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100-F Reactor Site Technical Baseline Report Including Operable Units 100-FR-1 and 100-FR-2

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1.0 INTRODUCTION

This document is prepared in support of the 100 Area Environmental Restoration activity at the U.S. Department of Energy's Hanford Site near Richland, Washington. It provides a technical baseline of waste sites located at the 100-F Reactor site and results from an environmental investigation undertaken by the Westinghouse Hanford Company History Office in support of the Environmental Restoration Engineering Function. It is based 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. Units of measure are shown as they appear in reference documents.

The 100-F Area is made up of the 100-FR-1, 100-FR-2, and 100-FR-3 Operable Units and includes liquid and solid waste disposal sites in the vicinity of, and related to, the 100-F Reactor and Experimental Animal Farm. This report describes 100-FR-1 and 100-FR-2 facilities and waste sites including cribs, canals, trenches, pits, french drains, retention basins, solid waste burial grounds, septic tanks, and drain fields. It does not include 100-FR-3 data. Each waste site is described separately. Photographs are provided where available. It should be noted that this document was previously issued as WHC-SD-EN-TI-169, Rev. 0.

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

2.0 BACKGROUND

2.1 GENERAL DESCRIPTION OF 100-F FACILITIES

Nine water-cooled, graphite-moderated plutonium production reactors were constructed by the U.S. Government along the Columbia River at the Hanford Site over a 20-year period from 1943 to 1963. All nine are owned by the U.S. Government and are managed by the U.S. Department of Energy (DOE). All are retired from service, have been declared surplus by the DOE, and are available for decommissioning. The 100-F Reactor is one of these.

Adjacent to the 100-F Reactor site was the Experimental Animal Farm (EAF), which operated from 1945 until 1976 to study the effects of occupational exposure of ionizing radiation to humans.

Figure 2-1 shows facilities present at 100-F Area during reactor operation. Figures 2-2 through 2-6 are aerial photographs of the area.

2.2 AREA HISTORY

The area included in and immediately adjacent to the 100-FR-1 and 100-FR-2 Operable Units was irrigated farm and livestock grazing land prior to its acquisition by the U.S. Army in January 1943.

Anciently, the area along the banks of the Columbia River in the area of 100-F was a favorite camping and village site for northwestern Indian tribes and is thereby rich in Native American archeology. Nine prehistoric archaeological sites exist within 2 km, although none have been identified within the confines of the operable units (Cushing 1988).

Within the same 2 km resides the area's principal historic site at the East White Bluffs ferry landing and townsite. It has been nominated to the National Register of Historic Places.

All facilities at 100-F Area have been fully deactivated and no personnel are assigned or reside there. The site is seldom visited for other than routine security checks by Hanford Patrol and periodic radiation/contamination checks by Site safety personnel. Boaters and sports fishermen frequent the Columbia River adjacent to the site but are legally prohibited from trespassing.

2.3 REACTOR SITE HISTORY

Construction of the 100-F Reactor began in December 1943. It was the third of three original Hanford reactors built during, and in support of, World War II. Its mission was to manufacture plutonium for explosive devices to be used in the European and/or Pacific Theaters.

Figure 2-1. Map of the 100-F Area Showing Facilities Present During Reactor Operation.

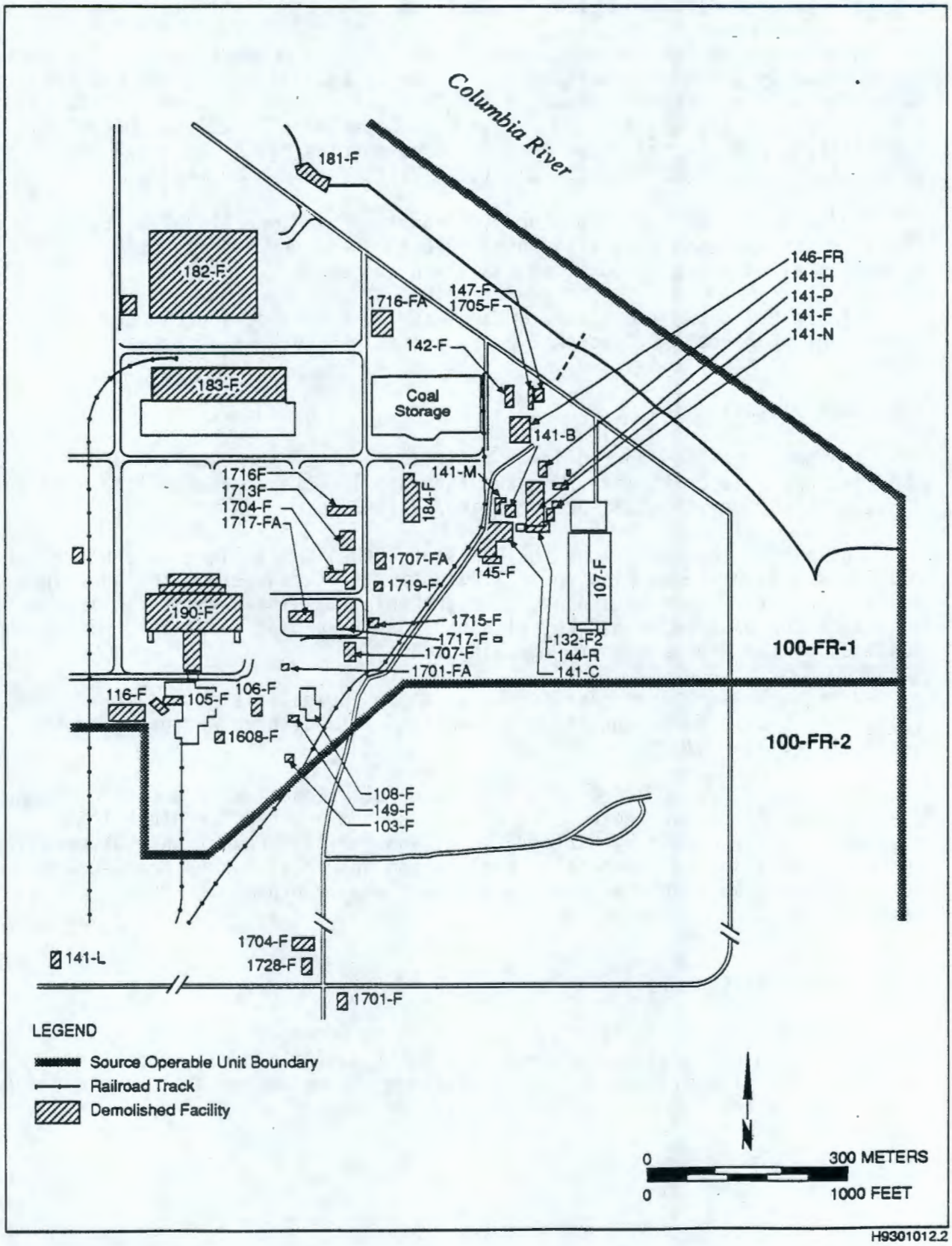

Figure 2-2. Aerial View from Southwest, 100-F Area During Construction. Photograph taken December 1944 (P-7840).

Figure 2-3. Aerial View from East, 100-F Area During Reactor Operation (6451-5).

Figure 2-4. Aerial View from West, 100-F Area During Reactor Operation (6451-8).

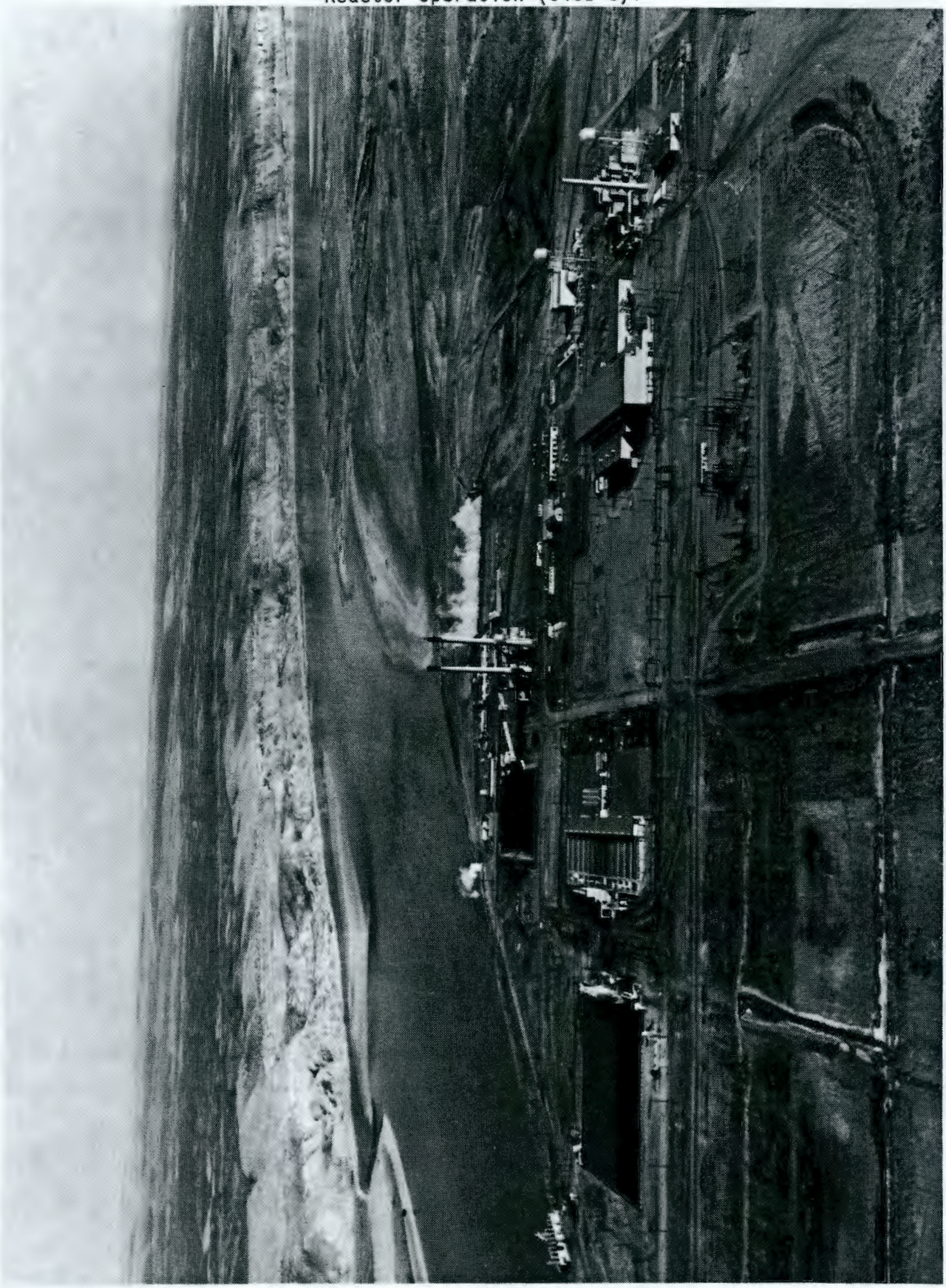

Figure 2-5. Aerial View from South, 100-F Area, ca. Late 1960's (91041622-1).

Figure 2-6. Aerial View, 100-F Area As It Appears Today (91060518-6).

European victory in May 1945 had little effect on the urgency to develop nuclear weapons which, it was hoped, would bring a speedy end to the war in the Pacific. 100-F construction was completed in February 1945. Initial fuel load was accomplished later that month, and the reactor went critical for the first time on February 25, 1945. Construction, from ground breaking to initial operation, took only 14 months.

Operating initially at 265 MW (thermal) of power, 100-F operating limits were gradually increased over the years until 2,090 MW was authorized in 1961, and operations continued at that level until deactivation on June 25, 1965. The reactor has continued in deactivated status since that date.

The reactor site consisted of several major buildings including the reactor building and several structures associated with the treatment and storage of reactor cooling water. Most were deactivated with the reactor in 1965 and have since been decommissioned. Of the dozen or so reactor-related structures, only the 105-F Reactor Building, the 107-F Retention Basins, and the 108-F Reactor Lab (later to become the Biology Lab) remain standing today.

2.3.1 Reactor Process Liquid Wastes and Cooling Water Effluent

DOE-RL (1992) and other sources provide the following summary of reactor-based waste streams.

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-F Area in terms of potential impact on the groundwater. Tens of millions of liters of this waste were disposed of directly to the soil column, both intentionally and as a result of leaks in the cooling water effluent system (DOE-RL 1992).

2.3.1.1 Reactor Cooling Water System. A continuous supply of high-quality cooling water was essential to reactor operations to prevent damage to the reactor core from excess heat generated by the fission reactions. Many of the facilities in the 100-F Area were part of this cooling water system. At a daily use rate of 50 to 100 million gal, this system generated the largest effluent volume in the area.

Water obtained from the Columbia River was extensively treated before passing through the reactor. 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, and reactor horizontal control rods. The cooling water exiting the reactor contained radioactive species from the reactor and chemical contaminants added to treat the raw water before use. After exiting the reactor, the cooling water passed through a retention basin and was then discharged to the river (DOE-RL 1992).

Several chemical additives were used to treat the cooling water. These included aluminum sulfate (alum) with excess hydrated calcium oxide to enhance the removal of suspended sediment, sulfuric acid to control water pH, chlorine to control algae growth, and sodium dicromate to inhibit corrosion. The pH

was maintained at about 7.5, and the free chlorine residual was approximately 0.2 mg/L. Sodium dichromate was added at a rate of about 2 mg/L (Richards 1953, DOE-RL 1992).

Water discharged from the reactor was near boiling. It passed through at a rate of 47,700 gal/min until 1956 when the flow was increased to 71,000 gal/min (DeNeal 1965).

While the water was in the reactor, it absorbed thermal energy from the nuclear process and became contaminated with radioactive isotopes. Several sources of contamination were as follows.

- The high neutron flux in the reactor core 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 (^{41}Ca is a notable exception).

- Activation products from the graphite reactor core, 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}Eu, ^{154}Eu, and ^{155}Eu.

- Fuel element fission products such as ^{90}Sr and ^{137}Cs and transuranics such as ^{239}Pu and ^{240}Pu were introduced into the cooling water in the event of fuel cladding failures.

The concentrations of radionuclides in reactor cooling water were low during normal operations, with an approximated activity of 0.2 μCi/L (Parker 1947). This reference does not address radionuclide concentrations at elevated reactor power levels, which were permitted in later years.

The cooling water was transferred from the reactor building through effluent lines to the 116-F-14 Retention Basin for cooling and decay of short-lived radionuclides (approximately 2.5 to 4 h) (Healy 1951). From the retention basins, the water was transferred through a large pipe to the 116-F-8 outfall structure and into pipes that discharged at the center bottom of the Columbia River. Overflow from the outfall would discharge directly to the shore of the river via the outfall spillway.

Over the operating lifetime of the reactor facility, the retention basins and effluent piping developed leaks, releasing cooling water to the area in and around the basins, lines, and river shore at a rate as high as several thousand liters per minute (Dorian and Richards 1978). Specific information on leak rates from the 116-F-14 Retention Basin is not available; however, contamination detected around the basin indicates that leakage did occur. A particularly significant release occurred at the basin in May 1955 when baffles in the basin broke loose and plugged the basin outlet. The cooling water overflow contaminated the immediate vicinity of the basin and drained to the Columbia River via a narrow trench near the northeast corner of the basin (the basin leak trench) (Selby and Soldat 1958).

During reactor operations, fuel cladding failures sometimes occurred while the fuel elements were in the process tubes. The first such cladding failure in any reactor occurred at the F Reactor in 1948. Over the

operational lifetime of the reactor, there were several hundred such cladding failures (DeNeal 1965).

When fuel cladding failed, the cooling water in the affected process tube became highly contaminated, and elevated radiation levels were observed in the cooling water exiting the reactor core. It was decided to divert the contaminated water through a trench to the soil column rather than to the river via the retention basin. In 1947, the 116-F-2 Overflow Trench was excavated in the area just south of the retention basin. The retention basin was, by construction, divided into two compartments. When a fuel cladding failure occurred, the highly contaminated water was segregated into one of the two compartments and drained to the overflow trench via a 12-in.-diameter steel pipe that connected the basin outlet with the north end of the trench. This practice was continued on a regular basis until 1954 when increased flows and structural stresses on the basin due to the temperature differences between the full and empty sides necessitated that both sides of the basin be used in parallel. It appears that at that time, a ditch (the EM bypass ditch) was excavated from the basin inlet to the center of the overflow trench and was used to direct contaminated cooling water to the trench.

A second system that was briefly used for handling contaminated cooling water from fuel cladding failures was a soil column disposal site called the 116-F-4 Pluto Crib. The Pluto Crib received only the highly contaminated water that was flushed directly from the process tube affected by the fuel cladding failure before it could mix with water from unaffected tubes. The crib was used from 1950 to 1952, after which the highly contaminated cooling water was no longer segregated from the bulk of the cooling water. The 116-F-2 and 116-F-4 Trench and Crib are significant waste units because they consisted of direct soil column discharge of liquid wastes with presumably high contaminant concentrations (DOE-RL 1992).

Major reactor maintenance and upgrade outages generated large volumes of cooling water effluent to be disposed of. When the Ball 3X system was installed in 1953, the reactor effluent was discharged to the river via the 116-F-1 Trench (Lewis Canal). Another major disposal area for cooling water effluent during reactor and retention basin maintenance outages between 1952 and 1965 was the 116-F-6 Trench located just south of the reactor building.

2.3.1.2 Fuel Storage Basin Water. Occasionally, a fuel element in the storage basin would rupture or an element would be found to be ruptured when discharged from the reactor core. This caused the storage basin shielding water to become highly contaminated. From the information available on the F Reactor, it is not clear how often this occurred or where the contaminated water was disposed of. When the storage basin was decommissioned in 1970, the water level was drained to within 2 to 4 ft from the basin bottom and the water was drained to the 116-F-2 Trench. The basin was subsequently back-filled with soil, burying the sludge and miscellaneous equipment (fuel buckets Oand spacers, aluminum tubing, and wood floor planking) that was in the basin aOt the time (Dorian and Richards 1978).

2.3.1.3 Decontamination Solutions. During reactor operations and reactor shutdowns, large quantities of decontamination solutions were used routinely to remove radionuclides from reactor equipment and facility surfaces. Decontamination activities took place at the F Reactor dummy decontamination facility wash pad, which was adjacent to the fuel storage basin.

Known decontamination solutions included chromic, citric, oxalic, nitric, sulfamic and sulfuric acids (neutralized with sodium carbonate before disposal), and sodium fluoride. Other chemicals, including organic solvents, also were used for some decontamination processes. These solutions were generally disposed of in cribs, trenches, and/or french drains in the immediate vicinity of the building where they were used. Decontamination solutions from the 189-F Building were released to the 116-F-1 Trench. Occasionally, solutions were combined with the cooling water and discharged to the river via the 107-F Retention Basin. 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 1992).

2.3.1.4 Radioactive Sludges 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-F-14 Retention Basin, and in the reactor fuel storage basin. Smaller volumes of sludge also collected in water traps located in the 115-F Gas Treatment Building and the 117-F Air Treatment Facility. The sludge consisted of diatomaceous earth used periodically to scour the reactor process tubes and fine particulate matter that originated from dissolved and suspended solids in river water, pipe slag, rust, failed fuel elements, graphite powder, 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-F-14 Retention Basin and the reactor storage basin. At least once during reactor operations, an unknown quantity of sludge was removed from the 116-F-14 Retention Basin to an unspecified burial site approximately 100 ft from the southeast corner of the basin. Approximately 1.8×10^6 kg (2,000 tons) of sludge is estimated to remain in the retention basin (Dorian and Richards 1978).

Sludge from the reactor fuel storage basin was removed once in 1951 and placed in the 116-F-3 Storage Basin Trench. No other records have been located that describe sludge removal until 1970 when the basin was backfilled and the sludge buried in situ.

Radioactive solid wastes generally consisted of reactor components, contaminated equipment, and 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, process tubes, and lead. Lesser quantities of gunbarrels, thimbles, control rods, nozzles, pigtails, 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 ^{63}Ni. The following two reactor modification projects were responsible for much of the solid waste from F Reactor:

- The Ball 3X Project, in which the liquid boron system for emergency reactor control was modified to a system using solid boron steel and carbon steel balls

- The tube replacement project, in which nearly 4,000 aluminum process tubes from the F Reactor were replaced between 1956 and 1965 (DeNeal 1965).

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

The primary disposal areas for the 100-F Area were the 118-F-1 and 118-F-2 Burial Grounds located in the 100-FR-2 Operable Unit. Irradiated reactor components removed during the Ball 3X system installation were buried in the 118-F-3 Burial Ground. Other reactor hardware has been placed in the 118-F-7 Storage Box, a buried concrete vault with a wooden lid.

Radioactive solid waste buried within the boundaries of the 100-FR-1 Operable Unit include buried building foundations, buried contaminated concrete-lined tunnels, buried pieces of concrete and other materials from demolished buildings, and buried pipelines. Contamination in these cases resulted mainly from surface contact with contaminated air, dust, and liquid solutions. In cases where decontamination and decommissioning have occurred, radiation levels are low (DOE-RL 1992).

2.3.1.5 Reactor Ventilation System and Inert Gas System Wastes. Two gas systems were associated with the reactor: the primary ventilation system and the inert gas system. The primary ventilation system circulated fresh air through the staffed areas of the reactor building into zones of increasing contamination levels and upward past the reactor to an overhead duct. The duct carried the air to an exhaust fan system located adjacent to the exhaust stack. Air in the reactor building became contaminated with radionuclides that were present as radioactive gases, entrained vapors, and particulates generated by the cascade of cooling water in the reactor. The emissions may have resulted in surface contamination in the 100-F Area, as evidenced in part by the presence of ^{14}C in vegetation. Other radionuclides associated with gaseous emissions include tritium and ^{129}I.

Originally, the ventilation air was released directly from the reactor building to the stack and subsequently to the atmosphere. In 1960, a filtering system was added to minimize the release of radioactive matter from the reactor building. This filtering system was placed below ground in the 117-F Building just west of the reactor building. The exhaust air was passed downward through a duct to a tunnel leading to the filter building. After filtration, the air was routed back through a second tunnel to the air exhaust stack. Two types of filter banks were used, a fine-particulate removal bank and an activated charcoal bank. Samples obtained during decommissioning of the 117-F Building revealed that the inside surfaces of the concrete-lined

tunnels and the equipment and wall surfaces of the fan rooms and filter chambers had surface-smearable radioactive contamination.

The purpose of the reactor inert gas system was to provide a closed-loop nonreactive gas environment in the graphite core that would remove moisture and gases from the core and serve as a heat transfer medium between the graphite core and the process tubes. The system also served to detect water leaks within the reactor core. A mixture of helium and carbon dioxide, driven at low pressure by a blower system located in the 115-F Gas Treatment Facility, was circulated through the graphite pile.

Filters, gas coolers, blowers, condensers, and silica gel drying towers were located within the 115-F Building. The system was designed to maintain gas pressure in the reactor at a slightly positive value with respect to the ventilation air so that the air could not make contact with the graphite core. When a leak was detected, the gas was routed to the ventilation exhaust system. Contamination of the 115-F Building occurred on the inside surfaces of ducts, concrete surfaces, machinery, and filters, as indicated by analysis of smear samples taken from these surfaces (Dorian and Richards 1978). The tunnels that connected the 115-F Building to the 105-F Reactor Building were also radioactively contaminated (DOE-RL 1992).

2.4 EXPERIMENTAL ANIMAL FARM HISTORY

Experimental Animal Farm operations began in 1945 and continued until 1976 after which all research was conducted at the new Life Sciences Center in the 300 Area. Early EAF studies were conducted to measure the effects of reactor effluents on fish. Later research included the use of swine, sheep, dogs, and rats. Other animals were used to a lesser extent.

Experimental Animal Farm facilities included numerous laboratories, barns, pens, pastures, and kennels. Most facilities were decommissioned and razed in 1978 and 1979. Only the 108-F Biology Lab remains standing today. Figure 2-7 shows EAF facilities that existed during EAF operation.

Operations varied widely depending on the nature and scope of the particular experiment, but generally involved the introduction of radioisotopes into living tissue, with followup study to identify and measure its effect over time. Radioisotopes were introduced to laboratory animals through several methods including inhalation, inoculation, ingestion, and absorption. Radioisotopes included ^{131}I, ^{90}Sr, ^{137}Cs, and isotopes of plutonium and uranium. Nearly all such research contributed to radioactively contaminated waste streams. Additional experiments measured the effects of radiation without the introduction of radioisotopes.

Essentially all EAF research required the use of laboratory animals or plants and generated waste streams. It was typical for part of each animal experimental group to be sacrificed following exposure to radiation or radioisotopes to study the short-term effects of the exposure. Other exposed animals were bred and long-term effects studied over many generations of offspring.

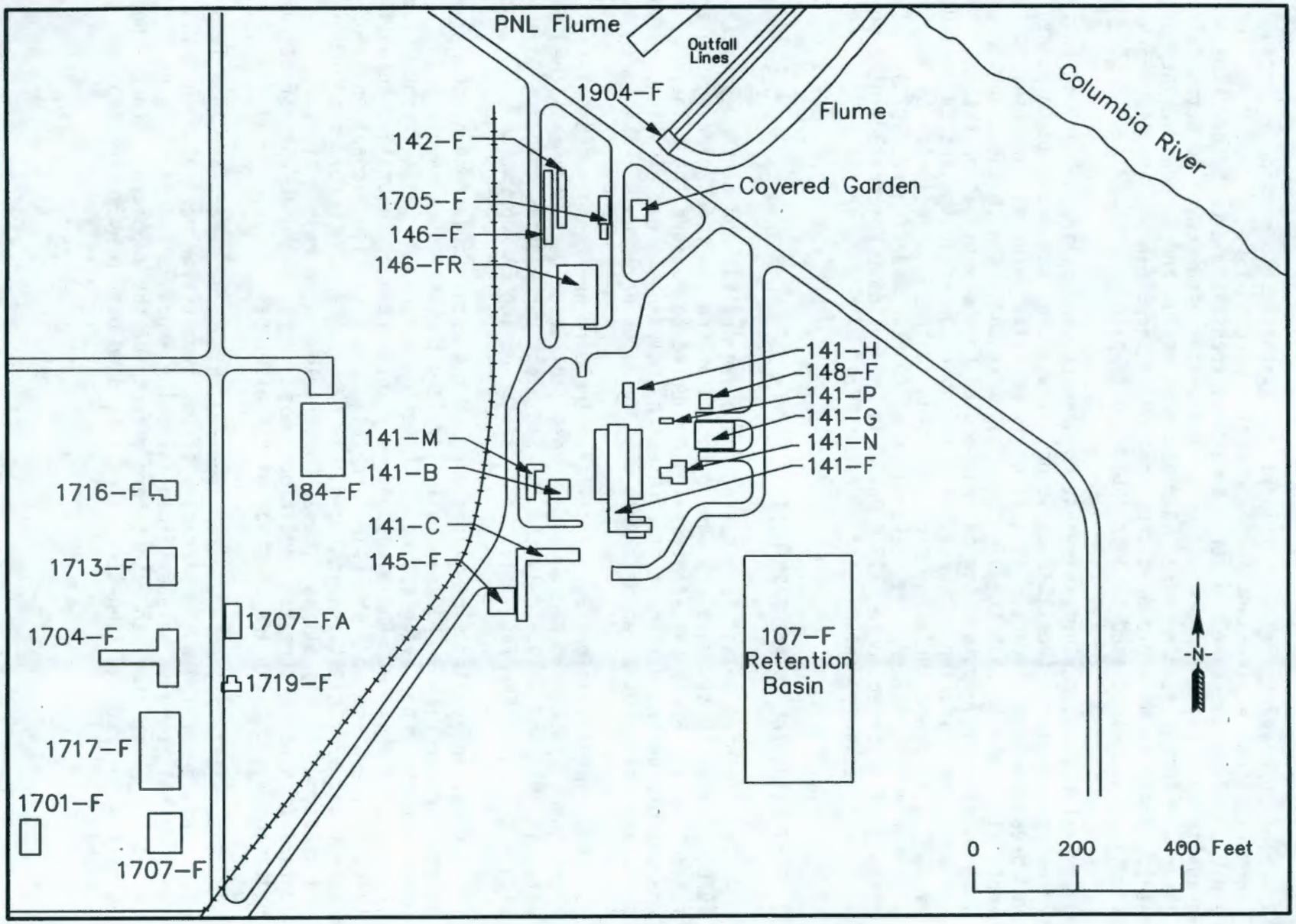

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Figure 2-7. Map of the Experimental Animal Farm Showing Facilities Present During the Operation.

Several liquid and solid waste sites were required for EAF operation. Sacrificed animal carcasses were disposed of in solid waste burial grounds. Animals kept for long-term study were caged in a laboratory environment and their urine and feces collected for analysis. Droppings that were not collected for analysis were collected with sawdust from pen floors and disposed of in the 118-F-5 Sawdust Pit. Other dropping wastes were washed down drains and into the 141-N Sewer from which solid materials were filtered and disposed of as solid waste; liquid waste was pumped to the EAF outfall structure for disposal in the Columbia River.

2.4.1 Experimental Animal Farm Facilities

DOE-RL (1992) provides an excellent summary of EAF facilities and their operational histories. This section summarizes that data.

The main biology laboratory for studying the effects of radiation on animals and plant life was the 108-F Building, which operated from 1945 to 1976. It contained offices and laboratories and a heavily shielded high-energy exposure cell. It should be noted that the first few years of 108-F operation were as a reactor laboratory and its biology mission did not begin until about 1950. The building was modified and added to several times over its operational life span.

The earliest animal research at 100-F was fish research that began in 1945 at the 146-F Fish Lab. These studies involved exposing fish to varying concentrations of reactor cooling water effluent to assess possible effects of effluent discharge on aquatic life in the Columbia River. In addition to hatchery troughs in 146-F, there were six rearing ponds located next to the laboratory (see Hanford Drawing H-1-13850, sheet 3). Effluent water was supplied to the laboratory facilities via the 147-F Pump House. Water was continuously circulated through the troughs at a rate of about 0.2 to 0.3 L/s (3 to 5 gal/min) (Foster 1946) and was discharged to the Pacific Northwest Laboratory (PNL) outfall via the 147-F Pump House.

Around 1951, a second aquatic biology facility (146-FR) was constructed. Like 146-F, it had hatchery troughs and laboratories. Activities in 146-F were phased out, and the building was used for storage after construction of 146-FR.

Studies involving sheep began in the late 1940's. Up to 1,000 head of sheep were kept for use in dose studies using ^{131}I, ^{90}Sr, ^{239}Pu, and ^{137}Cs. Most of the work performed involved 20-year lifetime exposure studies. In 1952, the first studies involving swine began at the site. Similar dose studies were performed as with the sheep. At various times, pilot studies were performed using miniature goats, milk cows, chickens, and ducks.

The main facilities used to house the animals were 141-F and 141-C. Animal pens in both buildings had concrete floors and were connected to a special sewer for contaminated animal wastes. Two smaller buildings, 141-P and 141-S, were also used for housing animals. These buildings had dirt floors. Feed was stored in 141-B, and the laboratory facilities were housed in 141-H. The animal monitoring laboratory, housing a whole body counter, was in 145-F.

The other major animal research activity to take place in the EAF was a series of studies on the effects of ionizing radiation on beagle dogs. Approximately 300 to 400 dogs were housed in the 144-R dog kennel located on the south side of the 141-F barn. Plutonium-239 and radium-226 were the main isotopes used in the dog studies. Laboratory facilities for this research were located in the 144-F Building inhalation laboratory.

Radioecology experiments also took place at the EAF. Greenhouses located in the 1705-F Building were used for growing potted plants. In addition, the strontium garden plots, located in the southwest corner of the site, were used for growing cereal grains, alfalfa, and other crops in soil containing controlled amounts of ^{90}Sr and ^{137}Cs. A 10-acre pasture in the vicinity of the strontium gardens was used to keep pregnant animals and animals too young for experiments.

Contaminated manure and sawdust were removed from animal pens on a regular basis and placed in plastic-lined cardboard radiation boxes. These were buried in the 118-F-6 Burial Ground. Each box was 18 by 18 by 24 in. and weighed 50 to 75 lb.

The contaminated manure and sawdust that could not be shoveled out of the animal pens were washed into a sewer that went to the 141-N Sump. When the sump became full, the wastewater was pumped through a screen to the river via the PNL outfall. The solids trapped by the screen were dried and sent to the 118-F-5 sawdust pit. Manure and sawdust from noncontaminated areas were also sent to the same pit. In 1963, the 116-F-9 animal leach trench was constructed near the northeast corner of the 116-F-14 Retention Basin and the liquid portion of the contaminated pen wash wastewater from the 141-N Sump was diverted there.

Contaminated animal carcasses and tissue were incinerated. The carcasses were placed in one of two railcar tank (referred to by workers as "submarines") that were located near the 118-F-6 Burial Ground. The carcasses were dropped through a manhole into the tank and lime was added to facilitate decomposition. When the tank was sufficiently full, 400 to 500 gal of fuel oil was added to the tank and ignited. Reportedly, the carcasses burned relatively completely, with only small amounts of ash remaining. The ash was not cleaned out and when one tank eventually began to fill with ash, the second tank was constructed. Both tanks were buried in the 118-F-6 Burial Ground. See Section 5.6.

The majority of the ^{239}Pu contaminated carcasses and animal wastes from the dog experiments were incinerated as part of the experimental analysis. The carcasses and tissue were incinerated in a muffle furnace in 144-F, and analysis was performed on the ash to determine the total radionuclide burden in the animals. The contaminated waste from the laboratory was placed in radiation boxes and buried in the 118-F-6 Burial Ground. Other contaminated solid waste generated by the biology laboratories was also disposed of in this manner. The quantities of waste and ash produced from the various biology facilities have not been determined.

An unplanned release, UN-100-F-1, occurred in March 1971 when the main sewer line between 141-C and 141-N became plugged and animal pen washwater was released over approximately 1,600 ft^2. The water contained ^{90}Sr and ^{239}Pu. See Section 4.26.

After reactor operations ceased in 1965, EAF took over some of the office buildings and maintenance shops previously associated with the reactor. The 1707-F Building was converted to a dog inhalation laboratory, and the 1707-FA Building was converted to a rodent inhalation laboratory. The 1713-F Building was used for a pathology laboratory, and the 1701-F Building was converted to an animal care facility. Small animals were housed in the 1701-FA Building. It is not known what radioisotopes or other chemicals were used in these buildings (DOE-RL 1992).

2.5 SANITARY LIQUID WASTES

Sanitary wastes were produced in various 100-F Area buildings equipped with sanitary facilities. These wastes were routed by sewer lines to six 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 of to these sewer systems (DOE-RL 1992). One tank, however, is posted as a radiation zone. See Section 4.25.

2.6 NONRADIOACTIVE LIQUID WASTES

DOE-RL (1992) reports that nonsanitary, nonradioactive liquid chemicals potentially contributed to 100-F 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 study.

- Water treatment chemicals (alum, sulfuric acid, chlorine, sodium dichromate) were used and stored at or near the 183-F and 190-F Buildings.

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

- Ash from the coal-fired powerhouse (184-F) was passed as a water slurry by pipeline to the 126-F-1 ash pit. Leakage in the pipeline and seepage at the ash pit were potential liquid contamination sources.

- Boiler water treatment chemicals for the 184-F Powerhouse included sodium sulfate, trisodium 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.

- Three zeolite water softeners were located in the 184-F Powerhouse where filtered water was treated before use in the heat exchangers.

Sodium chloride solutions were used to regenerate the zeolite beds in the water softener tanks. The salt was delivered in railcar lots to brine pits located adjacent to railroad tracks just north of the powerhouse. The disposal of the waste from this process is not known and there is no record of leaks or spills.

- Emergency electrical power for instrumentation in the F Reactor Building consisted of two backup systems, a 10-kVA gasoline engine generator for the station in general and a set of batteries for the Ball 3X system. The storage tank location for the gasoline engine is not known.

- Oils, paints, and solvents were stored and used in the 1715-F and 1717-F Buildings.

- Automotive repair and service was performed at the 1716-FA Building. Fuel storage and pumps were located adjacent to this building. See Hanford Drawing M-2938, sheet 5.

- Three 25,000-gal oil tanks were located on the west side of the 1717-F Boiler Building (Griffin 1988).

- A 1,000-gal underground fuel oil tank was located west of the 1705-F Building. See Hanford Drawing H-1-1569.

- Additional wastewater was generated from various cleaning processes. Disposal locations for these solutions are unknown (DOE-RL 1992).

2.7 NONRADIOACTIVE SOLID WASTES

Nonradioactive solid waste generated in the 100-F Area primarily included miscellaneous materials such as paper, trash, pieces of metal, and plastic parts generated in the facilities. The 128-F-1 Burial Ground in the southeast corner of the 100-FR-1 Operable Unit is listed in Stenner et al. (1988) as a burning pit in which combustible wastes were disposed of. The 128-F-2 burn pit served a similar purpose and also contains noncontaminated hardware.

Other solid wastes consisted of relatively uncontaminated concrete, metal parts, and other materials during decommissioning and demolition activities. Asbestos, chemical waste, and contaminated solids were removed from the area to an unknown location during the decontamination and decommissioning work. Building materials that were not considered to be contaminated were buried in place. Some of these materials may have had very low-level radiological contamination.

Solid waste-generating operations associated with the 184-F Powerhouse consisted of an anthracite coal storage yard and the 126-F-1 Ash Disposal Pit. Leachates may have entered the soil at these sites and along the coal conveyor system. There may be other solid waste disposal sites on the property not previously identified (DOE-RL 1992).

3.0 SOIL AND VEGETATION SAMPLING

Routine environmental surveillance of the 100-F Area is conducted by Westinghouse Hanford Company 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 in the summer of each year, soil and vegetation samples are collected and submitted for radioanalysis. The analyses include those radionuclides expected to be found in the areas sampled (i.e., gamma-emitting radionuclides, strontium isotopes, uranium, and/or plutonium isotopes). The results are compared to regional background levels, which are derived from Pacific Northwest Laboratory offsite monitoring data, to determine the difference between contributions from Hanford Site operations and contributions from natural causes and world-wide fallout. The results are also compared to soil contamination standards developed for use by Westinghouse Hanford Company at the Hanford Site (Schmidt et al. 1991).

Tables 3-1 and 3-2 provide results of 100-F 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, are not provided here due to length but are available in the referenced document.

Table 3-1. Average Radionuclide Concentrations Detected in the 100-F Area Surface Soil Samples from 1981 to 1991.

Year	^{60}Co (pCi/g)	^{90}Sr (pCi/g)	^{137}Cs (pCi/g)	^{238}Pu (pCi/g)	$^{239,240}Pu$ (pCi/g)
1981	2.9 E-01	NR	6.0 E-01	NR	NR
1982	1.4 E+00	NR	1.7 E+00	NR	NR
1983	2.7 E-01	NR	8.6 E-01	NR	NR
1984	1.1 E+00	4.4 E-01	7.0 E-01	5.0 E-04	1.0 E-02
1985	3.0 E-01	2.9 E-01	8.3 E-01	6.5 E-04	9.8 E-03
1986	2.3 E-01	2.7 E-01	7.4 E-01	3.8 E-04	1.1 E-02
1987	1.9 E-01	2.4 E-01	5.5 E-01	6.4 E-04	9.3 E-03
1988	1.7 E-01	1.6 E-01	6.2 E-01	1.3 E-03	1.4 E-02
1989	1.3 E-01	1.1 E-01	4.3 E-01	8.0 E-04	1.3 E-02
1990	4.4 E-02	1.1 E-01	6.5 E-01	5.2 E-04	1.1 E-02
1991	4.9 E-02	1.6 E-01	8.3 E-01	8.6 E-04	1.4 E-02

Source: Schmidt et al. 1991.
NR = not reported.

Table 3-2. Average Radionuclide Concentrations Detected in the 100-F Area Vegetation Samples from 1981 to 1991.

Year	^{60}Co (pCi/g)	^{90}Sr (pCi/g)	^{137}Cs (pCi/g)	^{238}Pu (pCi/g)	$^{239,240}Pu$ (pCi/g)
1981	9.2 E-01	NR	2.2 E+00	NR	NR
1982	1.6 E-01	NR	7.9 E-01	NR	NR
1983	2.8 E-01	NR	1.0 E+00	NR	NR
1984	2.2 E+00	7.6 E+00	2.0 E+01	4.9 E-04	3.9 E-03
1985	3.3 E-01	1.4 E+00	5.8 E-01	4.9 E-05	5.3 E-04
1986	1.7 E-01	9.3 E-02	1.1 E+00	8.3 E-05	1.2 E-04
1987	2.4 E-01	1.8 E-01	1.8 E-01	3.8 E-04	1.7 E-04
1988	9.9 E-01	8.9 E-02	3.1 E-01	3.3 E-05	1.1 E-04
1989	2.8 E-01	9.6 E-02	2.0 E+00	5.2 E-05	1.4 E-04
1990	5.0 E-02	2.7 E-01	4.2 E-01	<4.9 E-05	3.6 E-04
1991	8.2 E-02	2.9 E-01	3.8 E-01	2.9 E-05	7.0 E-03

Source: Schmidt et al. 1991.
NR = not reported.

4.0 100-FR-1 OPERABLE UNIT

Three operable units are associated with the 100-F Area. 100-FR-1 and 100-FR-2 encompass source operable units that include liquid and solid waste sites. 100-FR-1 includes the northern portion of the area and includes the liquid and sludge disposal sites associated with the operation of the F Reactor and the Experimental Animal Farm (EAF). 100-FR-2 includes the southern portion of the area and primarily includes solid waste burial grounds associated with the operation of the reactor and the EAF. A third operable unit, 100-FR-3, is the groundwater operable unit that encompasses 100-FR-1 and 100-FR-2 and is not addressed in this document.

This section describes the 100-FR-1 Operable Unit, which includes the sites of all remaining 100-F Area buildings and facilities. It encompasses 38 waste sites, 20 of which are included in the *Hanford Federal Facility Agreement and Consent Order* (commonly referred to as the Tri-Party Agreement) (Ecology et al. 1989). These include decommissioned facilities, trenches, cribs, french drains, septic tanks, burial grounds, and unplanned releases. Each waste site is described separately. Waste Information Data System (WIDS) data inventory sheets are provided in Appendix A.

Many of the 100-FR-1 waste sites have been previously evaluated as part of the preliminary assessment/site inspection activities performed at the Hanford Site. Each was assigned a hazard ranking score under the hazard ranking system evaluation procedures spelled out under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* in 40 CFR 300. The hazard ranking scores are provided for each waste site and are summarized in Table 4-1.

Figure 4-1 shows the waste sites located at the 100-FR-1 Operable Unit.

4.1 116-F-1 TRENCH (LEWIS CANAL)

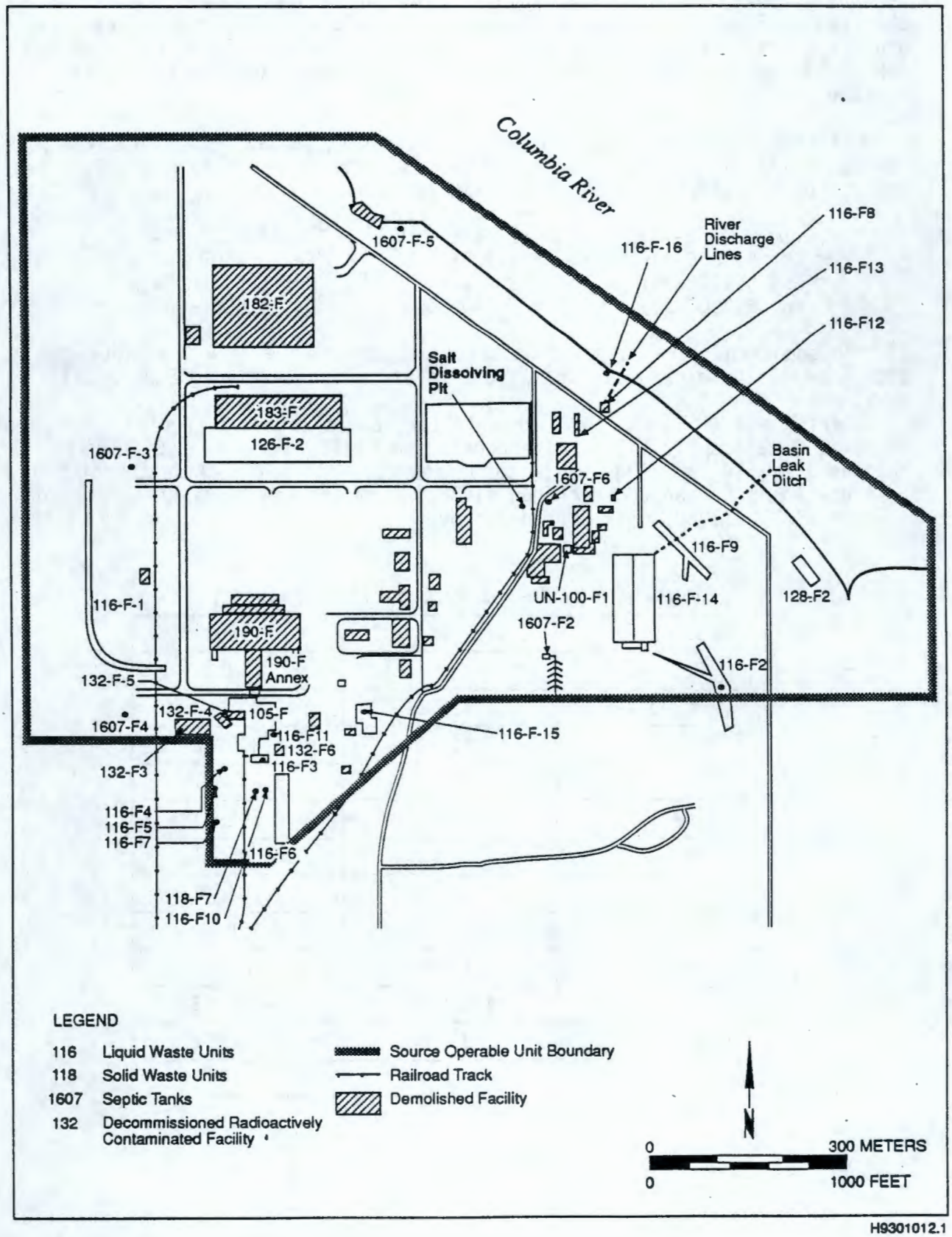
The 116-F-1 Trench, commonly known as the Lewis Canal, is an inactive liquid waste site that operated from 1953 until 1965 to receive liquid wastes from the 105-F, 182-F, 189-F, and 190-F Buildings. It is a 3,000- by 40- by 10-ft-deep trench that begins at a point 750 ft northeast of the reactor building and terminates at the Columbia River. At its headwall, the trench flows to the west but immediately bends northward around a 400-ft radius and runs northward until it intersects the river shoreline. Water entered the river without benefit of an outfall structure, i.e., water simply ran across the cobble-covered beach and into the river. Its location, and those of its permanent concrete monuments, are described on Hanford Drawing H-1-15244.

Two 4-ft-deep feeder ditches also drained into the canal. The upstream ditch enters the canal at a point immediately south of the east-west running gravel road that passes south of the 183-F Filter Plant, providing drainage for that facility. The second (or downstream) ditch entered the canal at a point east of the 182-F Reservoir and pump house, providing drainage for that facility (Hanford Drawing M-1600-F).

Table 4-1. 100-FR-1 Operable Unit Waste Site Hazard Ranking Score.

Waste site number	Hazard ranking score
116-F-1	44.55
116-F-2	42.32
116-F-3	42.32
116-F-4	4.63
116-F-5	3.66
116-F-6	42.32
116-F-7	40.09
116-F-8	--
116-F-9	42.32
116-F-10	42.32
116-F-11	0.0
116-F-12	0.0
116-F-13	0.0
116-F-14	76.91
116-F-15	--
116-F-16	--
118-F-8	--
126-F-2	--
128-F-2	--
132-F-3	--
132-F-4	--
132-F-5	--
132-F-6	--
Septic tanks	--
UN-100-F-1	7.13

Figure 4-1. Map of the 100-FR-1 Operable Unit Showing Waste Sites Present During Reactor Operation.



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An estimated 100,000,000 L of waste entered 116-F-1. This included reactor cooling water when, during the Ball 3X project in 1953, reactor coolant was diverted to the river via this waste site. It also received reactor coolant that was diverted to the trench during reactor process tube chemical scaling activities, i.e., when chemicals were flushed through the process tubes to remove scale that had built up on their inner surfaces and during the H-558 Increased Cooling Water Flow Project and other reactor upgrade projects.

Estimated radionuclide inventory for 116-F-1, in curies and decayed by the Waste Information Data System (WIDS) database to April 1, 1986, includes the following (Stenner et al. 1988, WHC 1991):

^{60}Co: 2.230E-001	^{154}Eu: 1.960E-001	^{240}Pu: 6.600E-004
^{134}Cs: 6.000E-005	^{155}Eu: 1.330E-003	^{90}Sr: 5.150E-002
^{137}Cs: 9.100E-001	^{3}H : 2.010E-001	^{234}U : 1.600E-004
^{152}Eu: 5.590E-001	^{239}Pu: 5.940E-003	^{238}U : 1.880E-002

In addition, 116-F-1 has a hazardous chemical inventory that includes 100 kg of sodium dichromate and 10,000 kg of sulfamic acid (DOE-RL 1987).

Dorian and Richards (1978) reports the results of soil samples taken from 14 Lewis Canal sample sites. It reports the canal volume as 1.5 x 10^6 ft^3 and mass as 1.0 x 10^{11} g. Table 4-2 summarizes 116-F-1 radionuclide inventories as reported in Dorian and Richards (1978). Compare the "Curies" column to Stenner et al. (1988) data provided above.

Table 4-2. 116-F-1 Radionuclide Inventory.

Radionuclide	Ave. pCi/g	Curies
^{238}Pu	--	0.0
$^{239/240}$Pu	6.60E-02	6.60E-03
^{90}Sr	6.30E-01	6.30E-02
^{3}H	3.2	3.20E-01
^{152}Eu	8.5	8.50E-01
^{60}Co	6.6	6.60E-01
^{154}Eu	3.8	3.80E-01
^{134}Cs	9.30E-03	9.30E-04
^{137}Cs	11.0	1.1
^{155}Eu	4.20E-02	4.20E-03
Uranium	1.90E-01	1.90E-02
Total Curies		3.4

Dorian and Richards (1978).

The Hazardous Ranking System Migration Score assigned to this waste site is 44.55 (Stenner et al. 1988).

Only the southern (upstream) third of the trench continues to be recognized as a radiation zone. The northern (downstream) two-thirds has been released as a radiation zone, and no monuments or warning signs are in place there. No markers uniquely identify the site as the 116-F-1 site. See Figure 4-2.

The current radiation zone is unfenced but is marked by permanent concrete monuments and underground radioactive material warning signs. This portion of the trench has been fully backfilled and is covered with large cobbles. It continues to be treated with defoliant and no vegetation grows on its surface. Its headwall has also been buried and no portion of it is visible.

The upstream (southern) feeder ditch has been backfilled and is grass covered. Its headwall is covered and no portion of it is visible. No monuments or warning signs mark this ditch. It was fed by a 48-in. extra strong reinforced concrete pipe (RCP-XS) before decommissioning. It is unclear if this pipe remains in place.

The downstream (northern) feeder ditch remains intact (not backfilled). It has a concrete headwall that is protected by a double-railed wooden fence in poor repair. The opening in the headwall reveals a 48-in. reinforced concrete pipe (RCP-XS) running from the direction of the 182-F Building. The headwall area is filled with tumbleweeds. No monuments or warning signs mark this ditch. Hanford Drawing M-1904-F shows the routes of the concrete feed pipes.

The northern portion of 116-F-1 has not been backfilled and is overgrown with grass. No fences, monuments, or warning signs mark this part of the canal. The canal bottom is unlined except at the points where each feeder ditch intersects the canal. These intersections are concrete lined.

4.2 116-F-2 (107-F) TRENCH

The 116-F-2 Trench is an inactive liquid waste site that operated from 1950 until 1965 to receive reactor cooling water from the 107-F Retention Basin during reactor outages due to fuel ruptures. It also received overflow water from the 105-F Fuel Storage Basin during deactivation of the reactor. It was a 300- by 50- by 15-ft-deep trench located 150 ft southeast of the southeast corner of the 107-F Basin.

The trench was fed by a 12-in. steel line that ran from the north end of the 107-F Basin to the north end of the trench (Hanford Drawing H-1-4048). It was also fed by a ditch that connected the trench to the 42-in. effluent line running to the south end of the 107-F Basin. This ditch is considered part of the 116-F-2 waste site.

Environmental sampling showed that the majority of contamination is located in the northern half of the trench. The maximum contamination was 600 counts per minute (cpm) in a sample taken 20 ft below grade and about

Figure 4-2. 116-F-1 Lewis Canal from Southeast (122440-372CN).

100 ft north of the trench center point. Contamination was also detected in the connecting ditch where a reading of 1,000 cpm was detected in a sample taken at 10 ft below grade (Dorian and Richards 1978).

Estimated radionuclide inventory for 116-F-2, in curies and decayed by the WIDS database to April 1, 1986, includes the following (Stenner et al. 1988, WHC 1991):

^{60}Co: 8.000E-001	^{154}Eu: 1.490E+000	^{240}Pu: 8.200E-004
^{134}Cs: 2.900E-004	^{155}Eu: 2.070E-001	^{90}Sr: 6.950E-002
^{137}Cs: 7.610E-001	^{3}H : 3.730E-001	^{235}U : 1.400E-004
^{152}Eu: 6.050E+000	^{239}Pu: 7.380E-003	^{238}U : 1.580E-002

In addition, 116-F-1 has a hazardous chemical inventory that includes 60 kg of sodium dichromate (DOE-RL 1987).

Dorian and Richards (1978) reports the results of soil samples taken from four sample sites in the trench and four in the connecting ditch. It records the trench volume as 1.2×10^6 ft^3 with a mass of 8.1×10^{10} g. The full report is provided in Appendix B and is summarized in Tables 4-3 and 4-4.

The Hazardous Ranking System Migration Score assigned to this waste site is 42.32.

The 116-F-2 Trench and connecting ditch have been fully backfilled and appear today as a cobble-covered field that is common to the 116-F-9 Trench to the north. The site has been treated with defoliant and no vegetation grows on its surface. A feeder line mentioned in WHC (1991) has been buried or removed and is no longer visible.

Table 4-3. 116-F-2 Radionuclide Inventory, Trench.

Radionuclide	Ave. pCi/g	Curies
^{238}Pu	--	0.0
$^{239/240}$Pu	8.60E-02	7.00E-03
^{90}Sr	8.40E-01	6.80E-02
^{3}H	6.8	5.50E-01
^{152}Eu	100	8.1
^{60}Co	24	1.9
^{154}Eu	30	2.4
^{134}Cs	--	0.0
^{137}Cs	95	7.70E-01
^{155}Eu	72	5.80E-01
Uranium	1.60E-01	1.30E-02
Total Curies		15.0

Dorian and Richards (1978).

Table 4-4. 116-F-2 Radionuclide Inventory, Connecting Ditch.

Radionuclide	Ave. pCi/g	Curies
^{238}Pu	--	0.0
$^{239/240}Pu$	6.70E-02	1.20E-03
^{90}Sr	9.70E-01	1.70E-02
^{3}H	2.4	4.30E-02
^{152}Eu	59	1.1
^{60}Co	26	4.70E-01
^{154}Eu	27	4.90E-01
^{134}Cs	2.60E-02	4.70E-04
^{137}Cs	85	1.50E-01
^{155}Eu	41	7.40E-02
Uranium	1.60E-01	2.90E-03
^{14}C	--	0.0
Total Curies		**2.60**

Dorian and Richards (1978).

The waste site is unfenced but is marked by permanent concrete monuments and underground radioactive warning signs. No markers uniquely identify the trench as the 116-F-2 site. See Figure 4-3.

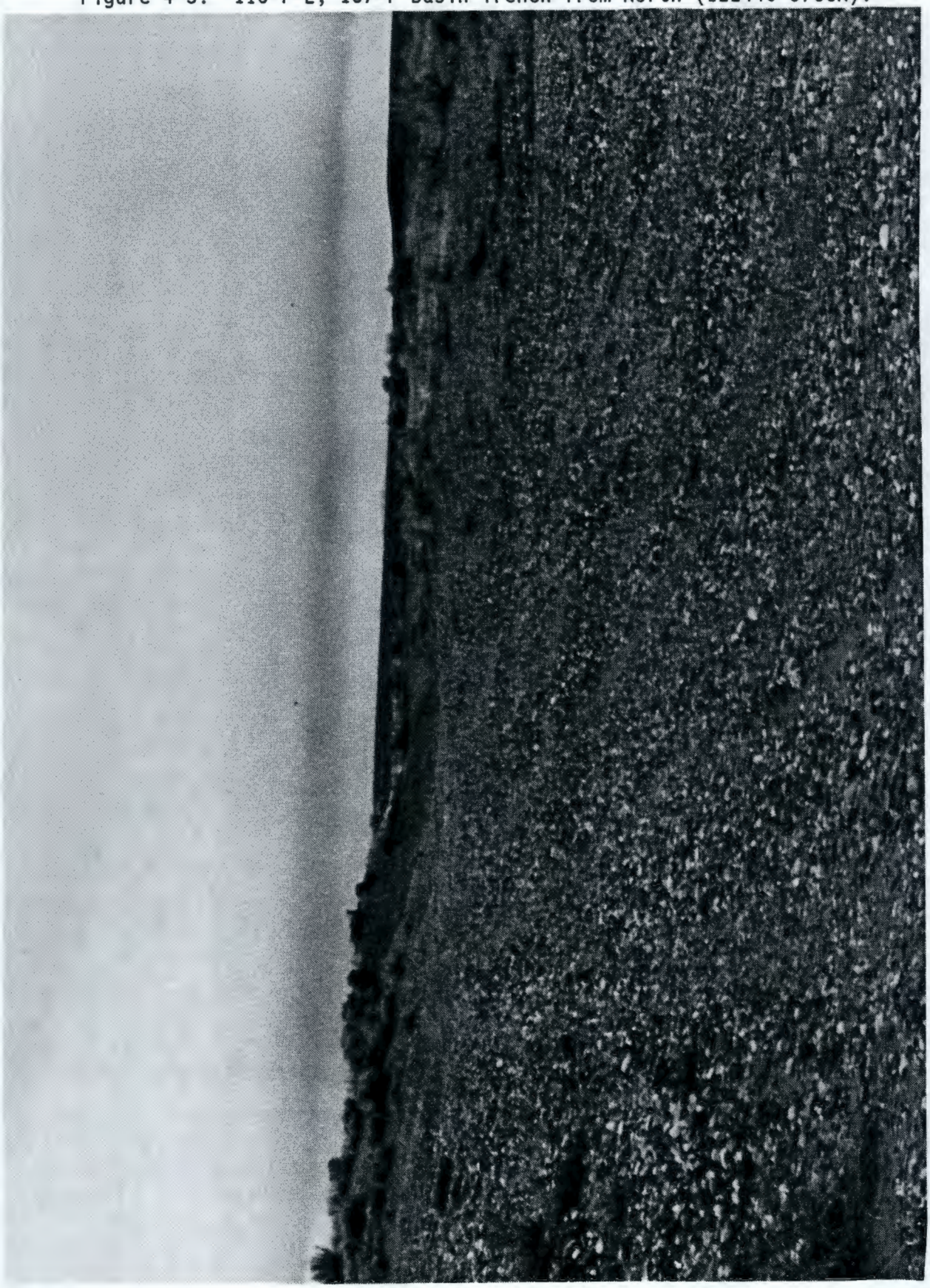
4.3 116-F-3 (105-F) STORAGE BASIN TRENCH

The 116-F-3 Storage Basin Trench is an inactive liquid waste site that operated from 1947 to 1951 to receive reactor effluent and reactor storage basin sludge. It was a 100- by 20- by 11-ft-deep (maximum dimensions) east-west-oriented trench located about 130 ft south of the reactor building, just inside the reactor exclusion area security fence.

The trench received reactor cooling water during an early fuel rupture outage and, in 1951, received sludge from the 105-F fuel storage basin. It is unclear from available records if the trench remained open during the years between the two events.

An estimated 7,000,000 L of liquid waste entered this trench (Stenner et al. 1988), but no volume estimates are provided to distinguish between the two waste types.

Figure 4-3. 116-F-2, 107-F Basin Trench from North (122440-375CN).



Estimated radionuclide inventory for 116-F-3, in curies and decayed by the WIDS database to April 1, 1986, includes the following (Stenner et al. 1988, WHC 1991):

^{60}Co: 5.000E-005
^{152}Eu: 3.000E-004
^{155}Eu: 9.000E-005
^{90}Sr: 3.600E-004
^{3}H : 4.800E-004

In addition, 116-F-3 has a hazardous chemical inventory that includes 4 kg of sodium dichromate (DOE-RL 1987).

Dorian and Richards (1978) reports the results of soil samples taken from two sample sites in the 116-F-3 Trench. It records the trench volume as 8.0 x 10^4 ft^3 with a mass of 5.4 x 10^9 g. The full report is provided in Appendix B and is summarized in Table 4-5.

Table 4-5. 116-F-3 Radionuclide Inventory.

Radionuclide	Ave. pCi/g	Curies
^{238}Pu	--	0.0
$^{239/240}$Pu	--	0.0
^{90}Sr	8.20E-02	4.40E-04
^{3}H	1.40E-01	7.60E-04
^{152}Eu	8.50E-02	4.60E-04
^{60}Co	2.50E-02	1.40E-04
^{154}Eu	--	0.0
^{134}Cs	--	0.0
^{137}Cs	--	0.0
^{155}Eu	5.50E-02	3.00E-04
Total Curies		2.10E-03

Dorian and Richards (1978).

The Hazardous Ranking System Migration Score assigned to this waste site is 42.32.

The 116-F-3 Trench has been fully backfilled and appears today as an unmarked, gravel-covered field. The trench site is within the reactor building security fence but has no fencing unique to the trench. Concrete monuments and underground contamination warning signs mark a general radiation zone that includes the trench area, but no warning or identification markers are unique to the trench. No vent pipes or other appurtenances are visible.

4.4 116-F-4 CRIB (PLUTO CRIB)

The 116-F-4 Crib, commonly known as the F Reactor Pluto Crib, is an inactive liquid waste site that operated from about 1950 to 1952 to receive liquid wastes from the 105-F Reactor Building during outages due to fuel ruptures. (One data source suggests that it continued in operation until 1956, but this seems unlikely in the context of other 100-F Area waste sites.)

The crib is a 10- by 10- by 10-ft-deep wooden vault located 100 ft south of the southwest corner of the reactor building at Hanford coordinates N78840 W31090. This location is about 10 ft inside the reactor security fence.

An estimated 4,000 L of contaminated reactor cooling water was diverted to this crib from reactor process tubes. Cooling water diversion occurred when a fuel rupture was detected within a process tube. Cooling water was diverted from the affected tube through a valve known as a "pluto valve" (also referred to as a "pluto cap") and through a rubber hose to the crib. The hose ran above ground from the rear face of the reactor to the crib. The pluto valve had a bulbous shape suggestive of the nose on the cartoon character "Pluto" (a registered trademark of Walt Disney Company) and is the probable genesis of the popular name for the valve and, by extension, the crib.

The wooden crib was buried so that its upper surface was approximately at grade. A wooden hatch in the upper surface was opened to receive the rubber hose, and the contaminated cooling water was allowed to flood into the crib. The crib was covered with fresh soil after its use was discontinued.

Estimated radionuclide inventory for 116-F-4, in curies and decayed by the WIDS database to April 1, 1986, includes the following (Stenner et al. 1988, WHC 1991):

^{60}Co: 1.900E-004	^{154}Eu: 2.470E-002	^{240}Pu: 4.200E-003
^{134}Cs: 1.570E-003	^{155}Eu: 3.470E-002	^{90}Sr: 1.060E+000
^{137}Cs: 1.570E+000	^{3}H : 1.070E-002	^{235}U : 1.000E-005
^{152}Eu: 7.230E-003	^{238}Pu: 5.300E-004	^{238}U : 1.590E-003
	^{239}Pu: 3.780E-002	

In addition, 116-F-4 has a hazardous chemical inventory that includes .004 kg of sodium dichromate (DOE-RL 1987).

Dorian and Richards (1978) reports the results of soil samples taken from two sample sites at the 116-F-4 Crib. It records the trench volume as 1.8 x 10^4 ft^3 with a mass of 1.2 x 10^9g. The full report is provided in Appendix B and is summarized in Table 4-6.

The Hazardous Ranking System Migration Score assigned to this waste site is 4.63.

The 116-F-4 Pluto Crib appears today as a level, gravel-covered field marked by a 4-in. steel pipe extending about 48 in. above grade and a 2-in. capped steel pipe extending about 12 in. above grade. Weeds growing on the surface appear to be dying, probably from having been treated with herbicide. The crib site is within the reactor building security fence but has no fencing unique to the crib. Concrete monuments and underground contamination warning signs mark a general radiation zone that includes the crib area, but no

Table 4-6. 116-F-4 Radionuclide Inventory.

Radionuclide	Ave. pCi/g	Curies
^{238}Pu	4.70E-01	5.60E-04
$^{239/240}Pu$	3.50E+01	4.20E-02
^{90}Sr	1.10E-03	1.30E+00
^{3}H	1.40E+01	1.70E-02
^{152}Eu	8.90E+00	1.10E-02
^{60}Co	4.70E-01	5.60E-04
^{154}Eu	4.00E+01	4.80E-02
^{134}Cs	2.10E+01	2.50E-02
^{137}Cs	1.60E+03	1.90E+01
^{155}Eu	9.40E+01	1.10E-01
Uranium	1.30E+00	1.60E-03
Total Curies		3.50E+00

Dorian and Richards (1978).

warning or identification markers are unique to the crib. No cave-in-potential warnings are posted. No part of the wooden crib structure is visible.

4.5 116-F-5 CRIB (BALL WASHER CRIB)

The 116-F-5 Crib, commonly known as the Ball Washer Crib, is an inactive liquid waste site that operated from 1962 to 1964 to receive 3,000 L of liquid decontamination wastes from the F Reactor ball washer assembly. The ball washer assembly was located in the transfer basin area of the 105-F Reactor Building. It served to clean and decontaminate small, steel-jacketed boron balls used in the Ball 3X safety system.

Crib construction is unclear. WIDS hard files show it as a 15- by 15- by 10-ft-deep wooden vault-type crib constructed of heavy timbers and set in a gravel-filled excavation. Hanford Drawing H-1-5147 shows the same configuration, but the diagram is cross-hatched to suggest that the wooden vault configuration was not used. A replacement configuration on the same drawing shows a circular construction described as "Drain Hole - 12 ft. deep, 10 ft diameter at bottom, side natural repose fill with 3 in. aggregate, exact location to be determined by field conditions." Hanford Drawing M-1904-F also shows the crib to be circular in shape. It seems probable that the circular configuration without wooden timbers was used. Its location is best described on Hanford Drawing H-1-15244.

In either case, the crib was fed by a vitrified clay pipe that ran from the 105-F Building to the edge of the excavation, from which point a 4-in. schedule 40 steel pipe was used. The lines were about 11 ft below grade.

A second line exited the crib to the south and continued for approximately 10 ft. It is shown on both mentioned drawings and appears to have been an overflow line, but neither drawing reveals its purpose or termination point.

Estimated radionuclide inventory for 116-F-5, in curies and decayed by the WIDS database to April 1, 1986, includes the following (Stenner et al. 1988, WHC 1991):

^{137}Cs: 4.000E-005
^{154}Eu: 3.300E-004
^{155}Eu: 6.000E-005
^{90}Sr: 2.000E-005

Dorian and Richards (1978) reports the results of soil samples taken from a single sample site in the 116-F-5 Crib. It records the crib volume as 1.8 x 10^4 ft^3 with a mass of 1.2 x 10^9 g. The full report is provided in Appendix B and is summarized in Table 4-7.

Table 4-7. 116-F-5 Radionuclide Inventory.

Radionuclide	Ave. pCi/g	Curies
^{238}Pu	--	0.0
$^{239/240}$Pu	--	0.0
^{90}Sr	2.70E-02	3.20E-05
^{152}Eu	--	0.0
^{60}Co	--	0.0
^{154}Eu	5.40E-01	6.50E-04
^{134}Cs	--	0.0
^{137}Cs	4.00E-02	4.80E-05
^{155}Eu	1.60E-01	1.90E-04
Total Curies		9.20E-04

Dorian and Richards (1978).

The Hazardous Ranking System Migration Score assigned to this waste site is 3.66.

The 116-F-5 Crib has been fully backfilled and appears today as an unmarked, gravel-covered field. The crib site is a few yards south of the southern reactor building fence. It is defined by four concrete monuments with underground contamination warning signs. The monuments are unmarked, and no identification markers exist that uniquely identify the crib. No vent pipes or other appurtenances are visible. A wooden railing mentioned in WHC (1991) has been removed and is no longer evident.

4.6 116-F-6 LIQUID WASTE DISPOSAL TRENCH (COOLING WATER TRENCH)

The 116-F-6 Trench, commonly known as the 105-F Liquid Waste Disposal Trench or Cooling Water Trench, is an inactive liquid waste site that operated from 1952 to 1965. It received 100,000 L of coolant water diverted from the 100-F Reactor via the 1608-F Pumping Station during several reactor shutdowns when maintenance was required on the effluent system (WHC 1991).

Located about 180 ft southeast of the southeast corner of the reactor building at Hanford coordinates N78730 W30930 (north-end center), the trench was 300 by 100 by 10 ft deep and ran from north to south. Its location is best described on Hanford Drawing H-1-15244.

WIDS notes that in the spring of 1956, effluent water overflowed, flooding an area south of the site (WHC 1991). The overflow was not treated as an unplanned release, but the trench area was expanded to include the area of the overflow.

The trench was covered with fresh soil after its use was discontinued.

Estimated radionuclide inventory for 116-F-6, in curies and decayed by the WIDS database to April 1, 1986, includes the following (Stenner et al. 1988, WHC 1991):

^{60}Co: 3.370E-001	^{154}Eu: 2.730E-001	^{240}Pu: 9.800E-004
^{134}Cs: 2.800E-004	^{155}Eu: 2.340E-002	^{90}Sr: 1.720E-001
^{137}Cs: 5.460E-001	^{3}H : 1.450E+000	^{235}U : 6.000E-005
^{152}Eu: 1.120E+000	^{239}Pu: 8.820E-003	^{238}U : 6.930E-003

In addition, 116-F-6 has a hazardous chemical inventory that includes 3,000 kg of sulfamic acid (DOE-RL 1987).

Dorian and Richards (1978) reports the results of soil samples taken from three sample sites in the 116-F-6 Trench. It records the trench volume as 6.0×10^5 ft^3 with a mass of 4.1×10^{10} g. The full report is provided in Appendix B and is summarized in Table 4-8.

Dorian and Richards (1978) refers to the 116-F-6 Trench as the "1608-F Liquid Waste Disposal Trench," suggesting that 1608-F Pumping Station wastes were disposed of at this site. Several other documents, including Gano and Hall (1987), Hanford Drawing H-1-15244, and Kiser (1988), also use this nomenclature for 116-F-6.

The Hazardous Ranking System Migration Score assigned to this waste site is 42.32.

The 116-F-6 Trench appears today as a large, cobble-covered field with little vegetation growing. It has been extensively stabilized with 10 to 12 ft of added soil. The site is unfenced but is within a larger zone of permanent concrete monuments with underground radioactive contamination warning signs. No vent pipes or other appurtenances are evident. The waste site has recently been extended to the east by erecting a light-weight chain fence with warning signs. The extension is approximately 25 by 400 ft and has not been stabilized as has the original site.

Table 4-8. 116-F-6 Radionuclide Inventory.

Radionuclide	Ave. pCi/g	Curies
^{238}Pu	--	0.0
$^{239/240}Pu$	2.40E-01	9.80E-03
^{90}Sr	5.00E+00	2.10E-01
^{3}H	5.50E+01	2.30E+00
^{152}Eu	4.20E+01	1.70E+00
^{60}Co	2.50E+01	1.00E+00
^{154}Eu	1.30E+01	5.30E-01
^{134}Cs	1.10E-01	4.50E-03
^{137}Cs	1.60E+01	6.60E-01
^{155}Eu	1.80E+00	7.40E-02
Uranium	1.70E-01	7.00E-03
Total Curies		**6.50E+00**

Dorian and Richards (1978).

4.7 116-F-7 (117-F) FRENCH DRAIN

The 116-F-7 French Drain is an inactive liquid waste site that operated from 1960 to 1965 to receive 300,000 L of drainage from the confinement exhaust systems filter seal pits in the 117-F Building. The drain is sometimes referred to as the 117-F French Drain. The 117-F facility filtered ventilation air from the confinement zone of the 105-F Reactor Building prior to its discharge to the atmosphere through the 105-F Stack.

Located about 450 ft south of the southwest corner of the reactor building at Hanford coordinates N78600 W31200, the drain is described as being 4 ft in diameter, 10 ft deep, and gravel filled.

Harmon and King (1975) notes that radioactive material drained to this site had a short half-life and has decayed to the point where it is no longer of concern. As a consequence, the site has been released from radiation zone status. Radionuclide inventories are, however, provided by Stenner et al. (1988) and Dorian and Richards (1978).

Estimated radionuclide inventory for 116-F-7, in curies and decayed by the WIDS database to April 1, 1986, includes the following (Stenner et al. 1988, WHC 1991):

^{152}Eu: 5.000E-005
^{239}Pu: 3.000E-005
^{90}Sr: 2.000E-005

Dorian and Richards (1978) reports the results of soil samples taken from a single sample site in the 116-F-7 French Drain. It records the drain volume as 4.5×10^3 ft^3 with a mass of 3.1×10^8 g. The full report is provided in Appendix B and is summarized in Table 4-9.

Table 4-9. 116-F-7 Radionuclide Inventory.

Radionuclide	Ave. pCi/g	Curies
^{239}Pu	1.00E-01	3.10E-05
^{90}Sr	5.70E-02	1.70E-05
^{152}Eu	2.60E-01	8.00E-05
^{137}Cs	3.20E-02	9.80E-06
Total Curies		**1.40E-04**

Dorian and Richards (1978).

The Hazardous Ranking System Migration Score assigned to this waste site is 40.09.

The 116-F-7 French Drain is located in open, sage-covered terrain. It is easily identified by its large metal vent, which is about 48 in. in diameter and stands about 48 in. above grade. No identification markers or warning signs exist at this waste site. See Figure 4-4.

4.8 116-F-8 (1904-F) OUTFALL STRUCTURE

The 116-F-8 Outfall Structure is an inactive liquid waste site located on the bank of the Columbia River at Hanford coordinates N80675 W29255. It served as a weir box for 105-F Reactor coolant water being ducted to the river and to provide an overflow capability in case the outfall lines became plugged. Effluent passed through the outfall structure into twin 42-in. outfall lines that carried it to the bottom of the river about 400 ft from shore. In the event of outfall line plugging, effluent would back up into the outfall structure and overflow into an open-topped concrete flume, or spillway, that led to the river and is considered part of the outfall structure.

The outfall structure was once assigned building number 1904-F. It is 27 by 14 by 26 ft deep, 25 ft of which was below grade. All walls are 1-ft-thick concrete. The flume was also of concrete and was about 200 by 15 ft with 24-in.-high side walls.

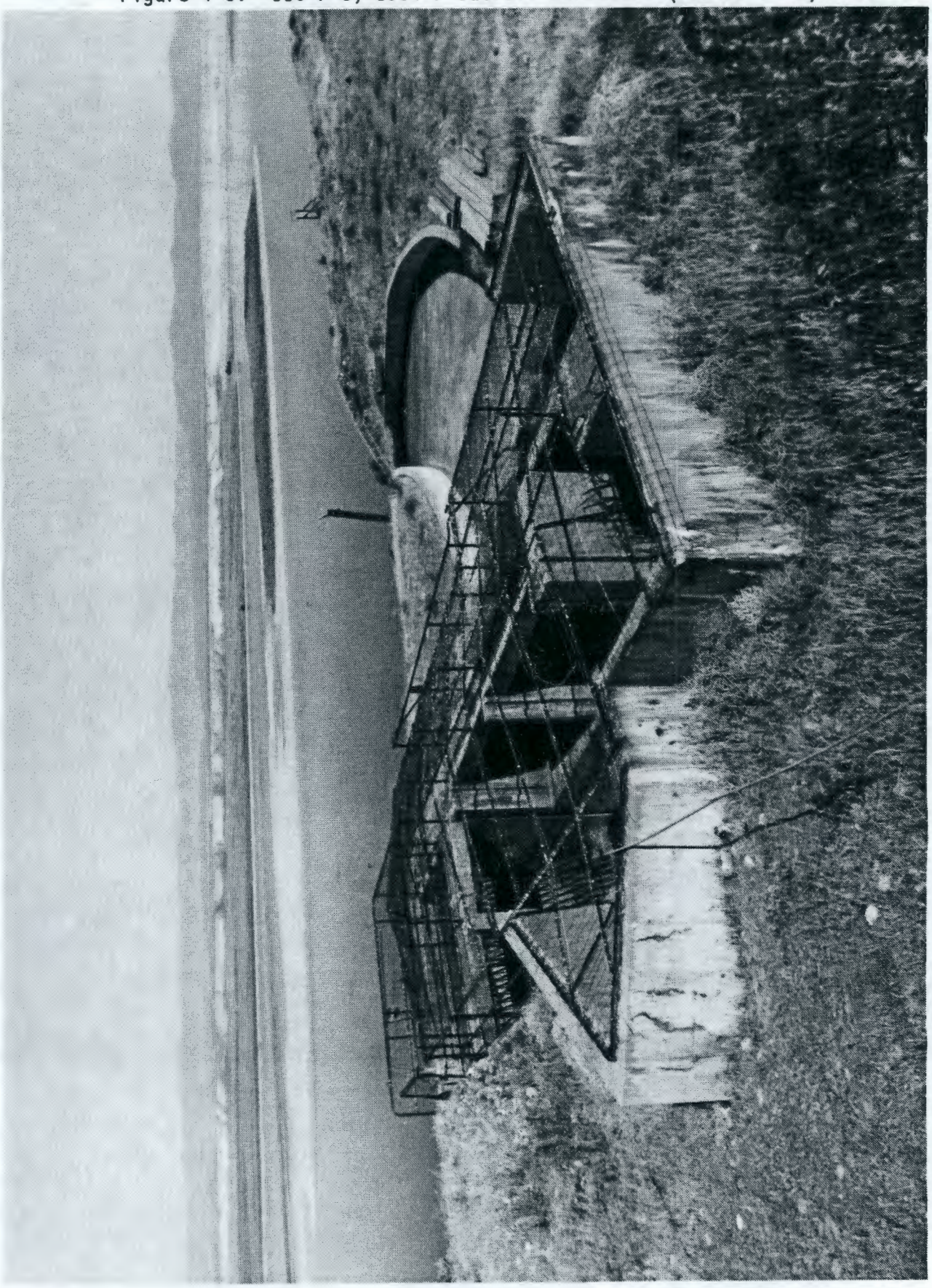
Figure 4-5 shows the outfall structure before it was demolished and covered.

No radionuclide inventory has been calculated for this waste site.

A second outfall flume, the PNL Outfall Structure, is located about 50 ft upstream from 116-F-8. It is described in Section 4.16.

Figure 4-4. 116-F-7 French Drain (122440-383CN).

Figure 4-5. 116-F-8, 1904-F Outfall Structure (768433-14-6).



No Hazardous Ranking System Migration Score has been assigned to this waste site.

The outfall site appears today as an earthen mound. The portion of the outfall structure that extended above grade was demolished into the cavity and the entire structure covered with clean soil. The upper part of the flume appears to have also been demolished and covered with clean soil. About 25 ft of the lower portion of the flume is intact and exposed. The center portion of the flume is covered with soil and it is unclear if it has been demolished (Wahlen 1991, site visit).

The general area of the outfall structures is protected by permanent concrete monuments and underground radioactive contamination warning signs. No signs uniquely identify the waste site, however. The site is not protected by fencing. The placement of the concrete monuments in relation to the structures is shown in Hanford Drawing H-1-15858. No warning signs protect the exposed portion of the flume, which is highly accessible to Columbia River boaters and fishermen. Contamination and/or dose rate data are unavailable for the flume. See Figure 4-5.

4.8.1 Junction Boxes and Underground Lines

Hanford Drawing H-1-13850, sheets 2 and 3, provide details on the underground lines and junction boxes that supported the outfall structure. Two junction boxes are shown: JB P-24F at Hanford coordinates N80700 W29255 and JB P-23F at N80365 W29255. More than 2,000 ft of large underground concrete pipe is also shown, including 72- and 36-in. reinforced concrete pipe, extra strong (RCP-XS).

No records have been located that suggest destruction or removal of lines or junction boxes, and it should be assumed that they remain in place. Lines and junction boxes processed millions of liters of waste effluent and should be assumed to be contaminated.

See Section 4.38 for more complete characterization.

4.9 116-F-9 TRENCH (ANIMAL WASTE LEACHING TRENCH)

The 116-F-9 Trench, commonly known as the animal waste leaching trench, is an inactive liquid waste site that operated from 1963 to 1976 to receive 300 million liters of waste water resulting from the cleaning of animal pens in the EAF.

Located about 150 ft northeast of the 107-F Retention Basin, it was "Y" shaped with its longer leg measuring 400 by 15 by 10 ft deep and its shorter branch leg measuring 100 by 15 by 10 ft deep. Its northwest corner is located at Hanford coordinates N80140 W28880. Hanford Drawing H-1-15858 shows this waste site.

Estimated radionuclide inventory for 116-F-9, in curies and decayed by the WIDS database to April 1, 1986, includes the following (Stenner et al. 1988, WHC 1991):

^{60}Co: 1.860E-001	^{154}Eu: 1.850E-001	^{240}Pu: 7.000E-004
^{137}Cs: 9.100E-002	^{155}Eu: 1.360E-002	^{90}Sr: 1.960E+000
^{152}Eu: 3.940E-001	^{239}Pu: 6.300E-003	

Dorian and Richards (1978) provides no soil sample information on this waste site because it was still in use at that time. Six samples were taken in August 1979 and are reported in a memo from V. R. Richards to J. J. Dorian dated August 10, 1981. The full report is included in Appendix B and is summarized in Table 4-10.

Table 4-10. Radionuclide Inventory, 116-F-9 Trench.

Radionuclide	Ave. pCi/g	Curies
$^{239/240}Pu$	1.40E-01	7.00E-03
^{90}Sr	4.80E+01	2.40E+00
^{152}Eu	1.20E+01	6.00E-01
^{60}Co	1.10E+01	5.50E-01
^{154}Eu	7.10E+00	3.60E-01
^{137}Cs	2.20E+00	1.10E-01
^{155}Eu	8.60E-01	4.30E-02
Total Curies		4.10E+00

Richards to Dorian (1981).

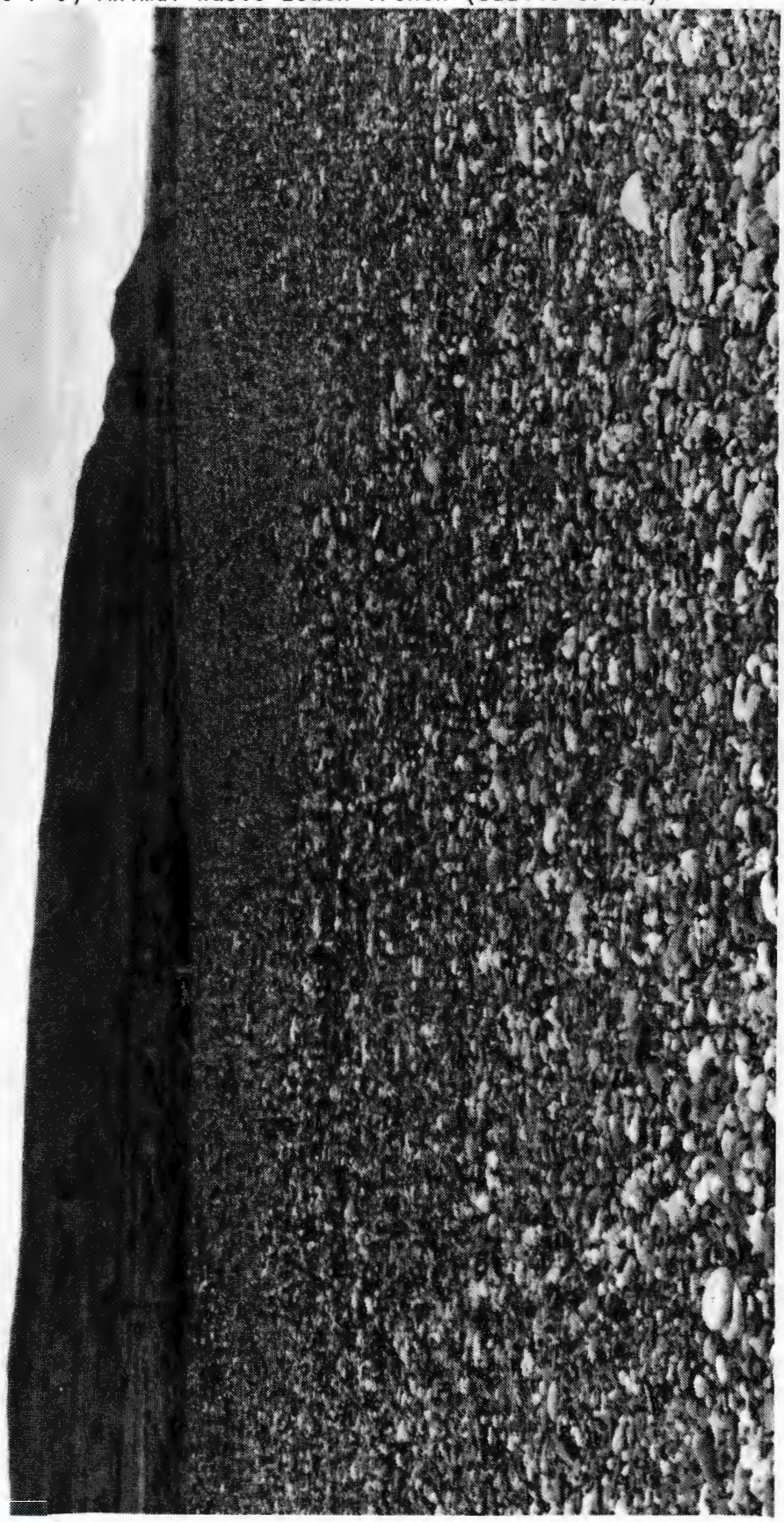
The Hazardous Ranking System Migration Score assigned to this waste site is 42.32.

An unplanned release site, the Basin Leak Ditch, crosses 116-F-9 from west to east. See Section 4.28.

The 116-F-9 Trench appears today as a cobble-covered, open field immediately northeast of the 107-F Retention Basin. It is not possible to identify the actual limits of the trench because the cobble covering extends over a much larger area east of the retention basin and no markers have been provided that are unique to the trench. See Figure 4-6.

The trench is unfenced and has no unique identifying markers. It resides within a larger area protected by permanent concrete markers and underground radioactive material warning signs. See Hanford Drawing H-1-15858.

Figure 4-6. 116-F-9, Animal Waste Leach Trench (122440-374CN).



4.10 116-F-10 FRENCH DRAIN (105-F DUMMY DECONTAMINATION FRENCH DRAIN)

The 116-F-10 French Drain, sometimes referred to as the 105-F Dummy Decontamination French Drain, is an inactive liquid waste site located south of the 105-F Reactor at Hanford coordinates N78762 W30875. It operated from 1948 until 1965 to receive 400,000 L of radioactive liquid water rinses and spent nitric acid from the decontamination of fuel element spacers and other reactor hardware. Hanford Drawing H-1-15244 provides the location of the drain, but no drawing could be located that provides details of drain construction.

The drain is made of vitrified tile and is 36 in. in diameter by 10 ft deep and rests on a bed of about 10 ft of sand and gravel (WHC 1991).

Estimated radionuclide inventory for 116-F-10, in curies and decayed by the WIDS database to April 1, 1986, includes the following (Stenner et al. 1988, WHC 1991):

^{60}Co: 1.010E-002	^{154}Eu: 1.340E-003	^{240}Pu: 7.000E-005
^{137}Cs: 6.700E-003	^{155}Eu: 1.960E-003	^{90}Sr: 6.000E-005
^{152}Eu: 1.180E-002	^{239}Pu: 3.710E-002	^{238}U : 3.000E-005

In addition, 116-F-10 has a hazardous chemical inventory that includes 2,000 kg of sodium dichromate, 2,000 kg of sodium oxalate, and 2,000 kg of sodium sulfamate (DOE-RL 1987).

Dorian and Richards (1978) reports the results of soil samples taken from three sample sites near the 116-F-10 drain. It records the drain volume as 4.5 by 10^3 ft^3 with a mass of 3.1 x 10^8 g. The full report is provided in Appendix B and is summarized in Table 4-11.

The Hazardous Ranking System Migration Score assigned to this waste site is 42.32.

The 116-F-10 French Drain appears today as a 36-in. tile pipe extending about 36 in. above grade. It has a steel lid and no warning signs. It appears to be about 8 ft deep, and a 4-in. steel line enters the drain from the north about 48 in. below grade. Radiation warning signs may be seen at the bottom of the drain where they appear to have been thrown. The surface in the area of the drain is covered with cobbles with little vegetation growing. See Figure 4-7.

4.11 116-F-11 FRENCH DRAIN (CUSHION CORRIDOR FRENCH DRAIN)

The 116-F-11 French Drain, commonly called the Cushion Corridor French Drain, is an inactive liquid waste site located near the southeast corner of the 105-F Reactor Building at Hanford coordinates N79016 W30885. It operated from 1953 until 1965 to receive 200,000 L of decontamination waste from the cushion corridor area of the reactor. The cushion corridor area is near the reactor rear face adjacent to the downcomer pipes. Contaminated liquids were generated when reactor hardware was decontaminated on the concrete floor in

Figure 4-7. 116-F-10 French Drain (12244-378CN).

Table 4-11. 116-F-10 Radionuclide Inventory.

Radionuclide	Ave. pCi/g	Curies
^{238}Pu	--	0.0
$^{239/240}Pu$	2.60E-01	8.10E-05
^{90}Sr	2.30E-01	7.10E-05
^{3}H	1.90E+02	5.90E-02
^{152}Eu	5.80E+01	1.80E-02
^{60}Co	9.60E+01	3.00E-02
^{154}Eu	8.40E+00	2.60E-03
^{134}Cs	2.30E-01	7.10E-05
^{137}Cs	2.60E+01	8.10E-03
^{155}Eu	2.00E+01	6.20E-03
Uranium	1.10E-01	3.40E-05
Total Curies		**1.20E-01**

Dorian and Richards (1978).

the cushion corridor and the decontamination solutions were flushed through a floor-level wall opening into the french drain. Additional waste fluids came from cushion chamber stop plug backups that were flushed through the wall opening into the drain.

No documentation could be located that characterizes the waste transferred to the 116-F-11 drain or that estimates its radionuclide content. No soil sampling has been conducted within 100 ft of the drain. The nearest sample, approximately 100 ft to the east and incomplete due to obstructions, showed radionuclide concentrations between .01 and 5.6 pCi/g. See Dorian and Richards (1978), sample site 105-F-A.

The Hazardous Ranking System Migration Score assigned to this waste site is 0.0.

The 116-F-11 French Drain appears today as a 36-in. tile pipe extending an inch or two above grade. It has a metal lid and is protected by three yellow steel stand pipes. There are no radioactive material warning signs or other identifying markers.

4.12 116-F-12 (148-F) FRENCH DRAIN

The 116-F-12 French Drain is an inactive liquid waste site located at Hanford coordinates N80255 W29135, about 8 ft east of the original site of the 148-F Pump House and Lift Station. It operated from 1944 through 1964 to receive 10,000 L of effluent pump prime from the lift station.

The drain was 36 in. in diameter and 6 ft deep. No records could be located that identify its construction material, but other 36-in. drains from this era were constructed of clay or concrete pipe and were usually gravel filled and/or rested on a gravel bed.

No information could be located that characterizes the waste effluent or provides radionuclide or hazardous chemical inventories.

The Hazardous Ranking System Migration Score assigned to this waste site is 0.0.

The site of the 116-F-12 French Drain is not readily identifiable. The general area of its original site is a grass-covered field. No markers identify its location, and the 148-F Pump House has been demolished. Hanford Drawing H-1-13850, sheet 2, shows its location with respect to existing roadways and other landmarks. It is identified as an unnumbered drywell on the drawing.

4.13 116-F-13 FRENCH DRAIN (1705-F EXPERIMENTAL GARDEN FRENCH DRAIN)

The 116-F-13 French Drain, commonly called the 1705-F Experimental Garden French Drain, is an inactive liquid waste site that was located adjacent to the original site of the 1705-F Building at Hanford coordinates N80620 W29290 (WHC 1991). These coordinates place the drain adjacent to the southwest corner of the 1705-F Radio-Botany Lab site (Hanford Drawing H-1-13850).

The drain received 10,000 L of liquid wastes from radio-botany experiments conducted in the 1705-F facilities. The 1705-F facilities are described in various documents as experimental gardens, a radio-botany laboratory, and a pharmacology laboratory. No information could be located that characterizes the waste effluent or provides radionuclide or hazardous chemical inventories.

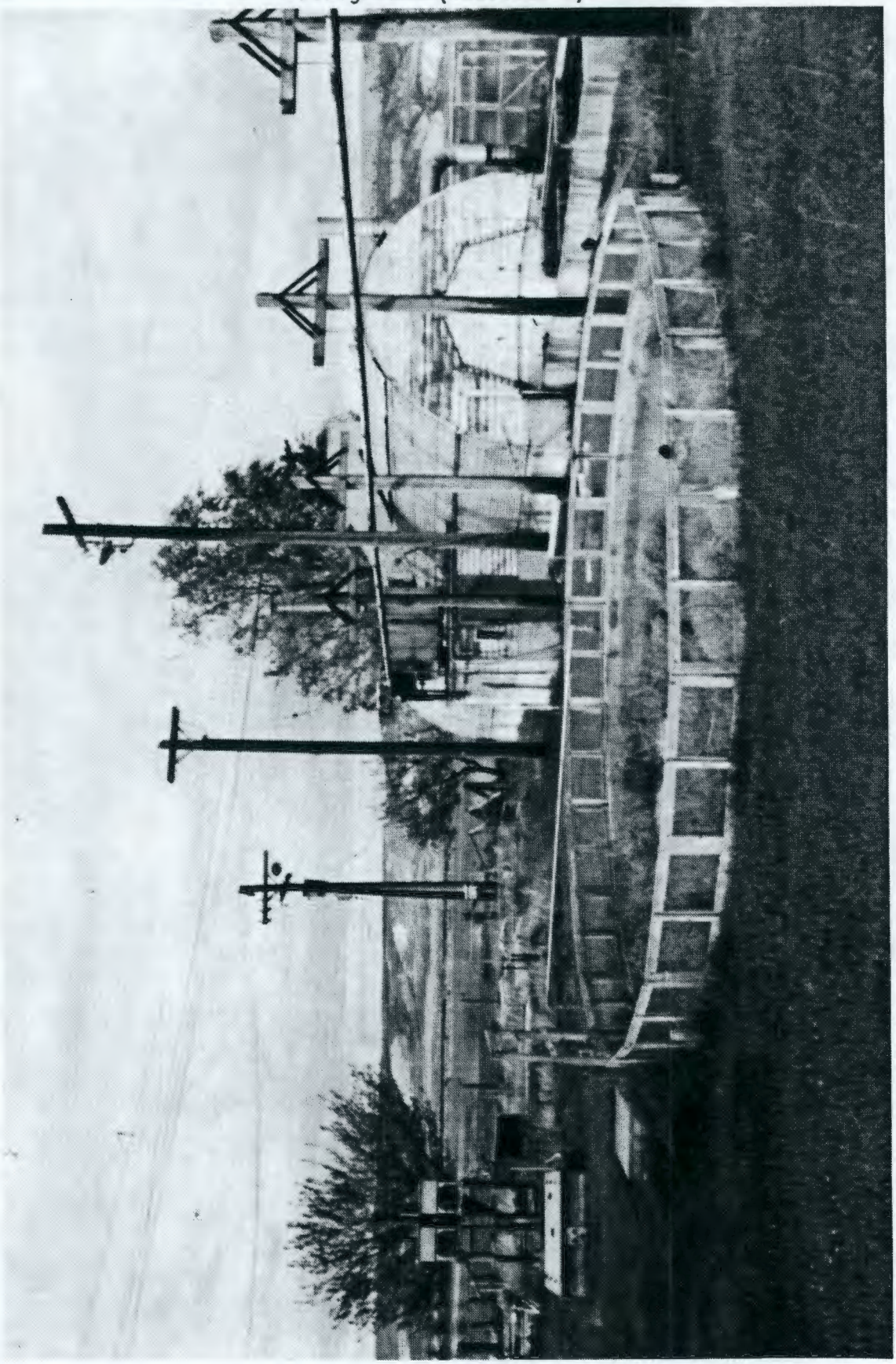
The Hazardous Ranking System Migration Score assigned to this waste site is 0.0.

The site of the 116-F-13 French Drain is not readily identifiable. No markers identify its location, and the 1705-F Building has been razed. Its approximate location can be identified by plotting its coordinates on Hanford Drawing H-1-13850, sheet 3. Note that the 1705-F Building is mislabeled as 1703-F on the drawing. Figure 4-8 is a photograph of the building and area.

4.14 116-F-14 (107-F) RETENTION BASIN

The 116-F-14 (107-F) Retention Basin is an inactive liquid waste site that served as an integral component of the F Reactor cooling system. Operating from 1945 to 1965, it received essentially all reactor cooling water passing from the reactor to the Columbia River. This volume has not been estimated, but the flow rate ranged between 41,000 and 78,000 gal/min. It served as a retention basin that held the water for a brief period of time, allowing radioactive decay and thermal cooling to occur before the water was discharged to the Columbia River.

Figure 4-8. 1705-F Radio Ecology Lab with Fish Tank in Foreground (91050839-1).



The basin is located about a one-half mile northeast of the reactor building at Hanford coordinates N79967 W29130 (northwest corner). Its location with respect to its permanent concrete monuments is best described on Hanford Drawing H-1-15244.

It is a 450- by 230- by 24-ft-deep reinforced concrete basin that is divided lengthwise into two chambers. Cooling water flowed from the reactor into the south end of the basin through one of three large lines that operated during different time periods. One was a 42-in. steel line, another a 60-in. steel line, and one a 42-in. reinforced concrete line. Water flowed from the north end of the basin through a 72-in. concrete pipe to the 116-F-8 Outfall Structure from which it flowed into the river.

Section 2.3.1.1 of this report describes the nature and source of liquid waste reaching the basin. Dorian and Richards (1978) reports the results of numerous soil samples taken from sample sites at and near the basin. It records the volume of contaminated soils adjacent to the basin as 1.0×10^6 ft^3 with a mass of 6.8×10^{10} g. It records the volume of contaminated soils underneath the basin as 5.5×10^5 ft^3 at both the 0- to 5-ft and 5- to 10-ft levels with 3.7×10^{10} g at each level. The full report is provided in Appendix B and is summarized in Tables 4-12 and 4-13.

Table 4-12. 116-F-14 Radionuclide Inventory Underneath the 107-F Basin.

Radionuclide	Ave. pCi/g at 0-5 ft	Ave. pCi/g at 5-10 ft	Curies
^{238}Pu	--	--	0.0
$^{239/240}Pu$	1.10+00	--	4.10E-02
^{90}Sr	1.10E+00	5.60E-01	6.10E-02
^{3}H	5.60E+00	a	4.10E-01
^{152}Eu	2.60E+02	2.10E+00	9.70E+00
^{60}Co	1.70E+02	2.40E+01	7.20E+00
^{154}Eu	8.00E+01	2.00E-01	3.00E+00
^{134}Cs	3.10E-01	2.90E-02	1.30E-02
^{137}Cs	1.90E+01	9.20E+00	1.00E+00
^{155}Eu	4.20E+00	--	1.60E-01
Uranium	3.10E-01	a	2.30E-02
^{14}C	1.30E+00	a	9.60E-02
Total Curies			**22.00E+00**

[a]Concentrations conservatively assumed to the same as the 0- to 5-ft interval for total curies calculation.

Table 4-13. 116-F-14 Radionuclide Inventory Adjacent to the 107-F Basin.

Radionuclide	Ave. pCi/g	Curies
^{238}Pu	1.90E-04	1.30E-05
$^{239/240}Pu$	2.40E-01	1.60E-02
^{90}Sr	1.50E+00	1.00E-01
^{3}H	4.00E+00	2.70E-01
^{152}Eu	1.20E+02	8.20E+00
^{60}Co	5.10E+01	3.50E+00
^{154}Eu	3.70E+01	2.50E+00
^{134}Cs	6.00E-02	4.10E-03
^{137}Cs	4.30E+00	2.90E-01
^{155}Eu	4.90E+00	3.30E-01
Uranium	2.10E-01	1.40E-02
^{14}C	9.50E-01	6.50E-02
Total Curies		**15.00E+00**

Dorian and Richards (1978).

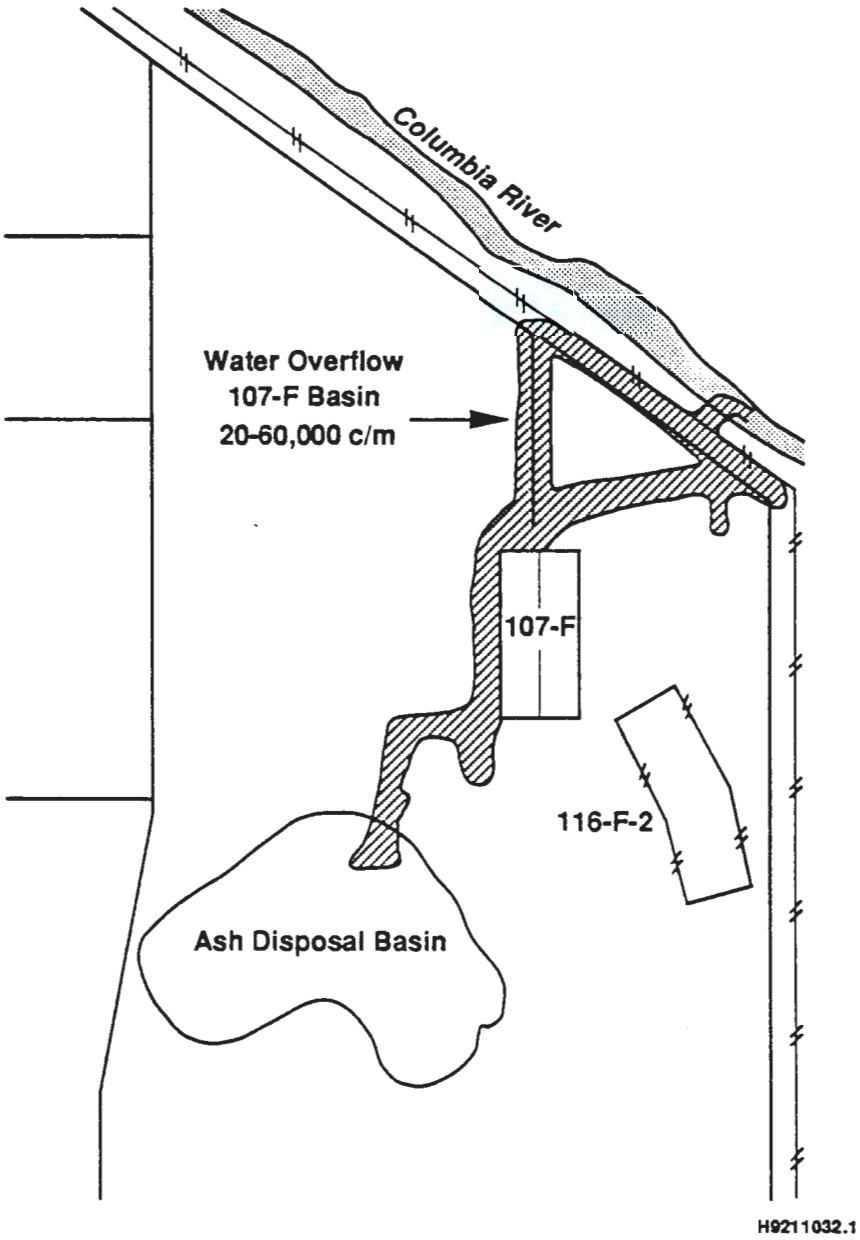
Numerous instances of soil contamination resulting from retention basin and basin line leakage contributed to the radionuclide inventory reported above. The basin leaked at numerous points in its walls and bottom. The basin outlet line overflowed many times in the early 1950's through manhole P-22F (see Hanford Drawing H-1-13850), located a few yards north of the north wall of the basin.

A major basin overflow occurred in 1955 when wooden baffles broke loose from the basin inlet and clogged the basin outlet. One of the baffles read 14 Rad/h, and gamma spectrometer analysis of a chip shows a high percentage of ^{46}Sc, with some ^{51}Cr.

Repeated overflow from the basin contaminated the surface soils in the immediate vicinity of the basin and a narrow path between the basin and the river. Contamination levels were 20,000 to 60,000 cpm with a maximum of 350 mRad/h. A ground contamination pattern in the area of the basin is provided in Figure 4-9 (Dorian and Richards 1978, WHC 1991, Hanford Drawing HW-54636, Selby and Soldat 1958).

At least once during reactor operations, an unknown quantity of sludge was removed from the basin to a site about 100 ft southeast of the southeast corner of the basin. Approximately 1.8×10^6 kg (2,000 tons) of sludge is estimated to remain in the retention basin (Dorian and Richards 1978).

Figure 4-9. Ground Contamination Pattern Around 107-F (116-F-14) Retention Basin Due to Basin Overflow.



A hole was dug adjacent to the basin inlet pipe in 1952 to drain the pipe for maintenance. This hole and all contamination described above has been stabilized by covering with clean soil, gravel, and cobbles. High winds spread contamination in 1964 when the basin was emptied for maintenance (WHC 1991).

The Hazardous Ranking System Migration Score assigned to this waste site is 76.91.

The retention basin floor was initially backfilled to a depth of about 5 ft with clean soil and gravel with the soil piled to cover its walls. The steel aboveground effluent pipe that ran from the reactor building to the basin was cut into 20-ft sections and laid on top of the fill in the east basin section. Further decommissioning in 1978-1979 knocked down the upper 10 ft of basin vertical walls at which time the effluent pipe sections were moved to the west basin section where it remains partially visible. See Figure 4-10.

The basin is protected by an 8-ft chain link security fence. Surface and underground contamination warning signs are in place, and permanent concrete monuments identify the greater basin area as a radiation zone.

4.15 116-F-15 CRIB (108-F RADIATION CRIB)

The 116-F-15 Crib, commonly known as the 108-F Radiation Crib, is an inactive liquid waste site about which little is known. It is located beneath the 108-F Biology Lab Building and is believed to have received liquid wastes from numerous biology laboratory research projects.

According to the WIDS database, the size and design of the unit is unknown and the floor opening is covered with plywood to restrict access. A 20-ft by 18-in.-wide trench exists on the first floor that appears to slope down into the unit that is located beneath the floor. The trench is covered with plywood and posted as radioactive (WHC 1991, interviews with site personnel).

The crib is reported to have received liquid wastes from 108-F Building sinks, glovebox drains, and ventilation hoods. Because alpha contamination experiments were conducted at 108-F, there is a potential for alpha contamination in the waste site. One reference (Ruppert 1953) describes the site as "a drain to receive condensate from the hoods inside the 108-F Biology building. Considerable duct work is exposed and in cold weather some of the condensate flows back down to this drain (visible on photograph). See Figure 4-11. To date, no activity has been detected in this condensate, but it is possible that contamination from plutonium as well as many beta emitting isotopes could be washed down the walls of the hoods and ductwork in the future." Another source (Wahlen 1991) notes that 108-F "fixtures and gloveboxes were highly contaminated with Pu^{239} and Sr^{90} and other radioisotopes" when decontaminated in 1978, but does not mention the crib.

Based on interviews with site personnel, it appears that the above data refer to two different waste sites: a waste facility beneath, or in the floor of, the 108-F Building that received waste from laboratory hoods and floor

Figure 4-10. 107-F Cooling Water Retention Basin (93041480-1CN).

Figure 4-11. 108-F Building, East Side (768433-6).

drains, and a french drain located immediately east of the building that received condensate from the externally mounted ventilation system on the east side of the building. For purposes of this report, the crib will be recognized as 116-F-15 and the french drain as an undocumented waste site. See Section 4.29 for a description of the french drain.

Interviews with site personnel suggest that the 116-F-15 Crib is a concrete structure of unknown size located beneath the 108-F Building approximately 30 ft from its south wall and centered beneath the original portion of the building, i.e., the east portion of the existing building. The unit may not be a true crib in that it may have a concrete bottom and not percolate to soil. It may have had an overflow drain that ran east from the building to the ash basin.

Hanford Historical Drawings HW-74552, HW-74665, and HW-74356 show a 18-in.-wide floor drain, or trench, that runs the length of much of the ground floor. It drains from both ends into a 36- by 36- by 36-in. sump located at the approximate center of the trench. Numerous laboratory floor and hood drains are connected to the trench and sump. A 6-in. earthen-ware pipe exits the sump and the building to the south. A continuation drawing (W-2934, sheet 5) that would show the route and destination of the earthen-ware pipe is no longer available. This concrete sump is almost certainly the "crib" that is remembered by plant personnel and referred to in WHC (1991).

Hanford Drawing H-1-2037 shows an 8-in. vitrified clay tile pipe running south from the 108-F Building to join a 12-in. vitrified clay tile pipe that runs south, then east, from the west side of 108-F to the ash pit. Although there is no clear connection between the sump and the lines known to run to the ash pit, it should be recognized as a strong possibility. See Figure 4-12.

Several documents that might be expected to report on the 116-F-15 Crib, if it were a true crib, are silent on its existence. These include Koop (1964), Gano and Hall (1987), Herman (1965a, 1965b), Stenner et al. (1988), Kiser (1988), and Cluckey (1954, 1956). This omission from acknowledged texts casts some doubt on the existence of the waste site. Additional effort should be expended to determine its existence and character.

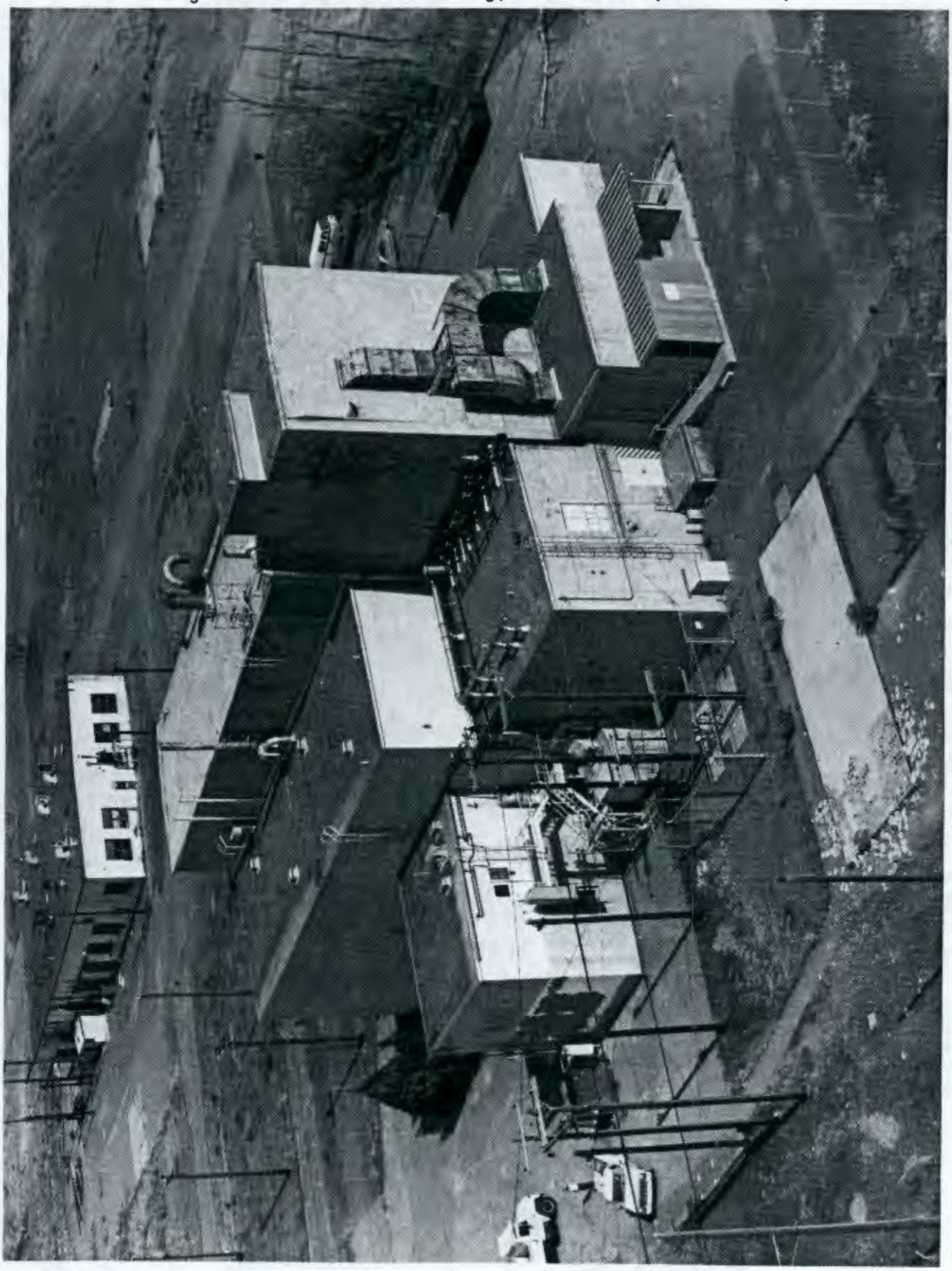
Access to the 108-F Building is severely limited, and this author was unable to inspect the waste site. A better characterization of the site will be possible only after such an inspection.

No radionuclide or hazardous chemical inventory is available for this site, nor has a Hazardous Ranking System Migration Score been assigned.

4.16 116-F-16 SITE (PNL OUTFALL STRUCTURE)

The PNL Outfall Structure is an inactive liquid waste site that is located a few yards upstream from the 116-F-8 site. It is a simple flume, or spillway, and lacks the weir box structure and outfall lines of 116-F-8. It was about 100 by 15 ft wide and had concrete side walls. It served to carry waste effluents from the EAF to the river. This site is not addressed in the Tri-Party Agreement.

Figure 4-12. 108-F Building, South Side (10669-90CN).



Only the lower portion of the PNL outfall flume is intact and visible today. The vertical walls of the upper section were broken down and the walls and bottom of the flume were covered with soil (Wahlen 1991, site inspection). Site personnel recall that the flume was fed by a 21-in. steel pipe running from the P-24F junction box, but this could not be confirmed on drawings.

Hanford Drawings H-1-26718 and H-1-13850 show underground effluent lines that served the 116-F-8 and 116-F-16 outfall structures. Both lines merged in the P-24F junction box located about 30 ft southwest of the 116-F-8 structure. The common junction box suggests the possibility that either outfall structure could have been used for effluents reaching the junction box from either source, i.e., that each outfall structure may have served as backup for the other and/or that PNL waste effluents were discharged through the 116-F-8 outfall before construction of 116-F-16. No further documentation has been located to suggest or refute this, and site personnel doubt that reactor effluent ever passed through the 116-F-16 outfall.

No radionuclide or hazardous material inventory is available for this site, nor has any soil sampling been accomplished in the immediate area.

No Hazardous Ranking System Migration Score has been assigned to this waste site.

4.17 118-F-7 BURIAL GROUND (HARDWARE STORAGE VAULT)

The 118-F-7 Storage Vault is classified as a solid waste burial ground (Stenner et al. 1988) but might better be referred to as a vault. It is an inactive solid waste storage vault that was used from 1945 to 1965 for temporary storage of reactor parts slightly contaminated with mixed waste from F Reactor site operations.

Its use was discontinued after reactor shutdown, but it continues to hold an inventory of waste material including 148 tons of lead and 6 tons of cadmium. Its radionuclide inventory is estimated to include 1.0 Ci of ^{60}Co (Miller and Wahlen 1987). Site personnel believe, however, that the vault is empty. A radiological field survey reported contamination levels of 200 to 300 cpm inside the vault (Herman 1965b).

Located a few yards south of the reactor building south security fence at Hanford coordinates N78760 W30905, the vault is a 16- by 8- by 8-ft-deep concrete box with a wooden cover. The cover surface is about 18 in. above grade.

No Hazardous Ranking System Migration Score has been assigned to this waste site.

The 118-F-7 Burial Ground appears today as a light-colored concrete box that extends about 18 in. above grade. It has a wooden lid that is covered with green rolled roofing material. Underground Radioactive Material signs are posted on its lid. The site is not fenced.

4.18 118-F-8 (105-F) REACTOR BUILDING

The 118-F-8 Reactor Building (105-F Building) is an inactive facility that operated from 1944 to 1964 to produce plutonium (see Section 2.3). Its contaminated components include the reactor block, a storage basin for irradiated fuel, and other contaminated portions of the reactor building. It contains an estimated 16,000 Ci of radionuclides, 94 tons of lead, asbestos, and 30 lb of cadmium. Some leakage to soil has occurred from the fuel storage basin (DOE-RL 1987).

A survey and report of contamination levels in the deactivated reactor building was prepared in 1965. Data are too extensive to summarize here. The reader should refer to Herman (1965a). Contamination and sample analysis data in the fuel storage basin were also prepared in 1965 (Copeland and Owen 1965).

Because reactor building remediation will not be accomplished as part of this project, no further description is provided here.

No Hazardous Ranking System Migration Score has been assigned to this waste site.

4.19 126-F-2 SITE (183-F CLEARWELLS)

The 126-F-2 waste site is an active burial site for nonhazardous and nonradioactive solid wastes. Beginning in the 1970's, this site received demolition rubble and inert waste from demolished facilities, including the 183-F, 190-F, 189-F, 185-F, 171-F, and the uncontaminated portions of the 115-F Buildings. Rubble is believed to include asbestos siding tiles from several buildings.

The site consists of the 183-F Clearwells that operated from 1945 to 1965 to store river water being processed for reactor coolant. These were covered, reinforced concrete basins with a total capacity of 10,000,000 gal. The facility was divided into two parts separated by a pump room. The aboveground portion of the pump room has been demolished and its rubble dumped into the lower portion. Part of the east clearwell contains rubble, mostly concrete, while the west portion remains empty. Part of the concrete cover on both clearwells has been demolished to permit dumping into the clearwell cavity. See Figure 4-13.

Because the clearwell has no chemical or radiological inventory, no further description is provided in this report.

No Hazardous Ranking System Migration Score has been assigned to this waste site.

4.20 128-F-2 (100-F) BURNING PIT

The 128-F-2 Burning pit is an inactive solid waste site located on the river bank about 100 ft east of the northeast corner of the area perimeter road at a point directly east of the 107-F Retention Basin.

Figure 4-13. 126-F-2 Clearwells (93020446-14CN).

The pit was a 150- by 60- by 10-ft irregularly shaped depression. It was a burning pit that received miscellaneous nonhazardous wastes including office waste, vegetation, and combustibles including paint and solvents. It also received some large metal materials such as hardware and machinery (WHC 1991).

No soil testing has been accomplished at this site. The nearest site of soil testing is at the 116-F-2 Basin Trench, described above.

Figure 2-3 in Chapter 2.0, foreground, shows the burn pit when in use.

The site has been covered over and appears today as a flat surface with no sign of the burn pit or its contents. The immediate pit area appears to have been filled and leveled in preparation for the installation of test well F5-42, which was installed in 1992.

No Hazardous Ranking System Migration Score has been assigned to this waste site.

4.21 132-F-3 (115-F) GAS RECIRCULATION FACILITY DEMOLITION SITE

The site of the 115-F Gas Recirculation Facility is an inactive low-level solid waste site located about 200 ft west of the 105-F Reactor Building. This waste site is shown in WHC (1991) as a building but might be better described as a solid waste burial ground because the building was demolished in 1984 and the contaminated portions of rubble buried in its own basement.

The gas recirculation facility was a single-story concrete building measuring about 168 by 89 ft that operated from 1943 to 1956 to house the reactor inert gas processing and recirculation system (see Section 2.3.1.5). Dorian and Richards (1978) characterizes the contamination levels in 115 Buildings and their connecting air tunnels as follows. Note that this characterization applies to 115 Buildings in general and not specifically to the 115-F Building.

Drier Rooms

> "Direct GM readings on piping, condensate drains, valves, turbine blowers, and condensers within the 115 building drier rooms are typically in the order of 10,000 c/m. Direct GM readings of the silica gel towers range from 1,000 to 15,000 c/m and average about 3,000 c/m. Background radiation levels within the 115 building drier rooms in general are about 1,000 c/m with a GM probe.
>
> "Smearable contamination (qualitative smears) on floors, walls, and equipment within the 115 building drier rooms averages about 1,000 c/m and ranges from less than 200 c/m to 6,500 c/m with a GM probe. Standard smears have beta counts averaging approximately 1,000 dpm/100 cm^2. Low level alpha contamination is present up to a maximum of 800 dpm/100 cm^2 and averages 20 dpm/100 cm^2."

Gas Piping Tunnels

"General background dose rates in the reactor gas piping tunnels are about 1 mR/hr. Direct dose rate readings of piping inside the tunnels range from 3 to 20 mR/hr... Direct GM readings on piping, valves, and drains average about 10,000 c/m up to a maximum of 40,000 c/m. Smearable contamination along floors, walls and piping averages about 2,000 c/m and was detected up to 8,000 c/m."

Filter Rooms

"Dose rates within the 115 building filter rooms are generally less than 1 mR/hr. The highest radiation levels are near the filter boxes which have direct GM readings ranging 200 c/m in the 115-H building to a maximum of 20,000 c/m in the 115-KW building. Direct GM readings of the filter boxes average a few thousand c/m. The filter boxes, walls, floors, and other equipment have smearable contamination up to 600 c/m and averaging about 300 c/m. Standard smears have beta counts ranging up to a maximum of 6,000 dpm/100 cm^2. Smearable beta contamination is usually less than 100 dpm/cm^2. Smearable alpha contamination is generally not detectable with a proportional lab counter."

Beckstrom (1984) reports that the waste site radioactive inventory includes ^{3}H, ^{14}C, ^{60}Co, ^{90}Sr, and ^{137}Cs, but does not quantify the inventory. It further reports that the building "was demolished in situ using ARCL methodology."

Chattin and Powers (1985) reports that the demolition "was started and completed during the last quarter of FY 84. The above-ground debris and rubble were trucked to the 100-F clearwell for disposal. The below-grade perimeter walls, which extended 13 ft. below grade, were demolished to 3 to 4 ft. below grade. The remaining walls were left intact and served as containment for the building rubble. The entire area was covered with clean backfill material. This overburden averaged 4 to 5 ft. in depth, which exceeded the ARCL requirements of 1 m. of clean fill. In addition, grading the final site to be compatible with the surrounding terrain added another 3 to 4 ft. of clean backfill."

Wahlen (1991) offers additional decommissioning information as follows: "equipment was removed from the drier/blower cells, packaged, and buried in the 200 West Area burial ground. The aboveground portion of the building was decontaminated, demolished, and used as fill in the gas tunnel and basement. The excess waste was hauled to the 183-F clear wells."

Decommissioning data are confirmed in Kiser (1988).

No Hazardous Ranking System Migration Score has been assigned to this waste site.

The site appears today as a level, gravel-covered field located west of the 105-F Reactor Building. It is within the reactor building security fence but has no markings or fencing that are unique to the burial site.

4.22 132-F-4 (116-F) REACTOR STACK DEMOLITION SITE

The 132-F-4 Reactor Stack Demolition Site is an inactive solid waste site consisting of buried rubble from the demolition of the 116-F Reactor Stack. The site is located immediately west of the 105-F Reactor Building, approximately between the original sites of the 117-F and the 115-F Buildings.

The stack stood 200 ft tall by 16 ft at the base. It disposed of confinement air that originated in the work areas in the 105-F Reactor Building. After flowing through filters in the 117-F Building, the air went through below- and aboveground concrete ducts into the stack.

The stack was toppled in 1983 into a trench that ran westward from the stack base. The trench was then backfilled to grade.

In speaking about reactor stacks before demolition, Dorian and Richards (1978) reports that "dose rates at the base of the reactor stacks are less than 1 mR/hr. General background levels within the bottoms of the stacks are approximately 1,000 c/m with a GM probe. Low level smearable alpha contamination is present up to 130 dpm/100 cm^2, and averages about 30 dpm/100 cm^2. Smearable beta contamination ranges from 100 to 5,000 dpm/100 cm^2." The stacks also have "C-14 and H-3 contamination on their interior surfaces. Standard smears from [the stacks] have C-14 present ranging from 200 pCi/100 cm^2 to 2.1×10^6 pCi/100 cm^2, generally averaging a few thousand pCi/100 cm^2. Average H-3 concentrations are similar, but range from 400 pCi/100 cm^2 to 1.3×10^4 pCi/100 cm^2. Radionuclide analysis indicate that beta-gamma activity (excluding H-3 and C-14) is primarily from Co-60 and Cs-137, though Sr-90, Cs-134, Eu-152, and Eu-155 are also present."

No Hazardous Ranking System Migration Score has been assigned to this waste site.

The site appears today as a level, gravel-covered field located west of the 105-F Reactor Building. It is within the reactor building security fence but has no markings or fencing that are unique to the burial site.

4.23 132-F-5 (117-F) FILTER FACILITY DEMOLITION SITE

The 132-F-5 (117-F) Filter Facility Demolition Site is an inactive solid waste burial site. The original facility was a 59- by 39- by 43-ft-high reinforced concrete facility of which 8 ft was above ground. It operated from 1960 until 1965 to filter the air that had passed through the 105-F Reactor Building. See Section 2.3.1.5.

Dose rates in 117-F filter cells were less than 1 mR/h. Direct Geiger-Mueller (GM) readings on the inlet surfaces of the filters were about 2,000 cpm. Smearable contamination (qualitative smears) along the floors, walls, and filter surfaces generally ranged from 1,000 to 2,000 cpm. No alpha contamination was detectable within portable survey instrumentation (i.e., less than 100 disintegrations per minute [dpm] using a portable alpha meter). Low-level alpha contamination was detectable using proportional counter analysis of the standard smears.

Standard smears of floors and walls taken from the inlet sides of the filter cells had beta counts ranging from less than 200 to over 16,000 dpm/100 cm^2. Dose rates in the inlet tunnels running from the reactor building to the 117 Building are on the order of 1 mR/h. Floors and walls within the inlet tunnels were dusty with accumulations up to 1/16 in. thick. Low-level smearable contamination on floors, walls, and turning vanes average 3,000 to 10,000 cpm.

Contamination levels were lower in the exhaust tunnels running from the 117 Building to the stack. Direct GM readings on qualitative smears were generally a few hundred counts per minute, to a maximum of 600 cpm.

Low-level smearable alpha contamination from 10 to 1,000 dpm/100 cm^2 was present in inlet tunnels. Smearable beta contamination in the inlet tunnels ranged between 10^3 to 10^4 dpm/100 cm^2. Smearable beta contamination in the exhaust tunnels was about 10^2 dpm/100 cm^2. Smearable alpha contamination was generally not detectable in the exhaust tunnel (Dorian and Richards 1978).

The 117-F structure was demolished by removing and packaging filters and fixtures and burying them in the 200 West Area burial grounds. The structure was then decontaminated, demolished, and buried in place (Wahlen 1991). The site was decommissioned using allowable residual contamination level (ARCL) methodology. The building and ducts were excavated and demolished in situ. The contaminated rubble was buried at least 1 m deep except for rubble from the seal pits, which was buried under a minimum of 5 m of clean soil (WHC 1991, Kiser 1988).

No Hazardous Ranking System Migration Score has been assigned to this waste site.

The site appears today as a level, gravel-covered field located west of the 105-F Reactor Building. It is within the reactor building security fence but has no unique markings or fencing.

Figures 4-14 and 4-15 show the facility before and during demolition.

4.24 132-F-6 (1608-F) WASTE WATER PUMPING STATION DEMOLITION SITE

The 132-F-6 (1608-F) Waste Water Pumping Station demolition site is an inactive solid waste burial site located about 100 ft southeast of the reactor building. The original facility was a 36- by 34- by 45-ft-high reinforced concrete facility of which 12 ft was above ground. It operated from 1944 until 1965 to receive waste water from multiple reactor building drains and sumps and to combine these wastes with reactor effluent water on its way to the Columbia River via the 107-F Retention Basin. It may also have pumped wastes to the 116-F-6 Trench.

The pumping station was demolished in situ in 1987 and backfilled with a minimum of 5 m of clean fill. Fixtures, equipment, and sludge were removed and buried elsewhere as solid waste. Asbestos lagging and sludge were also removed and buried elsewhere (WHC 1991, Wahlen 1991).

Figure 4-14. 132-F-5, 117-F Filter Facility Before Decommissioning (83E700-6CN).

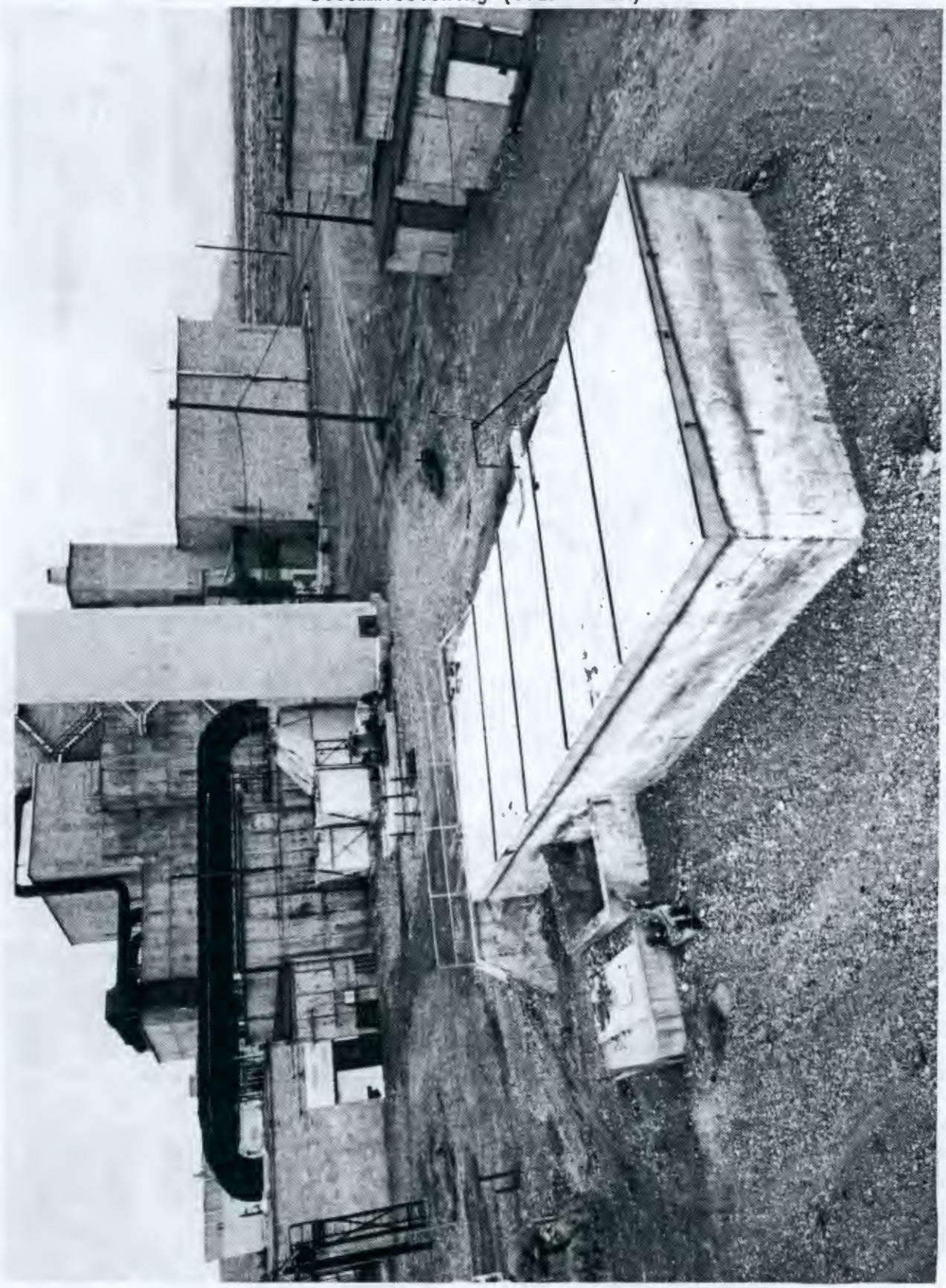
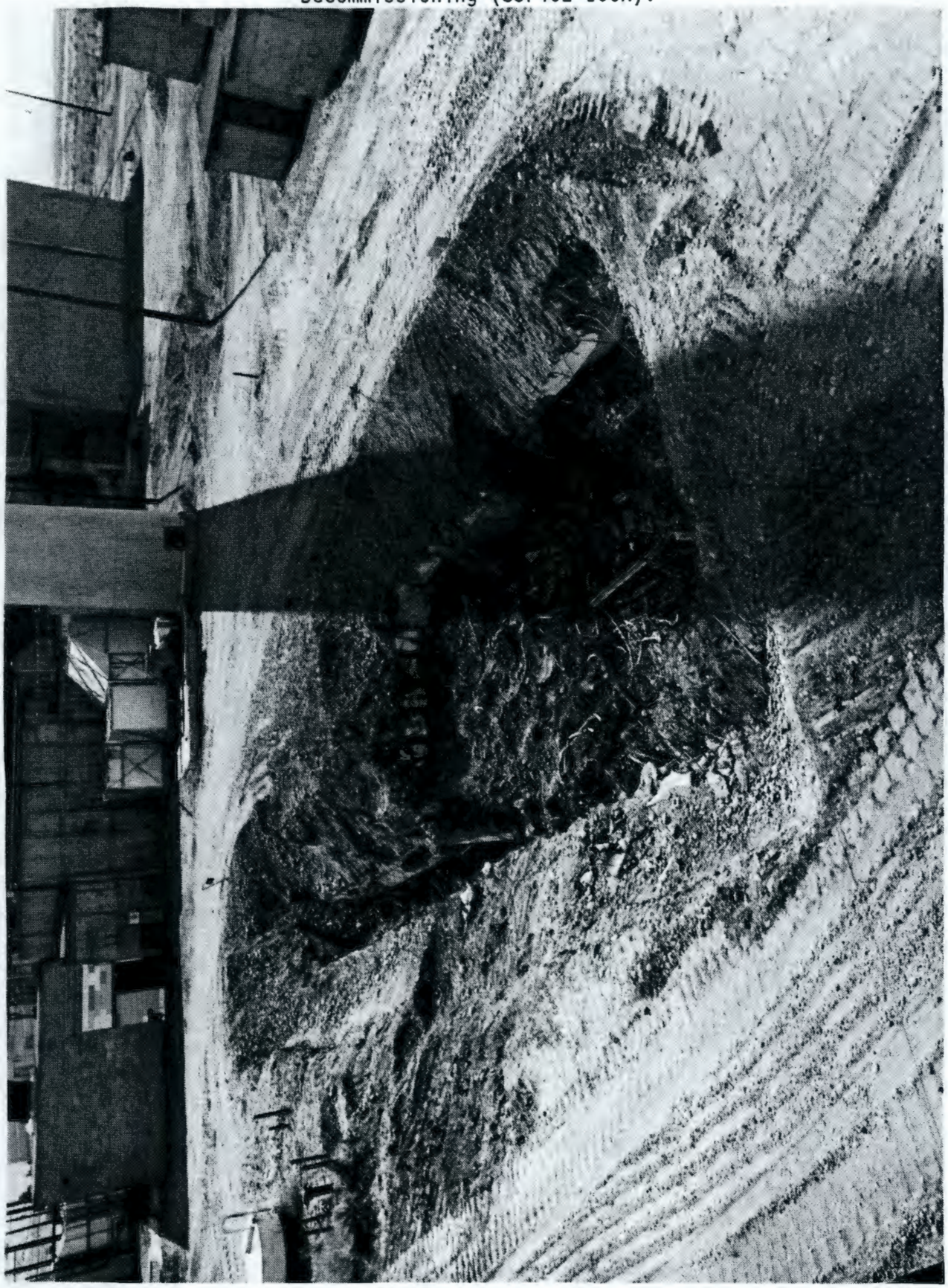


Figure 4-15. 132-F-5, 117-F Filter Facility During Decommissioning (83F462-10CN).



The facility received waste water containing trace amounts of low-level radionuclides and decontamination chemicals (primarily Turco [a tradename of Turco Products, Inc.]). Radionuclides were primarily miscellaneous activation products. The decontamination chemicals consisted of sodium fluoride, oxalic acid, and citric acid. Water was pumped from the reactor collection pits into a collection pit in the lower part of the pumping station from which it was pumped to the reactor cooling water effluent lines (DOE-RL 1987, WHC 1991). Underground lines between 105-F and 1608-F, with elevations, are shown on Hanford Drawing H-1-70185.

Basement floor smears were taken at the time of decommissioning, and results are shown in Table 4-14.

Soil sampling was accomplished from a single location adjacent to the lift station prior to demolition. Results are shown in Table 4-15 for 5-, 25-, and 30-ft depths.

Dorian and Richards (1978) refers to the 116-F-6 Trench as the "1608-F Liquid Waste Distribution Trench," suggesting that 1608-F Pumping Station wastes were disposed of at this site. Several other documents, including Gano and Hall (1987), Drawing H-1-15244, and Kiser (1988), also use this nomenclature for 116-F-6.

No Hazardous Ranking System Migration Score has been assigned to this waste site.

The site appears today as a level, gravel-covered field located southeast of the 105-F Reactor Building. It is within the reactor building security fence but has no unique markings or fencing.

4.25 1607-F SEPTIC TANKS AND DRAIN FIELDS

Six septic tanks are located in the 100-FR-1 Operable Unit. All are inactive liquid waste sites, are constructed of concrete, and include drain fields. None are known to have received hazardous or radioactive wastes, although all supported facilities where hazardous chemicals and radionuclides were routinely used. Five have been assigned designation numbers and are addressed in the Tri-Party Agreement while the sixth appears to have been overlooked and is identified in Table 4-16 as "Unlisted."

4.26 UN-100-F-1 UNPLANNED RELEASE

The only documented unplanned release in the 100-FR-1 Operable Unit was a spill that occurred in 1971 when the process sewer line from the 141-C Hog Barn became plugged and overflowed onto the surface adjacent to the building. The spill consisted of wash water used to clean out animal pens and contained 4.00E-05 Ci of Sr^{90} and 1.06E-06 Ci of ^{239}Pu. About 1,600 ft^2 of soil was contaminated (Stenner et al. 1988).

Table 4-14. Results of Smear Samples Taken at 1608-F Pumping Station Before Demolition.

Radionuclide	pCi/100 cm^2 Sample
^{239}Pu	3.10E-01
^{90}Sr	8.10E+00
^{152}Eu	5.80E+01
^{60}Co	4.10E+01
^{137}Cs	1.10E+01
^{155}Eu	2.30E+02

Dorian and Richards (1978).

Table 4-15. Radionuclide Inventory in Soil Adjacent to the 1608-F Lift Station.

Radionuclide[a]	pCi/g at 5 ft	pCi/g at 25 ft	pCi/g at 30 ft
^{238}Pu	--	--	--
$^{239/240}Pu$	1.70E-01	--	--
^{90}Sr	1.90E+00	8.20E-01	3.90E-01
^{3}H	3.20E+01	b	3.90E-01
^{152}Eu	9.20E+01	3.10E+01	5.60E+00
^{60}Co	1.20E+01	4.10E+00	8.80E-01
^{154}Eu	1.90E+01	6.20E+00	1.20E+00
^{134}Cs	4.00E-01	1.40E-01	b
^{137}Cs	6.20E+00	1.60E+00	1.50E+00
^{155}Eu	4.90E+00	1.50E+00	1.10E-02

[a]The total extent of soil contamination was not established; however, less than 1 Ci is believed to be present.
[b]Less than detectable limits.
Dorian and Richards (1978).

Table 4-16. Operable Unit 100-FR-1 Septic Tanks.

Septic tank designation	Years of operation	Location	Comments
1607-F-2[a]	1944-1988	N79500 W29740	Supported 184-F, 185-F, 190-F, 105-F, 108-F, and the 1700 Admin and Service Buildings
1607-F-3	1944-1965	N80440 W32100	Supported 182-F, 183-F, and 151-F
1607-F-4	1944-1965	N79130 W31550	Supported 115-F Gas Recirculation Building
1607-F-5	1944-1965	N82130 W31040	Supported the 181-F Pumphouse
1607-F-6	1945-1975	N80600 W29300	Supported the 141-B, -C, -F, and -M Buildings and 146-FR Animal Farm Buildings
Unlisted	ca 1945 to 1975	N80125 W29510	Supported the 141-M Building. See Drawing H-1-13850, sheet 3.

[a]A chain barrier and underground radioactive material warning signs have been erected around the 1607-F-2 Septic Tank. Neither the WHC organization responsible for the sanitary sewer system nor WHC Environmental Assurance has any information on the nature or degree of contamination at this site. None of the applicable references list it as a contaminated site. There have been some instances where a septic tank has been marked as a radiation zone simply because it is located in an area where a contamination potential exists or because it supported a facility from which contamination was likely to have been introduced into the sanitary sewer. Either reason could apply to 1607-F-2 due to its proximity to the reactor effluent lines that have a history of leakage, and because the septic tank supported both the 105-F Reactor Building and the 108-F Biology Lab.

The area was stabilized with clean gravel. No markers or barriers are unique to the spill site although it lies within the larger set of permanent concrete monuments that protect the EAF area. The area appears today as a level, grass-covered field (WHC 1991, site inspection).

No Hazardous Ranking System Migration Score has been assigned to this waste site.

Several undocumented waste sites were discovered during the preparation of this report. "Undocumented" means only that the waste site is not documented in WIDS (WHC 1991).

4.27 UNDOCUMENTED UNPLANNED RELEASE--MERCURY SPILL

A second unplanned release appears to have occurred in the operable unit when, in 1977, an unknown quantity of mercury was spilled on the floor of the 146-FR Fish Lab and was "squeegeed" across the floor and out the door onto the surface of the ground at the northeast corner of the building. The mercury contaminated an area approximately 10 by 10 ft. Personnel who remember the incident are unable to specify the volume of mercury, its chemical composition, or the exact area of soil that was contaminated. The spill site was reportedly stabilized with fresh soil (employee interview).

Hanford Drawing H-1-13850, sheet 3, shows the approximate site of the spill as being at Hanford coordinates N80500 W29300.

No Hazardous Ranking System Migration Score has been assigned to this waste site.

4.28 UNDOCUMENTED UNPLANNED RELEASE--BASIN LEAK DITCH

Another unplanned release is a narrow ditch, referred to in numerous sources as the Basin Leak Ditch, that was created from repeated effluent leakage at the north end of the 107-F Retention Basin (Dorian and Richards 1978, DOE-RL 1992).

The ditch was formed in 1955 following a basin overflow and was enlarged by repeated overflows from an effluent line manhole located just north of the basin. It runs in an approximately straight line from the northeast corner of the 107-F Basin to the bank of the Columbia River.

Soil samples were taken from four locations along the path of the ditch. Elevated concentrations of ^{152}Eu, ^{60}Co, and ^{137}Cs were measured. Full test results are provided in Appendix B (Dorian and Richards 1978).

The ditch appears today as an open, cobble-covered field that cannot be distinguished from the 116-F-9 Animal Waste Leach Trench site that it crosses from west to east. The point where the ditch reaches the river is unremarkable with no clear signs of erosion.

4.29 UNDOCUMENTED 108-F BUILDING VENTILATION DUCT FRENCH DRAIN

A french drain is located adjacent to the east wall of the 108-F Building at approximate Hanford coordinates N79100 W30360. Dates of operation are unknown as are the type and quantity of waste introduced to the drain.

The drain received condensate that formed inside of several large hood ventilation ducts mounted externally on the east wall of the building. Condensate formed during cold weather and ran through 1-in. stainless steel lines to the drain. The ventilation ducts and drain lines are visible on Figur 4-5.

The drain is a 36-in. concrete pipe of unknown length. It is buried to a depth that places its upper surface at grade. A highly degraded wooden cover is in place over the drain. For safety purposes, the drain and cover are protected by a sheet of plywood.

No radiation warning signs exist at the drain.

4.30 UNDOCUMENTED 108-F BUILDING 30-INCH FRENCH DRAIN

A french drain is located adjacent to the south wall of the 108-F Building East Porch, between the gas cylinder storage shed and the exit stairs from the loading dock. It is at approximate Hanford coordinates N79060 W30370. Dates of operation are unknown as are the type and quantity of waste introduced to the drain.

The drain is constructed of 30-in. steel pipe of unknown length. It is buried to a depth that places its upper surface a few inches above grade. It has a steel lid and is gravel filled.

No radiation warning signs exist at the drain.

4.31 UNDOCUMENTED 108-F BUILDING 12-INCH FRENCH DRAIN

A french drain is located adjacent to the south wall of the 108-F Building, a few feet east of the building's southwest corner. It is at approximate Hanford coordinates N70940 W30390. Dates of operation are unknown as are the type and quantity of waste introduced to the drain.

The drain is constructed of 12-in. vitrified clay pipe, or similar material. It has no cover and is filled with gravel. A 1/2-in. steel pipe enters the drain from the 108-F Building. The drain is visible on Figure 4-12.

No radiation warning signs exist at the drain.

4.32 UNDOCUMENTED 108-F BUILDING 18-INCH FRENCH DRAIN

A french drain is located adjacent to the northwest corner of the electrical substation that abuts the west wall of the 108-F Building. It is located at approximate Hanford coordinates N79090 W30450. Dates of operation are unknown as are the type and quantity of waste introduced to the drain.

The drain is constructed of 18-in. concrete pipe of unknown length. It is buried to a depth that places its surface a few inches above grade. It has no cover and is filled with gravel. A 1-in. steel pipe enters the drain from the 108-F Building. The drain is visible on Figure 4-12.

4.33 UNDOCUMENTED FRENCH DRAINS NEAR 105-F GATE

Two undocumented french drains are located near the main (north) entrance gate to the 105-F Reactor Building security fence. The first drain is about 75 ft south of the gate and the second is in line with the first and about 25 ft farther south. They are constructed of 36-in. concrete pipe of unknown length buried to a depth that places their upper surfaces a few inches above grade. Both drains are of the type frequently used to receive steam condensate from aboveground steam lines. No radiation warning signs are present. No characterization data have been located.

4.34 UNDOCUMENTED FRENCH DRAINS AT EAST END OF 105-F STORAGE ROOM

Two undocumented french drains are located adjacent to the southeast and northeast corners of the Miscellaneous Storage Room of the 105-F Reactor Building. The storage room is the easternmost portion of the reactor building. Each drain is a 36-in. concrete pipe buried to an unknown depth. The upper surface of each is a few inches above grade and each is gravel filled. Each drain is fed by one or more 1-in. steel pipe coming from the 105-F Building. No radiation warning signs are present. No characterization data have been located.

4.35 UNDOCUMENTED 36-INCH FRENCH DRAIN AT 105-F BUILDING

An undocumented french drain is located at the northeast corner of the 105-F Reactor Building. It is adjacent to a steel door marked "Electrical Equipment Room No. 1."

The drain is constructed of 36-in. concrete pipe of unknown length. It stands a few inches above grade and has a steel lid. Five 3/4-in. steel lines enter the drain from the building. No radiation warning signs are present. No characterization data have been located.

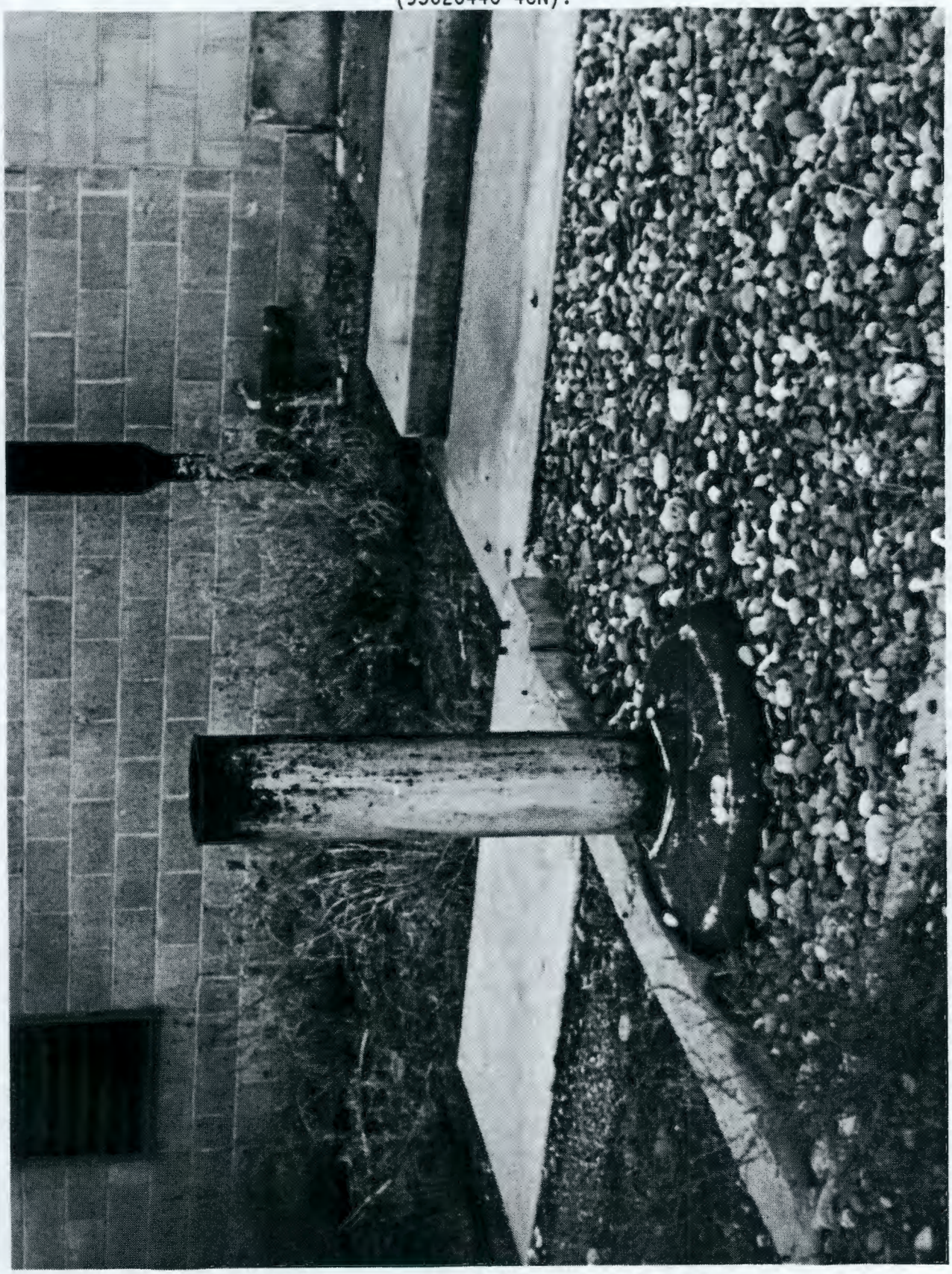
4.36 UNDOCUMENTED UNDERGROUND TANK--105-F BUILDING

An undocumented underground tank is located near the northwest corner of the 105-F Reactor Building, adjacent to the north wall of the fan house. It is a 36-in. circular steel tank of unknown length buried to a depth that places its upper surface a few inches above grade. An 8- by 36-in.-long steel pipe is welded to its upper surface. Liquid may be observed in the tank by looking down the 8-in. pipe.

The tank is located within the remnant foundation of a structure that was once attached to the north wall of the 105-F Building. See Figure 4-16.

No radiation warning signs are present. No characterization data have been located.

Figure 4-16. Undocumented Underground Tank with 105-F in Background (93020446-4CN).



4.37 CHEMICALS USED AT 108-F BUILDING

The 108-F Building was originally used as a reactor laboratory before being converted for use as a biology laboratory, probably about 1950. While serving as a reactor laboratory, several chemicals appear to have been used in large quantities for various kinds of water treatment and reactor effluent scaling research applications. These included sodium dichromate, sodium silicate, oxalic acid, lime, and sulfuric acid. Large sulfuric acid and sodium silicate storage tanks were located immediately west of the building, and other storage tanks were located within the building. Drawings provide references to chemical drainage to sewers, sumps, and french drains without providing detail. See Hanford Drawings H-1-2037, HW-74552, HW-74640, HW-74641, and HW-74665. The outdoor storage tanks are visible in Figure 2-2, taken in December 1944, and appear to still be there in 1951 but have been removed by 1956.

The drawings that cite the use of the above chemicals are not "as built" drawings, and there is some uncertainty as to their accuracy. This section is included to address the possibility that they were used and may have reached soil through the 108-F Building ground floor trench and sump (see Section 4.15).

4.38 CONTAMINATED UNDERGROUND LINES

Numerous underground lines remain in place in the 100-FR-1 Operable Unit that must be assumed to be radioactively and/or chemically contaminated. These include process sewer lines to waste sites, lines to the 141-N Sump and the 1608-F Lift Station, effluent lines to and from the retention basin, lines from the 108-F Biology Lab, and numerous others that were left in place when their associated facilities were decommissioned.

No records have been located that suggest destruction or removal of lines or junction boxes, and it should be assumed that they remain in place. Interviews with personnel of WHC Deactivation and Decommissioning Engineering suggest that underground lines were typically left in place during deactivation and/or decommissioning.

The lines vary widely in size, material, and depth below grade. Most are identified on current or historical Hanford drawings, but others are probably undocumented. Little information exists that characterizes contaminants in the lines and junction boxes, but they are known to have processed millions of liters of waste effluent and should be assumed to be contaminated.

No records have been located that directly address contamination levels in most underground lines, but Dorian and Richards (1978) reports scale samples taken in the 107-F Effluent Line upstream of the 107-F Retention Basin (Table 4-17). It seems likely that the downstream lines would be similarly contaminated but at lower levels because effluents would have been held up in the retention basins before entering the downstream lines, allowing radioactive decay and settling to occur. It should also be noted that the upstream effluent lines were steel while the downstream lines were concrete, the materials differing in scale creation and retention properties.

Table 4-17. Concentration of Radionuclides on Scale Samples Taken from 42-inch Effluent Lines Upstream of 107-F Retention Basin.

Radionuclide	Concentration (pCi/g)
^{152}Eu	Less than detection limits
^{60}Co	1.70E+02
^{154}Eu	Less than detection limits
^{137}Cs	2.50E+02
^{155}Eu	4.90E+02

Dorian and Richards (1978).

4.39 UNDOCUMENTED UNDERGROUND FUEL TANK--1705-F BUILDING

Hanford Drawing H-1-1518 shows the location of a 1,000-gal underground fuel oil tank located immediately west of the 1705-F Radio Botany Lab. The laboratory has been decommissioned and no trace exists of its original location. Hanford Site personnel note that underground lines and tanks were typically left in place at the time that related buildings and facilities were razed.

4.40 SUSPECT WASTE SITE--FUEL TANK AND PUMP LOCATION (1716-FA BUILDING)

Hanford Drawing M-2938, sheet 5, shows the location of the 1716-FA Automotive Repair Shop with gas tanks and gas pumps at approximate Hanford coordinates N80800 W30000. The facilities probably operated during the 100-F Site construction period and were then removed along with the many other so-called "temporary construction" or "TC" buildings. The facilities are present in Figure 2-2, dated December 22, 1944, but are not present on later photographs. The concrete pad for the decommissioned repair shop is visible in Figure 2-5.

The drawing does not specify the fuel tanks as being underground or aboveground, and the tanks are not apparent on the photograph. Temporary automotive fueling facilities at other Hanford Site locations used aboveground fuel tanks.

4.41 SUSPECT WASTE SITE--UNDERGROUND FUEL TANKS AND DRY WELL AT 1717-F BUILDING

Hanford Drawing H-1-14562 shows three 25,000-gal underground fuel oil tanks located about 150 ft west of the original location of the 1717-F Building at approximate Hanford coordinates N79600 W30400. Each tank was 35 ft long and 8 ft in diameter. Lines ran to the 1717-F Building through a pump pit immediately east of the tanks.

The same drawing shows a 48-in. dry well located between the fuel tanks and the 1717-F Building. It is connected to the building by two lines, one of which is labeled as a "4 in. blowdown to drywell."

The 1717-F Building was used as a combined shop and boiler room.

Tank filler pipes and the french drain are visible in Figure 2-5.

5.0 100-FR-2 OPERABLE UNIT

This chapter describes the 100-FR-2 Operable Unit, which encompasses the southern portion of the 100-F Area and includes primarily solid waste burial grounds that supported reactor operations and the Experimental Animal Farm (EAF). It includes 17 waste sites, only 10 of which are included in the Tri-Party Agreement (Ecology et al. 1989). These include burial grounds, pits, a trench, a septic tank, and suspect waste sites. Each waste site is described separately. Figure 5-1 shows 100-FR-2 Operable Unit waste sites.

Dorian and Richards (1978) provides the following brief outline of past 100 Area solid waste burial practices:

1944 - 1954

- No intensive segregation program
- Combustibles and noncombustibles were buried in the same trenches
- Burial records contain minimal information.

1955 - 1965

- Alternate disposal methods and sites studied, documented, and in some cases, implemented
- Burning of combustibles in burial trenches began and ended (in 1955)
- Records improved.

1966 - 1973

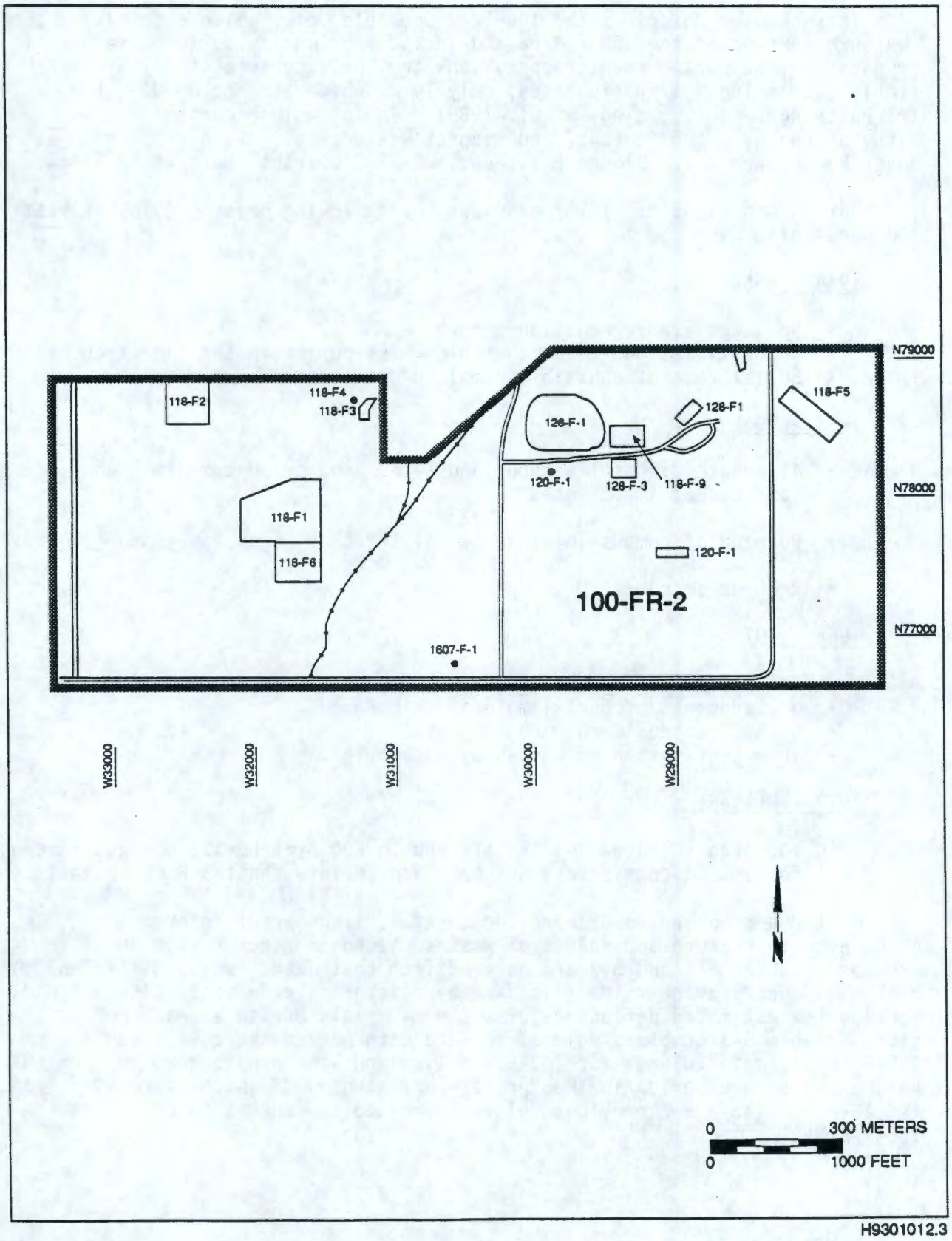
- Centralization of burial grounds began and completed
- Measurements of burial materials improved
- Burial records much more complete
- Some segregation of wastes by categories.

1973 - Present

- 100 Area solid wastes transferred to 200 Area burial grounds (except for some decommissioning rubble dumped into the 183-F Clear Wells.)

Miller and Wahlen (1987) provides useful, if generic, information concerning the nature and volume of wastes placed in reactor site burial grounds. Tables 5-1 and 5-2 are derived from that data. While Miller and Wahlen did not provide volumetric data by reactor site or waste site, it did provide the estimated percentage of waste materials buried at each reactor site. Table 5-1 combines volumetric data with percentage data cited for 100-F to estimate volumes for 100-F. Miller and Wahlen note that most of the volumes cited are buried in the "primary burial ground" which, for 100-F Area, is 118-F-1. Table 5-2 provides volumes of miscellaneous waste buried at the 100-F Area.

Figure 5-1. Map of the 100-FR-2 Operable Unit Showing Waste Sites Present During Reactor Operations.



H9301012.3

Table 5-1. Estimated Volumes of Solid Wastes Buried at 100-F Area.

Material type	Volume at F Reactor	Total at all reactors (tons)	Volume at F Reactor (tons)
Spacers	10%	425	42.5
Lead-calcium poison pieces	21%	1,103	232
Splines Aluminum Boron	 14% 14%	 62.5 8.5	 8.75 1.20
Graphite	12%	.7	.08
Desiccant	12%	6.6	.80
Process tubes (4,788)			45.5
Lead	14%[a]	170	24.0

[a]Percentage is author's estimate and not provided by Miller and Wahlen.

Table 5-2. Volumes of Miscellaneous Waste Buried at 100-F Area.

Type of material	Volume (tons)
Gun barrels	1.00
HCR/VSR Thimbles	2.75
HCRs	0.75
VSRs	1.50
Nozzles/pigtails	15.0
Reactor tools	0.50
Total	**21.5**

Miller and Wahlen (1987).

5.1 118-F-1 BURIAL GROUND

The 118-F-1 Burial Ground is an inactive solid waste site that operated from 1954 to 1965 to receive miscellaneous radioactive solid wastes and reactor components and hardware from the 100-F Reactor operations (WHC 1991). It is sometimes referred to in literature as the primary 100-F burial ground.

Located about 1,000 ft southwest of the reactor building at Hanford coordinates N78071 W32200 (northwest corner), the burial ground received about

20,000 m^3 of waste (Stenner et al. 1988, Hanford Drawing H-1-15396). Note that the southern boundary of 118-F-1 forms the northern boundary of 118-F-6, and some drawings and literature identify the two waste sites as a single site, usually referred to as Burial Ground #1, or a similar notation. This report separates the two waste sites.

Herman (1965b) characterizes the site as follows:

"The 118-F-1 Burial Ground combines two locations formerly called Minor Construction Burial Ground No. 2, and Solid Waste Burial Ground No. 2. Solid waste from 105-F construction work was put into 2 holes in 1954, and covered with soil to grade in late 1955 or early 1956. Adjacent to this site, on the south side, a trench was opened in 1955, and extended on two subsequent occasions. Miscellaneous solid waste was buried in the 2 trenches, running north and south, and covered to grade with at least 2 feet of soil. West of these trenches a number of pits containing irradiated process tubing and dummy elements were similarly covered. All of these trenches and pits are considered to be part of the 118-F-1 Burial Ground.

"A third trench at the east side of the burial ground was used during July and August, 1965, for burial of gun barrel tips, steel sleeves, and metal chips removed from the reactor. Filter boxes containing reactor graphite chips were also buried in this trench which was then back filled to grade with 4 feet of soil cover. A pit near the west side of the site was used during the same period for burial of miscellaneous surface contaminated waste and subsequently back filled with about 6 feet of soil cover. Dose rate at the surface of the ground is less than 1 mR/hr. The boundaries of this burial ground are permanently marked by posts numbered F-65-1 through F-65-21."

118-F-1 was 600 by 500 by 20 ft deep before it was backfilled. It received an estimated 11,000 tons of solid waste between 1954 and 1965 (DOE-RL 1991).

Estimated radionuclide inventory for 118-F-1, in curies and decayed by the WIDS database to April 1, 1986, includes the following (Stenner et al. 1988, WHC 1991):

^{14}C : 6.600e-001 Ci	^{152}Eu: 1.540e+001 Ci	^{63}Ni: 8.310e+001 Ci
^{60}Co: 7.643e+002 Ci	^{154}Eu: 2.810e+001 Ci	^{90}Sr: 1.300e+000 Ci
^{137}Cs: 1.300e+000 Ci	^{3}H : 3.500e+000 Ci	

No soil sampling has been accomplished at 100-F burial grounds. However, sampling was accomplished at the 118-B-1 Burial Ground that may, to some extent, be representative of conditions at the 118-F-1 Burial Ground. Some general results of this sampling from six 118-B-1 sample holes are as follows (Dorian and Richards 1978).

- No measurable migration of radionuclides is indicated by data.
- The maximum $^{239,240}Pu$ concentration detected in samples is 1 pCi/g. Plutonium-239,240 is generally not detectable.

- The primary radionuclide identified is ^{60}Co, although $^{152,}Eu$, ^{154}Eu, ^{134}Cs, ^{137}Cs, ^{90}Sr, and ^{63}Ni are also present.

- The maximum beta-gamma concentration detected in samples is 1.80E+05 pCi/g of which 1.70E+05 is ^{60}Co.

- Nickel-63 was detected up to 7.50E+01 pCi/g. Based on sampling of the 105-DR Reactor core, considerably higher ^{63}Ni concentrations are probably present in metallic wastes within this (118-B-1) burial ground.

- Specific activities of samples taken in older trenches used before reactor power upgrade modifications were made are considerably less than for trenches used after the reactor power operating levels were increased.

The Hazardous Ranking System Migration Score assigned to this waste site is 2.01.

The 118-F-1 Burial Ground appears today as a cobble-covered, open field. It is protected by permanent concrete monuments that surround 118-F-1 and 118-F-6 but has no markings that are unique to 118-F-1. Underground radioactive material warning signs are posted.

5.2 118-F-2 BURIAL GROUND

The 118-F-2 Burial Ground is an inactive solid waste site that operated from 1945 to 1965 to receive 10,000 m^3 of miscellaneous solid waste from 105-F and the biology facilities (Koop 1964, WHC 1991).

Located about 1,500 ft west of the reactor building at Hanford coordinates N78990 W32787 (northwest corner), the boundaries of this burial ground are marked by permanent concrete monuments numbered F-65-22 through F-65-37 (Herman 1965b).

Koop (1964) characterizes the site as follows: "The 118-F-2 Burial Ground was referred to as the Solid Waste Burial Ground No. 1 and was the original solid waste disposal site in the 100 F Area. Eight trenches containing miscellaneous solid waste from 105-F Reactor building and one containing solid waste from the biology facilities were covered to grade prior to 1956. Several large cylindrical sleeves used for disposal of liquid waste from 108-F were buried under about 6 feet of soil in 1955." Cluckey (1954, 1956) describes the cylindrical tubes as being seven 6- by 18-ft-long metal pipes with wooden lids into which animal carcasses and liquid wastes were placed.

Herman (1965b) states that "subsequent excavations were made to recover dummy elements and as a result some dummies with relatively low radioactivity remain near the surface. Three horizontal control rods are buried under 2 feet of soil near the south side. Dose rate at the ground surface is less than 1 mR/hr".

118-F-2 was 368 by 326 by 20 ft deep before it was filled with waste and backfill. The individual trenches run north and south and are typically 250

by 20 ft wide. It received an estimated 10,000 m^3 of miscellaneous radioactive solid waste between 1945 and 1965 (Stenner et al. 1988). Miller and Wahlen (1987) states "that the quantity of metallic and other waste is included with the estimates for 118-F-1".

Estimated radionuclide inventory for 118-F-2, in curies and decayed to April 1, 1986, includes 1.00 Ci of ^{60}Co (WHC 1991).

The Hazardous Ranking System Migration Score assigned to this waste site is 1.34.

The 118-F-2 Burial Ground appears today as a cobble-covered, open field. It is protected by permanent concrete monuments but has no markings that are unique to 118-F-2. Underground radioactive material warning signs are posted. The site was also known as the Minor Construction Burial Ground No. 1.

5.3 118-F-3 BURIAL GROUND

The 118-F-3 Burial Ground is an inactive solid waste site that operated for a short period of time in 1952. It received irradiated reactor parts that were removed during the project to convert the 100-F Reactor from the liquid 3X to the ball 3X safety systems. These parts primarily included vertical safety rod thimbles and step plugs (Miller and Wahlen 1987).

The burial ground is located immediately outside the reactor building south security fence, near its southwest corner, at Hanford coordinates N78839 W31274 (northernmost point). Its exact location is best described on Hanford Drawing H-1-15244, which identifies the concrete monuments that delineate the burial ground. It was 175 by 50 by 15 ft deep, ran from north to south, and was somewhat irregular in shape. It is estimated to have received about 10 m^3 of solid waste and was backfilled after use (WHC 1991, Dorian and Richards 1978).

Thimbles are described as being 35 ft long with a diameter of 3.5 in. and a wall thickness of .15 in. Each weighed about 90 lb and was made of aluminum. Thirty-eight were removed during the ball 3X conversion and are buried at 118-F-3. An additional 23 were replaced for maintenance purposes at an earlier date, and it is unclear where these are buried (Miller and Wahlen 1987). If only the 38 conversion thimbles were buried at 118-F-3, their combined weight would be about 3,400 lb (5,500 lb if all 61 thimbles were buried there).

The burial ground is estimated to contain about 1 Ci of ^{60}Co (Miller and Wahlen 1987). Dose rates at the surface are less than 1 mR/h (Herman 1965b).

The Hazardous Ranking System Migration Score assigned to this waste site is 1.34.

This waste site appears today as an open field covered with cobbles. No vegetation grows on its surface. It is surrounded with permanent concrete monuments on which are mounted underground radioactive material warning signs. No fencing is provided. The water table at this site is approximately 30 ft below grade.

Aliases for this site include Burial Ground No. 3 and Minor Construction Burial Ground.

5.4 118-F-4 BURIAL GROUND (115-F PIT)

The 118-F-4 Burial Ground is an inactive solid waste site that operated during 1949 to receive silica gel wastes from the 115-F Building (WHC 1991).

Located about 400 ft southwest of the reactor building at Hanford coordinates N78880 W31400, the burial ground received about 10 m^3 of waste (WHC 1991). Hanford Drawing H-1-15244 shows its approximate location.

Herman (1965b) characterizes the site as follows: "The 118-F-4 Burial Ground, known as the 115-F Pit, was excavated in 1949 to receive silica gel removed from the gel tower in one of the 115-F dryer rooms. The pit was promptly covered to grade with 5 to 6 feet of soil." It was 10 by 10 by 10 ft deep before filling with waste and backfill.

Estimated radionuclide inventory for 118-F-4, in curies and decayed by the WIDS database to April 1, 1986, includes 2.00E-02 Ci of ^{14}C and 8.00E-01 of ^{3}H (WHC 1991).

Miller and Wahlen (1987) notes that .30 tons of desiccant was included in 118-F-4 wastes.

The Hazardous Ranking System Migration Score assigned to this waste site is 1.75.

The 118-F-4 Burial Ground appears today as a flat field covered with large cobbles. Because no markings are unique to the burial ground, its exact location is unclear.

5.5 118-F-5 PNL SAWDUST PIT

The 118-F-5 Sawdust Pit is an inactive solid waste site that operated from 1954 to 1975 to receive radioactively contaminated sawdust from the floors of animal pens in the 100-F EAF.

The site is located about 1,000 ft southeast of the 107-F Retention Basin at Hanford coordinates N78980 W28990. It measured 500 by 150 by 15 ft deep before being backfilled and stabilized with clean soil (WHC 1991).

Estimated radionuclide inventory for 118-F-1, in curies and decayed by the WIDS database to April 1, 1986, includes the following (Stenner et al. 1988, WHC 1991):

^{239}Pu	$3.00E^{-01}$ Ci
^{90}Sr	$1.04E^{+01}$ Ci

Miller and Wahlen (1987) characterizes this waste site as follows: "The PNL Sawdust Repository, 118-F-5, consists of sawdust and other solids removed from the dog kennels and swine pens and is located outside the old

perimeter road east of the 188-F Ash Disposal Area. The disposal at this site was begun in about 1958. Since that time, about 10,000 yd^3 of sawdust containing strontium-90 and some plutonium-239 have been deposited. The solids at this site have been covered with a 4-ft layer of soil. The volume of waste is estimated to be 3,000 ft^3."

Miller and Wahlen (1987) further characterizes the waste as containing 15.0 Ci of ^{90}Sr and 0.3 Ci of ^{239}Pu by citing a 1971 internal memo from W. D. Richmond, Pacific Northwest Laboratory, to M. R. Schneller, U.S. Atomic Energy Commission. This agrees with Stenner et al. with respect to plutonium but differs with respect to strontium (also Dorian and Richards 1978).

Further characterization is provided in an internal memo from V. R. Richards to J. J. Dorian, dated August 10, 1981, and published in Miller and Wahlen (1987). It notes that five soil sample holes were dug at 118-F-5 in 1979. "Several samples from two of these test holes indicated contaminated fine sand and sawdust (150 to 700 c/m) at about 6 to 7 ft. below fill grade. Samples from other test holes showed no indication of radioactive contamination. The GM probe used to show the radioactivity profile of the sample holes detected a narrow band of activity (600 to 800 c/m) and was less than 10 in. wide in both holes."

Richards comments further that "I feel an estimate of the total radioactive inventory involved (in 118-F-5) would be a rough guess. My educated guess would be 2 to 4 curies." Estimated concentration of radionuclides involved are indicated in Table 5-3.

Table 5-3. Radionuclides Detected in 118-F-5 Test Holes.

Radionuclide	Maximum concentration (pCi/g)	Minimum concentration (pCi/g)
^{60}Co	5.30E-01	4.70E-01
^{90}Sr	2.00E+02	1.70E+01
$^{239/240}Pu$	2.10E-01	2.10E-01

Richards to Dorian (1981).

Past employees remember that sawdust from the EAF was placed in paper boxes or 55-gal metal drums before burial in this site. They were transported to the site in light trucks and the packaged waste thrown into the pit by hand.

The Hazardous Ranking System Migration Score assigned to this waste site is 2.01.

This waste site appears today as a soil- and cobble-covered area with no fencing or markers that uniquely identify the site. The pit area has been backfilled and further stabilized by covering with an additional 36 to 48 in. of soil, creating a sizable mound above the original burial site.

5.6 118-F-6 BURIAL GROUND (PNL SOLID WASTE BURIAL GROUND)

The 118-F-6 Burial Ground is an inactive solid waste site that operated form 1965 to 1973 to receive approximately 10,000 m^3 of biological solid waste from animal research studies (DOE-RL 1991).

Located about 1,500 ft southwest of the 105-F Reactor Building at Hanford coordinates N77780 W31948, the burial ground received 10,000 m^3 of solid mixed waste (WHC 1991). It was 400 by 200 by 20 ft deep before filling with waste and backfill and contains about 353,000 ft^3 of solid mixed waste. It adjoins the southern boundary of the 118-F-1 Burial Ground and is marked by permanent concrete monuments (Stenner et al. 1988).

DOE-RL (1991) characterizes the site as follows:

> "The 118-F-6 Burial Ground, known as the PNL Solid Waste Burial Ground, was used ... for the disposal of biological solid waste from animal research studies. The site also contains two large rail tankcars (known by employees as 'submarines') used for incineration of animal tissue and carcasses. The carcasses were dropped through a manhole and lime was placed on them to facilitate decomposition. When the tank was full, 400 to 500 gallons of fuel oil were added to the tank and ignited. The residual ash was left in the tank after each incineration until the tank was near full, then the second tank was utilized.
>
> "Pu^{238} contaminated carcasses and animal wastes from the dog experiments were also incinerated in a muffle furnace located in the 114-F Laboratory and placed in radiation boxes for burial in the 118-F-6 Burial Ground."

Its estimated radionuclide inventory, in curies and decayed to April 1, 1986, includes 1.04E+01 Ci of ^{90}Sr (WHC 1991).

The 118-F-6 Burial Ground appears today as a level field covered with cobbles. Additional stabilizing soil has been placed on the burial ground, which has raised its surface to a level 2 to 3 ft above grade. It is unfenced but is surrounded by permanent concrete monuments. A 300- by 20- by 10-ft-deep open trench runs east to west along its southern boundary. This may have been the source of the stabilizing material placed on the burial ground, or it could be an unused burial ground trench.

The Hazardous Ranking System Migration Score assigned to this waste site is 1.67.

5.7 118-F-9 BURIAL GROUND (PNL RAD SITE)

The 118-F-8 Burial ground is an inactive solid waste burial ground about which little is known. It operated late in the history of the EAF operations; exact dates are unknown. Located within the general confines of the 100-F Ash Pit at approximate Hanford coordinates N78500 W29445, the site received undocumented miscellaneous solid wastes from the EAF.

Figure 2-3, Chapter 2.0, may provide some clues to the size and location of the burial ground as it shows two parallel burial trenches that lie side by side in the approximate area described above. The pits lie at the southeastern corner of the 126-F-1 Ash Pit and appear to be about 100 by 15 by 5-10 ft deep.

The site is not uniquely identified but is estimated to be within the current chains and warning signs that apply to the ash pit. The surface is grass covered, and there is no physical evidence of the exact location of the burial ground.

No Hazardous Ranking System Migration Score has been assigned to this waste site, and no radionuclide or hazardous chemical inventory is available.

5.8 120-F-1 GLASS DUMP

The 120-F-1 Glass Dump is a inactive solid waste site located about 2,000 yd southeast of the 128-F-1 Ash Pit at Hanford coordinates N77500 W29000 (approximate). The site is most easily located by walking about 150 yd northeast of the newly drilled test well F8-4.

The dump site is a 35 by 8 by 4-ft-deep trench that runs east to west. It was used to dump glass products and batteries. Fluorescent tubes, incandescent light bulbs, vacuum tubes, small batteries, chemical bottles, and laboratory apparatus are visible in the pit. Earth from excavation has been mounded at the west end of the trench. No backfilling appears to have occurred. See Figure 5-2.

The dump site is protected by a 100- by 100-ft temporary barrier made of yellow nylon rope attached to metal posts. Hand printed "Danger - Do Not Enter" signs hang from the rope.

The site is visible in the extreme left foreground of Figure 2-3 in Chapter 2.0.

Soil appears to have also been disturbed about 150 ft southeast of the glass dump site, and remnant pieces of 1/2-in. plastic or plexiglass are scattered on the surface.

No radionuclide or hazardous chemical inventory is available, nor has a Hazardous Ranking System Migration Score has been assigned.

5.9 126-F-1 POWERHOUSE ASH PIT

The 126-F-1 Ash Pit is characterized in WHC (1991) as an inactive nonhazardous/nonradioactive solid waste site. It operated from 1944 to 1965 to receive coal ash from the 184-F Powerhouse.

The site is an irregularly shaped natural depression located east of the 108-F Building and south of the effluent lines leading to the 116-F-14 Retention Basin at Hanford coordinates N79000 W29650.

Figure 5-2. 120-F-1 Glass Dump (93020446-9CN).

Large, but unquantified, amounts of coal ash were sluiced with raw river water to this pit through an 8-in. ashcolite pipe. The pipe originally terminated at a point between the aboveground effluent lines but was later extended to the south.

Ash that was disposed of at this pit has been analyzed using the EP Toxicity Test and found to contain no hazardous materials. However, the site is radioactively contaminated due to leakage from the reactor effluent lines that pass through the pit area. The entire area is a radiation control area and is bounded by permanent concrete monuments and radiation warning signs. The effluent leakage was contained with an earthen dike in the late 1940's, and the ashcolite pipe extended through the dike to a point many yards farther south where a new ash pit was established. The new area is also a radiation control area, but the contamination levels are low. The new area is not within the permanent concrete markers but is protected by a light-weight chain barrier and surface contamination warning signs (WHC 1991, site inspection).

An ultrasonic ranging and data system (USRADS) radiological surface contamination survey was conducted at the ash pit in November 1992 that disclosed surface contamination across much of the pit with a few isolated points that exceed 20,000 cpm, and two that exceed 50,000 cpm. Figures 5-3 and 5-4 provide graphical representations of survey results.

No Hazardous Ranking System Migration Score has been assigned to this waste site.

The waste site appears today as a sage- and grass-covered area that includes a natural depression and several small rises and hills. It is partly bounded by permanent concrete monuments and surface contamination warning signs. A light-weight chain barrier protects the entire pit. No soil sampling is known to have been accomplished at this site.

5.10 128-F-1 BURNING PIT

The 128-F-1 Burning Pit is an inactive solid waste site that operated from 1945 to 1965 to receive hazardous waste from the 100-F Area. It is located east of the 126-F-1 Ash Pit at Hanford coordinates N78850 W28800.

Before backfilling, the pit measured 100 by 100 by 10 ft deep. Approximately 20,000 m^3 of waste was disposed of at this site. This included nonradioactive, combustible materials such as paint waste, office waste, and chemical solvents (Stenner et al. 1988). Site personnel remember the pit as being about 150 by 150 by 10 ft deep.

No soil sampling is known to have been accomplished at this site.

No Hazardous Ranking System Migration Score has been assigned to this waste site.

No unique markers identify 128-F-1, but it is located within the general protective zone established around the 126-F-1 Ash Pit.

Figure 5-3. 100-F Ash Pit USRADS Survey Radiological Contour.

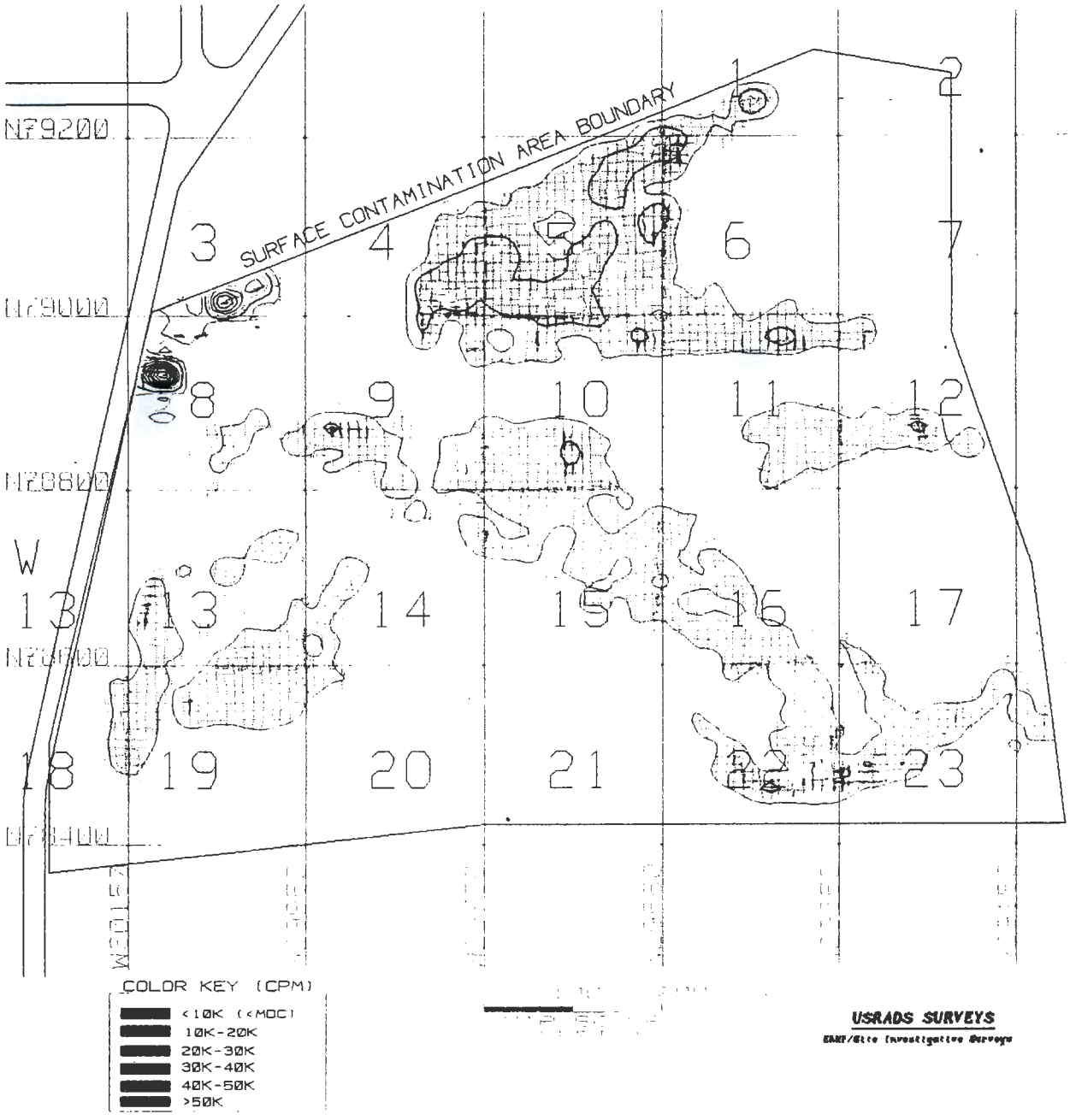
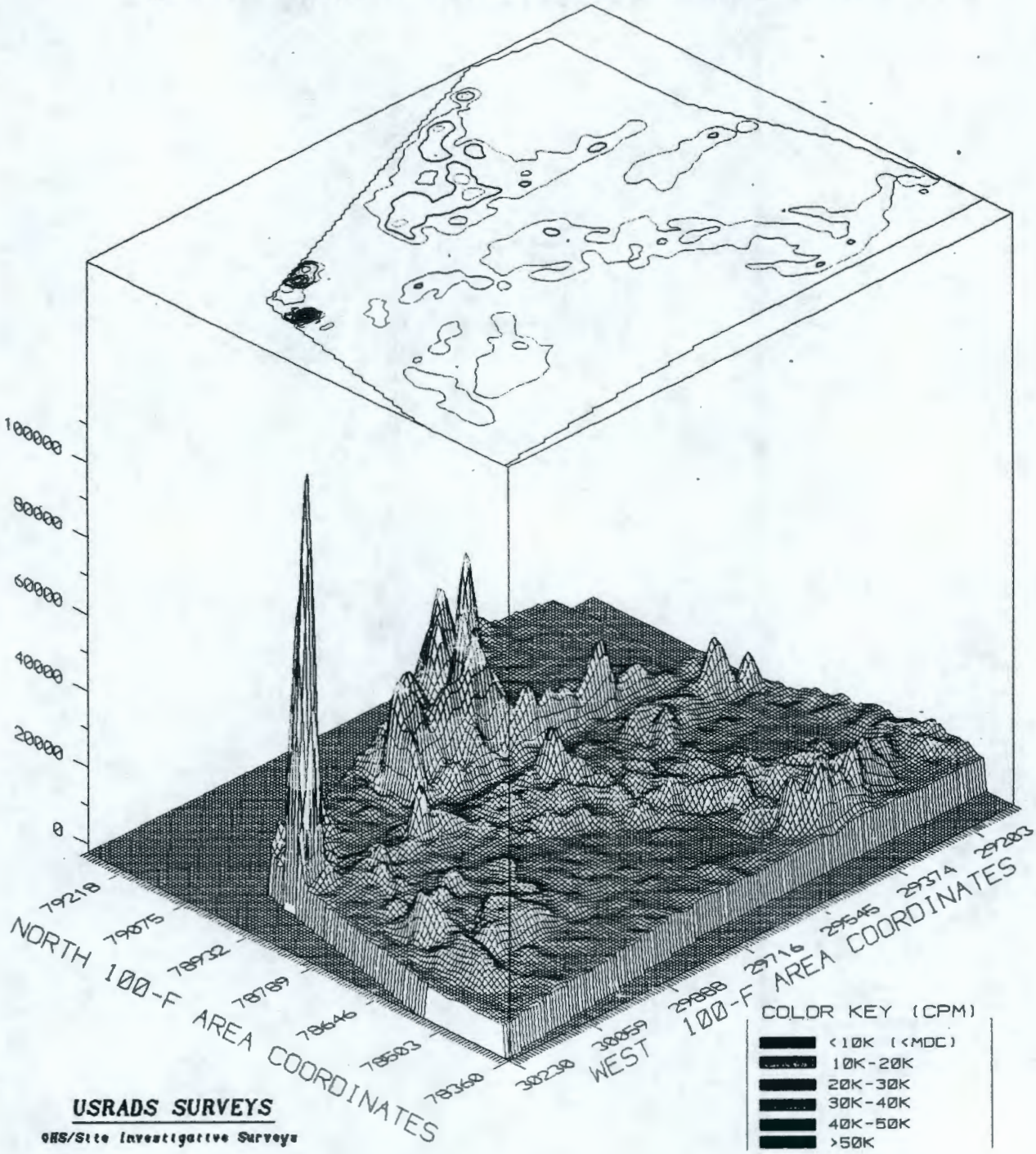


Figure 5-4. 100-F Ash Pit USRADS Survey Radiological Profile.



5.11 128-F-3 PNL BURNING PIT

The 128-F-3 PNL Burning Pit is an inactive solid waste site about which little is known. Located about 100 ft south of the dirt road that passes south of the 126-F-1 Ash Pit and 100 ft east of the ash pit, the burn pit was, before backfilling, a shallow 100- by 100-ft pit in which EAF materials were burned.

No records could be located that characterize the wastes that were disposed of at this site, nor has any soil testing been accomplished in the immediate area. WHC (1991) notes that "It was verified that the site was used for burning by PNL and WHC employees. In 1988, the DOE Headquarters Environmental survey conducted sampling at this site. A backhoe was used for the investigation. A hole was dug 6 to 8 ft deep, but because of the coal ash used for fill, the sides of the ditch caved in. Nothing but coal ash was found at the site.

"The surface has a thin layer of coal and coal ash mixed with fine sandy soil. Scraping the surface a few inches reveals black ash or coal dust. Nothing on the soil surface distinguishes this site from sites of coal ash dumping found along the dirt road just south of the ash disposal pit." (WHC 1991)

No Hazardous Ranking System Migration Score has been assigned to this waste site.

5.12 1607-F-1 SEPTIC TANK

The 1607-F-1 Septic Tank is an inactive nonhazardous/nonradioactive liquid waste site that operated from 1944 to 1960 to receive sanitary waste from the 100-F Area badge house, fire station, and administrative offices. Its flow rate was about 1,225 gal/day.

Located at the southern extremity of the 100-F Area at Hanford coordinates N76550 W30375, the septic tank was 14- by 7- by 11-ft-deep reinforced concrete and included an east-west trending tile field. Its walls and floor were 10 in. thick. The tile field was constructed of 4-in. vitrified pipe, concrete pipe, or drain tile. The laterals were open jointed and spaced 8 ft apart (WHC 1991).

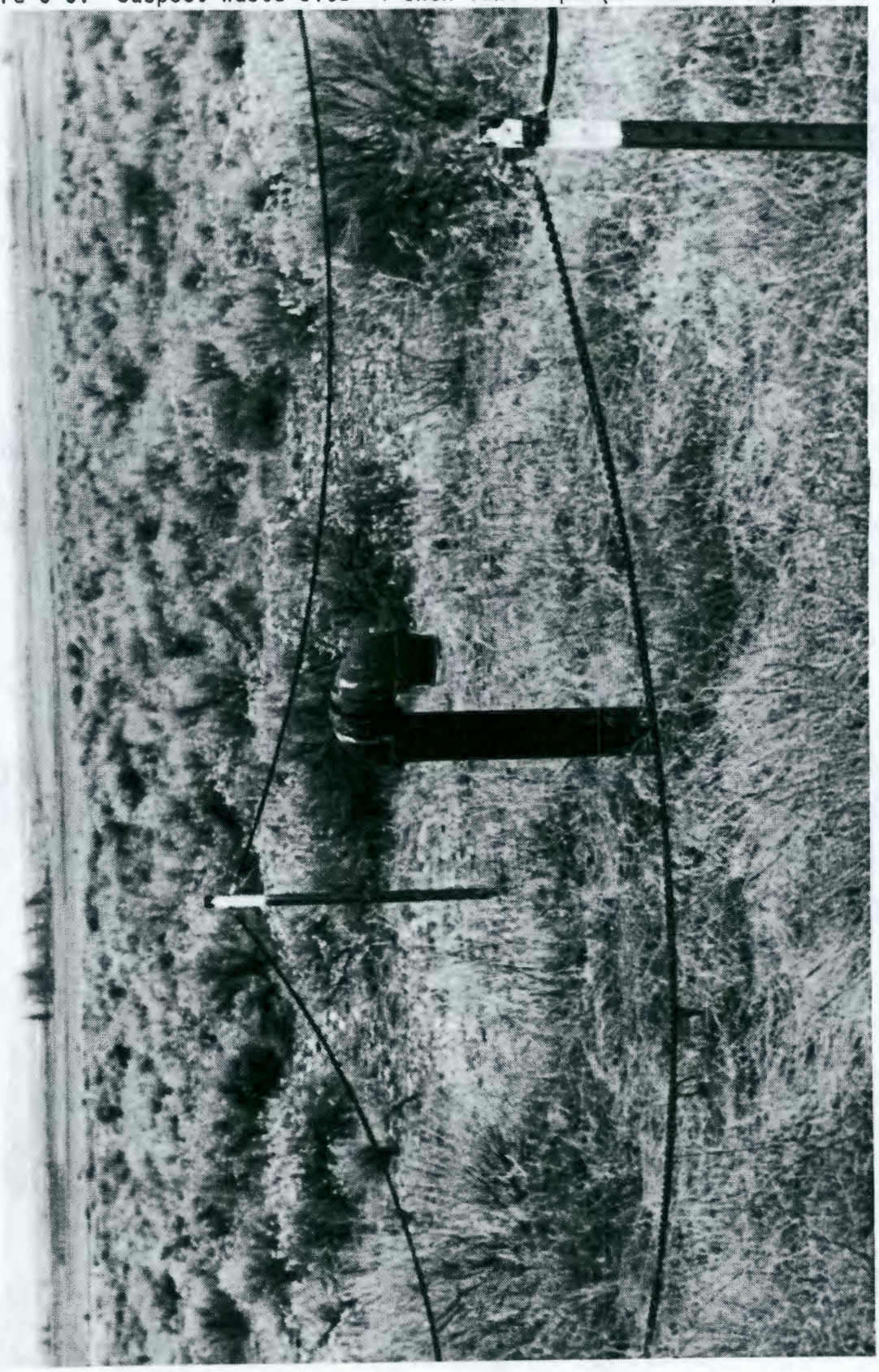
No Hazardous Ranking System Migration Score has been assigned to this waste site.

The approximate area is sage and grass covered, and no markers exist that identify the location of the septic tank or drain field.

5.13 SUSPECT WASTE SITE--VENT PIPE

A 4-in. steel vent extends 40 in. above grade at approximate Hanford coordinates N78525 W31750. The pipe has a 90-degree bend at its top so that it points downward at its tip, which is fitted with a vent assembly. See Figure 5-5.

Figure 5-5. Suspect Waste Site--4-Inch Vent Pipe (93020446-5CN).



It is located north of the 118-F-1 Burial Ground and about 800 ft southwest of the southwest corner of the 105-F Reactor Building. It may be located by walking about 45 ft west of a concrete floor pad that remains from a demolished carpenter shop.

5.14 SUSPECT WASTE SITE--DEPRESSION IN SURFACE

About 300 ft southwest of the above-described vent pipe and 100 ft north of the northwest corner of the 118-F-1 Burial Ground is a 8- by 8- by 3-ft-deep depression protected by a degraded wooden barrier. The surface of the depression is grass covered. See Figure 5-6.

5.15 UNDOCUMENTED WASTE SITE--STRONTIUM GARDEN

A known waste site exists at the southwest extremity of the 100-F Area at Hanford coordinates N76550 W33300. The PNL Ecological Study Strontium Garden is a site used for growing cereal grains, alfalfa, and other crops in soil containing controlled amounts of ^{90}Sr and ^{137}Cs (DOE-RL 1992).

The site consists of a 150- by 25- by 10-ft-high screened garden plot. A wooden frame supports 1/4-in. screen on all sides and overhead. Radiation Area warning signs are posted on all sides (site inspection). See Figure 5-7.

The site is mentioned in Cluckey (1954, 1956) where it notes that the site operated from summer 1952 until present (1956) and that ^{90}Sr was used in solution for botany experiments.

The site is clearly identified on Hanford Drawing H-13-000144 where it is described as a "Steel Structure" just north of the intersection of F Avenue and an unidentified north-south street.

A 10-acre pasture in the vicinity of the strontium gardens was used to keep pregnant animals and animals too young for experiments. No contaminants are known to exist at this location.

Figure 5-6. Suspect Waste Site--Depression in Surface (93020446-6CN).

Figure 5-7. Undocumented Waste Site--Strontium Garden (93020446-7CN).

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APPENDIX A

WIDS DATA SHEETS, HAZARDOUS MATERIAL INVENTORIES, AND RADIONUCLIDE INVENTORIES

Waste Information Data System
General Summary Report
February 10, 1993

SITE NAME: 116-F-1 [309]
ALIASES:
Lewis Canal [309]

SITE TYPE: Trench [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1953 [309]
END DATE: 1965 [318]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 44.55 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78920 W28457, N80000 W28881, N79389 W31024, N78824 W31430 [370]
LOCATION: 750 ft northeast of the 105-F Building [17]

WASTE VOLUME RECEIVED: 100,000,000.00 liters [309]

GROUND ELEVATION: 400.00 feet above MSL [309]
WATER TABLE DEPTH: 13.00 feet below grade [309]

SITE DIMENSIONS (Bottom) [17]: **Length:** 3,000.00 feet [309]
Width: 40.00 feet [309]
Depth: 10.00 feet [309]

WASTE TYPES AND AMOUNTS: The site received liquid wastes from 105-F and 190-F buildings and decontamination wastes from 189-F Building. Occasionally, contaminated coolant from the reactor front and rear faces was also drained to the unit [309].

KNOWN RELEASES: During the Ball 3X outage in 1953, effluent water drained to the river via this unit [309].

SITE NAME: 116-F-1

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Quarterly
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

HAZARDOUS CHEMICAL INVENTORY [315]

Sodium Dichromate: 1.00e+002 Kg

Sulfamic Acid: 1.00e+004 Kg

RADIONUCLIDE INVENTORY

Isotope data [309]

Curies decayed through 4/01/86

^{60}Co:	2.230e-001 Ci	^{154}Eu:	1.960e-001 Ci	^{240}Pu:	6.600e-004 Ci
^{134}Cs:	6.000e-005 Ci	^{155}Eu:	1.330e-003 Ci	^{90}Sr:	5.150e-002 Ci
^{137}Cs:	9.100e-001 Ci	^{3}H:	2.010e-001 Ci	^{235}U:	1.600e-004 Ci
^{152}Eu:	5.590e-001 Ci	^{239}Pu:	5.940e-003	^{238}U:	1.880e-002 Ci

Waste Information Data System
General Summary Report
February 10, 1993

SITE NAME: 116-F-2 [309]
ALIASES:
107-F Liquid Waste Disposal Trench [309]

SITE TYPE: Trench [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1950 [309]
END DATE: 1965 [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 42.32 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N79500 W28675,N79366 W28600,N79290 W28556,N79010 W28540 (centerline) [605].
LOCATION: 150 ft southeast of the southeast corner of 107-F Retention Basin [17]

WASTE VOLUME RECEIVED: 60,000,000.00 liters [309]

GROUND ELEVATION: 410.00 feet above MSL [309]
WATER TABLE DEPTH: 35.00 feet below grade [309]

SITE DIMENSIONS (Top) [309]:
Length: 300.00 feet [309]
Width: 50.00 feet [309]
Depth: 15.00 feet [309]

ASSOCIATED STRUCTURES:
A 6-in., 12-gauge distribution pipe enters the unit (length of the pipe within the unit is unknown) [388];
EM bypass ditch, ~300 ft long, running from the west center side of the unit to the 42-in. pipeline valve that ran to the 107-F Basin Inlet Distribution Box at the south end of the 107-F Retention Basin [605].

WASTE TYPES AND AMOUNTS: The site received coolant effluent from 107-F Retention Basin during reactor outages due to fuel ruptures [17]. During deactivation of the 105-F Reactor, the unit received overflow water from the 105-F Storage Basin via the retention basin [605].

ENVIRONMENTAL MONITORING: Sampling showed the majority of contamination is in the northern half. The maximum contamination was 600 ct/min in a sample taken 20 ft below grade and ~100 ft north of the center point [65].

SITE NAME: 116-F-2

CLEANUP ACTIONS: The unit was covered with 4 to 10 ft of soil [605].

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Quarterly
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

HAZARDOUS CHEMICAL INVENTORY [315]

Sodium Dichromate: 6.00e+001 Kg

RADIONUCLIDE INVENTORY

Isotope data [309] Curies decayed through 4/01/86

^{60}Co:	8.000e-001 Ci	^{154}Eu:	1.490e+000 Ci	^{240}Pu:	8.200e-004 Ci
^{134}Cs:	2.900e-004 Ci	^{155}Eu:	2.070e-001 Ci	^{90}Sr:	6.950e-002 Ci
^{137}Cs:	7.610e-001 Ci	^{3}H:	3.730e-001 Ci	^{235}U:	1.400e-004 Ci
^{152}Eu:	6.050e+000 Ci	^{239}Pu:	7.380e-003	^{238}U:	1.580e-002 Ci

Waste Information Data System
General Summary Report
February 10, 1993

SITE NAME: 116-F-3 [309]
ALIASES:
105-F Storage Basin Trench [309]

SITE TYPE: Trench [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1947 [309]
END DATE: 1951 [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 42.32 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78890 W30910 [309]
LOCATION: ~130 ft south of the 105-F Building [318]

WASTE VOLUME RECEIVED: 8,000,000.00 liters [309]

GROUND ELEVATION: 413.00 feet above MSL [309]
WATER TABLE DEPTH: 37.00 feet below grade [309]

SITE DIMENSIONS: **Length:** 100.00 feet [309]

SITE DESCRIPTION: The unit is an open excavation ranging from 10 to 20 ft wide and from 8 to 11 ft deep, according to various references. No drawings show exact dimensions [309].

WASTE TYPES AND AMOUNTS: The site received reactor effluent (105-F) during an early fuel failure outage. In 1951, the site received sludge from the 105-F Storage Basin [309].

CLEANUP ACTIONS: The unit was covered with 8 ft of soil [309].

SITE NAME: 116-F-3

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Monthly
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

HAZARDOUS CHEMICAL INVENTORY [315]

Sodium Dichromate: 4.00e+000 Kg

RADIONUCLIDE INVENTORY

Isotope data [309] Curies decayed through 4/01/86

^{60}Co: 5.000e-005 Ci
^{152}Eu: 3.000e-004 Ci
^{155}Eu: 9.000e-005 Ci
^{3}H: 4.800e-004 Ci
^{90}Sr: 3.600e-004 Ci

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SITE NAME: 116-F-4 [309]
ALIASES:
105-F Pluto Crib [309]

SITE TYPE: Crib [309] (Registered Class VI Underground Injection Well) [324]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1950 [309]
END DATE: 1952 ?1956 [17]? [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 4.63 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78840 W31090 [605]
LOCATION: 100 ft south of the southwest corner of the 105-F Building [17]

WASTE VOLUME RECEIVED: 4,000.00 liters [309]

GROUND ELEVATION: 413.00 feet above MSL [309]
WATER TABLE DEPTH: 36.00 feet below grade [309]

SITE DIMENSIONS:
Length: 10.00 feet [309]
Width: 10.00 feet [309]
Depth: 10.00 feet [309]

SITE DESCRIPTION: The unit is wooden and filled with gravel [309]. A yellow steel post and capped pipe mark the site [566].

WASTE TYPES AND AMOUNTS: The site received coolant water from pressure tubes containing ruptured fuel elements [309].

CLEANUP ACTIONS: The site was covered to grade with clean soil [309].

SITE NAME: 116-F-4

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Monthly
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

HAZARDOUS CHEMICAL INVENTORY [315]

Sodium Dichromate: 4.00e-003 Kg

RADIONUCLIDE INVENTORY

Isotope data [309] Curies decayed through 4/01/86

^{60}Co:	1.900e-004 Ci	^{155}Eu:	3.470e-002 Ci	^{240}Pu:	4.200e-003 Ci
^{134}Cs:	1.570e-003 Ci	^{3}H:	1.070e-002 Ci	^{90}Sr:	1.060e+000 Ci
^{137}Cs:	1.570e+000 Ci	^{238}Pu:	5.300e-004 Ci	^{235}U:	1.000e-005 Ci
^{152}Eu:	7.230e-003 Ci	^{239}Pu:	3.780e-002	^{238}U:	1.590e-003 Ci
^{154}Eu:	2.470e-002 Ci				

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SITE NAME: 116-F-5 [309]
ALIASES:
Ball Washer Crib [309]

SITE TYPE: Crib [309] (Registered Class VI Underground Injection Well) [324]

WASTE CATEGORY: Mixed Waste [605]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1962 [706]
END DATE: 1964 [706]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 3.66 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78855 W31126 [309]
LOCATION: 250 ft southwest of the 105-F Building [17]

WASTE VOLUME RECEIVED: 3,000.00 liters [309]

GROUND ELEVATION: 412.00 feet above MSL [309]
WATER TABLE DEPTH: 36.00 feet below grade [309]

SITE DIMENSIONS:
Length: 10.00 feet [605]
Width: 10.00 feet [605]
Depth: 10.00 feet [605]

SITE DESCRIPTION: The site is marked with an old wooden railing fence and radiation zone signs [605].

WASTE TYPES AND AMOUNTS: The site received liquid waste from decontamination of boron steel balls [309].

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Quarterly
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

SITE NAME: 116-F-5

RADIONUCLIDE INVENTORY

Isotope data [309]

Curies decayed through 4/01/86

^{137}Cs: 4.000e-005 Ci
^{154}Eu: 3.300e-004 Ci
^{155}Eu: 6.000e-005 Ci
^{90}Sr: 2.000e-005 Ci

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SITE NAME: 116-F-6 [309]
ALIASES:
1608-F Liquid Waste Disposal Trench [309];
105-F Cooling Water Trench [NR]

SITE TYPE: Trench [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1952 [566]
END DATE: 1965 [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 42.32 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78730 W30930 (north end center), N78552 W30774 (south end center) [605]
LOCATION: 180 ft south of the southwest corner of the 105-F Building [17]

WASTE VOLUME RECEIVED: 100,000.00 liters [309]

GROUND ELEVATION: 413.00 feet above MSL [309]
WATER TABLE DEPTH: 36.00 feet below grade [309]

SITE DIMENSIONS (Bottom) [309]: **Length:** 300.00 feet [309]
Width: 100.00 feet [309]
Depth: 10.00 feet [309]

WASTE TYPES AND AMOUNTS: The site received diverted water during reactor shutdown, where maintenance was necessary on the effluent system [309]. This practice was used during several reactor upgrades. During the Ball 3X Project (1953), effluent was diverted to 116-F-1 [566].

KNOWN RELEASES: In the spring of 1956, effluent water overflowed, flooding an area south of the site [65].

CLEANUP ACTIONS: The unit was covered with 6 ft of soil [309].

SITE NAME: 116-F-6

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Quarterly
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

HAZARDOUS CHEMICAL INVENTORY [315]

Sulfamic Acid: 3.00e+003 Kg

RADIONUCLIDE INVENTORY

Isotope data [309] Curies decayed through 4/01/86

^{60}Co:	3.370e-001 Ci	^{154}Eu:	2.730e-001 Ci	^{240}Pu:	9.800e-004 Ci
^{134}Cs:	2.800e-004 Ci	^{155}Eu:	2.340e-002 Ci	^{90}Sr:	1.720e-001 Ci
^{137}Cs:	5.460e-001 Ci	^{3}H:	1.450e+000 Ci	^{235}U:	6.000e-005 Ci
^{152}Eu:	1.120e+000 Ci	^{239}Pu:	8.820e-003	^{238}U:	6.930e-003 Ci

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SITE NAME: 116-F-7 [309]
ALIASES:
117-F Crib [309]

SITE TYPE: French Drain [309] (Registered Class VI Underground Injection Well) [324]

WASTE CATEGORY: Low-Level Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1960 [309]
END DATE: 1965 [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 40.09 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78600 W31200 [370]
LOCATION: 450 ft south of the southwest corner of 105-F Building [17]

WASTE VOLUME RECEIVED: 300,000.00 liters [309]

GROUND ELEVATION: 404.00 feet above MSL [309]
WATER TABLE DEPTH: 27.00 feet below grade [309]

SITE DIMENSIONS (Top) [309]: **Depth:** 10.00 feet [566]
Diameter: 4.00 feet [309]

SITE DESCRIPTION: The unit is filled with gravel and covered with clean soil. The facility is marked by a vent pipe [309].

WASTE TYPES AND AMOUNTS: The site received drainage from confinement exhaust systems filter seal pits [17] in the 117 Building [566].

COMMENTS: Radioactive material drained to this site had a short half-life and has decayed to the point where it is no longer of concern. As a consequence the site has been released from radiation zone status [17].

SITE NAME: 116-F-7

RADIONUCLIDE INVENTORY

Isotope data [309]

Curies decayed through 4/01/86

^{152}Eu: 5.000e-005 Ci
^{239}Pu: 3.000e-005
^{90}Sr: 2.000e-005 Ci

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SITE NAME: 116-F-8 [318]
ALIASES:
1904-F Outfall Structure [318]

SITE TYPE: Outfall Structure [318]

WASTE CATEGORY: Mixed Waste [360]
WASTE TYPE: Liquid [318]

STATUS: Inactive [318] Pre-1980 [318]
START DATE: 1945 [318]
END DATE: 1965 [318]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: No [606]
TPA: Yes [329]

HANFORD AREA: 100-F Area [329]
COORDINATES: N80675 W29255 [566]
LOCATION: ~850 ft north of the 107-F Retention Basin [318]

GROUND ELEVATION: 400.00 feet above MSL [17]

SITE DIMENSIONS: Length: 27.00 feet [566]
Width: 14.00 feet [566]

SITE DESCRIPTION: This unit was designed to provide an escape for the effluent flow from the 107 Retention Basin to the river should the line, which normally carried the effluent to the center of the river, become plugged. If the main line did plug, the effluent would overflow into a spillway that led to the edge of the Columbia River. The unit consists of a reinforced, compartmentalized concrete water box with walls 1 ft above grade and 25 ft below grade. Spillways are constructed of reinforced concrete [566]. Quantities of broken concrete are visible on the river bank in this location [17].

WASTE TYPES AND AMOUNTS: Reactor water from the 107 Basin was piped into the outfall structure that discharges into the Columbia River [318].

ENVIRONMENTAL MONITORING: The facility is surveyed annually [318].

CLEANUP ACTIONS: The unit was reduced to near-grade and backfilled with clean soil [706].

SITE NAME: 116-F-8

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Semiannual
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

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SITE NAME: 116-F-9 [309]
ALIASES:
Animal Waste Leaching Trench [309]

SITE TYPE: Trench [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1963 [309]
END DATE: 1976 [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 42.32 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N80140 W28880, N79860 W28610, N80110 W28910, N79840 W28640 [309]
LOCATION: 150 ft northeast of the 107-F Retention Basin [17]

WASTE VOLUME RECEIVED: 300,000,000.00 liters [309]

GROUND ELEVATION: 420.00 feet above MSL [309]
WATER TABLE DEPTH: 50.00 feet below grade [309]

SITE DIMENSIONS: **Depth:** 10.00 feet [309]

SITE DESCRIPTION: Two trenches are connected together, forming a Y shape. The long section is 400 ft, and the shorter branch section is 100 ft long. Both trenches are 15 ft wide (all surface dimensions) [309].

WASTE TYPES AND AMOUNTS: The site received wash wastewater from animal pens [309].

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Quarterly
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

SITE NAME: 116-F-9

RADIONUCLIDE INVENTORY

Isotope data [309]

Curies decayed through 4/01/86

^{60}Co:	1.860e-001 Ci	^{154}Eu:	1.850e-001 Ci	^{240}Pu:	7.000e-004 Ci
^{137}Cs:	9.100e-002 Ci	^{155}Eu:	1.360e-002 Ci	^{90}Sr:	1.960e+000 Ci
^{152}Eu:	3.940e-001 Ci	^{239}Pu:	6.300e-003		

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SITE NAME: 116-F-10 [309]
ALIASES:
105-F Dummy Decontamination French Drain [309]; 116-F-8,
105 Dummy/Perf Decontamination Crib, Perf Decontamination Drain [65]

SITE TYPE: French Drain [309] (Registered Class VI Underground Injection Well) [324]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1948 [566]
END DATE: 1965 [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 42.32 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78762 W30875 [370]
LOCATION: South of the 105-F Building [329]

WASTE VOLUME RECEIVED: 400,000.00 liters [309]

GROUND ELEVATION: 412.00 feet above MSL [309]
WATER TABLE DEPTH: 38.00 feet below grade [309]

SITE DIMENSIONS: **Depth:** 20.00 feet [566]
Diameter: 3.00 feet [309]

SITE DESCRIPTION: A vitreous tile extends a few feet out of the ground [65]. There is about 10 ft of sand and gravel beneath the tile [566].

WASTE TYPES AND AMOUNTS: The site received radioactive water rinses and spent acids from the decontamination of fuel element spacers and other reactor hardware, primarily pressure tube caps [566].

SITE NAME: 116-F-10

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Quarterly
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

HAZARDOUS CHEMICAL INVENTORY [315]

Sodium Dichromate: 2.00e+003 Kg
Sodium Sulfamate: 2.00e+003 Kg
Sodium Oxalate: 2.00e+003 Kg

RADIONUCLIDE INVENTORY

Isotope data [309]

Curies decayed through 4/01/86

^{60}Co:	1.010e-002 Ci	^{154}Eu:	1.340e-003 Ci	^{239}Pu:	7.000e-005
^{137}Cs:	6.700e-003 Ci	^{155}Eu:	1.960e-003 Ci	^{90}Sr:	6.000e-005 Ci
^{152}Eu:	1.180e-002 Ci	^{3}H:	3.710e-002 Ci	^{238}U:	3.000e-005 Ci

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SITE NAME: 116-F-11 [309]
ALIASES:
105-F Cushion Corridor French Drain [309]

SITE TYPE: French Drain [309] (Registered Class VI Underground Injection Well) [324]

WASTE CATEGORY: Low-Level Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1953 [309]
END DATE: 1965 [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 0.00 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N79016 W30885 [370]

WASTE VOLUME RECEIVED: 200,000.00 liters [309]

GROUND ELEVATION: 412.00 feet above MSL [309]
WATER TABLE DEPTH: 37.00 feet below grade [309]

SITE DIMENSIONS: **Depth:** 3.00 feet [309]
Diameter: 3.00 feet [309]

WASTE TYPES AND AMOUNTS: The site received cushion corridor decontaminated waste [309].

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Monthly
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

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SITE NAME: 116-F-12 [309]
ALIASES:
148-F French Drain [309]

SITE TYPE: French Drain [309] (Registered Class VI Underground Injection Well) [324]

WASTE CATEGORY: Low-Level Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1944 [309]
END DATE: 1964 [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 0.00 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N80270 W29120 [309]

WASTE VOLUME RECEIVED: 10,000.00 liters [309]

GROUND ELEVATION: 407.00 feet above MSL [309]
WATER TABLE DEPTH: 50.00 feet below grade [309]

SITE DIMENSIONS: **Depth:** 6.00 feet [309]
Diameter: 3.00 feet [309]

WASTE TYPES AND AMOUNTS: This site received recovered effluent pump prime from the lift station that discharged back to the effluent line [309].

SURVEILLANCE INFORMATION [563]

SURVEY SCHEDULE: Quarterly
SITE POSTING: Underground Radioactive Material

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SITE NAME: 116-F-13 [309]
ALIASES:
1705-F Experimental Garden French Drain [309]

SITE TYPE: French Drain [309] (Registered Class VI Underground Injection Well) [324]

WASTE CATEGORY: Low-Level Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1952 [309]
END DATE: 1976 [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 0.00 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N80620 W29290 [309]

WASTE VOLUME RECEIVED: 10,000.00 liters [309]

GROUND ELEVATION: 407.00 feet above MSL [309]
WATER TABLE DEPTH: 40.00 feet below grade [309]

SITE DIMENSIONS: **Depth:** 3.00 feet [309]
Diameter: 3.00 feet [309]

WASTE TYPES AND AMOUNTS: This site received effluent water for a botany experiment [309].

SURVEILLANCE INFORMATION [563]

SURVEY SCHEDULE: Quarterly
SITE POSTING: Underground Radioactive Material

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SITE NAME: 116-F-14 [333]
ALIASES:
107-F Retention Basin [333]; 107-F [309]

SITE TYPE: Retention Basin [309]

WASTE CATEGORY: Mixed Waste [NR]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1945 [309]
END DATE: 1965 [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 76.91 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N79967 W29130, N79967 W28900, N79500 W28900, N79500 W29130 [318]
LOCATION: ~1/2 mi northeast of 105-F [17]

GROUND ELEVATION: 400.00 feet above MSL [309]
WATER TABLE DEPTH: 30.00 feet below grade [309]

SITE DIMENSIONS:
Length: 450.00 feet [17]
Width: 230.00 feet [309]
Depth: 24.00 feet [309]

SITE DESCRIPTION: The unit is concrete-lined with 20-ft walls, similar in design to the 107-B and 107-D retention basins. The unit has been backfilled to a depth of ~5 ft, with soil piled to cover the walls [309].

WASTE TYPES AND AMOUNTS: This site received cooling water effluent from the 105-F Reactor for radioactive decay and thermal cooling prior to release to the Columbia River. Seventy percent of the total radionuclide inventory is contained within the soil adjacent to the basin. Approximately 10 Ci have leached into the concrete floor and walls [309].

KNOWN RELEASES: The largest known leak extended roughly 25 ft from the foot of the unit wall. A leak in the effluent lines going to the 148-F Pumphouse was discovered in the summer of 1952. Another source of contamination was a large manhole at the outlet end of the unit. Effluent overflowed intermittently for an extended period before it was stopped [65]. The extent of the release is well within the zone encompassed by the unit and is within the limit of the AC-5-40 permanent posting [309]. See comments for May 23, 1955 incident.

SITE NAME: 116-F-14

COMMENTS: On May 23, 1955, water overflowed the unit after baffles broke loose and plugged the outlet. General contamination around the basin and along a narrow path to the river ranged from 20,000 to 60,000 c/m with a maximum of 350 m rad/hr [59].

CLEANUP ACTIONS: The unit has been backfilled to a depth of ~5 ft, with soil piled to cover the walls [309]. In response to the May 23, 1955 incident, contaminated area was covered with clean soil [59].

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Quarterly
SITE POSTING: Underground/Surface

This unit is in compliance with the Environmental Compliance Manual.

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SITE NAME: 116-F-15 [790]
ALIASES:
108-F Radiation Crib [790]

SITE TYPE: Crib [790]

WASTE CATEGORY: Low-Level Waste [790]
WASTE TYPE: Liquid [790]

STATUS: Inactive [790]

OPERABLE UNIT: 100-FR-1 [790]
O.U. CATEGORY: CERCLA Past Practice [790]
SWMU: Yes [635]
TPA: Yes [790]

HANFORD AREA: 100-F Area [790]
COORDINATES: N79125 W30375 [790]
LOCATION: Under the 108-F Building [790]

SITE DESCRIPTION: The size and design of the unit is unknown. The floor opening is covered with plywood to restrict access. A 20-ft by 18-in. trench is present and appears to slope down into the unit. The trench is covered with plywood and posted as radioactive [790].

ASSOCIATED STRUCTURES:
108-F glove box ventilation hoods and drains [790]

WASTE TYPES AND AMOUNTS: The unit has not been sampled for radiological or chemical contaminations. It is known that alpha contamination experiments were conducted in the 108-F Building [790].

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SITE NAME: 116-F-16 [790]
ALIASES:
PNL Outfall [790]

SITE TYPE: Outfall Structure [790]

WASTE CATEGORY: Mixed Waste [790]
WASTE TYPE: Liquid [790]

STATUS: Inactive [790]

OPERABLE UNIT: 100-FR-1 [790]
O.U. CATEGORY: CERCLA Past Practice [790]
SWMU: No [635]
TPA: Yes [790]

HANFORD AREA: 100-F Area [790]
LOCATION: Upstream of 116-F-8 [790]

SITE DESCRIPTION: A pipe discharged into a concrete spillway, which extends into the river. The spillway is an 8- to 10-ft-wide concrete structure that extends ~20 ft out from the shoreline and ~12 ft into the Columbia River. The sides are 18 in. high and extend down the length of the structure [790].

ASSOCIATED STRUCTURES:
The unit was the discharge from the PNL Experimental Farm Building [790].

WASTE TYPES AND AMOUNTS: The unit received animal sewage, 107-F Retention Basin water, and low-level contamination from the farm projects. The 107-F Retention Basin water was used in animal experiments at the farm project [790].

CLEANUP ACTIONS: The majority of the unit has been backfilled; only a small portion near the shoreline is visible [790].

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SITE NAME: 118-F-1 [309]
ALIASES:
Minor Construction Burial Ground No. 2 [17]; Burial Ground No. 1 [309]; Solid Waste Burial Ground No. 2 [17]

SITE TYPE: Burial Ground [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Solid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1954 [309]
END DATE: 1965 [309]

OPERABLE UNIT: 100-FR-2 [329]
O.U. CATEGORY: Undefined [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 2.01 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78071 W32200,N78178 W31800,N78178 W31600,N77671 W31600,N77671 W32200 [309]
LOCATION: ~1,000 ft southwest of the 105-F Building [566]

WASTE VOLUME RECEIVED: 20,000.00 cubic meters [309]

GROUND ELEVATION: 394.00 feet above MSL [309]
WATER TABLE DEPTH: 18.00 feet below grade [309]

SITE DIMENSIONS:
Length: 600.00 feet [309]
Width: 500.00 feet [309]
Depth: 20.00 feet [309]

SITE DESCRIPTION: The site contains trenches that run north-south and are typically 300 ft long by 20 ft wide [309].

WASTE TYPES AND AMOUNTS: This site contains miscellaneous radioactive solid wastes [309] and reactor components and hardware [706].

SITE NAME: 118-F-1

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Semiannual
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

RADIONUCLIDE INVENTORY

Isotope data [309] Curies decayed through 4/01/86

^{14}C:	6.600e-001 Ci	^{152}Eu:	1.540e+001 Ci	^{63}Ni:	8.310e+001 Ci
^{60}Co:	7.643e+002 Ci	^{154}Eu:	2.810e+001 Ci	^{90}Sr:	1.300e+000 Ci
^{137}Cs:	1.300e+000 Ci	^{3}H:	3.500e+000 Ci		

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SITE NAME: 118-F-2 [309]
ALIASES:
Burial Ground No. 2 [309]; Solid Waste Burial Ground No. 1 [17]

SITE TYPE: Burial Ground [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Solid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1945 [309]
END DATE: 1965 [309]

OPERABLE UNIT: 100-FR-2 [329]
O.U. CATEGORY: Undefined [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 1.34 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78990 W32787, N78985 W32461, N78626 W32469, N78623 W32796 [309]
LOCATION: ~1,500 ft west of the 105-F Building [17]

WASTE VOLUME RECEIVED: 10,000.00 cubic meters [309]

GROUND ELEVATION: 396.00 feet above MSL [309]
WATER TABLE DEPTH: 20.00 feet below grade [309]

SITE DIMENSIONS:
Length: 368.00 feet [309]
Width: 326.00 feet [309]
Depth: 20.00 feet [309]

SITE DESCRIPTION: The individual trenches run north and south and are typically 250 ft by 20 ft [309].

WASTE TYPES AND AMOUNTS: The site contains miscellaneous radioactive solid wastes, reactor components and hardware [309].

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Semiannual
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

SITE NAME: 118-F-2

RADIONUCLIDE INVENTORY

Isotope data [309]

Curies decayed through 4/01/86

^{60}Co: 1.000e+000 Ci

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SITE NAME: 118-F-3 [309]
ALIASES:
Minor Construction Burial Ground No. 1 [17]; Burial Ground No. 3 [309]

SITE TYPE: Burial Ground [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Solid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1952 [309]
END DATE: 1952 [309]

OPERABLE UNIT: 100-FR-2 [329]
O.U. CATEGORY: Undefined [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 1.34 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78839 W31274, N78812 W31232, N78749 W31273, N78660 W31317 [309]
LOCATION: ~400 ft southwest of the 105-F Building [17]

WASTE VOLUME RECEIVED: 10.00 cubic meters [309]

GROUND ELEVATION: 406.00 feet above MSL [309]
WATER TABLE DEPTH: 33.00 feet below grade [309]

SITE DIMENSIONS:
Length: 175.00 feet [309]
Width: 50.00 feet [309]
Depth: 15.00 feet [309]

SITE DESCRIPTION: The site runs north and south [309].

WASTE TYPES AND AMOUNTS: The site contains irradiated wastes, such as thimbles and step plugs, that were removed from the 105-F pile during the Ball 3X work in 1952 [309].

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Semiannual
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

SITE NAME: 118-F-3

RADIONUCLIDE INVENTORY

Isotope data [309] Curies decayed through 4/01/86

^{60}Co: 1.000e+000 Ci

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SITE NAME: 118-F-4 [309]
ALIASES:
115-F Pit [309]; 115-F Crib [NR]

SITE TYPE: Burial Ground [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Solid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1949 [309]
END DATE: 1949 [309]

OPERABLE UNIT: 100-FR-2 [329]
O.U. CATEGORY: Undefined [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 1.75 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78880 W31400 [309]
LOCATION: ~400 ft west-southwest of the 105-F Building [17]

WASTE VOLUME RECEIVED: 10..00 cubic meters [309]

GROUND ELEVATION: 406.00 feet above MSL [309]
WATER TABLE DEPTH: 70.00 feet below grade [309]

SITE DIMENSIONS:
Length: 10.00 feet [309]
Width: 10.00 feet [309]
Depth: 10.00 feet [309]

SITE DESCRIPTION: The unit is a small pit covered with 6 ft of soil [309]. A yellow steel post marks the site [566].

WASTE TYPES AND AMOUNTS: The site contains silica gel removed from gel tower in one of the 115-F dryer rooms [309].

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Monthly
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

SITE NAME: 118-F-4

RADIONUCLIDE INVENTORY

Isotope data [309]

Curies decayed through 4/01/86

^{14}C: 2.000e-002 Ci
^{3}H: 8.000e-001 Ci

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SITE NAME: 118-F-5 [309]
ALIASES:
PNL Sawdust Repository [309]

SITE TYPE: Burial Ground [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Solid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1954 [309]
END DATE: 1975 [309]

OPERABLE UNIT: 100-FR-2 [329]
O.U. CATEGORY: Undefined [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 2.01 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78980 W28990, N79020 W27900, N78600 W27780, N78690 W28380 [309]
LOCATION: ~1,100 ft southeast of the 107-F Retention Basin [17]

WASTE VOLUME RECEIVED: 10,000.00 cubic meters [309]

GROUND ELEVATION: 406.00 feet above MSL [309]
WATER TABLE DEPTH: 30.00 feet below grade [309]

SITE DIMENSIONS:
Length: 500.00 feet [309]
Width: 150.00 feet [309]
Depth: 15.00 feet [309]

SITE DESCRIPTION: The site is a large raised mound with trenches running north and south [706].

WASTE TYPES AND AMOUNTS: The site contains low-level activity sawdust from animal pens [309].

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Semiannual
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

SITE NAME: 118-F-5

RADIONUCLIDE INVENTORY

Isotope data [309]

Curies decayed through 4/01/86

^{239}Pu: 3.000e-001
^{90}Sr: 1.040e+001 Ci

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SITE NAME: 118-F-6 [309]
ALIASES:
PNL Solid Waste Burial Ground [309]

SITE TYPE: Burial Ground [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Solid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1965 [309]
END DATE: February 1973 [17]

OPERABLE UNIT: 100-FR-2 [329]
O.U. CATEGORY: Undefined [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 1.67 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N77780 W31948, N77390 W31270 [309]
LOCATION: ~1,500 ft southwest of the 105-F Building [566]

WASTE VOLUME RECEIVED: 10,000.00 cubic meters [309]

GROUND ELEVATION: 396.00 feet above MSL [309]
WATER TABLE DEPTH: 18.00 feet below grade [309]

SITE DIMENSIONS:
Length: 400.00 feet [309]
Width: 200.00 feet [309]
Depth: 20.00 feet [309]

SITE DESCRIPTION: The unit runs north and south. It adjoins the 118-F-1 Burial Ground and is designated by HPS-AC-5-40 concrete markers [309].

WASTE TYPES AND AMOUNTS: This unit contains animal and laboratory wastes. This is considered a biology burial ground not receiving reactor-related wastes [309].

SURVEILLANCE INFORMATION [563]

SURVEY DATE: 8/89-12/89
SURVEY SCHEDULE: Semiannual
SITE POSTING: Underground Radioactive Material

This unit is in compliance with the Environmental Compliance Manual.

SITE NAME: 118-F-6

RADIONUCLIDE INVENTORY

Isotope data [309]

Curies decayed through 4/01/89

^{90}Sr: 1.040e+001 Ci

Waste Information Data System
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SITE NAME: 118-F-7 [309]
ALIASES:
100-F Miscellaneous Hardware Storage Vault [309]

SITE TYPE: Burial Ground [309]

WASTE CATEGORY: Mixed Waste [NR]
WASTE TYPE: Solid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1945 [309]
END DATE: 1965 [309]

OPERABLE UNIT: 100-FR-2 [329]
O.U. CATEGORY: Undefined [323]
SWMU: Yes [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 1.17 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78760 W30905 [309]

GROUND ELEVATION: 412.00 feet above MSL [309]
WATER TABLE DEPTH: 38.00 feet below grade [309]

SITE DIMENSIONS:
Length: 16.00 feet [309]
Width: 8.00 feet [309]
Depth: 8.00 feet [309]

SITE DESCRIPTION: The unit consists of a concrete box with a wooden cover [309].

WASTE TYPES AND AMOUNTS: This site served as temporary storage for miscellaneous reactor hardware. The hardware is still present [309].

SITE NAME: 118-F-7

RADIONUCLIDE INVENTORY

Isotope data [309]

Curies decayed through 4/01/86

^{60}Co: 1.000e+000 Ci

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SITE NAME: 118-F-8 [333]
ALIASES:
105-F Reactor Building [315]

SITE TYPE: Reactor [315]

WASTE CATEGORY: Mixed Waste [315]
WASTE TYPE: Solid [315]

STATUS: Inactive [315] Pre-1980 [315]
START DATE: 1944 [315]
END DATE: 1964 [315]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: Other [368]
SWMU: No [606]
TPA: No [329]

HANFORD AREA: 100-F Area [315]
COORDINATES: N79150 W30940 [370]
LOCATION: Inside the exclusion area fence [315]

SITE DESCRIPTION: The unit consists of: 1) A reactor block, which includes the graphite moderator stack, biological and thermal shields, pressure tubes and the safety and control systems; 2) the irradiated fuel storage basin; and 3) contaminated portions of the reactor building [315].

WASTE TYPES AND AMOUNTS: This unit contains an estimated 16,000 Ci of radionuclides, 94 tons of lead, less than 100 cu ft of asbestos, and 30 lb of cadmium [315].

KNOWN RELEASES: 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 [315].

ENVIRONMENTAL MONITORING: Routine radiation surveys and visual inspections are performed. Groundwater data for the 100 Areas can be found in the Hanford Site Annual Groundwater Surveillance Report listing (Appendix C). Routine maintenance of the facility is also performed [315].

RELEASE POTENTIAL: Minimal release potential--over 90% of the radionuclide inventory is bound in activated metal and graphite [315].

CLEANUP ACTIONS: A notice of intent was published in the Federal Register on May 16, 1985, stating that an environmental impact statement will be prepared by DOE for the decommissioning of the eight shut-down Hanford reactors [315].

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SITE NAME: 118-F-9 [790]
ALIASES:
PNL Rad Site [790]

SITE TYPE: Burial Ground [790]

WASTE CATEGORY: Low-Level Waste [790]
WASTE TYPE: Solid [790]

STATUS: Inactive [790]

OPERABLE UNIT: 100-FR-2 [790]
O.U. CATEGORY: Undefined [790]
SWMU: Yes [635]
TPA: Yes [790]

HANFORD AREA: 100-F Area [790]
COORDINATES: N78500 W29444 [790]
LOCATION: Southeast of 126-F-1 and directly north of 128-F-3, ~70 ft north of the dirt road [790]

SITE DIMENSIONS:
Site Area: 4,500.00 square feet [790]
Length: 150.00 feet [790]
Width: 30.00 feet [790]

SITE DESCRIPTION: The site contains only one trench. The site appears to have been backfilled, and native vegetation has become re-established. The site is posted as a surface-contaminated area, and a chain barricade with radiation signs surrounds the site [790].

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SITE NAME: 120-F-1 [638]
ALIASES:
Glass Dump [638]

SITE TYPE: Trench [638]

WASTE CATEGORY: Hazardous Waste [638]
WASTE TYPE: Solid [638]

STATUS: Inactive [638]

OPERABLE UNIT: 100-FR-2 [638]
O.U. CATEGORY: Undefined [638]
SWMU: Yes [635]
TPA: Yes [638]

HANFORD AREA: 100-F Area [638]
LOCATION: 210 yards south of 128-F-1 [638]

SITE DIMENSIONS:

Length:	30.00 feet [638]
Width:	8.00 feet [638]
Depth:	4.00 feet [638]

SITE DESCRIPTION: The site was cut into the ground with the front blade of a bulldozer, pushing all the dirt to the west end of the unit. The original access road is overgrown with 3-ft-high sagebrush, indicating this site has not been used for many years [638].

WASTE TYPES AND AMOUNTS: The site is covered with ~2 ft of florescent tubes; incandescent light bulbs; instrument vacuum tubes; and small AAA, C, and D batteries. The site also contains an assortment of chemical bottles, both large and small [638].

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SITE NAME: 126-F-1 [351]
ALIASES:
184-F Powerhouse Ash Pit [315]; 188-F Ash Disposal Area [333]

SITE TYPE: Ash Pit [315]

WASTE CATEGORY: Low-Level Waste [706]
WASTE TYPE: Solid [315]

STATUS: Inactive [315] Pre-1980 [315]
START DATE: 1944 [315]
END DATE: 1965 [315]

OPERABLE UNIT: 100-FR-2 [329]
O.U. CATEGORY: Undefined [323]
SWMU: Yes [606]
TPA: Yes [329]

HANFORD AREA: 100-F Area [315]
COORDINATES: N79000 W29650 [370]

SITE DESCRIPTION: The original site is a low lying area between the above-ground effluent lines leading to 116-F-14. This area is radioactively contaminated because of large volume leakage from the effluent systems in this area. The entire area is a radiation control area and is within the HPS-AC-5-40 permanent markers. Probably in the late 1940's, the effluent leakage area was contained by an earthen dike, and the ash sluice pipe was extended through the dike into the new ash pit area. The new area is also a radiation control area, but the contamination levels are very low. The new area is not within the HPS-AC-5-40 permanent markers [706].

WASTE TYPES AND AMOUNTS: Unknown amounts of coal ash from the 184-F Powerhouse were sluiced to this unit with raw river water [315]. The ash has been analyzed using the EP Toxicity Test in accordance with WAC 173-303, and no hazardous materials were found [351]. This site also received low-level radionuclides from effluent system leakage [706].

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SITE NAME: 126-F-2 [333]
ALIASES:
183-F Clearwells [333]

SITE TYPE: Demolition and Inert Landfill [333]

WASTE CATEGORY: Nonhazardous/Nonradioactive [766]
WASTE TYPE: Solid [766]

STATUS: Active [766]
START DATE: 1970s [766]

OPERABLE UNIT: 100-FR-1 [766]
O.U. CATEGORY: CERCLA Past Practice [766]
SWMU: Yes [635]
TPA: Yes [766]

HANFORD AREA: 100-F Area [766]
COORDINATES: N80475 W30850 [707]
LOCATION: ~ 1,400 ft north of the 105-F Reactor Building, at the site of the 183-F Water Treatment Facility (demolished) [707]

SITE DIMENSIONS:

Site Area:	101,385.00 square feet [766]
Length:	751.00 feet [766]
Width:	135.00 feet [766]

SITE DESCRIPTION: The unit consists of covered, reinforced concrete basins, having a capacity of about 10M gal, separated in the center by a pump room. The pump room was reinforced concrete and largely below grade. The above-ground portion of the pump room has been demolished, and the below-ground portion has been filled with pump room rubble and backfill. Approximately 25% of the east clearwell basin contains waste. The west clearwell remains intact [766].

ASSOCIATED STRUCTURES:
The clearwells were associated with the 183-F Water Treatment Facility [766].

WASTE TYPES AND AMOUNTS: The unit now contains nonhazardous and nonradioactive demolition and inert waste from demolished facilities. This waste includes rubble from the released portion of 115-F as well as rubble from such noncontaminated facilities as 183-F, 190-F, 189-F, 185-F, 171-F [766].

COMMENTS: This unit is under the Hanford Surplus Facility Program [766].

ENVIRONMENTAL MONITORING: The unit receives monthly Environmental Protection surveillance. Inactivities & Maintenance (landlord) maintains waste disposal logs [766].

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SITE NAME: 128-F-1 [373]
ALIASES:
100-F Burning Pit [309]; 100-F Burning Pit No. 1 [373]

SITE TYPE: Burning Pit [309]

WASTE CATEGORY: Hazardous Waste [NR]
WASTE TYPE: Solid [309]

STATUS: Inactive [309] Pre-1980 [309]
START DATE: 1945 [309]
END DATE: 1965 [309]

OPERABLE UNIT: 100-FR-2 [329]
O.U. CATEGORY: Undefined [323]
SWMU: Yes [606]
TPA: Yes [329]

HANFORD AREA: 100-F Area [309]
COORDINATES: N78850 W28800 [373]
LOCATION: Directly east of the 126-F-1 Coal Ash Disposal Pile, ~500 ft west of the southwest corner of 118-F-5 Burial Ground [373]

WASTE VOLUME RECEIVED: 20,000.00 cubic meters [309]

SITE DIMENSIONS (Top) [309]:

Length:	100.00 feet [309]
Width:	100.00 feet [309]
Depth:	10.00 feet [309]

WASTE TYPES AND AMOUNTS: The site was used for the disposal of nonradioactive, combustible materials, such as paint waste, office waste, and chemical solvents [309].

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SITE NAME: 128-F-2 [764]
ALIASES:
100-F Burning Pit

SITE TYPE: Burning Pit [764]

WASTE CATEGORY: Hazardous Waste [764]
WASTE TYPE: Solid [764]

STATUS: Inactive [764]

OPERABLE UNIT: 100-FR-1 [764]
O.U. CATEGORY: CERCLA Past Practice [764]
SWMU: Yes [635]
TPA: Yes [764]

HANFORD AREA: 100-F Area [764]
COORDINATES: N80000 W28200 [764]
LOCATION: ~100 ft east of the northeast corner of the 100-F Area perimeter road along the riverbank, directly east of 107-F Retention Basin [764]

SITE DIMENSIONS:
Site Area: 9,000.00 square feet [764]
Length: 150.00 feet [764]
Width: 60.00 feet [764]

SITE DESCRIPTION: The ground still shows signs of burning. Broken glass, cans, and ashes mark areas of the site. Smaller areas of surface burning are located close to the original burn pit [764].

WASTE TYPES AND AMOUNTS: Nonradioactive, combustible materials (vegetation, office waste, paint waste, and chemical solvents) have been burned at the site. There are also some large metal materials present, such as hardware, machinery, and other noncontaminated miscellaneous equipment [764].

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SITE NAME: 128-F-3 [765]
ALIASES:
PNL Burn Pit

SITE TYPE: Burning Pit [765]

WASTE CATEGORY: Hazardous Waste [765]
WASTE TYPE: Solid [765]

STATUS: Inactive [765]

OPERABLE UNIT: 100-FR-2 [765]
O.U. CATEGORY: Undefined [765]
SWMU: Yes [635]
TPA: Yes [765]

HANFORD AREA: 100-F Area [765]
LOCATION: South of 126-F-1 Ash Pile, ~100 ft south of the dirt access road [765]

SITE DIMENSIONS: **Length:** 100.00 feet [765]
Width: 100.00 feet [765]

SITE DESCRIPTION: The site is characterized by annual weeds. The surface has a thin layer of coal and coal ash mixed with fine sandy soil. Scraping the surface a few inches reveals black ash or coal dust. Nothing on the soil surface distinguishes this site from other sites of coal ash dumping found along the dirt road just south of the ash disposal pit [765].

WASTE TYPES AND AMOUNTS: It is not known what was burned at the site. It was, however, verified that the site was used for burning by PNL and WHC employees. In 1988, the DOE Headquarter Environmental survey conducted sampling at this site. A backhoe was used for the investigation. A hole was dug 6 to 8 ft deep, but because of the coal ash used for fill, the sides of the ditch caved in. Nothing but coal ash was found at the site [765].

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SITE NAME: 132-F-3 [658]
ALIASES:
115-F Gas Recirculating Facility [658]

SITE TYPE: Building [658]

WASTE CATEGORY: Low-Level Waste [658]
WASTE TYPE: Solid [658]

STATUS: Inactive [658] Pre-1980 [654]
START DATE: 1943 [654]
END DATE: 1956 [654]

OPERABLE UNIT: 100-FR-1 [658]
O.U. CATEGORY: CERCLA Past Practice [658]
SWMU: Yes [635]
TPA: Yes [658]

HANFORD AREA: 100-F Area [654]
LOCATION: ~200 ft due west of 105-F Building [654]

SITE DIMENSIONS:

Length:	168.00 feet [654]
Width:	98.00 feet [654]
Depth:	11.00 feet [658]

SITE DESCRIPTION: This unit was a single-story, reinforced concrete structure, 20 ft high. An operating gallery extended down the center and was flanked on either side by cells that contained the gas processing equipment. The equipment cell walls and floors were 3 ft thick. At right angles to the operating gallery and extending across the full width of the west end was the service section, which contained the ventilation fan, air compressor, office, locker room, etc. A pipe tunnel 36 ft wide by 8 ft high ran beneath the full length of the building. The main gas lines to and from the 105-F Building entered through this tunnel [654]. At present, the site looks like a gravel parking lot that is free of any debris [658].

WASTE TYPES AND AMOUNTS: The resident radionuclides are H-3, C-14, Co-60, Sr-90, Cs-137 [655].

CLEANUP ACTIONS: The building was demolished in situ using ARCL methodology [655]. The demolition was started and completed during the last quarter of FY84. The above-ground debris and rubble were trucked to the 100-F clearwell for disposal. The below-grade perimeter walls, which extended 13 ft below grade, were demolished to 3 to 4 ft below grade. The remaining walls were left intact and served as containment for the building rubble. The entire area was covered with clean backfill material. This overburden averaged 4 to 5 ft in depth, which exceeded the ARCL requirements of 1 m of clean fill. In addition, grading the final site to be compatible with the surrounding terrain added another 3 to 4 ft of clean backfill [654].

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SITE NAME: 132-F-4 [333]
ALIASES:
116-F Reactor Stack [17]; 116-F Reactor Exhaust Stack [333]

SITE TYPE: Stack [17]

WASTE CATEGORY: Low-Level Waste [360]
WASTE TYPE: Solid [NR]

STATUS: Inactive [17] Pre-1980 [17] Exhumed [352]
START DATE: 1944 [566]
END DATE: 1965 [17]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [819]
SWMU: Yes [606]
TPA: Yes [606]

HANFORD AREA: 100-F Area [329]
COORDINATES: N79140 W31010 [370]
LOCATION: The west side of the 105-F Building [17]

GROUND ELEVATION: 405.00 feet above MSL [17]

SITE DIMENSIONS:
Site Area: 220.00 square feet [566]
Length: 200.00 feet [17]
Diameter: 16.58 feet [566]

SITE DESCRIPTION: This was used to dispose of confinement air that originated from the work areas in the 105 Reactor Building [352]. The unit has reinforced concrete construction with a base diameter of ~16 ft [65].

ASSOCIATED STRUCTURES:
Following completion of the confinement project in 1960, the air was diverted via underground, reinforced concrete ducts to the 117-F Filter Building. After flowing through the filters, the air went through below-grade and above-grade concrete ducts into the exhaust stack [566].

WASTE TYPES AND AMOUNTS: The interior of the unit contained 4.2 mCi of radioactive materials [352].

CLEANUP ACTIONS: This unit was demolished in September 1983 [380] and buried in a trench between the 117-F Building Site and the 115-F Building Site [352].

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SITE NAME: 132-F-5 [701]
ALIASES:
117-F Filter Building [701]

SITE TYPE: Building [701]

WASTE CATEGORY: Low-Level Waste [701]
WASTE TYPE: Solid [701]

STATUS: Inactive [701] Pre-1980 [701]

OPERABLE UNIT: 100-FR-1 [701]
O.U. CATEGORY: CERCLA Past Practice [701]
SWMU: Yes [635]
TPA: Yes [701]

HANFORD AREA: 100-F Area [707]
COORDINATES: N79100 W31450 [707]
LOCATION: West 105-F [707]

GROUND ELEVATION: 405.00 feet above MSL [17]

SITE DIMENSIONS: Length: 59.00 feet [701]
Width: 39.00 feet [701]

SITE DESCRIPTION: The unit and duct work were all made of reinforced concrete, 1 to 2 ft thick. The building was 35 ft high with 8 ft above ground [701].

ASSOCIATED STRUCTURES:
The building received exhaust fan discharge through an inlet duct from the 105-F and discharged the filtered air through a discharge duct and out the 116-F Stack [701].

WASTE TYPES AND AMOUNTS: The radionuclides found in the 117-F Building are H-3, C-14, Co-60, Cs-137, Sr-90, Eu-154, and Eu-152 [701].

CLEANUP ACTIONS: The site was decommissioned using ARCL methodology. The building and ducts were excavated and demolished in situ. The contaminated rubble was buried at least 1 m deep except for rubble from the seal pits, which was buried under a minimum of 5 m of clean earth [701].

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General Summary Report
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SITE NAME: 132-F-6 [380]
ALIASES:
1608-F Waste Water Pumping Station [315];
1608-F Effluent Pumping Station [366]

SITE TYPE: Pump Station [315]

WASTE CATEGORY: Low-Level Waste [315]
WASTE TYPE: Liquid [315]

STATUS: Inactive [315] Pre-1980 [315]
START DATE: 1944 [315]
END DATE: 1965 [315]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [819]
SWMU: Yes [606]
TPA: Yes [606]

HANFORD AREA: 100-F Area [315]
COORDINATES: N78925 W30800 [370]
LOCATION: Near the southeast corner of the 105-F Reactor Building [315]

SITE DIMENSIONS: Length: 36.00 feet [566]
Width: 34.00 feet [566]

SITE DESCRIPTION: The unit was constructed of reinforced concrete, 12 ft above grade and 32 ft below grade. The unit included a wastewater collection pit [706].

WASTE TYPES AND AMOUNTS: This site received water from reactor building drains containing trace amounts of low-level radionuclides and decontamination chemicals (primarily Turco). Radionuclides were primarily miscellaneous activation products. The decontamination chemicals consisted of sodium fluoride, oxalic acid, and citric acid. Water was pumped from the reactor collection pits into the reactor effluent lines near the reactor building and became part of the 107-F effluent that was discharged to the Columbia River [315].

ENVIRONMENTAL MONITORING: The environmental monitoring consisted of routine visual inspections and portable instrument surveys [315].

CLEANUP ACTIONS: The facility was demolished in situ and backfilled with a minimum of 5 m of clean fill [351]. The unit was decommissioned in 1987 [352]. Water and sludge were removed from the facility, and all incoming piping was sealed prior to demolition [706].

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SITE NAME: 1607-F1 [380]
ALIASES:
1607-F1 Septic Tank and Associated Drain Field [NR]; 124-F-1 [351];
1607-F1 Sanitary Sewer System [333]; 1607-F1 Septic Tank [315]

SITE TYPE: Septic Tank [315]

WASTE CATEGORY: Nonhazardous/Nonradioactive [315]
WASTE TYPE: Liquid [315]

STATUS: Inactive [315] Pre-1980 [315]
START DATE: 1944 [315]
END DATE: 1960 [315]

OPERABLE UNIT: 100-FR-2 [329]
O.U. CATEGORY: Undefined [323]
SWMU: No [606]
TPA: Yes [329]

HANFORD AREA: 100-F Area [315]
COORDINATES: N76550 W30375 [370]

SITE DIMENSIONS: **Length:** 14.00 feet [703]
Width: 7.00 feet [703]

SITE DESCRIPTION: The unit includes a tile field [315]. It is 11 ft deep, constructed of reinforced concrete, and has a 125-person capacity (35 gal per capita) with an average detention period of 24 h. The walls and floor are 10 in. thick. The tile field is constructed of 4-in. vitrified pipe, concrete pipe, or drain tile with a minimum of 8 linear feet per capita. The laterals are open jointed and spaced 8 ft apart [703].

WASTE TYPES AND AMOUNTS: This unit received sanitary sewage from 1701-F Badge House (security checkpoint), 1709-F Fire Station, and 1720-F Administrative Office and change room for security patrol personnel. The flow rate to this unit is estimated at 1,225 gal/d [315].

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SITE NAME: 1607-F2 [380]
ALIASES:
1607-F2 Septic Tank [315]; 124-F-2, 1607-F2 Sanitary Sewer System [333]

SITE TYPE: Septic Tank [315]

WASTE CATEGORY: Nonhazardous/Nonradioactive [315]
WASTE TYPE: Liquid [315]

STATUS: Inactive [351] Post-1980 [351]
START DATE: 1944 [315]
END DATE: 1988 [351]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: No [606]
TPA: Yes [329]

HANFORD AREA: 100-F Area [315]
COORDINATES: N79500 W29740 [370]

SITE DIMENSIONS: **Length:** 26.50 feet [703]
Width: 11.50 feet [703]

SITE DESCRIPTION: The unit is 13 ft 6 in. deep, constructed of reinforced concrete, and has a 522-person capacity (35 gal per capita) with an average detention period of 24 h. The walls and floor are 10 in. thick. The tile field is constructed of 4-in. vitrified pipe, concrete pipe, or drain tile with a minimum of 8 linear feet per capita. The laterals are open jointed and spaced 8 ft apart [703].

WASTE TYPES AND AMOUNTS: This unit received unknown amounts of sanitary sewage from the 184-F Powerhouse, 185-F Chemical Treatment Building, 190-F Pumphouse, 105-F Reactor Building, 108-F Building, and the 1700 administration and service buildings. The unit now services the 105-F and 108-F buildings only. The other buildings have been demolished [351].

Waste Information Data System
General Summary Report
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SITE NAME: 1607-F3 [380]
ALIASES:
1607-F3 Septic Tank [315]; 124-F-3, 1607-F3 Sanitary Sewer System [333]

SITE TYPE: Septic Tank [315]

WASTE CATEGORY: Nonhazardous/Nonradioactive [315]
WASTE TYPE: Liquid [315]

STATUS: Inactive [315] Pre-1980 [315]
START DATE: 1944 [315]
END DATE: 1965 [315]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: No [606]
TPA: Yes [329]

HANFORD AREA: 100-F Area [315]
COORDINATES: N80440 W32100 [370]

SITE DIMENSIONS: Length: 8.50 feet [703]
Width: 4.50 feet [703]

SITE DESCRIPTION: The unit includes a tile field [315]. It is 11 ft deep, constructed of reinforced concrete, and has a 41-person capacity (35 gal per capita) with an average detention period of 24 h. The walls and floor are 10 in. thick. The tile field is constructed of 4-in. vitrified pipe, concrete pipe, or drain tile with a minimum of 8 linear feet per capita. The laterals are open jointed and spaced 8 ft apart [703].

WASTE TYPES AND AMOUNTS: This unit received sanitary sewage from the 182-F Pump Station, 183-F Water Treatment Plant, and 151-F Substation, amounts unknown [315].

Waste Information Data System
General Summary Report
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SITE NAME: 1607-F4 [380]
ALIASES:
1607-F4 Septic Tank [315]; 124-F-4, 1607-F4 Sanitary Sewer System [333]

SITE TYPE: Septic Tank [315]

WASTE CATEGORY: Nonhazardous/Nonradioactive [315]
WASTE TYPE: Liquid [315]

STATUS: Inactive [315] Pre-1980 [315]
START DATE: 1944 [315]
END DATE: 1965 [315]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: No [606]
TPA: Yes [329]

HANFORD AREA: 100-F Area [315]
COORDINATES: N79130 W31550 [370]

SITE DIMENSIONS: Length: 4.00 feet [703]
Width: 2.00 feet [703]

SITE DESCRIPTION: The unit includes a tile field [315]. It is 8 ft 4 in. deep, constructed of reinforced concrete, and has a 6-person capacity (35 gal per capita) with an average detention period of 24 h. The walls are 8 in. thick, and the floor is 6 in. thick. The tile field is constructed of 4-in. vitrified pipe, concrete pipe, or drain tile with a minimum of 8 linear feet per capita. The laterals are open jointed and spaced 8 ft apart [703].

WASTE TYPES AND AMOUNTS: This unit received sanitary sewage from 115-F Gas Recirculation Building amount unknown [315].

Waste Information Data System
General Summary Report
February 10, 1993

SITE NAME: 1607-F5 [380]
ALIASES:
1607-F5 Septic Tank [315]; 124-F-5, 1607-F5 Sanitary Sewer System [333]

SITE TYPE: Septic Tank [315]

WASTE CATEGORY: Nonhazardous/Nonradioactive [315]
WASTE TYPE: Liquid [315]

STATUS: Inactive [315] Pre-1980 [315]
START DATE: 1944 [315]
END DATE: 1965 [315]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: No [606]
TPA: Yes [329]

HANFORD AREA: 100-F Area [315]
COORDINATES: N82130 W31040 [370]

SITE DIMENSIONS: Length: 4.00 feet [703]
Width: 2.00 feet [703]

SITE DESCRIPTION: The unit includes a tile field [315]. It is 8 ft 4 in. deep, constructed of reinforced concrete, and has a 6-person capacity (35 gal per capita) with an average detention period of 24 h. The walls are 8 in. thick, and the floor is 6 in. thick. The tile field is constructed of 4-in. vitrified pipe, concrete pipe, or drain tile with a minimum of 8 linear feet per capita. The laterals are open jointed and spaced 8 ft apart [703].

WASTE TYPES AND AMOUNTS: This unit received sanitary sewage from 181-F Pumphouse, amount unknown [315].

Waste Information Data System
General Summary Report
February 10, 1993

SITE NAME: 1607-F6 [380]
ALIASES:
1607-F6 Septic Tank [315]; 124-F-6, 1607-F6 Sanitary Sewer System [333]

SITE TYPE: Septic Tank [315]

WASTE CATEGORY: Nonhazardous/Nonradioactive [315]
WASTE TYPE: Liquid [315]

STATUS: Inactive [315] Pre-1980 [315]
START DATE: 1945 [315]
END DATE: 1975 [315]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: No [606]
TPA: Yes [329]

HANFORD AREA: 100-F Area [315]
COORDINATES: N80400 W29725 [370]

SITE DESCRIPTION: The unit includes a tile field [315].

WASTE TYPES AND AMOUNTS: This unit received sanitary sewage from 141-B, -C, -F, and -M buildings and 146-FR Animal Farm buildings, amounts unknown [315].

Waste Information Data System
General Summary Report
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SITE NAME: UPR-100-F-1 [857]
ALIASES:
141 Building Sewer Line Spill [NR]; UN-100-F-1 [857]
141-C to 141-M Sewer Line Leak [333]

SITE TYPE: Unplanned Release [309]

WASTE CATEGORY: Mixed Waste [309]
WASTE TYPE: Liquid [309]

STATUS: Inactive [309] Pre-1980 [309]
OCCURRENCE DATE: March 13, 1971 [309]

OPERABLE UNIT: 100-FR-1 [329]
O.U. CATEGORY: CERCLA Past Practice [323]
SWMU: No [606]
TPA: Yes [329]

PNL Hazardous Ranking System Migration Score: 7.13 [309]

HANFORD AREA: 100-F Area [309]
COORDINATES: N80000 W92440 [370]
LOCATION: Between the 141-C and 141-M buildings [309]

WASTE VOLUME RECEIVED: 64,351.80 liters [315]

GROUND ELEVATION: 420.00 feet above MSL [309]
WATER TABLE DEPTH: 50.00 feet below grade [309]

SITE DIMENSIONS (Top) [309]:
Site Area: 1,600.00 square feet [309]
Length: 40.00 feet [309]
Width: 40.00 feet [309]

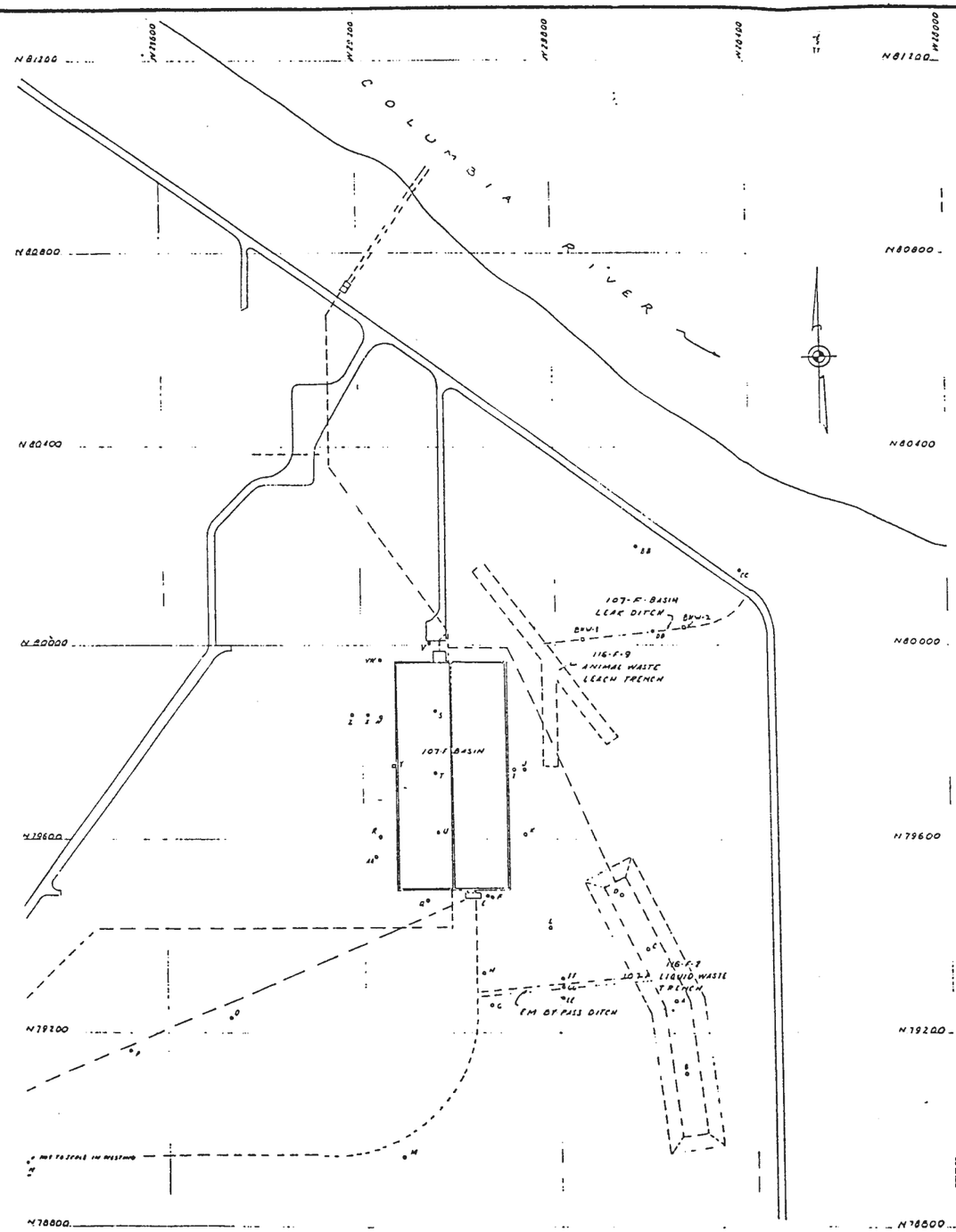
WASTE TYPES AND AMOUNTS: The spill consisted of wash water used to clean out animal pens. The water contained 4.0E-5 Ci of Sr-90 and 1.06E-6 Ci of Pu-239 [309].

KNOWN RELEASES: The main sewer lines from 141-C to 141-M buildings became plugged and spread contamination on the ground [309].

CLEANUP ACTIONS: The area was stabilized with clean gravel and is now within the permanent AC-5-40 markers [309].

APPENDIX B

SELECTED MATERIALS FROM DORIAN AND RICHARDS (1978)



107-F BASIN AREA

TEST HOLE	N	W	ELEV
A	79268.05	20364.03	406.15
B	79117.59	20544.14	405.75
C	79374.62	20618.28	408.10
D	79487.71	20670.00	406.00
E	79485.93	20947.22	412.25
F	79481.31	20941.44	412.36
G	79258.47	20941.71	406.61
H	79373.26	20955.34	406.67
I	79368.40	20859.047	414.01
J	79740.93	20869.44	415.05
K	79609.27	20869.46	401.29
L	79419.87	20619.28	411.52
M	78945.18	29126.60	402.67
N	78935.64	29996.62	388.10
O	79232.05	29475.75	406.18
P	79163.53	29678.85	403.07
Q	79476.81	29068.82	404.70
R	79606.30	29163.87	412.39
S	79861.48	29049.61	413.03
T	79734.90	29051.58	415.63

TEST HOLE	N	W	ELEV
U	79615.41	29049.83	414.10
V	80007.04	29061.05	417.30
W	79557.90	29459.78	415.58
X	79624.35	29182.21	414.79
Y	79750.48	29126.82	423.09
Z	79555.55	29220.75	414.42
AA	79565.81	29177.06	
BB	80702.89	28629.75	391.34
CC	80156.16	28432.12	391.11
DD	80028.99	28596.06	398.02
EE	79776.36	28791.03	410.56
FF	79115.76	28796.16	410.09
GG	79195.27	28791.78	410.03
HH	78972.46	29160.63	420.17

NOTE:
COORDINATES AND ELEVATIONS SHOWN ARE FROM A FIELD SURVEY OF 6-20-75

FIGURE 2.7-8

107-F SAMPLE HOLES

FIGURE 2.7-9

BACKHOE SAMPLING LOCATIONS WITHIN 107-F

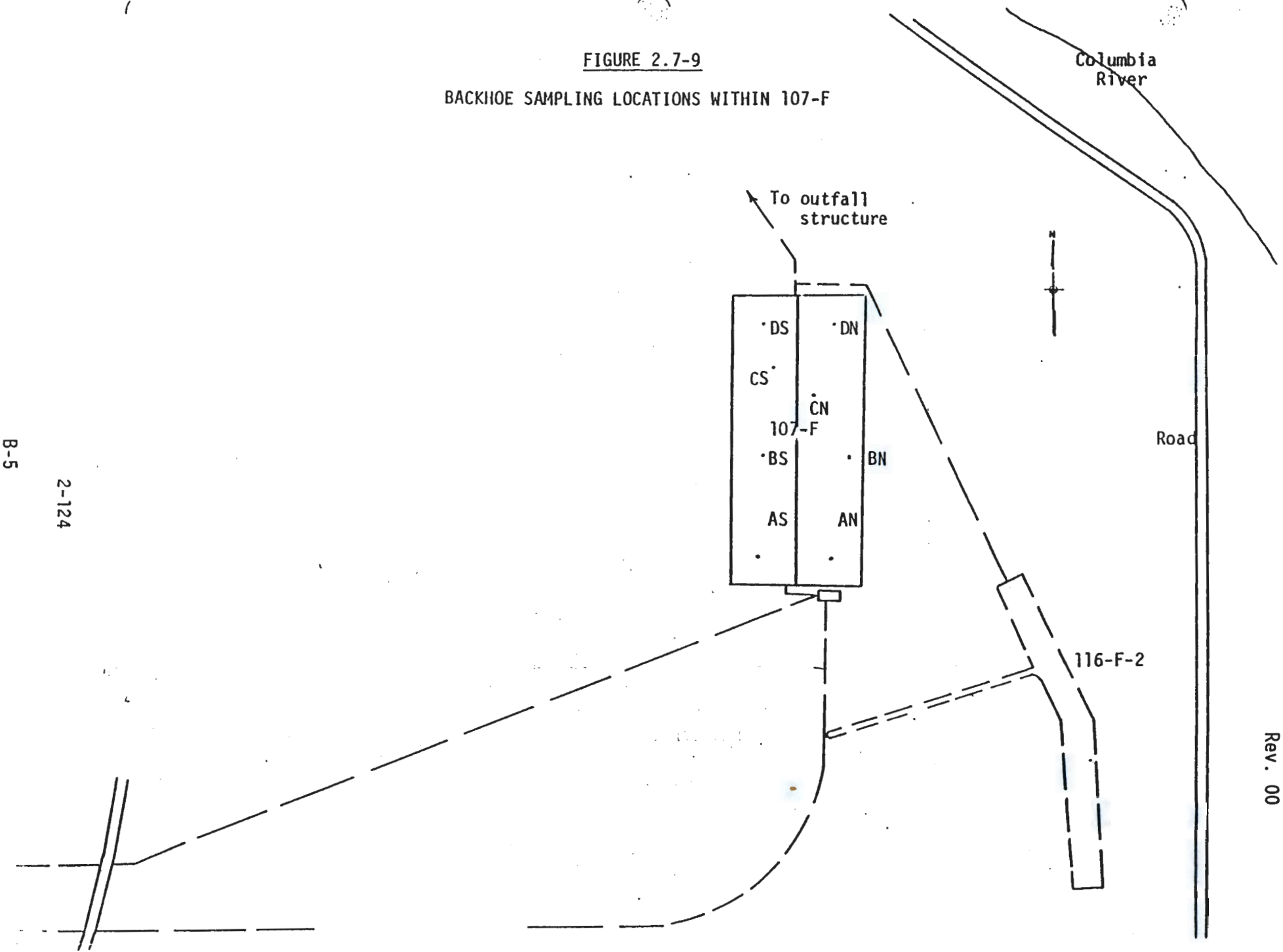


TABLE 2.7-60

107-F 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	U	C-14
E	5	*	$1.2x10^{0}$	$8.8x10^{0}$	$5.7x10^{0}$	3,000	$7.4x10^{2}$	$4.9x10^{2}$	$2.9x10^{2}$	*	$5.1x10^{1}$	$3.3x10^{1}$	$3.9x10^{-1}$	*
F	0	*	$2.8x10^{-1}$	$9.1x10^{-1}$		1,000	$6.2x10^{1}$	$1.0x10^{2}$	$2.5x10^{1}$	*	$3.4x10^{0}$	$9.9x10^{-1}$	$1.1x10^{-1}$	*
H	15	*	*	$3.0x10^{-1}$	$1.0x10^{0}$	<200/40	$2.1x10^{1}$	$6.4x10^{0}$	$5.9x10^{0}$	*	$2.0x10^{0}$	$2.7x10^{0}$	$5.7x10^{-2}$	*
	20	*	*	$4.0x10^{-1}$		<200/20	$1.1x10^{1}$	$8.6x10^{0}$	$2.8x10^{0}$	*	$9.2x10^{-1}$	$1.6x10^{0}$		
I	15	*	*	$2.2x10^{-1}$		<200/20	$1.5x10^{-1}$	*	*	*	$6.9x10^{-2}$	$3.8x10^{-1}$		
	22-1/5	*	*	$1.4x10^{0}$		200	$4.0x10^{1}$	$4.6x10^{1}$	$1.3x10^{1}$	*	$2.3x10^{0}$	$1.5x10^{0}$		
	25	*	$2.1x10^{-1}$	$4.9x10^{0}$	$3.2x10^{0}$	700	$1.7x10^{2}$	$9.9x10^{1}$	$6.2x10^{1}$	*	$2.6x10^{0}$	$5.4x10^{0}$	$1.2x10^{-1}$	*
	30	$5.2x10^{-3}$	*	$2.9x10^{0}$		<200/20	$1.3x10^{1}$	$3.2x10^{0}$	$2.0x10^{0}$	*	$1.4x10^{0}$	$2.5x10^{-1}$		
J	25	*	*	$5.4x10^{0}$	$6.7x10^{-1}$	<200/80	$9.2x10^{0}$	$2.9x10^{1}$	$3.0x10^{0}$	*	$5.9x10^{0}$	$3.4x10^{-1}$	$1.4x10^{-1}$	*
	30	*	*	$1.7x10^{0}$		<200/40	$1.4x10^{1}$	$2.2x10^{1}$	$3.9x10^{0}$	*	$4.6x10^{0}$	$4.4x10^{-1}$		
K	0	*	*	$3.8x10^{-1}$	$1.6x10^{0}$	<200/60	$2.5x10^{1}$	$1.5x10^{1}$	$7.8x10^{0}$	*	$1.2x10^{0}$	$7.1x10^{-1}$	$5.5x10^{-2}$	*
	5	*	*	$3.3x10^{-1}$		<200/10	$2.5x10^{-1}$	$3.3x10^{-1}$	$2.8x10^{-1}$	*	$2.1x10^{-1}$	*		
	15	*	*	$3.7x10^{-1}$		<200/10	$4.7x10^{-1}$	*	*	*	$2.2x10^{0}$	$2.2x10^{-1}$		
L	0	*	$4.7x10^{-1}$	$1.3x10^{1}$	$6.3x10^{0}$	20,000	$4.4x10^{3}$	$3.8x10^{2}$	$1.4x10^{3}$	*	$8.9x10^{1}$	$1.6x10^{2}$	$9.7x10^{-2}$	*
	1/2	*	$1.9x10^{0}$	$3.7x10^{1}$		800	$6.2x10^{3}$	$5.6x10^{2}$	$1.8x10^{3}$	*	$1.5x10^{2}$	$4.8x10^{2}$		
M	5	*	*	$1.2x10^{-1}$	*	<200/10	$1.7x10^{-1}$	*	*	*	*	*	$1.2x10^{-1}$	*
N	5	*	*	$9.7x10^{-2}$		<200/20	*	*	*	*	*	*		
O	5	*	*	$2.2x10^{-1}$	*	<200/30	$1.7x10^{-1}$	$7.3x10^{-2}$	*	*	*	*	$5.5x10^{-2}$	*
	10	*	*	$6.3x10^{-2}$		<200/10	*	$4.7x10^{-2}$	*	*	*	*		
	20	*	*	$3.0x10^{-2}$		<200/10	*	*	*	*	$2.7x10^{-2}$	*		
P	5	*	*	$2.6x10^{-1}$		<200/20	*	*	*	*	*	$1.2x10^{-1}$	$3.8x10^{-1}$	
	15	*	*	$1.1x10^{-2}$	$1.1x10^{0}$	<200/20	*	*	*	*	$3.6x10^{-2}$	*		*
	20	*	*	$2.0x10^{-2}$		<200	*	*	*	*	*	*		
Q	0	*	*	$1.7x10^{-1}$	$2.0x10^{1}$	<200/25	$3.5x10^{0}$	$1.1x10^{0}$	$5.5x10^{-1}$	$6.8x10^{-2}$	$3.8x10^{-1}$	$4.3x10^{-2}$	$4.6x10^{-2}$	*
	10	*	*	$2.4x10^{-1}$		<200/15	*	*	*	*	$1.2x10^{0}$	*		
	20	*	*	$1.6x10^{-2}$		<200/20	*	*	*	*	$2.9x10^{0}$	*		

TABLE 2.7-60 (Cont'd)

107-F RETENTION BASIN (Cont'd)

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	U	C-14
R 0	*	*	$1.4x10^{-1}$		<200/15	$6.4x10^{-1}$	$2.9x10^{-1}$	*	*	$2.7x10^{-1}$	*		
5	*	*	$1.3x10^{-1}$		<200/20	*	*	*	*	$7.3x10^{-2}$	*		
V 0	*	*	$6.2x10^{-1}$	*	<200/20	$6.8x10^{0}$	$1.7x10^{0}$	$1.6x10^{0}$	$5.4x10^{-2}$	$4.6x10^{-1}$	$1.5x10^{-1}$	$3.0x10^{-1}$	*
10	*	*	$2.5x10^{-1}$		<200/10	*	*	*	*	*	*		
W 0	*	$1.1x10^{0}$	$4.0x10^{0}$		1,000	$3.4x10^{2}$	$1.9x10^{2}$	$1.2x10^{2}$	$7.3x10^{-1}$	$7.1x10^{0}$	$1.5x10^{1}$		
W 12-1/2	*	$2.1x10^{0}$	$3.0x10^{0}$	$1.1x10^{1}$	1,500	$1.2x10^{3}$	$3.7x10^{2}$	$3.7x10^{2}$	*	$9.0x10^{0}$	$2.7x10^{1}$	$5.2x10^{-1}$	*
X 10	*	$1.2x10^{0}$	$1.2x10^{0}$	$1.2x10^{0}$	800	$6.1x10^{2}$	$6.0x10^{1}$	$1.4x10^{2}$	*	$1.0x10^{1}$	$5.1x10^{1}$	$3.5x10^{-1}$	*
20	*	$1.4x10^{-1}$	$6.7x10^{-1}$		<200/20	$1.5x10^{0}$	$1.8x10^{-1}$	$3.4x10^{-1}$	$4.4x10^{-2}$	$4.3x10^{0}$	*		
Y 25	*	$3.8x10^{-1}$	$2.1x10^{0}$	*	<200/20	$1.0x10^{1}$	$3.3x10^{0}$	$2.7x10^{0}$	*	$4.4x10^{0}$	$6.0x10^{-1}$	$1.3x10^{-1}$	*
Z 10	*	*	*	$4.2x10^{-1}$	<200	$2.6x10^{-1}$	$5.8x10^{-2}$	*	*	*	*	$1.1x10^{-1}$	
20	*	*	$2.1x10^{-1}$		<200	$1.8x10^{-1}$	$7.2x10^{-2}$	*	$7.5x10^{-2}$	$1.8x10^{0}$	*		
AA 5	*	$2.1x10^{-1}$	$2.0x10^{-1}$		<200	$1.8x10^{-1}$	$1.1x10^{-1}$	*	$4.6x10^{-2}$	$1.7x10^{0}$	$1.2x10^{-1}$		
AA 10	*	*	$1.8x10^{-1}$	*	<200/15	$1.5x10^{0}$	$6.7x10^{-1}$	$9.0x10^{-1}$	*	$2.0x10^{-1}$	$2.5x10^{-1}$	$1.9x10^{-1}$	
AA 15	*	*	$2.8x10^{-1}$		<200	*	*	*	*	$7.0x10^{-1}$	$1.0x10^{-1}$		
Effluent line scale			$7.3x10^{1}$		8,000	*	$1.7x10^{2}$	*	*	$2.5x10^{2}$	$4.9x10^{2}$		

TABLE 2.7-61

107-F RETENTION BASIN

SAMPLE HOLES DRILLED INSIDE 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	U	Ni-63	C-14
S 0	*	*	$1.1x10^{-1}$		<200/50	$4.7x10^{1}$	$2.8x10^{1}$	$1.7x10^{1}$	$3.7x10^{-1}$	$3.1x10^{0}$	$3.3x10^{0}$			
2	*	*	$1.7x10^{-1}$	*	<200/40	$3.1x10^{1}$	$1.8x10^{1}$	$8.5x10^{0}$	$1.2x10^{-1}$	$2.4x10^{0}$	*	$1.5x10^{-1}$		*
4	*	*	$1.6x10^{0}$		<200/40	$2.0x10^{2}$	$1.2x10^{1}$	$6.6x10^{0}$	*	$1.1x10^{0}$	*			
4-1/5	*	$3.7x10^{-1}$	$1.5x10^{1}$	$3.4x10^{0}$	1,000	$1.4x10^{3}$	$5.3x10^{3}$	$9.1x10^{3}$	$2.8x10^{2}$	$5.0x10^{2}$	$4.2x10^{2}$	$9.6x10^{-2}$		
5	$6.2x10^{-1}$	$1.9x10^{-1}$	$3.5x10^{0}$	$5.7x10^{1}$	15,000	$5.8x10^{2}$	$2.0x10^{2}$	$3.4x10^{2}$	$1.6x10^{-1}$	$1.7x10^{1}$	$9.0x10^{1}$	$9.8x10^{-2}$	$1.8x10^{3}$	
7-1/2	*	$9.5x10^{-1}$	$1.2x10^{-1}$	$1.2x10^{1}$	800	$6.4x10^{0}$	$3.9x10^{1}$	$1.9x10^{2}$	$6.9x10^{-1}$	$1.9x10^{1}$	$1.1x10^{1}$	$3.5x10^{-1}$		
15	*	*	$3.8x10^{-1}$		<200/70	$4.1x10^{1}$	$6.8x10^{1}$	*	*	$1.0x10^{1}$	*			
T 0	*	*	$5.7x10^{-1}$		<200/40	$3.8x10^{1}$	$1.7x10^{1}$	$1.2x10^{1}$	$8.0x10^{-2}$	$4.2x10^{0}$	$4.7x10^{-1}$			
3	*	$3.1x10^{-1}$	$1.7x10^{-1}$	*	<200	$3.7x10^{1}$	$1.1x10^{1}$	$1.5x10^{1}$	*	$1.9x10^{0}$	$5.3x10^{-1}$	$7.6x10^{-2}$		*
5	*	*	$3.4x10^{-2}$		<200/30	$1.9x10^{1}$	$8.4x10^{0}$	$5.5x10^{0}$	*	$2.5x10^{0}$	*			
5-1/2	*	*	$1.1x10^{-1}$	*	<200/30	$1.1x10^{2}$	$4.0x10^{2}$	$3.2x10^{2}$	$1.6x10^{-1}$	$1.5x10^{1}$	$5.7x10^{-1}$	$5.5x10^{-2}$		*
6	*	$1.1x10^{0}$	$3.0x10^{0}$	$6.8x10^{-1}$	600	$2.7x10^{2}$	$1.1x10^{2}$	$1.2x10^{2}$	$2.2x10^{0}$	$1.1x10^{0}$	$3.4x10^{1}$	$1.5x10^{-1}$		*
C1	*	$2.8x10^{0}$	$2.2x10^{1}$		400	$1.8x10^{1}$	$3.0x10^{2}$	$6.7x10^{1}$	*	$8.7x10^{1}$	$1.3x10^{0}$			
8-1/2	*	$3.9x10^{-1}$	$1.8x10^{-1}$	$3.2x10^{0}$	<200/100	$5.8x10^{0}$	$1.2x10^{0}$	$2.0x10^{1}$	$5.4x10^{-1}$	$1.5x10^{1}$	$1.7x10^{0}$	$1.5x10^{-1}$		*
20	*	*	$1.1x10^{-1}$		<200/20	$1.4x10^{0}$	$3.3x10^{0}$	$3.9x10^{-1}$	$8.6x10^{-2}$	$1.1x10^{1}$	*			
U 0	*	*	*		<200/30	$1.3x10^{1}$	$6.6x10^{0}$	$3.8x10^{0}$	$8.6x10^{-2}$	$1.3x10^{0}$	$2.2x10^{-1}$			
2	*	*	$1.5x10^{-1}$	*	<200	$4.0x10^{0}$	$2.2x10^{0}$	$1.7x10^{-1}$	*	$2.8x10^{-1}$	*	$1.2x10^{-1}$		*
4	*	*	$4.9x10^{-2}$		<200/Bkg	$2.3x10^{0}$	$1.2x10^{0}$	$2.7x10^{0}$	$6.4x10^{-2}$	$2.2x10^{-1}$	$3.1x10^{-1}$			
4-1/2	*	$3.2x10^{-2}$	$2.3x10^{-1}$	*	<200/10	$6.1x10^{3}$	$3.6x10^{2}$	$2.9x10^{3}$	$2.7x10^{-1}$	$4.3x10^{1}$	$5.6x10^{1}$	$8.5x10^{-2}$		*
5	*	$3.1x10^{-1}$	$1.3x10^{-1}$	$3.7x10^{0}$	800	$3.0x10^{0}$	$7.8x10^{1}$	$1.2x10^{-1}$	*	$4.0x10^{1}$	$2.0x10^{1}$	$7.7x10^{-2}$		*
7-1/2	*	$1.7x10^{0}$	$4.9x10^{0}$		/80	$5.9x10^{2}$	$1.1x10^{2}$	$8.8x10^{2}$	*	$1.7x10^{1}$	*			
10	*	$3.0x10^{1}$	$2.7x10^{0}$	$1.6x10^{0}$	1,000	$3.5x10^{-1}$	$1.6x10^{-1}$	$1.1x10^{-1}$	*	$2.4x10^{0}$	$4.1x10^{0}$	$4.2x10^{-1}$		
15	*	*	$1.2x10^{0}$		<200/20	$8.1x10^{-1}$	$2.1x10^{-1}$	$2.1x10^{-1}$	*	$6.7x10^{0}$	*			

TABLE 2.7-62

116-F-2

107-F LIQUID WASTE DISPOSAL TRENCH

		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	C-14
A	10	*	*	7.9×10^{-1}		<200/80	4.2×10^{0}	1.9×10^{1}	1.8×10^{1}	*	3.8×10^{0}	1.3×10^{1}	8.8×10^{-2}	*
	18	*	*	4.2×10^{-1}		<200/50	2.3×10^{1}	9.4×10^{0}	7.4×10^{0}	*	2.7×10^{0}	7.7×10^{-1}		
	20	*	*	1.8×10^{-1}		<200/20	2.0×10^{1}	7.5×10^{0}	4.6×10^{0}	*	2.3×10^{0}	2.3×10^{0}		
B	10	*	*	1.1×10^{-2}	*	<200/10	1.5×10^{0}	3.8×10^{-1}	1.3×10^{-1}	*	1.4×10^{-1}	2.3×10^{-1}	8.8×10^{-2}	*
	20	*	*	2.1×10^{-1}		<200/Bkg	1.0×10^{0}	5.7×10^{-1}	7.9×10^{-1}	*	2.4×10^{0}	1.9×10^{-1}		
C	15	*	2.4×10^{-1}	1.3×10^{0}		400	2.6×10^{2}	7.3×10^{1}	7.3×10^{1}	*	2.4×10^{1}	3.0×10^{1}		
	20	*	3.4×10^{-1}	2.0×10^{0}	6.5×10^{0}	600	4.8×10^{2}	8.2×10^{1}	1.6×10^{2}	*	5.9×10^{1}	2.6×10^{1}	1.9×10^{-1}	*
	25	*	3.6×10^{-1}	1.5×10^{0}		600	1.7×10^{2}	6.7×10^{1}	4.3×10^{1}	*	8.5×10^{0}	5.1×10^{0}		
	30	*	*	5.2×10^{-1}		<200/10	4.3×10^{0}	2.6×10^{-1}	6.9×10^{-1}	*	9.4×10^{-1}	1.4×10^{-1}		
D	10	*	*	3.3×10^{-1}	1.4×10^{1}	<200/100	1.4×10^{2}	4.2×10^{0}	2.2×10^{1}	*	5.0×10^{-1}	1.6×10^{0}	2.6×10^{-1}	*
	20	*	*	9.7×10^{-2}		<200/10	1.1×10^{0}	8.2×10^{-2}	2.9×10^{-1}	*	6.2×10^{-2}	1.6×10^{-1}		

TABLE 2.7-63

EM BY-PASS DITCH TO

116-F-2 TRENCH

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	C-14
G 8	*	5.5×10^{-1}	5.4×10^{0}		1,000	2.6×10^{2}	1.9×10^{2}	1.4×10^{2}	*	4.0×10^{1}	1.4×10^{1}		
G 10	*	2.6×10^{-1}	2.6×10^{-1}	5.2×10^{0}	1,000	3.6×10^{1}	5.1×10^{0}	1.3×10^{1}	*	2.7×10^{0}	2.7×10^{0}	1.4×10^{-1}	*
G 12-1/2	*	*	7.6×10^{-1}		200	3.0×10^{1}	9.7×10^{0}	1.2×10^{1}	*	5.6×10^{0}	2.9×10^{0}		
G 15	*	*	5.3×10^{-1}		<200/10	1.6×10^{0}	3.7×10^{-1}	5.2×10^{-1}	*	6.6×10^{-1}	1.5×10^{-1}		
EE 5	*	*	8.3×10^{-2}		<200/15	*	4.2×10^{-2}	*	3.3×10^{-2}	3.0×10^{-2}	2.1×10^{-1}		
10	*	*	3.7×10^{-1}		<200/10	2.0×10^{-1}	*	*	*	*	1.1×10^{-1}		
20	*	*	3.6×10^{-2}	1.0×10^{0}	<200/30	4.4×10^{-1}	1.6×10^{-1}	*	*	*	*	1.6×10^{-1}	
FF 5	*	*	*		<200/10	*	*	*	*	*	*		
15	*	*	*		<200/10	*	*	*	*	*	*		
GG 5	*	*	2.5×10^{-1}		<200/20	4.8×10^{0}	1.3×10^{0}	1.4×10^{0}	5.9×10^{-2}	2.7×10^{0}	4.0×10^{-1}		
7-1/2	*	*	1.4×10^{0}	8.7×10^{-1}	200	5.4×10^{1}	5.7×10^{1}	3.7×10^{1}	2.2×10^{-1}	4.9×10^{0}	4.5×10^{0}	1.7×10^{-1}	
10	*	*	1.7×10^{-1}		<200/20	*	4.6×10^{-2}	*	*	*	1.1×10^{-1}		

TABLE 2.7-66

107-F RETENTION BASIN FILL

BASIN SLUDGE

Ave. Depth = 3" Mass = 1.8×10^9g

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
AN 3-1/2	*	1.2×10^{-1}	1.8×10^{1}	9.8×10^{1}	1.6×10^{3}	1.5×10^{3}	1.1×10^{3}	3.2×10^{1}	1.3×10^{2}	1.9×10^{2}	6.9×10^{-1}		
BN 3-1/2	*	9.0×10^{-1}	2.6×10^{-1}	2.5×10^{0}	5.5×10^{2}	1.0×10^{2}	2.5×10^{2}	3.1×10^{0}	4.2×10^{0}	4.0×10^{1}	2.6×10^{-1}		
CN 3-1/2	1.1×10^{0}	4.5×10^{1}	5.1×10^{1}		9.2×10^{3}	1.5×10^{3}	5.5×10^{3}	2.7×10^{2}	5.7×10^{2}	1.6×10^{3}	7.4×10^{-1}		
DN 3-1/2	*	1.2×10^{1}	8.5×10^{1}	4.1×10^{0}	6.5×10^{3}	1.5×10^{3}	3.7×10^{3}	1.3×10^{2}	1.6×10^{2}	1.0×10^{3}	5.3×10^{-1}	3.4×10^{4}	
AS 3-1/2	5.7×10^{-1}	1.7×10^{-1}	1.1×10^{1}		7.5×10^{3}	6.0×10^{3}	5.0×10^{3}	5.5×10^{1}	5.9×10^{3}	8.6×10^{2}			
AS 4	3.9×10^{-1}	1.4×10^{1}	4.2×10^{0}	1.5×10^{1}	5.6×10^{3}	4.5×10^{3}	9.8×10^{3}	4.3×10^{2}	5.0×10^{2}	2.8×10^{3}	1.1×10^{0}	3.3×10^{3}	*
CS 4	6.8×10^{-1}	2.4×10^{1}	1.0×10^{1}	3.7×10^{0}	1.4×10^{4}	2.5×10^{3}	7.0×10^{3}	1.6×10^{1}	3.7×10^{1}	7.5×10^{2}			
DS 4	*	1.5×10^{0}	3.8×10^{0}	8.6×10^{0}	1.3×10^{3}	2.0×10^{2}	5.5×10^{2}	*	2.1×10^{0}	8.7×10^{1}	5.1×10^{-1}		
S 5	6.2×10^{-1}	1.9×10^{1}	3.5×10^{1}	5.7×10^{0}	5.8×10^{3}	2.0×10^{3}	3.4×10^{3}	1.6×10^{2}	1.7×10^{2}	9.0×10^{2}	9.8×10^{-2}	1.8×10^{3}	*
T 6	*	1.1×10^{0}	3.0×10^{0}	6.8×10^{-1}	2.7×10^{2}	1.1×10^{2}	1.2×10^{2}	2.2×10^{0}	1.1×10^{1}	3.4×10^{1}	1.5×10^{-1}		*
U 5	*	3.1×10^{0}	1.3×10^{1}	3.7×10^{0}	3.0×10^{3}	7.8×10^{2}	1.2×10^{3}	*	4.0×10^{1}	2.0×10^{1}	7.7×10^{-2}		*
Ave. pCi/g	3.1×10^{-1}	1.1×10^{1}	2.1×10^{1}	1.6×10^{1}	5.0×10^{3}	1.9×10^{3}	3.5×10^{3}	1.0×10^{2}	6.8×10^{2}	7.5×10^{2}	4.6×10^{-1}	1.3×10^{4}	0.0
Curies	5.6×10^{-4}	2.0×10^{-2}	3.8×10^{-2}	2.9×10^{-2}	9.0	3.4	6.3	1.8×10^{-1}	1.2×10^{0}	1.4×10^{0}	8.3×10^{-4}	23	0.0

Total Curies in sludge = 45

TABLE 2.7-67

107-F RETENTION BASIN FILL
BASIN FILL (EXCLUDING SLUDGE)
Ave. Depth = 4' Mass = 2.9×10^{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
AN	*	*	8.5×10^{-2}		2.4×10^{0}	7.3×10^{-1}	8.8×10^{-1}	*	2.4×10^{-1}	1.7×10^{-1}			
BN	*	*	3.5×10^{-1}		1.5×10^{0}	6.7×10^{-1}	5.4×10^{-1}	4.0×10^{-2}	8.0×10^{-2}	8.6×10^{-2}			
CN	*	2.3×10^{-1}	8.2×10^{-2}		4.4×10^{-1}	2.9×10^{-1}	6.8×10^{-1}	*	1.0×10^{-1}	1.6×10^{-1}			
DN	*	*	5.0×10^{-2}		8.6×10^{-1}	2.0×10^{1}	2.3×10^{-1}	4.6×10^{-2}	8.5×10^{-2}	7.0×10^{-2}			
AS	*	1.9×10^{-1}	3.1×10^{-1}		2.4×10^{1}	1.2×10^{1}	7.3×10^{0}	*	1.7×10^{0}	1.7×10^{-1}			
CS	*	*	1.4×10^{-1}		2.8×10^{2}	4.8×10^{1}	1.2×10^{2}	3.3×10^{-1}	5.2×10^{-1}	1.4×10^{-1}		*	
DS	*	1.5×10^{-1}	2.9×10^{-1}		8.3×10^{1}	4.1×10^{1}	2.5×10^{-1}	3.8×10^{-2}	3.6×10^{0}	5.2×10^{-1}			
S	*	9.3×10^{-2}	4.9×10^{-1}	*	6.0×10^{1}	2.8×10^{1}	3.1×10^{1}	8.2×10^{-1}	2.9×10^{0}	2.3×10^{1}	1.2×10^{-1}		*
T	*	7.8×10^{-2}	2.2×10^{-1}	*	2.6×10^{1}	1.0×10^{1}	8.9×10^{0}	6.0×10^{-2}	2.5×10^{0}	5.2×10^{-1}	6.6×10^{-2}		*
U	*	8.0×10^{-3}	1.0×10^{-1}	*	6.4×10^{0}	3.4×10^{0}	2.2×10^{0}	1.4×10^{-1}	1.1×10^{0}	3.6×10^{-1}	1.0×10^{-2}		*
Ave. pCi/g	*	7.5×10^{-2}	2.1×10^{-1}	0.0	4.8×10^{1}	1.4×10^{1}	1.7×10^{1}	1.5×10^{-1}	1.3×10^{0}	2.5×10^{0}	6.5×10^{-2}	0.0	0.0
Curies	0.0	2.2×10^{-3}	6.1×10^{-3}	0.0	1.4	4.1×10^{-1}	4.9×10^{-1}	4.4×10^{-3}	3.8×10^{-2}	7.3×10^{-2}	1.9×10^{-3}	0.0	0.0

Total Curies in fill less sludge = 2.5
sludge = 45
Total Curies in basin fill = 48

TABLE 2.7-64

107-F BASIN LEAK DITCH

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	C-14
BNW1- 2-1/2	*	6.1×10^{-1}	3.7×10^{0}		1,000	3.0×10^{2}	2.4×10^{2}	8.9×10^{1}	2.1×10^{0}	4.2×10^{1}	1.9×10^{1}		
BB 15	*	*	4.1×10^{-1}	7.6×10^{-1}	<200/10	9.6×10^{-1}	2.4×10^{-1}	2.5×10^{-1}	3.7×10^{-2}	2.7×10^{-1}	3.2×10^{-1}	1.4×10^{-1}	
CC 1	*	*	9.0×10^{-1}		200	4.5×10^{1}	3.6×10^{1}	1.5×10^{1}	2.5×10^{-1}	5.2×10^{0}	1.2×10^{0}		
8-1/2	*	3.5×10^{-1}	1.3×10^{0}	9.1×10^{-1}	200	1.3×10^{2}	9.7×10^{1}	4.6×10^{1}	8.8×10^{-1}	1.5×10^{1}	6.7×10^{0}	1.7×10^{-1}	*
15	*	*	9.5×10^{-2}		<200/10	*	7.0×10^{-2}	*	*	*	*		
DD 5	*	*	2.6×10^{-1}	5.5×10^{-1}	<200/30	1.0×10^{1}	6.7×10^{0}	2.8×10^{0}	*	1.2×10^{0}	*	1.9×10^{-1}	
12-1/2	*	*	1.1×10^{-1}		<200/10	*	4.8×10^{-2}	*	*	*	*		

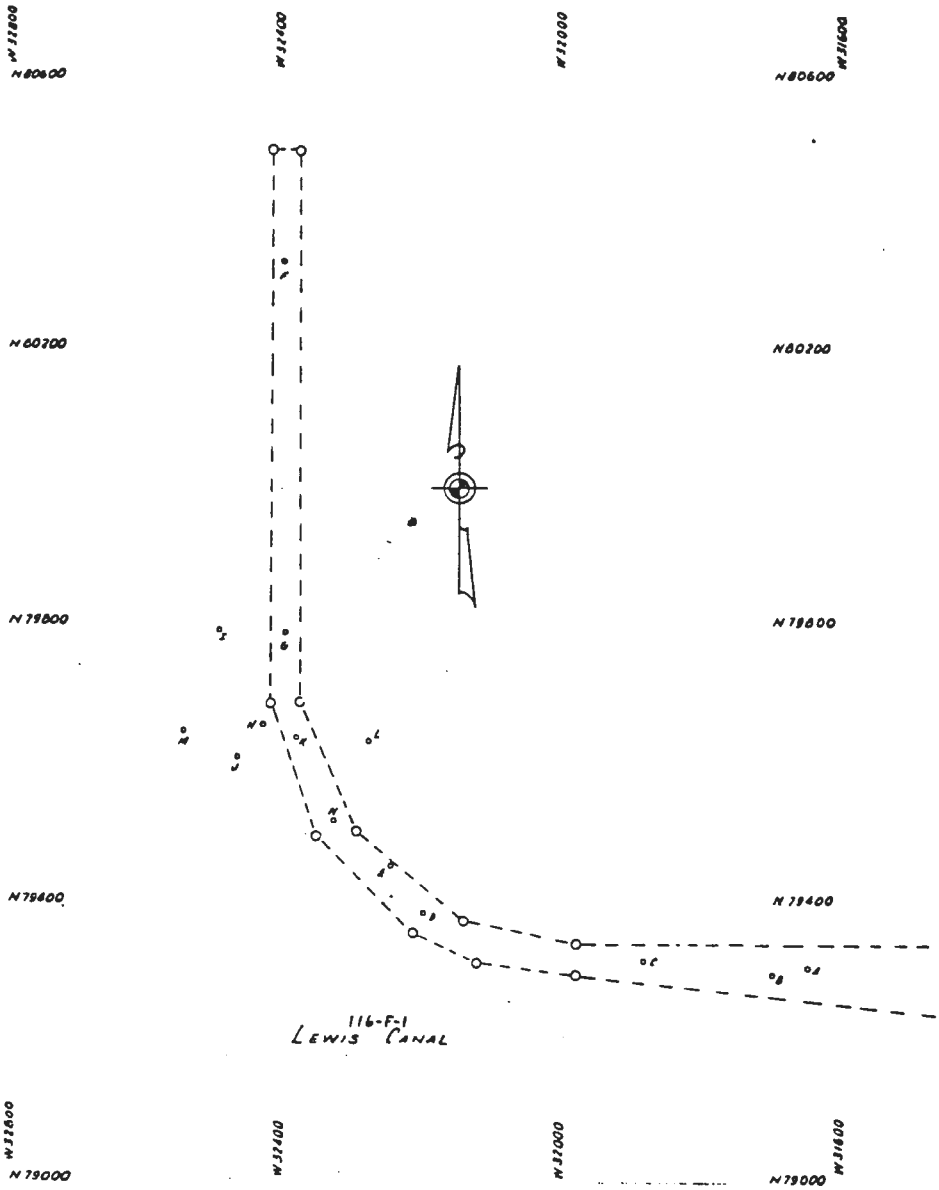
TABLE 2.7-65

107-F 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	C-14
AN	0	*	*	8.5×10^{-2}		<200/60	2.4×10^{0}	7.3×10^{-1}	8.8×10^{-1}	*	2.4×10^{-1}	1.7×10^{-1}			
	3-1/2	*	1.2×10^{-1}	1.8×10^{1}	9.8×10^{1}	6,000	1.6×10^{3}	1.5×10^{3}	1.1×10^{3}	3.2×10^{1}	1.3×10^{2}	1.9×10^{2}	6.9×10^{-1}		
BN	3	*	*	3.5×10^{-1}		<200/40	1.5×10^{0}	6.7×10^{-1}	5.4×10^{-1}	4.0×10^{-2}	8.0×10^{-2}	8.6×10^{-2}			
	3-1/2	*	9.0×10^{-1}	2.6×10^{-1}	2.5×10^{0}	1,000	5.5×10^{2}	1.0×10^{2}	2.5×10^{2}	3.1×10^{0}	4.2×10^{0}	4.0×10^{1}	2.6×10^{-1}		
CN	3	*	2.3×10^{-1}	8.2×10^{-2}		<200/30	4.4×10^{-1}	2.9×10^{-1}	6.8×10^{-1}	*	1.0×10^{-1}	1.6×10^{-1}			
	3-1/2	1.1×10^{0}	4.5×10^{1}	5.1×10^{1}		20,000	9.2×10^{3}	1.5×10^{3}	5.5×10^{3}	2.7×10^{2}	5.7×10^{2}	1.6×10^{3}	7.4×10^{-1}		
DN	3	*	*	5.0×10^{-2}		<200/30	8.6×10^{-1}	2.0×10^{-1}	2.3×10^{-1}	4.6×10^{-2}	8.5×10^{-2}	7.0×10^{-2}			
	3-1/2	*	1.2×10^{1}	8.5×10^{1}	4.1×10^{0}	10,000	6.5×10^{3}	1.5×10^{3}	3.7×10^{3}	1.3×10^{2}	1.6×10^{2}	1.0×10^{3}	5.3×10^{-1}	3.4×10^{4}	
AS	1	*	1.9×10^{-1}	3.1×10^{-1}		600	2.4×10^{1}	1.2×10^{1}	7.3×10^{0}	*	1.7×10^{0}	1.7×10^{-1}			
	3-1/2	5.7×10^{-1}	1.7×10^{-1}	1.1×10^{1}		20,000	7.5×10^{3}	6.0×10^{3}	5.0×10^{3}	5.5×10^{1}	5.9×10^{3}	8.6×10^{2}			
	4	3.9×10^{-1}	1.4×10^{1}	4.2×10^{0}	1.5×10^{1}	40,000	5.6×10^{3}	4.5×10^{3}	9.8×10^{3}	4.3×10^{2}	5.0×10^{2}	2.8×10^{3}	1.1×10^{0}	3.3×10^{3}	*
CS	3-1/2	*	*	1.4×10^{-1}		<200/120	2.8×10^{2}	4.8×10^{1}	1.2×10^{2}	3.3×10^{-1}	5.2×10^{-1}	1.4×10^{-1}		*	
	4	6.6×10^{-1}	2.4×10^{1}	1.0×10^{1}	3.7×10^{0}	30,000	1.4×10^{4}	2.5×10^{3}	7.0×10^{3}	1.6×10^{1}	3.7×10^{1}	7.5×10^{2}			
DS	0	*	1.5×10^{-1}	2.9×10^{-1}		<200/100	8.3×10^{1}	4.1×10^{1}	2.5×10^{-1}	3.8×10^{-2}	3.6×10^{0}	5.2×10^{-1}			
	4	*	1.5×10^{0}	3.8×10^{0}	8.6×10^{0}	2,000	1.3×10^{3}	2.0×10^{2}	5.5×10^{2}	*	2.1×10^{0}	8.7×10^{1}	5.1×10^{-1}		

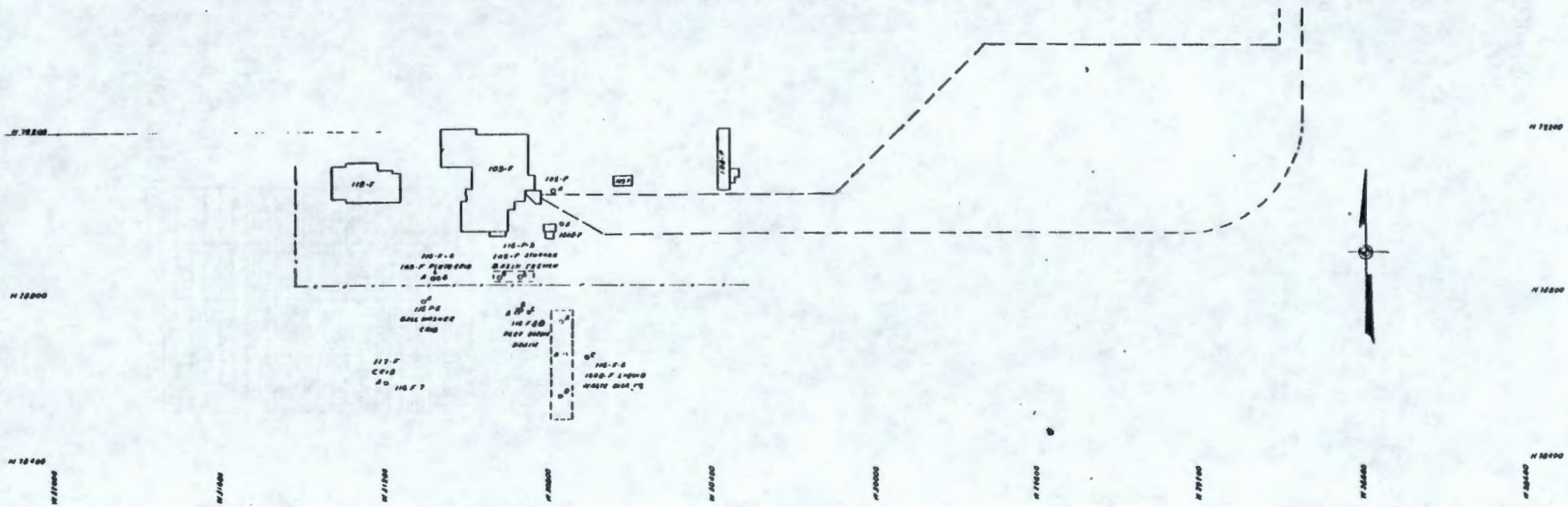


LEWIS CANAL TEST HOLES 116-F-1

TEST HOLE	N	W	ELEV
A	79310.40	31654.65	401.24
B	79300.35	31709.98	401.20
C	79318.11	31888.97	399.56
D	79387.69	32204.24	391.38
E	79457.02	32250.99	391.20
N	79517.32	32383.39	389.83
L	79636.22	32382.48	390.10
K	79647.06	32385.83	389.80
M	79657.91	32439.76	388.05
J	79611.30	32465.35	388.91
H	79642.74	32545.32	389.00
I	79793.78	32495.53	384.05
G	79788.83	32398.76	389.53
F	80332.65	32403.75	389.90

Figure 3.4-5

LEWIS CANAL SAMPLE HOLES



Test Hole	North	West	Elev.
116-F-5 A	78788.96	31115.84	409.23
116-F-7 A	78591.85	31203.67	404.28
116-F-10 A	78758.34	30885.33	413.98
116-F-10 B	78761.50	30875.29	414.0
116-F-10 C	78760.11	30853.60	414.20
116-F-6 A	78736.19	30775.50	413.78
116-F-6 B	78660.33	30764.90	409.88
116-F-6 C	78650.21	30712.33	414.48
116-F-6 D	78552.12	30774.85	409.9
116-F-4 A	78839.54	31090.68	410.2
116-F-4 B	78840.83	31078.10	411.0
1608-F A	78973.93	30771.42	412.3
105-F A	79051.00	30794.83	413.1
116-F-3 A	78843.31	30877.37	414.3
116-F-3 B	78840.00	30925.22	414.0

FIGURE 3.4-6

105-F AREA SAMPLE HOLES, MISC. CRIBS & TRENCHES

TABLE 3.4-18

116-F MISC. CRIBS & TRENCHES

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-F-3 105-F STORAGE BASIN TRENCH												
A 18	*	*	5.4×10^{-2}		<200/25	*	*	*	*	*	*	
B 20	*	*	1.1×10^{-1}	1.4×10^{-1}	<200/30	1.7×10^{-1}	5.0×10^{-2}	*	*	*	1.1×10^{-1}	
116-F-4 105-F PLUTO CRIB												
A 8	1.5×10^{0}	1.1×10^{2}	3.0×10^{3}	1.4×10^{1}	6,000	2.1×10^{1}	*	1.3×10^{2}	4.2×10^{1}	5.4×10^{3}	3.5×10^{2}	1.3×10^{0}
12-1/2	3.8×10^{-1}	2.9×10^{1}	6.4×10^{1}		3,000	1.4×10^{1}	1.4×10^{0}	3.1×10^{1}	*	1.1×10^{1}	2.6×10^{1}	
20	*	7.2×10^{-1}	1.6×10^{1}		<200/150	5.8×10^{-1}	*	*	*	2.2×10^{1}	3.1×10^{-1}	
B 5	*	1.1×10^{-1}	7.6×10^{-2}		<200/35	*	*	*	*	5.9×10^{-1}	7.6×10^{-2}	
116-F-5 BALL WASHER CRIB												
A 10	*	*	2.7×10^{-2}		<200/30	*	*	5.4×10^{-1}	*	4.0×10^{-2}	1.6×10^{-1}	
116-F-6 1608-F LIQUID WASTE DISPOSAL TRENCH												
A 7-1/2	*	7.6×10^{-1}	9.8×10^{0}	6.9×10^{1}	600	1.8×10^{2}	1.4×10^{2}	5.8×10^{1}	*	7.2×10^{1}	3.8×10^{0}	1.9×10^{-1}
15	*	2.0×10^{-1}	4.9×10^{0}		300	1.6×10^{0}	1.0×10^{0}	5.3×10^{0}	*	9.4×10^{0}	1.6×10^{-1}	
27			4.5×10^{0}		<200/25	2.1×10^{0}	1.3×10^{0}	6.3×10^{-1}	4.4×10^{-2}	1.1×10^{0}	3.1×10^{-1}	
B 10	*	2.0×10^{-1}	3.0×10^{0}	5.4×10^{1}	400	7.6×10^{1}	4.4×10^{1}	2.2×10^{1}	3.8×10^{-1}	2.5×10^{1}	5.1×10^{0}	
17-1/2	*	1.7×10^{-1}	3.4×10^{0}		<200/160	4.8×10^{0}	2.5×10^{1}	1.4×10^{1}	*	2.2×10^{1}	7.2×10^{-1}	
22-1/2			2.3×10^{0}		<200/30	1.1×10^{0}	3.4×10^{-1}	2.3×10^{-1}	5.3×10^{-2}	3.1×10^{-1}	7.3×10^{-2}	
C 25	*	*	2.3×10^{0}		<200/40	*	*	*	*	*	1.1×10^{-1}	
28			3.6×10^{0}		<200/25	*	*	*	*	*	*	
D 5	*	*	2.3×10^{0}		<200/75	7.6×10^{0}	3.3×10^{0}	1.2×10^{0}	5.6×10^{-2}	1.1×10^{1}	9.2×10^{-2}	
20	*	5.7×10^{-1}	7.9×10^{1}	4.2×10^{1}	400	1.3×10^{2}	4.8×10^{1}	3.6×10^{1}	6.4×10^{-1}	3.4×10^{1}	9.8×10^{0}	1.5×10^{-1}
25	*	*	1.1×10^{1}		<200/60	3.8×10^{-1}	1.2×10^{-1}	2.0×10^{-1}	*	1.2×10^{-1}	*	

TABLE 3.4-18 (Cont'd)

116-F MISC. CRIBS & TRENCHES (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	Eu-155	U
	Concentration (pCi/g)											
116-F-7 117-F CRIB												
A 10	*	1.0×10^{-1}	5.7×10^{-2}		<200/25	2.6×10^{-1}	*	*	*	3.2×10^{-2}	*	
116-F-10 Perf Decontamination Drain												
A 15	*	*	*		<200/30	*	*	*	*	1.9×10^{-2}	*	
B 12-1/2	*	*	3.0×10^{-1}	1.9×10^{2}	1,500	2.5×10^{2}	3.8×10^{2}	3.1×10^{1}	3.9×10^{-1}	1.7×10^{1}	1.0×10^{2}	1.1×10^{-1}
17-1/2	*	4.3×10^{-1}	1.6×10^{-1}		400	2.7×10^{1}	6.1×10^{1}	6.7×10^{0}	7.0×10^{-1}	7.4×10^{1}	6.3×10^{-1}	
27	*	8.7×10^{-1}	7.0×10^{-1}		<200/150	1.1×10^{1}	4.0×10^{1}	4.5×10^{0}	4.9×10^{-2}	4.1×10^{1}	2.3×10^{-1}	
C 20	*	*	*		<200/25	3.3×10^{-1}	1.7×10^{-1}	*	*	*	2.0×10^{-1}	

TABLE 3.4-19

116-F-1

LEWIS CANAL

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)											
A 5	*	*	*		<200/10	*	*	*	*	$1.6x10^{-1}$	*	
10	*	$1.5x10^{-1}$	$1.3x10^{-1}$	$1.6x10^{-1}$	<200/10	*	*	*	*	*	*	$1.1x10^{-1}$
15	*	*	$1.4x10^{0}$		<200/10	*	*	*	$4.2x10^{-2}$	*	*	
B 5	*	*	$1.7x10^{-1}$		<200/15	*	$9.5x10^{-2}$	*	*	*	*	
10	*	*	$3.6x10^{-1}$	$6.9x10^{-1}$	<200/20	$2.4x10^{-1}$	$4.8x10^{-2}$	*	*	$2.8x10^{-2}$	*	$1.1x10^{-1}$
15	*	*	$1.4x10^{0}$		<200/10	*	*	*	*	$8.1x10^{-2}$	*	
C 5	*	*	$2.3x10^{0}$		<200	*	$4.3x10^{-2}$	*	*	*	*	
10	*	*	$2.0x10^{0}$		<200	*	*	*	$3.1x10^{-2}$	*	*	
18	*	*	*		<200	$1.7x10^{-1}$	*	*	*	$6.7x10^{-2}$	*	
D 5	*	*	$9.6x10^{-2}$		<200	$1.5x10^{0}$	$1.2x10^{0}$	$4-8x10^{-1}$	$3.8x10^{-2}$	$1.4x10^{-1}$	*	
10	*	*	$8.6x10^{-1}$		<200	*	*	*	*	*	*	
E 2-1/2	*	*	$3.1x10^{-1}$		<200/20	$2.0x10^{-1}$	*	*	$5.1x10^{-2}$	$1.9x10^{-1}$	*	
7-1/2	*	*	$9.5x10^{-1}$	$1.2x10^{-1}$	<200/30	$6.5x10^{0}$	$5.3x10^{0}$	$1.2x10^{0}$	*	$7.2x10^{-1}$	*	$1.4x10^{-1}$
F 5	*	*	$8.5x10^{-2}$	*	<200/20	$5.5x10^{-1}$	$1.7x10^{-1}$	$3.6x10^{-1}$	*	$2.0x10^{-1}$	*	$5.4x10^{-2}$
10	*	*	$2.2x10^{0}$		<200/10	*	*	*	*	*	*	
G 3	*	$5.3x10^{-1}$	$5.7x10^{0}$	$2.0x10^{1}$	500	$2.6x10^{2}$	$2.0x10^{2}$	$1.2x10^{2}$	*	$3.2x10^{1}$	$9.8x10^{-2}$	$1.6x10^{-1}$
5	*	$9.9x10^{-1}$	$4.4x10^{-1}$	$2.1x10^{0}$	<200/20	$2.1x10^{-1}$	$1.2x10^{-1}$	*	*	$5.4x10^{-2}$	*	$1.3x10^{-1}$
10	*	*	$1.2x10^{-2}$		<200/15	*	*	*	$3.4x10^{-2}$		$1.0x10^{-1}$	
H 5	*	*	*		<200/10	$2.7x10^{-1}$	$1.6x10^{-1}$	*	*	*	*	
10	*	*	$1.3x10^{-1}$	$2.4x10^{-1}$	<200/20	*	*	*	*	*	$1.2x10^{-1}$	$8.3x10^{-2}$
15	*	*	$6.8x10^{-2}$		<200/10	*	*	*	*	*	$1.9x10^{-1}$	
I 5	*	*	$1.2x10^{-1}$		<200/20	$8.0x10^{-1}$	$1.0x10^{0}$	*	*	$1.7x10^{-1}$	*	
10	*	*	$7.0x10^{-1}$		<200/10	*	*	*	*	*	$2.7x10^{-1}$	
J 2-1/2	*	*	$3.1x10^{-2}$		<200/25	*	$8.9x10^{-2}$	*	$3.9x10^{-2}$	*	*	
5	*	*	$5.2x10^{-2}$		<200/10	$1.7x10^{-1}$	$6.3x10^{-1}$	$4.7x10^{-1}$	*	$8.8x10^{-2}$	*	
10	*	*	*		<200/10	*	*	*	*	*	*	
15	*	*	$2.1x10^{-2}$	$4.9x10^{-1}$	<200/10	*	*	*	*	*	*	$2.0x10^{-1}$

TABLE 3.4-19 (Cont'd)

116-F-1

LEWIS CANAL (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
K 5	*	5.0×10^{-1}	5.2×10^{-1}	4.1×10^{0}	<200/40	7.8×10^{0}	8.0×10^{0}	3.5×10^{0}	*	1.4×10^{0}	2.7×10^{-1}	1.7×10^{-1}
15	*	*	*		<200/Bkg	*	*	*	*	1.2×10^{-1}	1.1×10^{-1}	
L 10	*	*	3.2×10^{-2}	6.0×10^{0}	<200/10	5.8×10^{-1}	2.6×10^{-1}	2.4×10^{-1}	*	1.2×10^{-1}	*	1.6×10^{-1}
M 15	*	*	2.9×10^{-2}		<200/Bkg	*	*	*	*	*	*	
N 2-1/2	*	*	3.6×10^{-1}		<200/10	3.8×10^{-1}	6.4×10^{-1}	*	7.1×10^{-2}	*	1.4×10^{-1}	
7-1/2	*	*	3.1×10^{-1}	1.8×10^{0}	<200/10	9.6×10^{-1}	9.2×10^{-1}	*	*	4.5×10^{-1}	8.8×10^{-2}	2.4×10^{-1}

Memorandum

To: J. J. Dorian

Date: August 10, 1981

V. R. Richards

From: V. R. Richards

Subject: RADIOLOGICAL CHARACTERIZATION OF THE 100-F AREA ANIMAL LEACH TRENCH (116-F-9) AND THE SAWDUST PIT (118-F-5)

The Animal Leach Trench and the Sawdust Pit were part of the old Battelle biology facilities and were used to dispose of low-level radioactive animal wastes. These facilities were not included in the scope of the "Radiological Characterization of the Retired 100 Areas," UNI-946, because they were still in use by Battelle Northwest Laboratories.

Radiological characterization of these facilities was initiated in August, 1979 and resulted in establishing the radionuclides involved, their concentrations, and an estimate of the total radioactive inventory of their respective contaminated soil columns.

A conventional cable well drilling rig equipped with a 5" dia. drive barrel was used to obtain soil samples at known depths from predetermined sample hole locations. Six sample holes were drilled in 116-F-9 and five were drilled in 116-F-5. Selected samples were analyzed for gamma emitters using a Ge-Li detector. The U. S. Testing Company did the alpha and beta analysis.

The total estimated radioactive inventory of the 116-F-9 (Animal Leach Trench) contaminated soil column is 4.1 Curies (see Table 2). The concentrations of the radionuclides involved are shown in Table 1 and the sample locations are shown in Figure 1.

Battelle Sawdust Pit: Because of time limitations, (end of fiscal year funds) the characterization effort for 118-F-5 was limited to 5 sample test holes for a relatively large designated crib area (450' x 250').

Several samples from two of these test holes indicated contaminated fine sand and sawdust (150 to 700 c/m) at about 6 to 7' below fill grade. Samples from other test holes showed no indication of radioactive contamination.

The GM probe used to show the radioactive profile of the sample holes detected a narrow band of activity (600 to 800 c/m) and was less than 10" wide in both holes. Concentrations of radionuclides involved are indicated below and the test hole locations are shown in Figure 2.

Radionuclide	Maximum Concentration (pCi/gram)	Minimum Concentration (pCi/gram)
Co-60	5.3E-1	4.7E-1
Sr-90	2.0E2	1.7E1
Pu-239/240	2.1E-1	2.1E-1

Note: Because of the relatively large designated crib area and the limited time available for locating and establishing the actual crib area, I feel an estimate of the total radioactive inventory involved would be a rough guess. My educated guess would be 2 to 4 Curies.

VRR/cmj

Attachments

cc: PA Carlson
WG Westover
RA Winship
RK Wahlen
VRR/File/lb

TABLE 1

116-F-9

Animal Leach Trench

Concentrations in pCi/gram

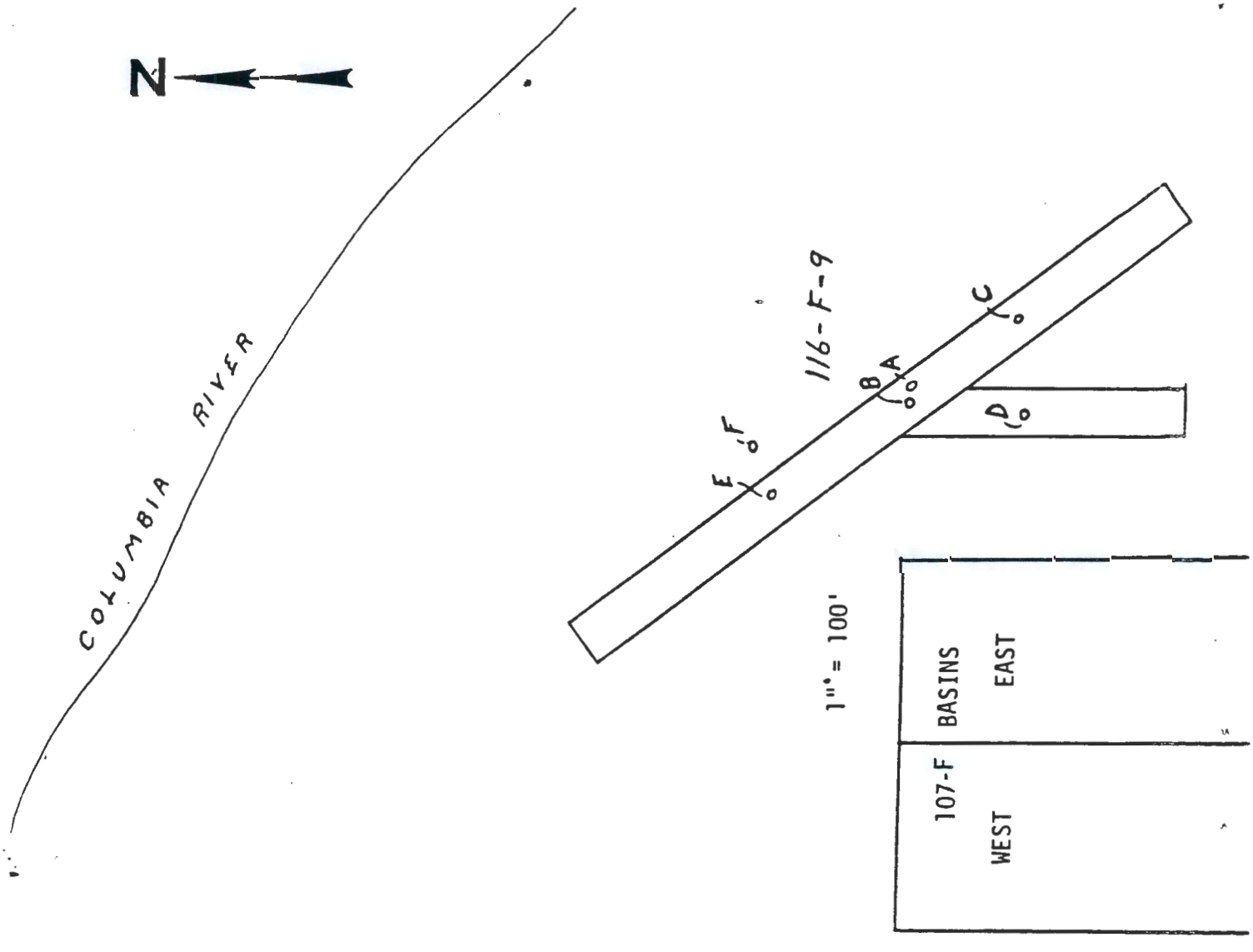
SAMPLE NUMBER	Cs-137	Co-60	Eu-152	Eu-154	Eu-155	Sr-90	Pu-238	Pu-239/240	GM CPM
116-F-9									
A-5	*	*	*	*	*	**	**	**	Background
A-10	*	*	*	*	*	**	**	**	Background
A-15	*	*	*	*	*	1.1E2	*	2.2E-1	180
A17.5	7.8E-1	1.5E0	5.5E-1	*	*	**	**	**	120
A-20	2.9E0	1.2E1	7.9E0	*	*	**	**	**	130
A-22.5	2.8E0	2.7E1	2.5E1	6.8E0	8.6E-1	9.3E1	*	2.1E-1	230
A-25	3.2E0	1.9E1	3.1E1	7.4E0	*	**	**	**	120
A-27	2.2E0	1.5E0	2.4E0	*	*	2.8E1	*	5.5E-2	120
B-20	1.1E0	7.4E0	3.3E0	*	*	4.9E1	*	6.9E-2	200
F-20	*	*	*	*	*	**	**	**	Background
F-25	*	*	*	*	*	5.2E0	*	*	Background
F-30	*	2.5E-1	*	*	*	3.4E0	*	*	Background

*Not Detected
**Not Requested

Note: F sample hole is 20' outside east edge of trench.

FIGURE I

116-F-9 ANIMAL WASTE LEACH TRENCH



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