDS.^{3}
8. Origination of material — GABLE MT. & ES [illegible]

Does material contain nonfriable asbestos? YES ___ NO X

If YES, volume of nonfriable asbestos: ___

ON 4/25/88, INSPECTION OF PIT REVEALED SEVERAL BAGS SOLAR SALT (WATER SOFTENER). KA GANO 100 AREA ENVIRONM[illegible] WAS NOTIFIED AS WELL AS THURMAN DAVIS, SUPERVISOR O[illegible] GABLE MT.; THURMAN IS TO BEGIN CLEANUP TOMORROW.

9413275.1964

MATL FROM NSTF TO 100 K LANDFILL

6 CU. YDS. — 4/18/88 - 10:20 CONDUIT & STEEL ITEMS.

5 CU. YDS — 4/18/88 - 1:07 CONDUIT & STEEL ITEMS CORRUGATED SIDING.

4/19/88

5 CU. YDS. — / 4/19/88 / 11:05 / PVC PIPE

4/20/88

5 CU YDS 4/20/88 SCRAP IRON & WOOD. RN MASIOS

10 CUYDS 4/20/88 SCRAP R.D. Schroeder

10 CUYDS 4/20/88 SCRAP R.D. Schroeder

4/21/88

6 CU YDS 4-21-88 SCRAP J.R. Marty

5 CU YARD 4-21-88 SCRAP [signature]

5 CU YDS 4-21-88 SCRAP RN Masinis

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100-K GRAVEL P[illegible]
2. Date of Request — 4/15/88
3. Person Requesting Permission — DALE HERLING
   Address and Telephone — GABLE MT. 3-5882
4. Person authorizing disposal — RH GRIFFIN
5. Date of disposal — 4/25/88 THRU 4[illegible]
6. Material to be disposed of — CONCRETE, WOOD, ASPHALT, WIRE, CON[illegible]
7. Volume of material — 238 YDS.^{3}
8. Origination of material — GABLE MT. & ES

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos:________

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100-K GRAVEL PIT
2. Date of Request — 4/15/88
3. Person Requesting Permission — DALE HERLING
   Address and Telephone — GABLE MT. 3-5882
4. Person authorizing disposal — R.H. GRIFFIN
5. Date of disposal — 5/9/88 THRU 5/15/
6. Material to be disposed of — CONCRETE, WOOD, ST. ASPHALT, WIRE, COND
7. Volume of material — ~~377~~ 417 YDS.^{3} + 1,34 ON OVERTIME = 1,757
8. Origination of material — GABLE MT. & ES

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos:____________

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100-K GRAVEL PIT
2. Date of Request — 4/15/88
3. Person Requesting Permission — DALE HERLING
   Address and Telephone — GABLE Mr.
   3-5882
4. Person authorizing disposal — R.H. GRIFFIN
5. Date of disposal — 5/23/88 THRU ~~5/29~~ 6/1/88
6. Material to be disposed of — CONCRETE, WOOD, STEEL, ASPHALT, WIRE, CONUIT.
7. Volume of material — 225 YDS.^{3}
8. Origination of material — GABLE Mr.

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos:____________

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100-K GRAVEL PIT
2. Date of Request — 4/20/88
3. Person Requesting Permission — V. RICE
   Address and Telephone — 1722-K 3-1448
4. Person authorizing disposal — RH GRIFFIN
5. Date of disposal — 4/22/88 THRU & 4/25/88
6. Material to be disposed of — 183-KE METAL FLOCCULATOR PADDLES
7. Volume of material — 4/22/88 1121 FT³ / 4/25/88 1294 FT³
8. Origination of material — 183-KE

Does material contain nonfriable asbestos? YES___ NO X

If YES, volume of nonfriable asbestos: ________

4/22/88

5 cu	4-22-88	Scrap	R. Russell
5 cu	4-22-88	Scrap	RR Russell
22 cu	4-22-88	Scrap	G.D. Sebade

4/25/88

5 cu	4-25-88	Scrap	R. Russell
22 cu	" " "	"	G. Sebade
5 cu	" " "	"	R. Masias
22 cu	" " "	concrete	G. Sebade
"	" " "	"	"

DATE 4-30-88

FROM [illegible]

		type	site
	yard	conduit steel	Goble Mitro
	yard	conduit steel	Goble Mitro
6	yard	conduit steel	Goble Mitro
	yard	conduit steel	Goble Mitro
10	yard	Cement + steel	Goble Mitro
10	yard	cement + steel	Goble Mitro
7 7	yard	scrap steel	Goble Mitro

POOR COPY RECEIVED

"TO MAKE LIFE LAST, PUT SAFETY FIRST"

ES & GABLE MT DISPOSAL RECORD 100-K PIT

4/26/88 " " concentrat 100K P.T

4/27/88

AMT.	TYPE	FROM (ES OR GABLE MT.)	
6 CU. YRDS	WIRE	GABLE MT.	
6 CU. YRDS	Insulation	GABLE mt.	
15 yds	concrete	ESS	5 loads

4/28/88

AMT.	TYPE	FROM (ES OR GABLE MT.)	
10 Yds	wood scrap Metal	ESS	
10 Yds	Scrap Iron & concrete	ES	
15 yds	concrete	ESS	5 load

4/29/88

AMT.	TYPE	FROM (ES or Gable MT.
~~35~~ 60 yds	Asphalt	ESS
10 Yds	Metal - concrete	ES
10 Yds	concrete - Iron	ES
10 Yds	wood - Metal	ES
5 YRDS,	SCRAP METAL	GABLE.

ES & GABLE MT. DISPOSAL RECORD 100-K PIT

5/3/88

AMT.	TYPE	SITE (ES OR GABLE MT.)
1-10 YDS. TRUCK LOAD	WOOD	ES-SITE
15 Yd TRUCK		
4 loads	wood, concrete, Pipe and wire	
1 load	asphalt	ES site
1-10 yd-TRUCK LOAD	GRAVEL + CONCRETE	ES-SITE

5/4/88

Amt	TYPE	SITE
5 YRDS	CONDUIT & WIRE	GABLE MTN
10 yrds	Concrete	Gable MT.
45 yrds	Pay-ment	ESS
45 yrds	PAYment	ESS

5/5/88

AMT	TYPE	SITE
6 yrds.	CONDUIT: WIRE	GABLE MT.
20 yrds	~~[illegible]~~ PAYment	ESS
30 yrds	PAYment	ESS

ES & GABLE MT. DISPOSAL RECORD 100-C PIT

5/6/88

Amt.	Type	Site (ES or Gable Mt.)
60 yrds	Payment	ES
50 yrds	Payment	ES

ES & Gabl Mt. Disposal

5/9/88

Amt.	Type	Site
10 yrds	Concrete	Gable Mt.
10 yrds	Concrete	Gable mt
10 yds	Pipe	Gable mtn
5 yds	pipe	Gable Mtn
10 YRDS	CONCRETE	GABLE MTN
10 yrds	Concr. & wire	"
10 yrds	Concr. & wire	"
10 YARD	CONCR. & WIRE	GABLE MTN.
10 yrds	Concrete	"
10 yards	Concrete	Gable Mtn
10 YARD	CABLE & CONDUIT	GABLE MTN.

ES & GABLE MT. DISPOSAL RECORD

5/10/88

Amt.	Type	Site
10 yrds	Concrete	Gable mtn
10 YARDS	CONCRETE & DIRT	GABLE MTN
10 YARDS	CONCRETE & Dirt	Gable mtn
10 YARDS	CONCRETE & DIRT	GABLE MTN
10 YARDS	CONCRETE & Dirt	Gable mtn
10 YARDS	CONCRETE & DIRT	GABLE MTN.
10 YARDS	CONCRETE & Dirt	Gable mtn
10 YARDS	CONCRETE & DIRT	GABLE MTN
10 yards	CONCRETE & Dirt	Gable mtn
10 yards	Concrete & Dirt	Gable mtn
10 yrds	Concrete	"
10 YARDS	CONCRETE & DIRT	GABLE MTN
10 YARDS	CONCRETE & Dirt	Gable mtn
10 yrds	" "	"

5/11/88

10 yrds	Concrete	Gable MT.
10 yrds.	CONCRETE DIRT + WIRE	Gable MT.
10 yrds	Concrete	"
10 yrds	concrete + Dirt	"
10 yrds	Concr. Dirt	"
10 yrd.	CONCRET "	"
10 yrd.	"	"

9413275.1975

F S & Coble Mtn Disposal

5-10-88

100 yards	pipe & wire	Coble mtn
90 yards	Pipe & wire	Coble mtn

5-11-88

60 yards	pipe & wire	coble mtn
110 yards	pipe & wire	Coble Mtn
150 yards	steel	Coble Mtn

5-12-88

240 yards	pipe & wire	Coble Mtn
90 yards	pipe & wire	Coble Mtn

5-13-88

120 yards	asphalt	Coble mtn
80 yards	steel & pipe	Coble Mtn

5-14-88

300 yards	asphalt	Coble Mtn

5-16-88

120 yards	pipe	Coble Mtn

5-17-88

130 yards	asphalt	Coble Mtn
80 yards	pipe	Coble Mtn

POOR COPY RECEIVED

ES & GABLE MT. DISPOSAL RECO

5/12/88

Amt.	Type	
10 yrds	Concrete & Dirt	Gable Mtn
10 YRDS	CONCRETE & DIRT	GABLE MTN
10 YRDS	CONCRETE & DIRT	Gable mtn
10 YRDS	CONCRETE & DIRT	GABLE MTN
5 yrds	Wire & Steel	" "
10 YARDS	wire, Pipe & Dirt	Gable MTN
10 yrds	Rock Dirt Conc.	" "
10 YRDS	CONCRETE & DIRT	GABLE MTN
10 YRDS	"CONCRETE"	Gable mtn
7 yrds	Concrete and Dirt	Gable mtn

5/13/88

10 YRDS	Conduit & Steel	GABLE MTN.

5/16/88

10 yrds	Asphalt	Gable Mt
10 yrds	Asphalt	" "
10 yrds	Asphalt	" "
10 yrds	Asphalt	" "
	5/16/88	" "
80 yrds	Asphalt	
10 YRDS	Asphalt	GABLE MTN
10 YARD	Asphalt	GABLE MTN.
10 YRDS	Asphalt	GABLE MTN.
10 YRDS	Asphalt	GABLE MTN.

POOR COPY RECEIVED

9113225.1974

E5 & Gable Mt Disposal Record

5/17/88

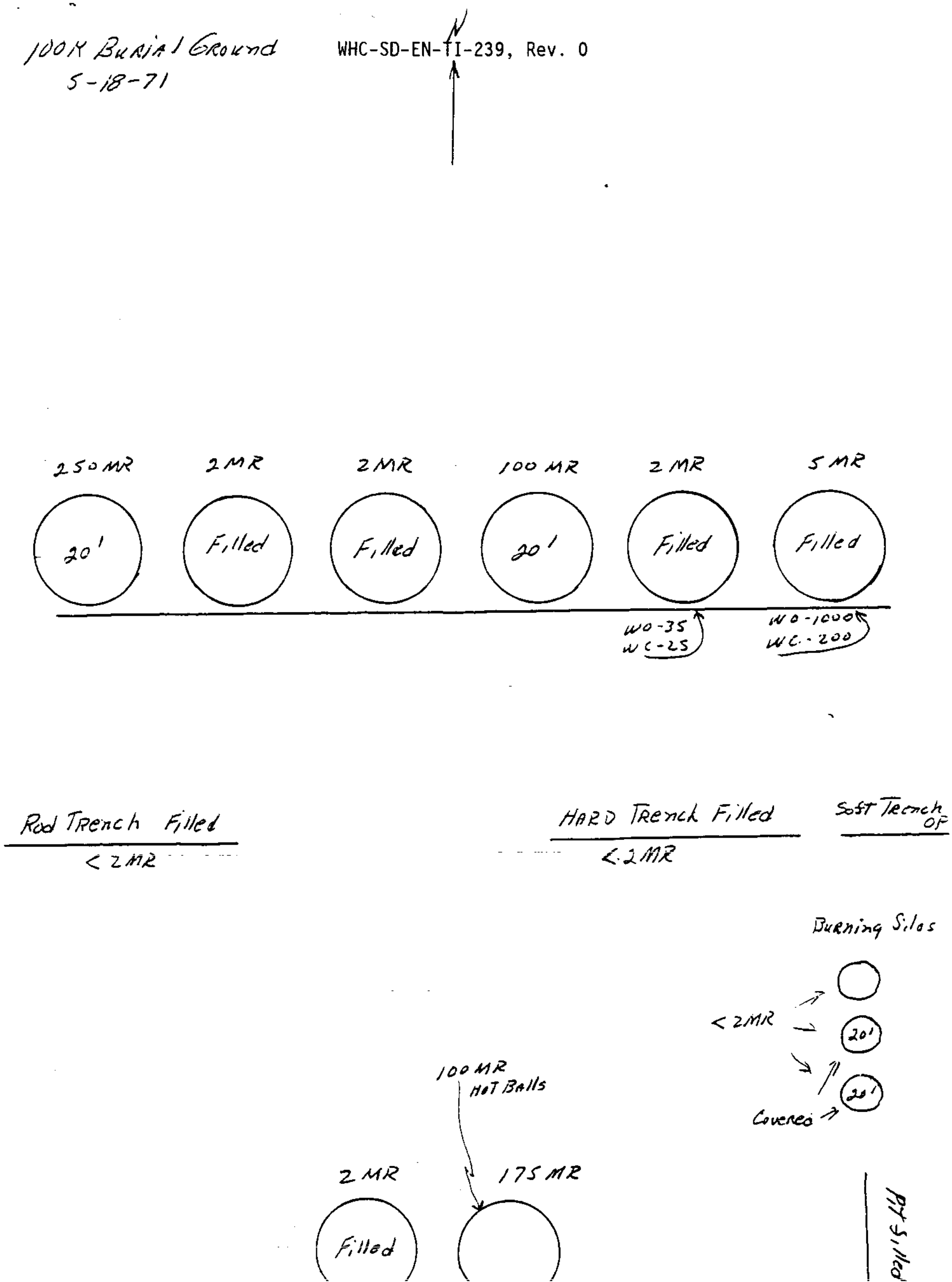
Amt	Type	Site
40 yrds	Concrete Asphalt	Gable Mt

5/20/88

Amt	Type	Site
90 yds	Concrete 5/17/88	Gable Mt
45 Yds	Concrete & Posts 5/18/88	Gable Mt
15 YDS	Conduit wire 5/19/88	Gable Mt
10 YDS	Concrete & Pipe	Gable mt
	5-23-88	
60 yrds	Concrete - Pipe	Gable Mt.
10 YRDS	SCRAP	GABLE MTN.
	May 24 1988	
10 YRDS	Dirt / Conduit & Wire	Gable Mtn
10 YARDS	Dirt / Conduit & Wire	Gable Mtn-
10 YRDS	Dirt / Conduit & Wire	GABLE MTN

ES & GABLE MT. DISPOSAL

AMT.	TYPE	SITE
	5/25/88	
10 YRDS	CONDUIT & DIRT	GABLE MTN
10 YARDS	CONCRETE	GABLE MTN
10 YRDS	CONCRETE	GABLE MTN
	5/26/88	
5 YARDS	CABLE & WIRE	GABLE MTN.
	5/27/88	
10 YARD	CONCRETE & POSTS	GABLE MTN.
10 YARDS	DIRT & PIPE	GABLE MTN
	5/31/88	
10 YARDS	POSTS	GABLE MTN
10 YRDS	DIRT & CONDUIT	GABLE MTN.
10 YRDS	POSTS	GABLE MTN
	1 June 1988	
40 YARDS	CONCRETE/PIPE/WIRE	GABLE MTN.


100K Burial Ground
5-18-71
N
250 MR
20'
2 MR
Filled
2 MR
Filled
100 MR
20'
2 MR
Filled
5 MR
Filled
WO-35
WC-25
WO-1000
WC-200
Rod Trench Filled
< 2MR
HARD Trench Filled
< 2MR
Soft Trench OF
Burning Silos
< 2MR
20'
20'
Covered
100 MR
Hot Balls
2 MR
Filled
175 MR
Pit Filled

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100-K GRAVEL PIT
2. Date of Request — 5/23/88 (~~_/_/88~~ initialed)
3. Person Requesting Permission — D. RILEY
   Address and Telephone — 1717-K, 3-3666
4. Person authorizing disposal — R.H. GRIFFIN
5. Date of disposal — 5/23 THRU 6/14/88
6. Material to be disposed of — CONCRETE PEDESTALS, METAL ONEEDS, TOP SOIL, SAND, AND FLOCCULATORS FROM 183-KE
7. Volume of material — 780 YDS³ TOP SOIL & SAND; 103 YDS³ CONCRETE & METAL; 883 YDS³ TOTAL
8. Origination of material — 183-KE SED. BASIN

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos:____________

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

9413275.1986

1. Disposal site	100-K Gravel Pit
2. Date of Request	6/30/88
3. Person Requesting Permission Address and Telephone	Jack Curl (MK) 3-4421 Mo 214 NSTF Const. Site.
4. Person authorizing disposal	R.H. Griffin
5. Date of disposal	6/30/88
6. Material to be disposed of	Galv. culvert pipe conduit & wire.
7. Volume of material	256 Ft.^{3}
8. Origination of material	Gable Mt.

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos:____________

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100-K GRAVEL PIT
2. Date of Request — 7/5/88
3. Person Requesting Permission Address and Telephone — D.A. RILEY 1717-K 3-3666
4. Person authorizing disposal — R.H. GRIFFIN
5. Date of disposal — 7/5/88
6. Material to be disposed of — WOOD & ROOFING
7. Volume of material — 2.5 YDS.^{3}
8. Origination of material — 1717-K

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos:______________

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100-K GRAVEL PIT
2. Date of Request — 9/8/88
3. Person Requesting Permission — THURMAN DAVIS
   Address and Telephone — 54-16 3-4298
4. Person authorizing disposal — R.H. GRIFFIN
5. Date of disposal — 9/8 - 9/9/88
6. Material to be disposed of — ASPHALT
7. Volume of material — 290 YDS^3
8. Origination of material — Gable Mountain

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos:______________

DISPOSAL RECORD NONRADIOACTIVE WASTES

en requests are received for authorization to dispose of .terial in the nonradioactive waste disposal sites in the :activated areas, the following information is required:

. Disposal site 100-K Gravel Pit

Date of Request 9/12 - 9/13/88

3-4298 54-16

Person Requesting Permission Thurman Davis

Address and Telephone 3-4298 54-16

. Person authorizing disposal RH Griffin

. Date of disposal 9/13/88

. Material to be disposed of Asphalt & Concrete

. Volume of material 390 YDS 3

. Origination of material Gable Mountain

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos:____________

POOR COPY RECEIVED

E & E Gable Mt

Amt		Type	Site
10 Yds	9-8-88	asphalt	Gable MT
10 Yds		asphalt	Gable MT
"		"	"
10 yds		Asphalt	GAble mt
10 yds		Asphalt	GAble mt
"		"	"
10 Yds		"	"
10 Yds	9-9-88	"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
10 Yds	9-17-88	Asphalt	Gable MT
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"

10 Yds	Asphalt	Gable MT
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"
10 Yds	Asphalt & concrete	Gable MT
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"
10 Yds	Asphalt	Gable MT
"	"	"
	9-13-88	
10 Yds	Asphalt	Gable MT
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"
"	"	"

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site 100-K Gravel Pit
2. Date of Request 9-15 - 9-19-88
3. Person Requesting Permission ______
   Address and Telephone ______
4. Person authorizing disposal RH Griffin
5. Date of disposal 9/15 - 9/19/88
6. Material to be disposed of Asphalt, Pipe, Plastic, Tin Metal, Iron, Wire, Conduit, Croncrete
7. Volume of material 330 YDS ^{3}
8. Origination of material Gable Mountain

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos:______________

ES & Gable Mountain

Amount	Date	Type	Site
100 yd	9-15-88	Asphalt	6436
10 yd		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
"		"	"
10 yd	9-16-88	Asphalt	Gable
10 yd	9-16-88	Pipe, Plastic & metel	"
10 yd		Asphalt	"
"		"	"
10 yd		concrete, tin, pipe	"
10 yd		Iron, plastic, wire, pipe	"
	9-19-88		
10 yd		concrete, iron-pipe	Gable
80 yd - DONE		conduit	Gable

9113275.1988

DISPOSAL RECORD NON-RADIOACTIVE WASTES

We requests are received for authorization to dispose of material in the non-radioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100-K Gravel Pit
2. Date of Request — 7-12 - 7-14-89
3. Person Requesting Permission — W. Blakeman

   Address and Telephone — 33666 - 100-K
4. Person authorizing disposal — J.E. Hodgson
5. Date of disposal — 7-12 - 7-14-89
6. Material to be disposed of — Concrete Demolition waste
7. Volume of material — 45 YDS^3
8. Origination of material — 1717-K

Does material contain nonfriable asbestos? Yes ______ No X

If YES, volume of nonfriable asbestos: ______________

9413275.1990

DISPOSAL RECORD NONRADIOACTIVE WASTES

When requests are received for authorization to dispose of material in the nonradioactive waste disposal sites in the deactivated areas, the following information is required:

1. Disposal site — 100-K Gravel Pit
2. Date of Request — 8-27-89
3. Person Requesting Permission — Art Mc Daniel
   Address and Telephone — 31635
4. Person authorizing disposal — J. E. Hodgson
5. Date of disposal — 8-27-89
6. Material to be disposed of — Concrect and Metal Build Rubble
7. Volume of material — 187.5 YDS^3
8. Origination of material — 183-KW.

Does material contain nonfriable asbestos? YES____ NO X

If YES, volume of nonfriable asbestos:____________

RECORD

KE

7530-290-5028

FEDERAL SUPPLY SERVICE

POOR COPY RECEIVED

9413275.1991

4-30-92 Deactivation

Completed all major work on deactivation of 105-KE building

Locked + barricade all sections of the building as per deactivation procedure

Burial.

Moved minor construction tractor from burial ground to 107 trench and fixed the tractor.

Burned all contaminated trash from the 105-KE building.

107

Electrical deactivated all 107 KE valve motors

J. L. Gordanow

Repaired + checked out the 167-KE Cannon - Equipment working satisfactory at the end of the shift

J. L. Gordanow

4-12-71 Sanitary Water System
Installed electric hot water tank in the 105-KE purge room.

Perfs, Tubulars + Expendables
Obtained an inventory of all perfs + Expendables in 105-KE building - Listed below are the numbers of all Dummies.

1. Self Support
1700 Preirradiation poles made up + stored in the 28' rear side room.
7,000 SS 16" Expendable in grey tubs in Metal Storage
16,000 Tubular + perfs 8" SS in grey tubs in Metal Storage

2. Smooth 8" perfs, Solids + tubulars.
11,000 in metal storage stored in grey tubs in Metal Storage
500 Solid al. in grey tubs in metal storage.
500 Tubulars in grey tubs in metal storage.

C+D work platform (Electrical)
Deactivated drive motors + all auxiliary equipment on C work platform.

J. L. Goodenow

4-13-71 Hydride Tanks
Buried all hydride tanks from area north of 105-fence in the 107 trench. placed wire cover back in place

107 Trench
Level at 5' 6"

4-13-71 Contaminated area Northwest of 105-KW
Covered with gravel and resurvey.
Radiation level below background - no
indication of contamination or radiation.

J. L. Goodenow

4-14-71 Inner Rod Room
Surveyed and decontaminated room,
completed additional housekeeping.
Resurveyed and found to be less than
10,000 c/m. + on rod racks + grating.
Room was considered to meet deactivation
procedure requirements.

Filled floor drains and locked +
sealed the door. Turned lights off.

Outer Rod Room
Completed additional housekeeping,
surveyed + released. Under limits
specified in deactivation procedure

Filled floor drains - Locked + sealed the
door - Turned lights off.

#2 Pipe Room
Decontaminated - Surveyed + released
the floor in this area.

X-0 Level
Korpis group decontaminated the walls

SITE ASSESSMENT REPORT

UST Site Owner: U.S. Department of Energy , Field Office, Richland

Owners Address: 825 Jadwin P.O. Box 550, Richland, WA 99352

Site ID Number: 012763

Tank ID Number: 130-KE-1A,1B

I. Site Conditions Maps

The following maps and drawings are provided:

Figure 1: Hanford Site Boundary Map
Figure 2: 100 K Area (with Building List)
Figure 3: Ground Penetrating Radar Map

III. Site Conditions Description

The Hanford Site (Figure 1) is located northwest of the city of Richland, Washington (population 33,000). The 100 K Area of the Hanford Site is located approximately 30 miles north-north west of Richland and contains two inactive reactors and associated facilities (Figure 2). The site is approximately on half mile south of the Columbia River.

IV. Site Investigation and Sampling Activities

Tank Site Description

The 130-KE-1A,1B diesel fuel tank system was permanently closed by removal of the tank and accessible piping on October 5, 1992. A ground penetrating radar map of the tank site is also presented (Figure 3).

Site Assessment

Safety hazards were addressed prior to tank removal and site assessment during prejob safety meetings. Both the removal and site assessment were performed according to a detailed work procedure and safety plan prepared by Westinghouse Hanford Company (WHC) (WHC 1992) based on Ecology's guidance documents (Ecology 1991a; Ecology 1991b). The site was intermittently monitored for both organic vapors and radiological hazards to ensure worker safety.

PROJECT 130-KE-1A and 1B UST Removal

Notebook No. EFL-1009

Continued From Page N/A

10-~~6~~-92 5 ~~JT~~ 10-6-92

Field Team Leader - Jonathan G. Lucas
Field Screening/Analysis - I.D. Jacques (Duane)
Site Safety Officer - Judy Vaughn
Site Assessor - Ron M. Mitchell
Soil Samplers - Chuck S. McClellan
Jim G. Hogan

Tank description - Two steel tanks approx. 6' diameter and 11' long. 1000 gal. tanks each. Tanks were used to hold diesel fuel.

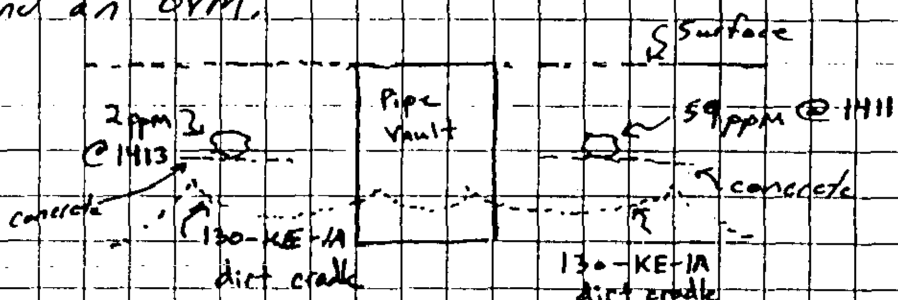
1230 - Arrived at UST storage tanks site. Assessed project site and photos of tanks 130-KE-1A & 1B were taken.

1330 - Diesel UST 130-KE-1A was lifted from excavated pit and photos of ~~tat~~ tank ~~was~~ were taken as outside of tank was inspected for leaks. Tank looked in good condition. Tank was placed on flatbed truck for removal.

1348 - UST 130-KE-1B was lifted from excavated pit. Tank was inspected for leaks and photos were taken. Tank looked ^ good condition. Tank was placed on flatbed truck for removal.

1405 HRS - Tank excavation was surveyed by HPT. Less than background.

1411 (- Two discolored soil spots were analyzed using a plastic bag
1413) and an OVM.



Drawing not to scale - looking SSW toward 105-KE building.

Continued on Page 41

Read and Understood By

Signed Date Signed Date

10-5-92

1415 - Performed OVM/plastic bag shake method at bottom of tank 130-KE-1A where lines attached to the tank. Reading of 0.3 ppm was recorded. See following drawing for location. Soil will be collected from this location (point A).

1418 - Performed OVM/plastic bag shake method at sidewall next to smokestack, on tank 130-KE-1A. Reading of 1.1 ppm was recorded. See following drawing for location. Soil will be collected from this location (point B).

1420 - Performed OVM/plastic bag shake method at ~~next~~ opposite sidewall ~~next~~ on tank 130-KE-1A. Reading of 1.1 ppm was recorded. See following drawing for location. Soil will be collected from this location (point C).

1422 - Performed OVM/plastic bag shake method at bottom of tank 130-KE-1B next to where lines attached to the tank. Reading of 1.1 ppm was recorded. See following drawing for location. Soil will be collected from this location (point E).

1427 - Performed OVM/plastic bag shake method below two pipe elbows extending from pipe vault. The pipes were connected to tank 130-KE-1B. Reading of 1.1 ppm was recorded. See following drawing for location. Soil will be collected from this location (point F).

1428 - Performed OVM/plastic bag shake method below two pipe elbows extending from pipe vault. The pipes were connected to tank 130-KE-1A. Reading of 1.1 ppm was recorded. See following drawing for location. Soil will be collected from this location (point D).

1435 - Performed OVM/plastic bag shake method at NE side of middle excavation pile. Reading of 0.7 ppm was recorded. See following drawing for location. Soil will be collected from this location (point H).

Continued on Page 42

Read and Understood By

Signed Date Signed Date

PROJECT 130-KE-1A and 1B UST Removal
Continued From Page 41

10-5-92

1440- Performed OVM/plastic bag shake method at SW side of middle excavation pile. Reading of 0.3 ppm was recorded. See following drawing for location. Soil will be collected from this location (point G).

1435- Soil sample # B07J16 was collected at point A from UST 130-KE-1A. See following drawing for location. Soil was also collected for field analysis using a EnSys Petro Risc Kit (see data sheet for results). Duplicate soil sample # B07J17 was collected this location (point A)

1440- Soil sample # B07J18 was collected at point B from UST 130-KE-1A. See following drawing for location.

1442- Soil sample # B07J19 was collected at point C from UST 130-KE-1A. See following drawing for location.

1445- Soil sample # B07J20 was collected at point D from UST 130-KE-1A. See following drawing for location.

1455- Soil sample # B07J21 was collected at point E from UST 130-KE-1B. See following drawing for location.

1455- Soil sample # B07J22 was collected at point F from UST 130-KE-1B. See following drawing for location.

1510- Soil sample # B07J23 was collected at point G from SW side of middle excavation pile. See following drawing for location

1515- Soil sample # B07J24 was collected at point H from NE side of middle excavation pile. See following drawing for location

Continued on Page 43

Read and Understood By

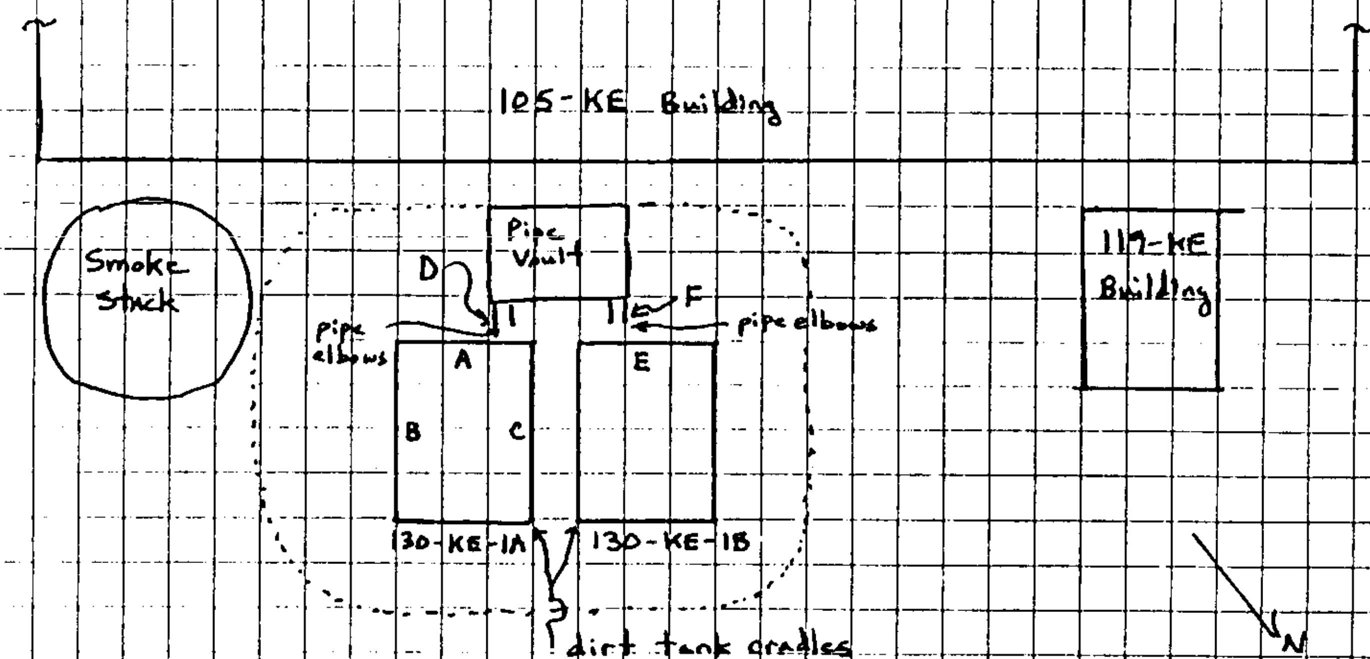
Signed Date Signed Date

Notebook No. EFL-1009

ROJECT 130-KE-1A and 1B UST Removal

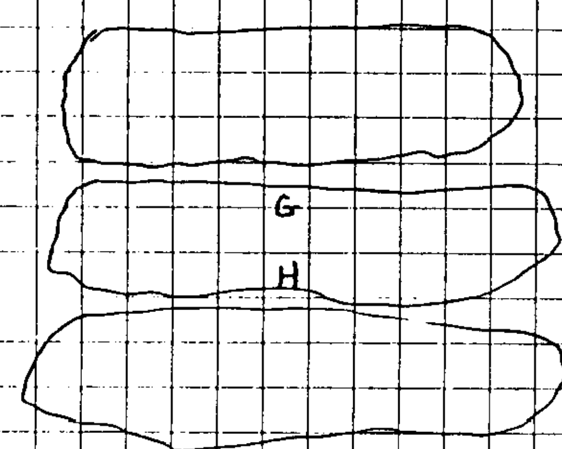
Continued From Page 42

-5-92



Legend

Sample Location = "X", eg - A



Excavated soil piles

"Drawing not to scale"

Continued on Page 44

Read and Understood By

Signed	Date	Signed	Date

PROJECT 130-KE-1A and 1B UST Removal

Notebook No. EFL-1009

Continued From Page 43

10-5-92

Field QC Sample

HB 1130 - Silica sand trip blank was prepared by Chuck McClellan. Sample # B07J15 was assigned to this blank sample.

Sample Bottle Lot Number

120ml aG (Eagle Picher) - 11294010

Continued on Page 45

Read and Understood By

Signed Date Signed Date

Notebook No. EFL-1009

PROJECT 130-KE-1A and 1B UST Removal

Continued From Page 44

10-5-92	50
Days entry for field/screening analysis	10/5/92 Duane Jacques

1230 Arrived at 100KE Area. Inspected tank sites. 130-KE-1A & 130-KE-1B tanks scheduled for removal. Will support sampling w/ field screening.

1250 Calibrated OVM 580B Serial Number 35382-250 w/ 101 ppm isobutylene span. Reading span gas as 101.2 ppm.

1255 Verified calibration w/ 9.51 ppm isobutylene check gas.
Readings: 9.8, 9.8, 9.8, 9.8, 9.8
OVM is within acceptable calibration range of ± 1.0 ppm.

1320 Set up EnSys PetroRisc Test kit materials.

1440 Began EnSys Test of 130-KE-1A

1535 Completed EnSys Test. Packed up equipment. Left site.

Continued on Page 46

Read and Understood By

Signed Date Signed Date

PROJECT 130-KE-1A and 1B UST Removal

Notebook No. EFL-1009

Continued From Page 45

10-5-92

EnSys PetroRisc Test Data Sheet

Project UST 130-KE-1A & 1B Removal Site 100-KE Area

EnSys Lot Number	Sample	Photometer S1:S2	Photometer S2:S1	use:	Photometer 100ppm	Photometer 1000ppm	Results/Comments
870	130-KE-1A Soil	0.11	-0.11	S2	0.29	0.35	<100 ppm TPH
870	130-KE-1B Soil	0.05	-0.05	S2	0.42	0.43	<100 ppm TPH

Notes: Soils were moist, course sand with some small pebbles. No ~~ot~~ odor or visible signs of petroleum product contamination

DJ 10-6-92

Samples Collected By: Chuck McClellan (DJ)

Date: 10-5-92

Samples Analyzed By: Duane Jacques

Date: 10-5-92

on Page 47

Signed Date Signed Date

9413275.2002

SITE ASSESSMENT REPORT

UST Site Owner: U.S. Department of Energy , Field Office, Richland

Owners Address: 825 Jadwin P.O. Box 550, Richland, WA 99352

Site ID Number: 012763

Tank ID Number: 130-KW-1A,1B

I. Site Conditions Maps

The following maps and drawings are provided:

Figure 1: Hanford Site Boundary Map
Figure 2: 100 K Area (with Building List)
Figure 3: Ground Penetrating Radar Map

III. Site Conditions Description

The Hanford Site (Figure 1) is located northwest of the city of Richland, Washington (population 33,000). The 100 K Area of the Hanford Site is located approximately 30 miles north of Richland and contains two inactive reactors and associated facilities (Figure 2). The site is approximately one half mile south of the Columbia River.

IV. Site Investigation and Sampling Activities

<u>Tank Site Description</u>

The 130-KW-1A,1B diesel fuel tank system was used for emergency generators, but was abandoned in 1971. A ground penetrating radar map of the tank site is also presented (Figure 3). These tanks were identified as orphans and undergoing removal. During excavation the site was found to be radioactively contaminated. After the tanks were removed from the pit on October 22nd, the tanks were found to be radioactively contaminated as well.

Site Assessment

Safety hazards were addressed prior to tank removal and site assessment during prejob safety meetings. The UST removal was performed according to a detailed work procedure and safety plan prepared by Westinghouse Hanford Company (WHC) (WHC 1992) based on Ecology's guidance documents (Ecology 1991a; Ecology 1991b). The site was monitored for both organic vapors and radiological hazards to ensure worker safety. Due to the radiological hazards of the site, an incomplete site assessment was done.

Field samples were taken, but no samples were sent offsite due to the radioactive contamination. Two field samples were taken from the tank impression and field analyzed. A Thermo Environmental Instruments model 580B Organic Vapor Monitor (OVM) photoionization detector with a 10.6 eV lamp was used to determine the Volatile Organic Compound (VOC). The total VOC concentration for each sample taken from the tank impressions was 0.2 ppm. The reading varied from 0.0 to 0.2 ppm. The OVM detection limit is 0.1 ppm. No visible soil discoloration or other unusual features were observed during excavation or removal.

There was nothing indicating the presence of free product during the excavation of the tank or the tank removal.

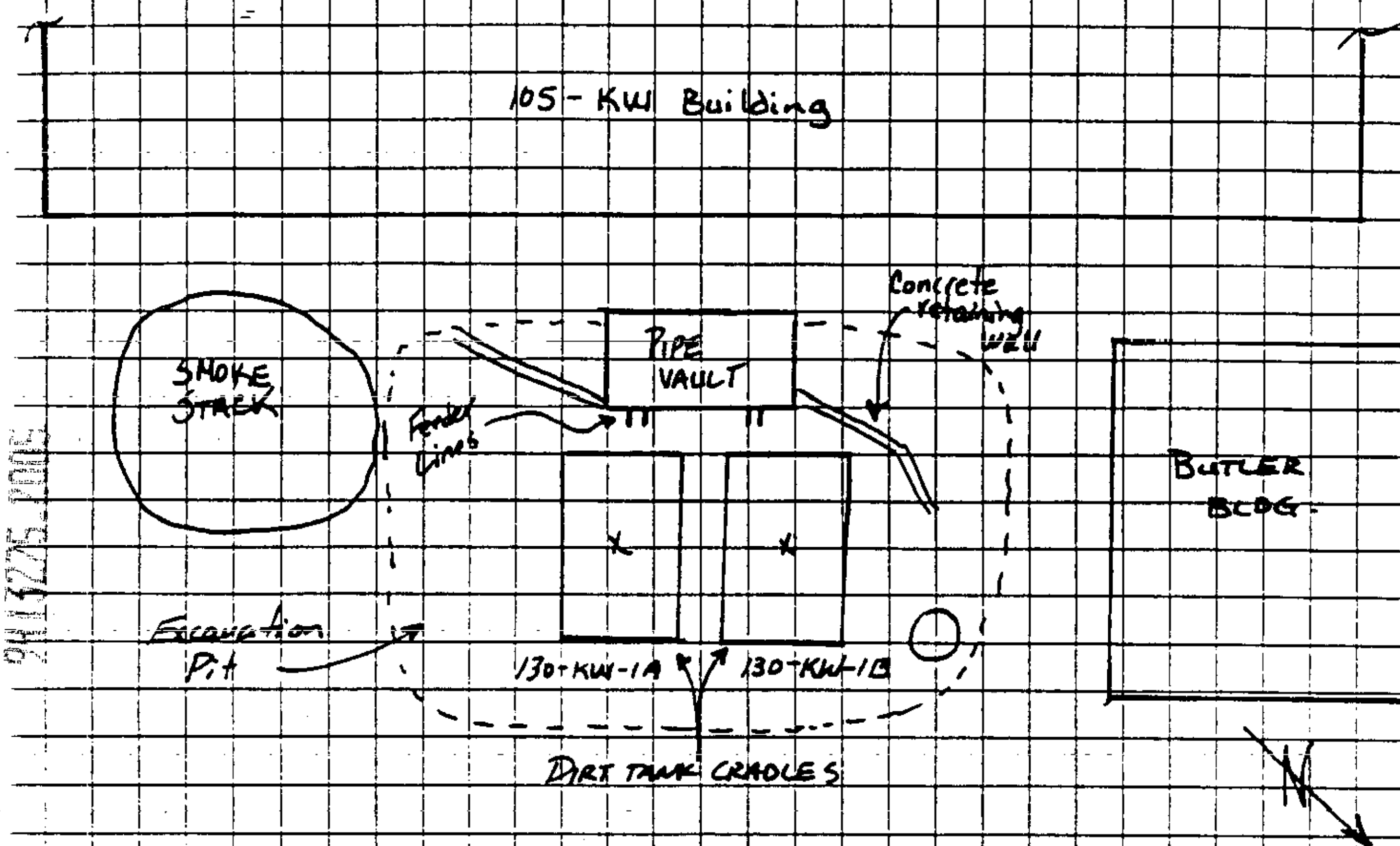
Planned Activities

Due to the radioactive contamination of the site and tanks, the pit was backfilled with uncontaminated soil and posted appropriately. Attempts to decontaminate the tanks was unsuccessful. The tanks have been wrapped with plastic and a plan to dispose of the tanks onsite is in progress.

Since the tanks are very close to the reactor building, the long term plan for the site is to decontaminate or remove any contaminated soil when the reactor and surrounding site is remediated. Since the field sample analyses indicated low organic vapor values and the site is radioactively contaminated, no attempts to collect soil samples for lab analysis will be made at this time.

T 130-KW-1A & 130-KW-1B UST Removal

Continued From Page 60



X = Sample location for OVM/plastic bag shake method test. (Field Screening)

Continued on Page

Read and Understood By

C.E. Heiden — Signed — 10/22/92 — Date

D-52

Signed — Date

Notebook No. ______

PROJECT 130-KW-1A & 130-KW-1B UST Removal

Continued From Page ______

10/22/92

General Weather Conditions: Cloudy, ~55°F, Wind Calm 10 mph

Field Team Leader - C.E. Heiden
Site Assessor - R.M. Mitchell
Site Safety Officer - Judy Vaughn
Samplers - LINO GUERRA 60M299

Tank Description(s): Two steel tanks (diesel), 1000 gallon, 11' (long) x 6' (dia.)

0830 Arrived at UST storage tank site. (130-KW-1A and 130-KW-1B) Photos of tanks taken prior to removal.

0900 Tailgate safety meeting conducted by Dan Riley (Supervisor - Site Services)

0915 130-KW-1A Diesel Tank lifted from excavation pit. Health Physics Technician (HPT) surveyed the tank. No radiation detected. The site safety officer (SSO) took OVM readings from soil adhering to the tank; readings were less than detectable. Dirt was cleaned off tank and loaded onto flatbed.

0945 130-KW-1B Diesel Tank lifted from excavation pit. HPT surveyed tank; contamination found on end of tank (~ 400 cpm). SSO took OVM readings from soil adhering to the tank; readings were less than detectable. Tank remained in roped area at top of excav. pit.

1010 130-KW-1A Diesel Tank was resurveyed on the flatbed. Contamination was found which was missed on the first survey. Contamination was on lower end of tank.

HPT stopped work until an updated RWP was available and the excavation site was properly secured.

Both tanks were inspected for leaks when lifted. Both appeared in very good condition.

Continued on Page ______

Read and Understood By

C.E. Heiden 10/22/92

Signed Date Signed Date

9413275.2006

PROJECT 130-KW-1A & 130-KW-1B UST Removal

Continued From Page 59

1015 Contacted Mike Douglas to notify of situation. The lab se in cont. to take UST soil samples can not accept radiation contaminated soil (Sound Analytical). HPT would not allow any personnel into excavation pit until the proper RWP was in hand and site secured. Mike Douglas will contact State Dept. of Ecology.

1030 Contacted Mike Douglas. Response from Dept. of Ecology was that radiological contamination overrides any potential fuel contamination. Decided no soil samples were to be taken from the excavation pit. Following lunch and after the RWP is hand and site secured, the HPT will collect a couple of bags of soil from bottom of dirt cradles. The OVM/plastic bag shake method will be conducted th

1315 Returned to UST removal site. HPT ~~agreed~~ agreed to collect a bag of soil from the bottom center of each tank cradle site. The following readings were obtained using the OVM/plastic bag shake method:

130-KW-1A → .2 ppm
130-KW-1B → .2 ppm

No visible discolored sites of other unusual features were observed in the excavation pit.

130-KW-1A is to be removed from flatbed and placed back in secured area with 130-KW-1B. Both tanks will be wrapped with plastic. Soil will be placed back in excavation pit within 3 ft. of grade level. Tanks will be decontaminated over the pit.

Continued on Page

Read and Understood By

C.E. Aiden — Signed | 10/22/92 — Date | Signed | Date

APPENDIX E

CHRONOLOGICAL LISTING OF SIGNIFICANT REACTOR AND FUELS EVENTS FOR 100-KE/KW

CHRONOLOGICAL LISTING OF SIGNIFICANT REACTOR AND FUELS EVENTS FOR 100-KE/KW.

DATE	REACTOR OR FUELS	EVENT/REMARKS
September, 1952	KE & KW	Construction began on both reactors as part of Project X.
1954	Fuels	Lead dip process was adopted for all fuels. Core pre-heat and fuel assembly operations partially mechanized. Ultrasonic transformation (grain size) testers placed in operation. Semiautomatic welding machines replaced manual welders. Resumed fabrication of 8-in. normal fuel.
1955	Fuels	Continued use of cored fuels - up to 15% of production. Developed I&E fuel and produced initial reactor test load. Production facilities expanded to meat requirements of two new reactors. Radiograph adopted for testing all fuel. Automatic core etch machine replaced manual line. Automatic quench replaced manual machine. Penetration tester adopted for all fuel.
January 4, 1955	KW	Initial reactor start-up at 8:47 a.m. Nameplate design level - 1850 MW.
January 5, 1955	KW	Reactor shutdown at 2:04 a.m. due to fuel element failures resulting from a coolant stoppage at the rear pigtail of tube 4669. The stoppage resulted from a plug not removed during start-up tests when pre-start-up static pressure tests on the delta-scale instrument had been incorrectly inferred to indicate flow. The tube and tube bearing graphite blocks were replaced after drilling a 6-in. opening through the rear shield. Resumed operation March 11, 1955.
February, 1955	All Reactors	The hot start-up procedure, used in recovering from reactor scrams was discontinued February 10. A revised procedure was initiated February 24, limiting the power level rise to 50 megawatts per minute.
April 17, 1955	KE	Initial reactor start-up at 3:30 p.m. Nameplate design level - 1850 MW.
April, 1955	All Reactors	Irradiated metal cooling time in reactor building basins was increased from 90 days to 105 days due to iodine emission.
April 25, 1955 to April 28, 1955	KE & KW	Both reactors shutdown when the 100-KE effluent outfall line broke loose from its anchor in the river bed. The flow from both reactors was diverted to the 100-KW line pending repair of the 100-KE line. The 100-KE line was returned to service May 18, 1955.
May 15, 1955	All Reactors	The process water pH was reduced from 7.5 - 7.8 to 7.2 - 7.4 in an attempt to reduce corrosion of aluminum process tubes and fuel element jackets.
August, 1955	KE & KW	Significant mercury separation in Panellit gage switch bottles was experienced.
September 18, 1955 to September 27, 1955	KW	Replaced all front face aluminum connectors with teflon (a trademark of E.I. Dupond De Nemours) stainless steel braid reinforced connectors; all of the remaining original temperature monitoring bulbs (used to monitor coolant temperature in the process tubes) were replaced with interim type bulbs.
October, 1955	All Reactors	Started using a helium detector for locating process tube water leaks. Gases from the reactor atmosphere, entrapped in reactor effluent, are drawn by vacuum pump from one header at a time. Presence of helium indicates a leak on that crossheader and tubes are individually pressure tested.

DATE	REACTOR OR FUELS	EVENT/REMARKS
October 2, 1955 to October 13, 1955	KE	Replaced all front face aluminum connectors with teflon-stainless steel braid reinforced connectors. All except eight rows of tube temperature elements were replaced with new interim elements.
January, 1956	Fuels	Ultrasonic bond tester adopted for all fuel. Statistical sampling plan initiated for control of fuel length and cap thickness. Developed can-sleeve vibration for canning operation.
April 29, 1956	KW	The first K Reactor fuel element failure occurred in tube 3585 at an exposure of 595 MWD/T. The failed element was eight-natural uranium and was a split type failure. This excludes the failures during initial start-up caused by a flow stoppage.
September, 1956	Fuels	Began large-scale reactor testing of I&E fuel elements. Automatic component cleaning machine replaced manual line. Automatic sleeve cleaning machine replaced manual line.
December 11, 1956 to December 22, 1956	KE	Tie-in of 1706-KER facility. This is a test facility constructed adjacent to the KE Reactor in order to utilize recirculating loops and single-pass tubes in the KE Reactor.
January, 1957	Fuels	Production of cored fuel elements was discontinued. Initiated use of x-8001 Al alloy for testing purposes.
January, 1957	All Reactors	Completed the installation of Separan feed facilities. Separan is a coagulant aid used in the filtering of process water.
February, 1957	KE & KW	A second generator was placed in parallel with BPA to prevent scrams from power failures or surges.
May, 1957	Fuels	Process development transferred from 313 Building to 306 Pilot Plant. Autoclave time reduced from 40 to 20 hr. Spire vibration developed to improve wetting.
Summer, 1957	All Reactors	Partial fringe poison blankets were charged to reduce biological shield temperatures and assure the continuing adequacy of shield attenuation.
September, 1957	Fuels	Use of standard tru-line fuel began. Conversion of reactor loading to I&E fuel began.
November, 1957	KE & KW	Gamma monitoring system for the detection of fuel element failures put in service.
December, 1957	Fuels	Bond-penetration testers installed in plant. Study of solid state diffusion bonding processes initiated.
January 31, 1958	KE & KW	Reactor power level limits of 3140 MW were recommended by the Advisory Committee for Reactor Safety, and imposed by the A.E.C.
January, 1958 to July, 1958	KE & KW	Started loading central zones with internally and externally cooled fuel elements.
March, 1958	Fuels	Weld recovery process developed and adopted.
August 11, 1958	KE & KW	The first shipment of watermix elements was received for use in the 17th fuel element position from the downstream end.

DATE	REACTOR OR FUELS	EVENT/REMARKS
November 3, 1958 to December 1, 1958	KW	Started the installation of Resistance Temperature Detectors replacing Thermohms for monitoring tube outlet water temperatures.
December, 1958	Fuels	Special spire etch process adopted. Began the use of projection fuels.
January, 1959 to July, 1959	Fuels	Automatic welders installed in production line.
January, 1959	KE & KW	ACRS limits were relaxed to 4000 MW.
February 16, 1959	All Reactors	All Hanford reactors operated continuously for 8.9 days, a record for eight-reactor operation.
April 15, 1959 to May 10, 1959	KE	Completed the installation of Resistance Temperature Detectors.
May, 1959	Fuels	Fuel Quality Certification Program started.
June, 1959	Fuels	Vendor (cladding components) Evaluation Program was initiated.
January, 1960	KE	Non-equilibrium start-up losses significantly reduced by use of splines.
December, 1960	KE	Started use of nitrogen-helium gas atmosphere.
December, 1960	Fuels	Full-scale use of x-8001 Al alloy clad fuel began. Pressure quench was installed in the plant.
NOTE: As power levels increased, the trend toward greater production losses per start-up was markedly reversed during 1960 through the large-scale use of poison spline supplementary control.		
January 22, 1961	KW	Exhaust air from 105 Building was routed through absolute filters - Project CGI-791, "Reactor Confinement." Administrative levels increased 10% with particulate filters in use to 4400 MW.
January 24, 1961	KE	Exhaust air from 105 Building was routed through absolute filters - Project CGI-791, "Reactor Confinement." Administrative levels increased 10% with particulate filters in use to 4400 MW.
October 20, 1961	All Reactors	Reactor confinement project halogen filters installed and beneficial use obtained.
April 6, 1962	All Reactors	First total loss of 100 Area electrical power. Six operating reactors were scrammed. Reactor coolant loads were picked up by the secondary systems and there was no damage to reactor facilities.
July 10, 1962	All Reactors	All operating reactors were scrammed by a BPA power fault. All equipment of importance to reactor safety operated satisfactorily.

DATE	REACTOR OR FUELS	EVENT/REMARKS
July 21, 1962	KE & KW	Beneficial use of Project CGI-844 - 100-K Area Coolant Backup. This provides standby diesel and steam driven pumping facilities.
October 2, 1962	KE & KW	Beneficial use of Project CGI-833 - Increased Process Water Flow. This project involved additional river pumps at the 181 Building, new impellers and associated equipment for the 190 Building low lift pumps, rewinding the low lift pump motors (from 900 HP to 1,500 HP), reworking the high lift pumps and upgrading the electrical supply system. The process water flow at each K Reactor was increased by 30,000 GPM.
December, 1962	All Reactors	A total of 6684 aluminum tubes was replaced during CY-1962.
February 2, 1963	KW	Started the installation of zirconium tubes.
April, 1963	Fuels	Development of arch rail projection fuels began.
May 2, 1963	KW	Charged 51 tubes with lithium target elements on a pilot irradiation (IP-561) at a K Reactor.
May, 1963	KE	Started the installation of zirconium tubes.
May, 1963	All Reactors	Three reactor scrams were experienced - a record (monthly) low for eight-reactor operation.
May, 1963	Fuels	Hot die sizing provisional process specifications published. Fuel grading program was initiated.
June, 1963	KE	First 100% (monthly) T.O.E. for a K Reactor.
July 18, 1963	KW	Concluded 45.2 days of continuous operation - a K Reactor record.
September, 1963	Fuels	Discontinued radiograph as a fuels test.
November, 1963	Fuels	Conducted study of thoria fuels fabrication.
December 2, 1963	KE & KW	Reactor maximum power level limited to the highest level previously achieved - 4400 MW.
December, 1963	All Reactors	A total of 5981 (3509 zirconium and 2472 aluminum) tubes was replaced during CY-1963.
December, 1963	Fuels	Dimensional behavior problem of hot die sized fuel during irradiation became known.
January, 1964	Fuels	Began investigation of hot die size fuel irradiation behavior. Test quantities of thoria elements fabricated in laboratories. Thoria element fabrication development began.
January, 1964	KW	Established an all-time monthly input production record for a Hanford reactor (136.2 KMWDs).
February 6, 1964	KE	Completed the installation of zirconium tubes - 2351 installed.
March 1, 1964	KW	Completed the installation of zirconium tubes - 2358 installed.

DATE	REACTOR OR FUELS	EVENT/REMARKS
March, 1964	KE	First 100% monthly time operated efficiency since startup. Established an all-time monthly input production record for a Hanford reactor (136.5 KMWDs).
May, 1964	KE & KW	Established a new monthly input production record (242.o KMWDs).
May, 1964	All Reactors	Established a new monthly input production record (542.1 KMWDs).
August, 1964	All Reactors	A monthly record quantity of (927 tons) irradiated metal was shipped to CPD.
August, 1964	KW	Irradiations of thoria in the 6-ton U-233 demonstration program completed.
August, 1964	KE	Ninety columns of depleted uranium were charged. These depleted columns are to be irradiated to exposures of 1600 MWD/T to meet the 18% ^{240}Pu requirements.
August, 1964	Fuels	Provisional process specifications for thoria process issued and fabrication began.
September, 1964	KE	A total of 194 columns of depleted uranium is now charged as part of a program to produce 25 kgs of plutonium with 18% ^{240}Pu content. Initial charging started in August.
September 30, 1964	KW	Initial loading of thoria target elements charged in KW fringe as part of 110 kg uranium-233 order.
September, 1964	Fuels	Initial reactor charge of arch rail test elements.
December, 1964	All Reactors	CY-1964 MWD input production exceeded record year 1963 by 8.2%.
February, 1965	KE & KW	Thoria blankets now exist.
February, 1965	All Reactors	All reactors operated continuously for 9.3 days, exceeding the seven operating reactors record of February 16, 1959 by 0.4 day.
March 1, 1965	KW	The hydriding of zircaloy-2 process tubes was first observed.
April, 1965	Fuels	Production test of oil quench hot die size fuel demonstrated a marked improvement in dimensional behavior during irradiation.
May, 1965	Fuels	Preliminary development work began on fabrication of UO_2 elements.
May, 1965	KE	Depleted uranium irradiations for the production of 25 kg of plutonium containing at least 18% ^{240}Pu have reached goal. The irradiation will continue until October, 1965 or until ruptures occur, whichever is first.
June 15, 1965	Fuels	A second production run of thoria target elements was started.
June, 1965	KW	A flexible cooled HCR was installed in No. 2 channel.
July 23, 1965	Fuels	While running pile periods, a record power level of 800 watts was achieved at the Hanford Test Reactor.

94132775.2014

DATE	REACTOR OR FUELS	EVENT/REMARKS
July 31, 1965	KW	The failure of the No. 3 boiler at KW was caused by an explosion in the oil-fired furnace. Following extensive repair the boiler was returned to service March 9, 1966.
August, 1965	KE & KW	The irradiation of thoria to meet the 140 kg uranium-233 program requirements was completed. The fringes of 105-KE and -KW Reactors (along with B, C, and D) have been recharged with thoria in anticipation of future U-233 needs.
August 9, 1965	All Reactors	As in past years, a program was initiated to achieve a reduction in reactor coolant water temperatures through controlled Columbia River discharge from Coulee Dam. This program involves discharging cool water through discharge gates at the bottom of the dam instead of releasing the warmer water over the spillway. The program was discontinued September 8, 1965. An average reduction of 2 C in water temperature was realized.
September 15, 1965	KE	VSR channel No 49 was lined with a graphite sleeve. Boring of the biological and thermal shields was completed during August. The principal benefit from sleeving is to prevent the loss of 3X system poison balls into known stack voids in severely distorted VSR channels.
October, 1965	KE & KW	A program has been established to sleeve 24 VSR channels at these reactors.
October 14, 1965	Fuels	Thoria target element fabrication was resumed to prepare elements for charging into the K Reactor cores.
October, 1965	KE	The 12-ton depleted uranium irradiation (IP-694-A) was completed and the material was discharged at an average exposure of 2700 MWD/T and a Pu-240 content of 25.5%. A similar irradiation at B Reactor is continuing.
October 1965	KE	A partial E-Q core load was charged into 105-KE Reactor.
January 21, 1966	KE	The No. 1 oil-fired boiler at 165-KE was internally damaged by a firebox explosion during scheduled engineering diagnostic tests of the combustion system. The boiler was returned to K Reactor Subsection April 22, 1966 by Project Engineering for routine PM work before placing in service.
February 15, 1966	KW	Four NpO_2 target elements with 5 wt% neptunium in aluminum were charged (PT-IP-805) to confirm calculations on Hanford capability for producing ^{238}Pu.
March, 1966	KE & KW	Record reactor input production of 414.9 KMWDs exceeded the previous monthly maximum for these reactors (as well as B, C, and D) by 6.6%.
March, 1966	KE & KW	Examination of three Zircaloy process tubes removed from the K Reactors further confirmed that hydriding has resulted primarily from the galvanic couple between the Zircaloy process tube and the aluminum dummies.
April, 1966	Fuels	In the hot-die-sizing process, a 500-piece per shift throughout capability with a 95% yield was demonstrated.
April 13, 1966	KE	One final column of depleted fuel (PT-IP-694-A) was discharged with an exposure of 4020 MWD/T
April 21, 1966	KW	Full reactor beneficial use of Project CGI-967, "High-Speed Scanning System for Temperature Monitor - KW Reactor," was obtained with tie-in of the scanner to resistance temperature detectors.

DATE	REACTOR OR FUELS	EVENT/REMARKS
May, 1966	Fuels	Fabrication of a fuel element, approximately 1-in. larger in diameter than the nominal small reactor size, utilizing the rod-in-tube concept was achieved. This fuel assembly provides a high flux environment for isotope production and permits the use of various combinations of uranium enrichment and target materials.
May 14, 1966	KW	High power density fuel irradiations were initiated with the charging of five columns of 125 Metal (PTA-022).
May, 1966	All Reactors	The Columbia River cooling program for CY-1966 was initiated.
June, 1966	KW	Initial on-reactor experiments with grit blasting of K Reactor zirconium process tubes for zirconium hydride removal were performed.
June, 1966	KW	Analyses of samples from a Zircaloy-2 process tube removed from KW Reactor after six months service with anodized aluminum dummies indicate no detectable hydrogen pickup.
July 8, 1966 to July 9, 1966	KE & KW	All operating reactors had to be shutdown because of strikes by the Hanford Atomic Metal Trades Council against two Hanford contractors - ITT/Fss and BNW. The 105-KE Reactor was on a scheduled outage when the strike began.
July, 1966	KE & KW	The cause of hydriding of Zircaloy-2 process tubes in the K Reactors has been established as an electric coupling of the aluminum (dummies) and the Zircaloy-2.
August 25, 1966	KE & KW	All DUN-operated reactors were back in operation following a strike by the Hanford Atomic Metal Trades Council.
August, 1966	All Reactors	The Columbia River Cooling Program was canceled because of extended reactor outages resulting from the work stoppage.
September 5, 1966	KW	The initial test of 125 Metal fuel elements for high power density fuel irradiation was discharged at an average exposure of 1060 MWD/T (PTA-022). This was the initial irradiation of elements operating at specific powers up to 150% of current powers.
October 10, 1966	KE	The high speed scanner, Project CAI-174, was connected to the process tube temperature detectors, thereby achieving beneficial use of the system.
October 23, 1966	KE	The first non-die-sized rod-in-tube fuel elements to be given in-reactor testing were charged into a KER test loop.
November 1, 1966	Fuels	Installation of the facility for anodizing aluminum dummies was completed. These coated dummies are for use in Zircaloy tubes at the K Reactors to inhibit hydriding.
December 19, 1966	KW	The automatic scram feature of high speed scanning system which monitors the effluent water temperature of individual process tubes at the rate of 4000 per second was tied into the No. 1 safety circuit.
December 25, 1966	KW	The first third of the KW Reactor E-Q load was charged (PITA-048). This charging of 100 tubes of depleted uranium plus supporting enrichment (94 Metal) represented the start of a program in 105-KE and -KW Reactors to produce 215 kg of plutonium containing about 27% ^{240}Pu.
December, 1966	KW	Examination of the second cycle of HDS columns (PTA-011) from KW Reactor supports previous observations that, in the K Reactors, HDS fuel appears to suffer greater localized corrosion than Al-Si-bonded fuel.

DATE	REACTOR OR FUELS	EVENT/REMARKS
January, 1967	KW	The first discharge of nondefense plutonium (fuel with 8-9% ^{240}Pu) for the Zero Power Plutonium Reactor program occurred. This is a continuing program to produce 1150 kg of nondefense plutonium for the ZPPR program.
January 9, 1967	KE	The first 100 columns of depleted uranium fuel plus supporting 94 Metal were charged. This represents the first third of 105-KE Reactor's E-D load under PITA-048, to produce plutonium containing 27% ^{240}Pu.
February, 1967	KE & KW	A total of 160 columns of depleted uranium fuel, plus supporting 94 Metal, was charged into each of the K Reactors. This is the second segment of the E-D loads (under PITA-048) to produce plutonium containing 27% ^{240}Pu.
March, 1967	KE & KW	Because of lower than expected reactivity the last segment of depleted uranium to be charged in 105-KE and -KW Reactor was split into batches. Twenty-five tubes at 105-KE and 24 at 105-KW were charged.
April, 1967	KE & KW	Analysis of eight Zircaloy tubes removed from the K Reactors indicates the rate of hydride formation in the base metal to be 26.9 ppm/yr, confirming previous observations indicating 25-30 ppm/yr.
April, 1967	KE	In the demonstration test for ^{238}Pu production, finished neptunium elements were made available for charging at 105-KE Reactor only 44 days after the neptunium had been discharged from 105-N Reactor. This is well within the 50-day turnaround considered critical for the recharging of neptunium.
April, 1967	KW	The last 23 tubes (for a total of 310) of depleted uranium were charged completing this special E-D loading (PITA-048) at KW Reactor. Approximately 850 tubes of 94 Metal have been charged in support of this irradiation.
April, 1967	KW	The 210 E-N test (PTA-054) which consists of 17 columns of 210 Metal fuel columns and five columns of lithium-bearing target elements was charged in a block array.
May, 1967	KE & KW	Analysis of Zircaloy coupons irradiated for 240 operating days confirmed earlier tests that elimination of the galvanic couple between aluminum and Zircaloy would prevent further movement of hydrogen into the base metal of the K Reactor tubes. Thus, the use of grit-blast to remove the existing hydride layer appears unnecessary.
May, 1967	KE	The last 25 columns of depleted uranium (for a total of 310) were charged into 105-KE Reactor completing the special E-D loadings in 105-KE and -KW in accordance with PITA-048.
May 7, 1967	KE	The supporting block for the neptunium irradiation was charged into 105-KE Reactor during an outage May 7 and the first neptunium column was charged during operation on May 14.
May 25, 1967	KW	On the high power density fuel program, 20 tubes were charged on PTA-067 which authorizes the irradiation of 100 tubes in KW Reactor at 150% of base specific power.
June, 1967	KE & KW	A nondefense plutonium program, as specified by the AEC-RL, is under way at the four production reactors.
June, 1967	KE	Two columns of neptunium target elements, being irradiated under PTA-063, were charged during equilibrium operation.
July, 1967	KE	KE Reactor achieved a K Reactor operating record when it concluded 46.5 days of continuous operation.

DATE	REACTOR OR FUELS	EVENT/REMARKS
July, 1967	KE & KW	Based on results from GETR irradiations of graphite samples removed from KW Reactor in December, 1966, and at current KE/KW operating conditions, contraction of the graphite should continue for at least another three to four years, after which expansion can be expected.
July, 1967	KE & KW	A production test program, involving both natural and enriched fuel, has been developed for determining the ability of K Reactors (as well as B and C) to produce plutonium with Pu-240 assays in the range of 12 to 15%.
July, 1967	Fuels	Hot-die-sizing process development for producing the rods of the 1-in. overbore rod-in-tube fuel elements was completed.
August, 1967	KE	A 100% time operated efficiency was achieved at K Reactor.
August, 1967	KE & KW	Both reactors operated concurrently for 13.3 days, their longest period of combined uninterrupted production.
August, 1967	KW	The first UO_2-Mo cermet fuel pin capsule cooled with recirculating helium was discharged from a special test facility at KW Reactor after achieving its goal exposure of 2,000 hr. A similar second capsule was charged. These experiments are part of a NASA-Lewis Research Center program for the development of a nuclear space propulsion system.
September 18, 1967	KE	Reactor achieved 48.5 days of continuous operation, a record run for a K Reactor.
October, 1967	KW	The 2.1 E-N test irradiation was terminated when one of the 210 Metal fuel elements failed due to the loss of element supports by corrosion.
January, 1968	KW	Sixty-one columns of 125 Metal and five thermocouple trains were charged in the second phase of the 150% specific power test (PTA-067).
February, 1968	KE & KW	An order was received for 360 kg of "clean" ^{233}U for use in the AEC's seed and blanket reactor development program.
April, 1968	KE	Achieved 48.8 days of continuous operation, a new record for a K Reactor.
May, 1968	KE & KW	Results of the analysis of 14 Zircaloy process tubes removed form the K Reactors after 55 to 59 months of exposure indicate the anodized spacers have not stopped hydrogen entry into the base metal.
May, 1968	KE & KW	An economic study of segmental charge-discharge at the K Reactors showed a substantial incentive for the use of this technique if the refueling rate for natural uranium fuel elements can be made to equal current rates.
May 25, 1968	KE	Reactor shutdown for the discharge of the depleted uranium load and the charging of a thoria load. The discharge in June of the remaining depleted metal in KW, and the charging of thoria there, will complete the program to produce plutonium containing 27% ^{240}Pu, and will finish the initial charging of thoria loads in 105-KE and -KW to assure the delivery of 360 kg of "clean" ^{233}U as scheduled.
June 19, 1968	KW	The reactor was scrammed at 11:23 p.m. by a low-pressure Panellit trip on tube 3560. A piece of metal about 11/16 in. diameter by 3 in. long had lodged in the venturi throat, completely stopping coolant flow to the tube. The fuel charge and process tube were removed form the channel and operation was resumed July 28, 1968.

DATE	REACTOR OR FUELS	EVENT/REMARKS
June, 1968	KE	For the year ended June 30, 105-KE exceeded its FY-1966 record by 0.1%.
August, 1968	KE	The testing of lithium-aluminum splines was started (PTA-136).
September, 1968	KE & KW	Effective September 1, top-of-riser pressure and process tube power limitations were imposed at both K Reactors because of safety concern for the brittle fracture potential of the inlet piping. TORP was reduced 10%. Maximum power levels were in the 400-4200 MW range.
September, 1968	KE	Two lithium-aluminum splines were irradiated in 105-KE Reactor for 15 days (PTA-136) to demonstrate this method the discharge of the depleted uranium load and the charging of a thoria load. The discharge in June of the remaining depleted metal in KW, and the charging of thoria there, will complete the program to produce plutonium containing 27 ^{240}Pu, and will finish the initial charging of thoria loads in 105-KE and -KW to assure the delivery of 360 kg of "clean" ^{233}U as scheduled.
June 19, 1968	KW	The reactor was scrammed at 11:23 p.m. by a low-pressure Panellit trip on tube 3560. A piece of metal about 11/16 in. diameter by 3 in. long had lodged in the venturi throat, completely stopping coolant flow to the tube. The fuel charge and process tube were removed form the channel and operation was resumed July 28, 1968.
June, 1968	KE	For the year ended June 30, 105-KE exceeded its FY-1966 record by 0.1%.
August, 1968	KE	The testing of lithium-aluminum splines was started (PTA-136).
September, 1968	KE & KW	Effective September 1, top-of-riser pressure and process tube power limitations were imposed at both K Reactors because of safety concern for the brittle fracture potential of the inlet piping. TORP was reduced 10%. Maximum power levels were in the 400-4200 MW range.
September, 1968	KE	Two lithium-aluminum splines were irradiated in 105-KE Reactor fir 15 days (PTA-136) to demonstrate this method for making tritium. No major problems were noted.
November, 1968	KE & KW	Three additional lithium-aluminum splines have been irradiated 43 days without incident except that one broke during removal. Subsequent inspection revealed extreme brittleness.
December, 1968	KE	The dome section and 25 in. of straight pipe were removed from the D riser as part of the riser sampling program for brittle fracture studies (PTA-156).
January 24, 1969	KE	A prototype uncooled control rod was installed at KE. This flat rod has hinged 40-in. segments, each consisting of a dysprosium oxide-nickel cermet core in a coextruded Inconel sheath.
February 20, 1969	KE	A 10 kg plutonium irradiation was charged into 105-KE Reactor to establish neutronic interactions and to investigate plutonium fuel characteristic (PTA-150).
March 27, 1968	KE	Discharge chute clearing equipment was installed (DAP-510).
May 27, 1969	KE	Twelve target samples of americium for the production of medical-grade ^{238}Pu were charged into a single column (PTA-171).

DATE	REACTOR OR FUELS	EVENT/REMARKS
June, 1969	KE	Examination of two Zircaloy tubes from 105-KE Reactor, which had been grit-blasted September 10, 1966 and subsequently operated with anodized dummies, agrees with earlier observations that no further hydriding occurs where the case layer removed by grit-blasting has been complete.
June, 1969	Fuels	$395,000 was authorized for replacing the Al-Si bonding process with not-die-sizing for the production of K Reactor fuels.
July, 1969	KE & KW	Tests indicate it is feasible to use 105-C Reactor fuel in the central zone of the 105-K reactors.
July 18, 1969	KE	Completed the modification of reactor coolant cross-tie piping.
September 22, 1969	Fuels	Al-Si canning operations were reduced from three to two lines per day, 5 days/wk.
October, 1969	KE & KW	Thoria and supporting 94 Metal were discharged completely from 105-KW and partially from 105-KE, with replacement by natural uranium. Subsequent discharge of the remaining thoria from 105-KE will complete the KNR ^{233}U program.
December, 1969	KE	The remaining thoria and supporting 94 Metal were discharged from 105-KE Reactor completing the DNR ^{233}U program.
December, 1969	KW	A 100% time operated efficiency represents the sixth time in its history that a full month of uninterrupted operation has been achieved.
December, 1969	KW	Twenty-eight columns of 11-in. hot-die-size-fuel elements were charged into the central zone to compare alternate heat treatment processes, as used by NLO, with respect to the dimensional stability of these fuel cores.
February, 1970	KW	Reactor deactivated.
January 1971	KE	Reactor deactivated.

THIS PAGE INTENTIONALLY LEFT BLANK