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Existing Data On The 216-Z Liquid Waste Sites

K.W. Owens

Prepared for the United States
Department of Energy
Under Contract DE-AC06-77RL01030

Rockwell International

Rockwell Hanford Operations
Energy Systems Group
Richland, WA 99352

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PRELIMINARY REPORT

This report contains information of a preliminary nature. It is subject to revision or correction and therefore does not represent a final report. It was prepared primarily for internal use within Rockwell Hanford Operations. Any expressed views and opinions are those of the author and not necessarily of the Company.

DISCLAIMER

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Informal Report

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CONTENTS

INTRODUCTION

During 36 years of operation at the Hanford Site, the ground has been used for disposal of liquid and solid transuranic and/or low-level wastes. Liquid waste was disposed in surface and subsurface cribs, trenches, French drains, reverse wells, ditches and ponds.

Disposal structures associated with Z Plant received liquid waste from plutonium finishing and reclamation, waste treatment and laboratory operations. The nineteen 216-Z* sites (Figures 1 and 2) have received 83% of the plutonium discharged to 325 liquid waste facilities at the Hanford Site.

The purpose of this document is to support the Hanford Defense Waste Environmental Impact Statement by drawing the existing data together for the 216-Z liquid waste disposal sites. This document provides an interim reference while a sitewide Waste Information Data System (WIDS) is developed and put on line. Eventually these and additional site data for all Hanford waste disposal sites will be available on WIDS. Compilation of existing data is the first step in evaluating the need and developing the technology for long-term management of these waste sites.

The scope of this document is confined to data describing the status of the 216-Z waste sites as of December 31, 1979. Information and sketches are taken from existing documents and drawings.

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*The numbering system used at the Hanford Site indicates the location and use of the facility. In the case of the 216-Z designation, the 2 indicates that the facility is in the 200 Areas (Chemical Processing Areas), the -16 indicates that the facility received liquid wastes, and the Z indicates that it is associated with Z Plant (Plutonium Processing).

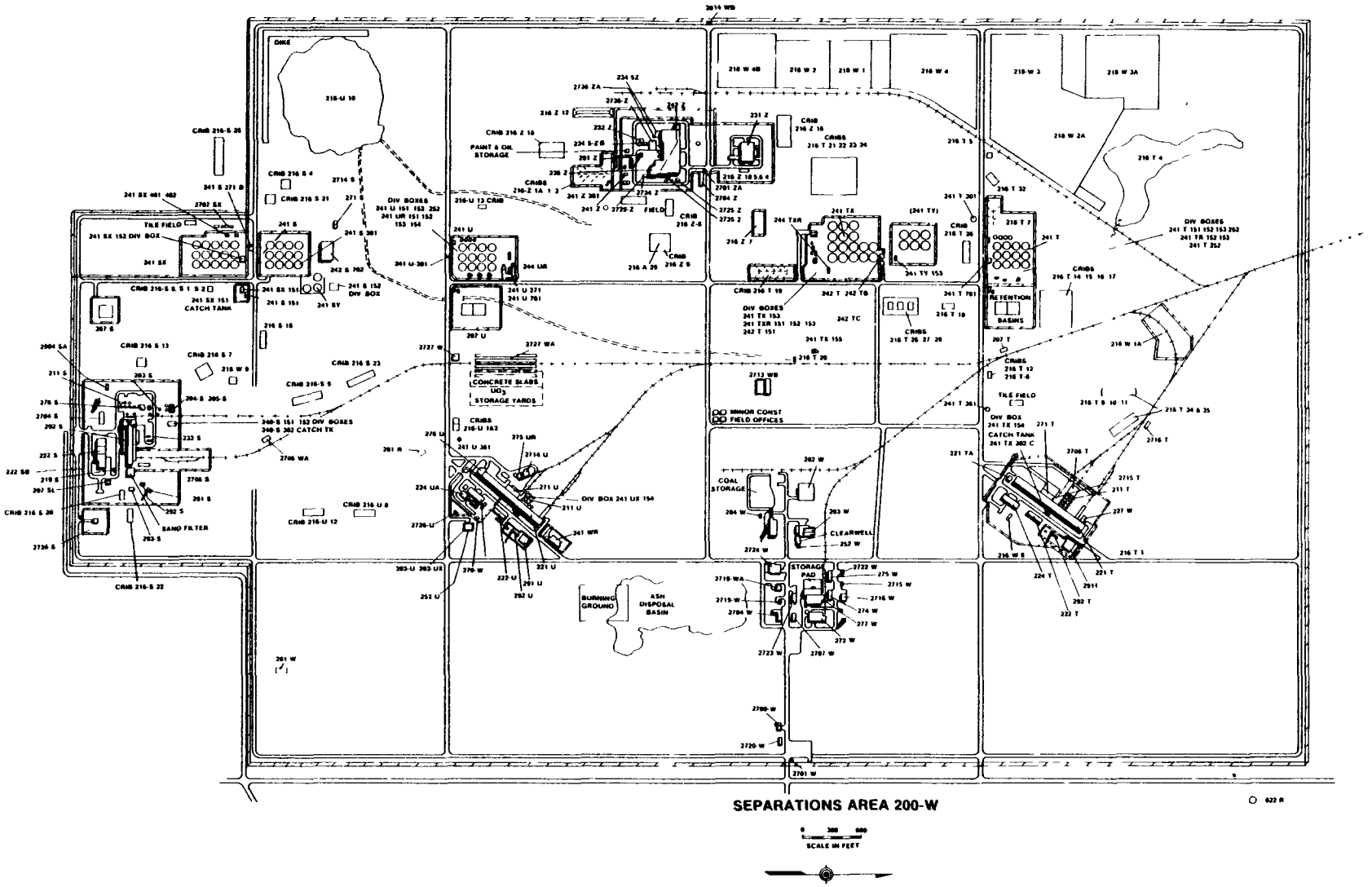

FIGURE 1. Separations Area 200 West.

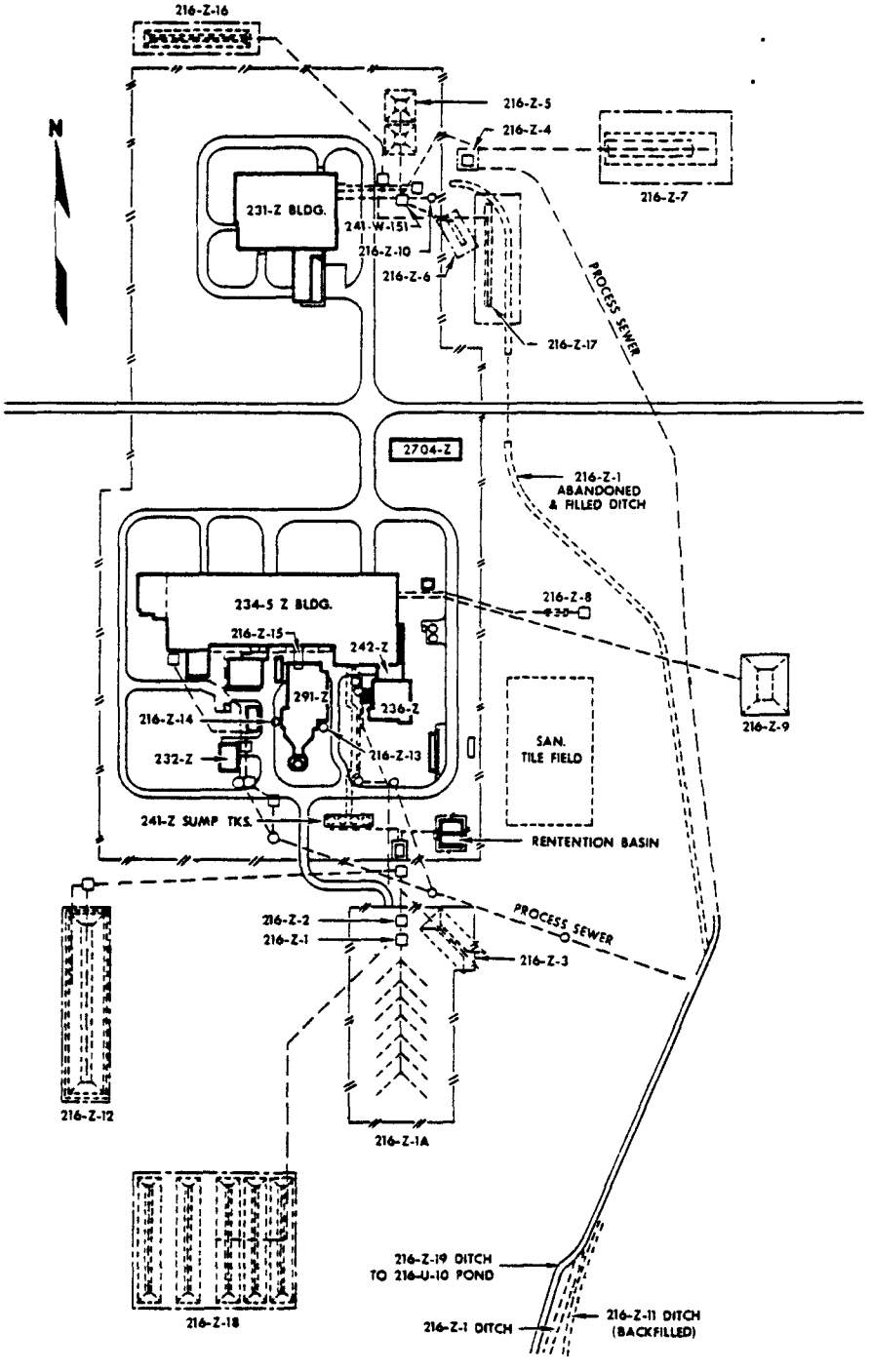

Figure 2. Z Plant Liquid Waste Sites.

SITE DATA

DESCRIPTION

A data package for each of the 19 sites follows. The packages include general and radionuclide data, a site schematic and well data. The number of figures included with each site depends on the complexity of the site. A plot plan indicates site size and location of monitoring wells. A cross-sectional schematic shows site construction, piping, materials and depths.

Most section headings and figure titles are followed by a set of numbers in parentheses. The numbers identify the reference(s) where the information originated. A "D" means the information was also found on a drawing listed in the Reference Drawings section (see below). The functions and limitations of each entry in the packages are discussed below.

Location

The Hanford Coordinates and an Area Description describe each site's location. The Hanford Coordinates, where one unit equals 1 ft, define either the center of the site (if one coordinate is given), the ends of the underground construction or excavation of a site (if two sets of coordinates are given) or the corners of the site perimeter at ground level (if four coordinates are given). Coordinates are based on surveyors' field notes and are often recorded as a fraction on drawings. In this document the coordinates are rounded to the nearest unit. The Area Description locates the site with respect to various structures in and around the Z Plant exclusion area.

Status

The site status is either active or retired. A site being used or ready for use as of December 31, 1979 is active. All other sites are

considered retired. In many cases, retired sites have been isolated from the waste source. The status of the 216-Z sites follows:

Active

216-Z-13 French Drain	216-Z-15 French Drain
216-Z-14 French Drain	216-Z-19 Ditch

Retired

216-Z-1 Ditch	216-Z-6 Crib	216-Z-11 Ditch
216-Z-1 and 2 TF Cribs and Tile Field	216-Z-7 Crib	216-Z-12 Crib
216-Z-3 Crib	216-Z-8 French Drain	216-Z-16 Crib
216-Z-4 Trench	216-Z-9 Trench	216-Z-17 Trench
216-Z-5 Crib	216-Z-10 Reverse Well	216-Z-18 Crib

Site

The site is identified by number and type as it is known in the Long Term Transuranic Defense Waste Program. Some disposal facilities previously designated by separate numbers are considered one site. Established site numbering sequences are followed as closely as possible to avoid confusion. For example, the site 216-Z-1 and 2 TF includes sites previously identified as 216-Z-1, 216-Z-2, 216-Z-1A, 216-Z-1AA, 216-Z-1AB and 216-Z-1AC in Reference 1.

Reference Drawings

This section lists drawings that give location, plan, section and detail information for the site.

Other Names

Other names by which the site has been known are included to help locate information in older documents.

Elevations and Depths

Site elevation from mean sea level (msl) is reported. The M-2600 W drawing series gives a topographic relief of 200 West Area and was used in determining site elevations. All elevations were taken at the site center.

Groundwater depths were estimated from drawing H-2-38397 sheet 5, dated December 1979 (Appendix C).(2) Due to fluctuations in groundwater level, the depths reported should be considered estimates.

Site depth indicates the depth from the ground surface to the bottom of the site excavation. The depth does not represent the extent of downward radionuclide migration. When there is a discrepancy in depths, the drawings are considered to be correct since many have been checked as "As Built." Contradictory depth data are included in the footnotes.

Description of Facility

The facility description provides information on structural material and site configuration and is supplemented by a schematic of the site. In this report the disposal facility is defined as the area constructed for waste disposal and does not include settling facilities, diversion boxes, etc. upstream of the disposal site.

Associated Structures

Any materials introduced into the site other than soil are associated structures. This includes wood members, piping, concrete, gravel and plastic. Dimensions of the associated structures within the site excavation (as it was originally constructed) are reported.

Service

The service dates indicate the time periods when the site was used. Corresponding to each time period is any entry under "function" that describes the sources of waste discharged to the site at that time.

Comments

This section contains information that does not fit elsewhere in the data package. Important entries are a waste description, isolation measures taken when a site was retired and occurrences associated with the site.

Footnotes

Footnotes referenced in one of the above sections usually discuss discrepancies in information. Information sources are identified, and where possible, a justification is given for selecting one source over another. This provides the most probable information and data that may be more restrictive for certain applications.

Radionuclide Data

The estimated yearly discharge of radionuclides to the disposal site is reported in tabular form. The final entry is the estimated radionuclude inventory remaining as of December 1979. Inventories were derived by multiplying the discharge volume by the radionuclide concentration and indicate the quantity of radionuclides discharged to the waste line that feeds the crib. In some cases the waste stream passed through a settling facility in the waste line before discharge. Therefore, the total reported inventory is not necessarily in the site. Entries written in scientific notation, such as 2.53E-2, are to be read 2.53×10^{-2}.

Three ditches, 216-Z-1, 216-Z-11 and 216-Z-19, have been used primarily for cooling water waste streams. Some radionuclides discharged to the ditches settled in the ditch during transport to 216-U-10 pond. A separate inventory has not been established for the Z ditches, but their inventories are included in that of 216-U-10. The matter is complicated further because the 216-U-14 ditch also discharged radionuclides to the pond.

The most prevalent radionuclides in Z waste sites are the alpha emitters, ^{239}Pu and ^{241}Am. Before the 1960s all alpha analyses were performed on an alpha proportional counter. All alpha activity detected was reported as ^{239}Pu. In the early 1960s the laboratory acquired alpha energy analysis (AEA). Plutonium was separated from the samples and analyzed by AEA. Alpha ^{239}Pu and ^{240}Pu have similar energies ($\sim$5.1 MeV) so show as a common peak. This alpha activity was all reported as ^{239}Pu. The ^{241}Am activity was also analyzed by AEA and was reported for a few sites used since 1977.

Well Data

The first entries in this section describe wells used to gather data for the particular site. Descriptions include size, relationship to the water table and distance to the site the wells monitor. Distance to the site is measured to the site center and may indicate a distance greater than that to the nearest zone of contamination.

Groundwater well scintillation evaluations are taken directly from ARH-ST-156 (Reference 3) except for references to figures. Depth measurements have been converted to feet to coincide with other data in this document. ARH-ST-156 indicates that breakthrough to groundwater occurs when radionuclides exceed 10% of an established guideline in ERDA Manual Chapter 0524.

Groundwater sample data are taken from a logarithmic computer printout as established by BNWL-2235 and BNWL-2336 (Reference 4). All results reported in a year are averaged to provide the value presented in this document. Values from the graphs are accurate to one significant figure and are to be read the same as those on the radionuclide data sheets; i.e., 2.7E-3 is read 2.7×10^{-3}.

DATA PACKAGES

LOCATION:

Hanford Coordinates: (D,1,5,6,7)

N-40829
W-76505
N-37050
W-76950

STATUS: Retired

SITE: 216-Z-1 Ditch

REFERENCE DWGS:
H-2-576
H-2-10011
H-2-14035
H-2-32682
H-2-34762
M-2600-W 15 & 18

OTHER NAMES:
Drain Ditch to U-Swamp
Z Plant Ditch
216-Z-11

Area Description of Location: (1)

200 West Area

Begins east of the 231-Z Plutonium Metallurgy Laboratory Bldg (231-Z Bldg) and runs south to the 216-U-10 Pond

ELEVATIONS & DEPTHS: (D,7,8)

Ground: 669-661 ft above msl
Site Depth: Minimum of 2 ft
Water Table: 192 ft (Head end) to 181 ft (Terminus) below grade

DESCRIPTION OF FACILITY: (D,1,5,6,7,8)

The site is a 4250*-ft-long ditch with a 4-ft-wide bottom and a minimum depth of 2 ft. In July 1949, the upper 1725 ft (N-40830, W-76505 to N-39329, W-76020)† was backfilled and replaced by a pipeline. In 1959, 2005 ft (N-39420, W-75991 to N-37495, W-76460) from the pipeline outlet to 665 ft northeast of 216-U-10 Pond was backfilled after a contamination release from 231-Z Bldg.‡ The last 665 ft (N-37495, W-76460 to N-37050, W-76950) was common to 216-Z-1 and 216-Z-11 ditches.

ASSOCIATED STRUCTURES:

None

SERVICE DATES: (1,5)

From	To	Function
12/44	7/49	Received process cooling water and steam condensate from the the 231-Z Bldg
7/49	5/53	Received 231-Z bldg effluents, process cooling water and steam condensate from the 234-5Z Plutonium Finishing Bldg (234-5Z Bldg), and the cooling and seal water from the 291-Z Stack
5/53	3/59	Received process cooling water and steam condensate from the 234-5Z Bldg, the cooling and seal water from the 291-Z Stack, and Hanford Laboratory waste from the 231-Z Bldg
3/59	-	Retired

COMMENTS: (D,1)

Radionuclide inventory is reported as part of the 216-U-10 Pond inventory (Table 1)

The first 120 ft of 216-Z-1 (starting at the 231-Z outfall) is common with 216-Z-11 and 216-Z-19

In 1971, 425 ft of 216-Z-1 Ditch, immediately south of the above section, was exhumed while digging the head end of 216-Z-19 Ditch

The last 665 ft of 216-Z-1 is common with 216-Z-11.

FOOTNOTES:

*Reference 1 reports the length at 4150 ft. Reference 5 and the drawings indicate that the ditch is possibly longer. This document carries the greater length of 4250 ft.

†References 6 and 7 report 1400 ft; Reference 1 reports 1480 ft. The coordinates reported in References 6 and 7 indicate the straight-line distance is 1576 ft. Estimates taken from a drawing generated the 1725-ft distance presented here.

‡Two drawings locate the pipeline outfall at N-39400, W-76000. More documents give the coordinates given here which also correspond to the head end of 216-Z-11 and 216-Z-19.

TABLE 1. Radionuclide Inventory of 216-U-10 Pond.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)	^{134}Cs (Ci)	^{144}Ce (Ci)	^{241}Am (g)	^{3}H (Ci)	^{155}Eu (Ci)
1944	1.62E+08	-	-	-	-	-	-	-	-	-	-	-	-
1945	9.67E+08	1.00E-01	1.00E-02	-	-	-	-	8.00E+00	-	-	-	-	-
1946	9.67E+08	1.00E-01	1.00E-02	-	-	-	-	8.00E+00	-	-	-	-	-
1947	9.67E+08	1.00E-01	1.00E-02	-	-	-	-	8.00E+00	-	-	-	-	-
1948	9.67E+08	1.00E-01	1.00E-02	-	-	-	-	8.00E+00	-	-	-	-	-
1949	1.24E+09	3.00E-01	5.00E-02	-	-	-	-	1.00E+01	-	-	-	-	-
1950	1.52E+09	3.00E-01	5.00E-02	-	-	-	-	1.20E+01	-	-	-	-	-
1951	1.52E+09	3.00E-01	5.00E-02	-	-	-	-	1.30E+01	-	-	-	-	-
1952	4.04E+09	3.00E-01	4.00E-02	-	-	-	-	3.30E+01	-	-	-	-	-
1953	1.15E+10	3.90E+00	4.20E+00	-	1.00E+00	-	-	9.50E+01	-	-	-	-	-
1954	1.13E+10	6.60E+00	1.98E+02	5.00E+00	8.30E+01	3.00E+00	-	9.30E+01	-	-	-	-	-
1955	1.17E+10	8.50E+00	2.29E+02	6.00E+00	1.01E+02	4.00E+00	-	9.70E+01	-	-	-	-	-
1956	1.19E+10	1.60E+01	1.60E+02	4.00E+00	7.10E+01	3.00E+00	-	9.80E+01	-	-	-	-	-
1957	1.12E+10	4.12E+01	1.50E+01	-	7.00E+00	-	-	9.20E+01	-	-	-	-	-
1958	1.07E+10	2.35E+01	6.20E+00	-	3.00E+00	-	-	8.80E+01	-	-	-	-	-
1959	1.98E+09	3.72E+01	4.40E+00	-	2.00E+00	-	-	1.60E+01	-	-	-	-	-
1960	3.58E+09	6.60E+00	6.30E-01	-	-	-	-	2.90E+01	-	-	-	-	-
1961	2.61E+09	-	1.95E+01	-	9.00E+00	-	-	2.20E+01	-	-	-	-	-
1962	2.24E+09	-	8.30E+00	-	4.00E+00	-	-	1.94E+02	-	-	-	-	-
1963	2.72E+09	-	1.80E+01	-	8.00E+00	-	-	1.48E+02	-	-	-	-	-
1964	2.58E+09	-	5.30E+00	-	2.00E+00	-	-	1.48E+02	-	-	-	-	-
1965	2.72E+09	-	1.14E+01	-	5.00E+00	-	-	3.80E+01	-	-	-	-	-
1966	2.41E+09	-	1.05E+01	-	4.00E+00	-	-	5.90E+01	-	-	-	-	-

[a]References, 9, 10, 11, 12, 13.

TABLE 1. Radionuclide Inventory of 216-U-10 Pond.[a] (Continued)

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)	^{134}Cs (Ci)	^{144}Ce (Ci)	^{241}Am (g)	^{3}H (Ci)	^{155}Eu (Ci)
1967	3.99E+09	7.86E+03	4.34E+01	<7.10E+00	<8.00E+00	<4.50E+00	<4.00E+00	4.78E+01	-	-	-	-	-
1968	3.30E+09	2.04E+01	8.39E+00	<3.52E-01	<1.07E+00	<7.07E-01	<3.50E-01	1.60E+01	-	-	-	-	-
1969	2.98E+09	<9.69E+00	6.49E+00	<1.46E-01	<2.40E-02	<4.66E-01	<1.10E-02	2.40E+01	-	-	-	-	-
1970	2.51E+09	<3.80E+00	<3.12E+00	-	-	-	-	9.93E+00	-	-	-	-	-
1971	2.71E+09	<3.49E+01	<5.29E+00	-	-	-	-	1.34E+01	-	-	-	-	-
1972	2.34E+09	<2.98E+01	<3.52E+00	-	-	-	-	<7.86E+00	-	-	-	-	-
1973	1.97E+09	8.39E+00	<8.47E-01	-	-	-	-	<5.59E+00	-	-	-	-	-
1974	5.81E+09	3.50E+00	<1.27E+00	-	-	-	-	<4.15E+01	-	-	-	-	-
1975	5.32E+09	<3.20E+00	<1.18E+00	3.07E-02	<7.55E-02	4.43E-02	<6.61E-03	<4.21E+01	-	-	-	-	-
1976	6.33E+09	<7.50E+01	<8.00E-01	-	-	-	-	<4.99E+01	-	4.47E-03	-	1.36E-01	-
1977	5.72E+09	2.05E+01	<8.24E-01	5.60E-03	<1.87E-02	<1.49E-03	<3.14E-03	<4.10E+01	-	1.61E-03	2.42E-04	4.08E-01	-
1978	5.78E+09	<2.43E+00	<3.31E-01	1.40E-02	<1.75E-02	1.31E-02	<8.20E-03	<4.67E+01	-	8.05E-04	6.32E-05	6.08E-01	<.82E-03
1979	4.54E+09	<1.41E+00	<3.51E+00	<3.81E-02	<1.06E-02	<1.51E+00	<9.07E-02	<3.42E+03	2.33E-02	-	2.52E-04	1.80E+00	-
Total To 12/31/79	1.55E+11	8.22E+03	7.60E+02	<2.27E+01	3.09E+02	<1.72E+01	<4.47E+00	<5.09E+03	2.33E-02	6.88E-03	5.58E-04	2.95E+00	<.82E-03
Amount After Decay 12/31/79	1.55E+11	8.22E+03	<5.25E+01	<1.39E+01	<2.31E-02	<1.15E+01	<9.45E-01	<5.09E+03	1.88E-02	5.33E-04	5.58E-04	2.78E+00	<.75E-03

[a]References 9, 10, 11, 12, 13.

LOCATION:

Hanford Coordinates: (D,1,5)*

N-39439
W-76601
N-39061
W-76601

Area Description of Location: (D,1)

200 West Area

500 ft south of the 234-5Z Bldg

STATUS:

Retired

SITE:

216-Z-1 & 2 TF
Crib & Tile Field

REFERENCE DWGS:

H-2-16459
H-2-24923
H-2-24924 No. 2
H-2-27503
H-2-32528

OTHER NAMES:

234-5 No. 1 Crib
216-Z-7

ELEVATIONS & DEPTHS: (D,1,2,6,7)†

Ground: 676 ft above msl
Site Depth: 21 ft below grade
Water Table: 195 ft below grade

DESCRIPTION OF FACILITY: (D,1,6,7,14,15)

This site consists of two wooden box cribs and a tile field (Figures 3, 4 and 5). Each wooden box is constructed of 6- by 6-in., 12-ft-long timbers, is 12 ft square and stands 14 ft high; the bottom is open. Each box stands in a 14-ft-square by 21-ft-deep, backfilled excavation. The No. 2 crib overflowed to the No. 1 crib which overflowed to the tile field (see comments). The tile field consists of a 260-ft trunk with seven pairs of 70-ft laterals. All tile field piping is 8-in. vitrified clay pipe.

ASSOCIATED STRUCTURES: (D,14,15)

33 ft of 8-in. SS effluent pipe feeding 216-Z-2 and between the two cribs

Two 5-ft sections of 8-in.-dia. pipe extending horizontally to blind flanges on either side of 216-Z-2. These are 12 ft above crib bottom

Two 44-ft-long, 8-in.-dia. steel test wells, one extending from 3 ft above grade, through the center of each crib to 20 ft below the crib bottom

Two 9-ft sections of 3-in.-dia. steel vent pipe. One at each crib extending from 2 ft above ground down through the crib top

Two 4-in., 6-ft-square concrete pads, one at each crib. The concrete pad supports the vent pipe and test well

150 ft of 0.5-in. purged air lines. Each crib has two lines that parallel the effluent pipe and reach from the crib top to within 1 ft of the crib bottom

175 ft of 2-in. SS pipe inside the main trunk of the tile field

Two 13-ft lengths of effluent pipe extending west from the cribs. There is one pipe feeding each crib approximately 8 ft below grade

35,000 ft^2 of 0.02-in. polyethylene

For location and depth of wells see Reference 15.

SERVICE DATES: (1,5,7,9,16)†

From	To	Function
6/49	6/52	Received process, analytical and development lab wastes from 234-5Z Bldg via the 241-Z Settling Tanks .
6/52	3/59	216-Z-1 & 2 were bypassed. 216-Z-1A Tile Field received the above waste via overflow from 216-Z-3 Crib
3/59	5/64	All portions of this site were inactive.
5/64	8/64	216-Z-1 & 2 were still inactive. 216-Z-1A received aqueous and organic waste from 236-Z Plutonium Reclamation Facility Bldg (236-Z Bldg)
8/64	5/66	Same as above plus 242-Z Waste Treatment and Americium Recovery Bldg (242-Z Bldg) waste
5/66	6/66	216-Z-1 & 2 received 236-Z Bldg aqueous and organic waste and 242-Z Bldg waste; the distribution point in 216-Z-1A Tile Field was moved from the A section 100 ft down the main trunk from the A section to the B section
6/66	10/67	216-Z-1 & 2 were inactive; section B of 216-Z-1A Tile Field received aqueous and organic waste from 236-Z Bldg and waste from 242-Z Bldg
10/67	10/67	216-Z-1 & 2 received 236-Z and 242-Z Bldg wastes while the discharge point was moved 75 ft further down the main trunk from the B section to the C section
10/67	3/68	216-Z-1 & 2 were inactive; 216-Z-1A Tile Field received 236-Z and 242-Z Bldg wastes
3/68	4/69	216-Z-1A Tile Field continued to receive the above wastes; 216-Z-1 & 2 received uranium wastes from 236-Z Bldg
4/69	-	All portions of the site were retired.

COMMENTS: (D,1,5,14,15,17)

From June 1949 to March 1959, waste went through the 241-Z Sump Tanks before disposal

Wastes from 236-Z and 242-Z Bldgs were discharged directly to the site

COMMENTS: (D,1,5,14,15,17) (Continued)

Waste Description: Waste disposed from June 1949 to March 1959 was slightly acidic with the pH adjusted to 8 to 10 before discharge. Waste disposed to the 216-Z-1A Tile Field after 1964 was acidic with the following approximate composition: 0.15M HNO_3, 0.2M $Al(NO_3)_3$, 0.3M $AlF(NO_3)_2$, 0.3M $Mg(NO_3)_2$, 0.2M $Ca(NO_3)_2$, 0.95M $NaNO_3$; organic disposed during this time consisted of TBP, DBBP and CCl_4. Deactivation: In 1952 the effluent line to the crib was valved out. The tile field was isolated by cutting the line from 216-Z-1 and plugging it with cement

Pipeline feeding 216-Z-1 & 2 from the west was cut and blanked when the cribs were retired

In 1964 the two cribs were bypassed and waste was discharged directly to the tile field. The A section (216-Z-1AA) denotes the tile field from the head end to 100 ft down the trunk. A 2-in.-dia. SS pipe was placed within the 8-in. vitrified clay pipe to reposition the discharge point for the 75-ft-long B section (216-Z-1AB). The 2-in.-dia. SS pipe was extended another 75 ft to move the discharge point to the head of the 85-ft C section (216-Z-1AC)

See Tables 2 and 3 for radionuclide data.

FOOTNOTES:

*These coordinates mark the head and foot end of this disposal site. Coordinates in various documents denote portions of this site. The centers of the various parts of the site follow:

216-Z-1	N-39379, W-77601
216-Z-2	N-39411, W-77601
216-Z-1A TF	N-39197, W-77601

†References 1 and 7 give the site depth as 17 ft. This is believed to be incorrect since drawings and Reference 6 support the depth given here.

‡The dates given for relocation of the discharge point in 216-Z-1A Tile Field are estimated from discharge records.

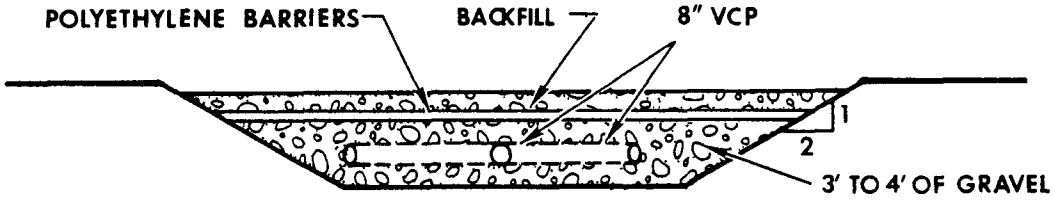

FIGURE 3. 216-Z-1A Tile Field.(14)

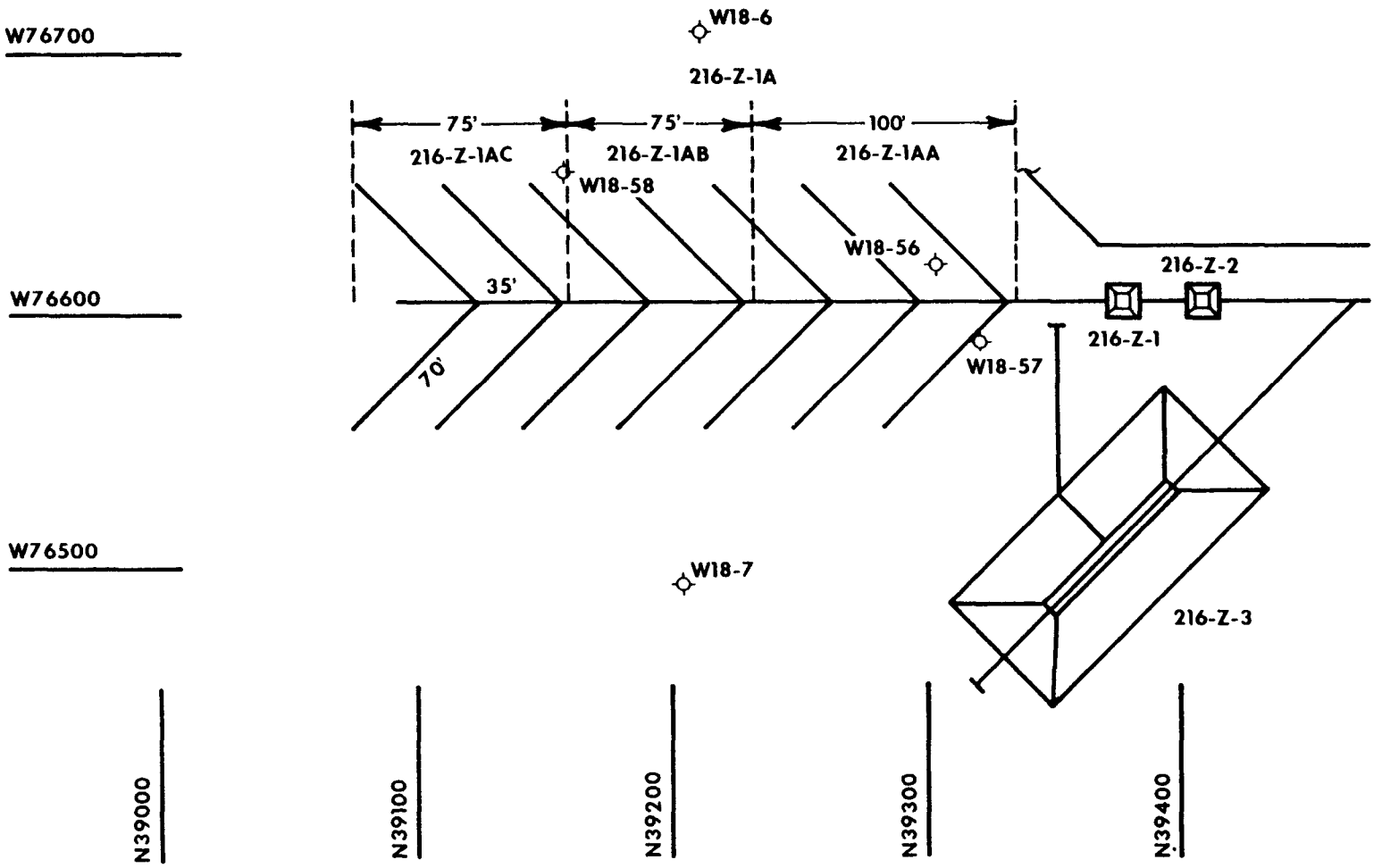

FIGURE 4. 216-Z-1 and 2 Cribs and Tile Field. (3,18)

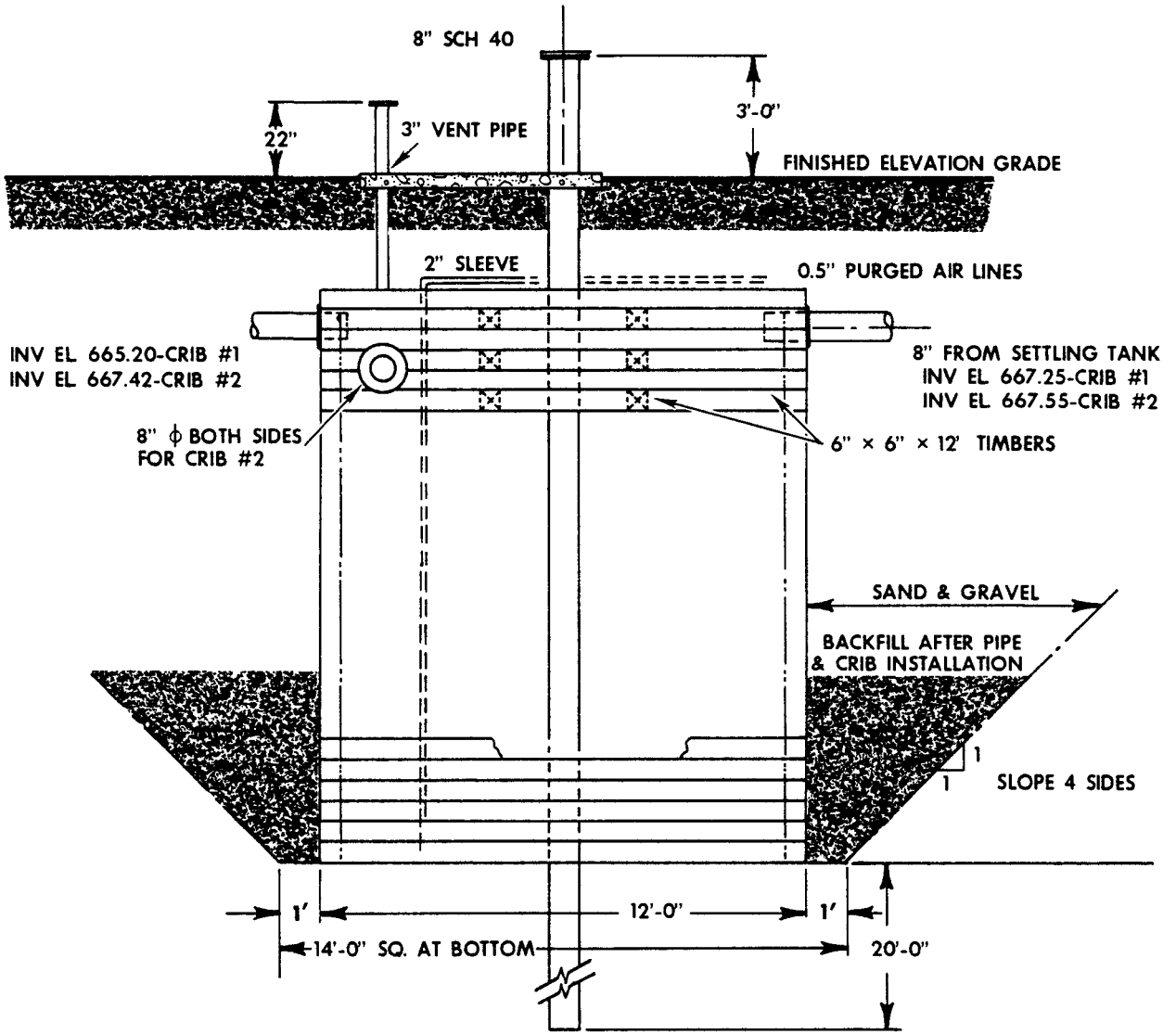

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FIGURE 5. 216-Z-1 and 2 Cribs and Cross Section.(14)

TABLE 2. Radionuclide Inventory of 216-Z-1 and 2 TF Crib and Tile Field.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1949	5.55E+06	9.02E+02	8.00E+00	-	2.00E+00	-	-	1.20E-02
1950	1.12E+07	1.80E+03	1.70E+01	1.00E-01	3.00E+00	1.00E-01	1.00E-01	2.30E-02
1951	1.12E+07	1.80E+03	1.60E+01	-	3.00E+00	-	-	2.30E-02
1952	5.55E+06	9.02E+02	9.00E+00	-	2.00E+00	-	-	1.20E-02
1966	1.00E+05	1.01E+02	-	-	-	-	-	-
1967	4.00E+03	5.00E+01	-	-	-	-	-	-
1968	3.80E+04	9.90E+02	-	-	-	-	-	8.05E+01
1969	6.00E+04	4.76E+02	-	-	-	-	-	3.07E-01
Total To 12/31/79	3.37E+07	7.03E+03	5.00E+01	1.00E-01	1.00E+01	1.00E-01	1.00E-01	8.09E+01
Amount After Decay 12/31/79	3.37E+07	7.03E+03	2.04E-01	4.84E-02	2.60E-08	5.07E-02	.204E-03	8.09E+01

[a]References 9, 12.

TABLE 3. Radionuclide Inventory of Subsections of 216-Z-1 and 2 TF Crib and Tile Field.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1949	6.00E+04	3.00E+00	-	-	-	-	-	<3.00E-03
1950	1.00E+05	5.00E+00	-	-	-	-	-	<5.00E-03
1951	1.00E+05	5.00E+00	-	-	-	-	-	<5.00E-03
1952	1.00E+05	5.00E+00	-	-	-	-	-	<5.00E-03
1953	1.00E+05	5.00E+00	-	-	-	-	-	<5.00E-03
1954	1.00E+05	5.00E+00	-	-	-	-	-	<5.00E-03
1955	1.00E+05	5.00E+00	2.20E+00	-	1.00E+00	-	-	<5.00E-03
1956	1.00E+05	5.00E+00	4.20E+00	-	2.00E+00	-	-	<5.00E-03
1957	1.00E+05	5.00E+00	6.60E+00	-	3.00E+00	-	-	<5.00E-03
1958	1.00E+05	5.00E+00	8.80E+00	<1.00E-01	4.00E+00	<1.00E-01	<1.00E-01	<5.00E-03
1959	4.00E+04	2.00E+00	1.00E+00	-	-	-	-	<2.00E-03
Total To 12/31/79	1.00E+06	5.00E+01	2.28E+01	<1.00E-01	1.00E+01	<1.00E-01	<1.00E-01	<5.00E-02
Amount After Decay 12/31/79	1.00E+06	5.00E+01	<2.42E-01	<5.89E-02	<2.22E-06	<6.10E-02	<5.87E-03	<5.00E-02
Radionuclide Inventory of 216-Z-1AA Tile Field								
1964	4.40E+05	1.43E+04	1.01E+02	<1.00E-01	4.80E+01	<1.00E-01	<1.00E-01	<2.00E-02
1965	9.20E+05	1.10E+04	7.70E+01	-	3.70E+01	-	-	<2.00E-02
1966	5.40E+05	4.64E+03	3.22E+01	-	1.50E+01	-	-	<1.00E-02
Total To 12/31/79	1.90E+06	3.00E+04	2.10E+02	<1.00E-01	1.00E+02	<1.00E-01	<1.00E-01	<5.00E-02
Amount After Decay 12/31/79	1.90E+06	3.00E+04	<3.12E-01	<6.83E-02	<4.12E-03	<7.00E-02	<1.30E-02	<5.00E-02

[a]References 9, 12.

TABLE 3. Radionuclide Inventory of Subsections of 216-Z-1 and 2 TF Crib and Tile Field (Continued).[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	90Sr (Ci)	106Ru (Ci)	137Cs (Ci)	60Co (Ci)	U (kg)
Radionuclide Inventory of 216-Z-1AB tile Field								
1966	9.60E+05	1.20E+04	1.05E+02	<1.00E-01	5.00E+01	<1.00E-01	<1.00E-01	<3.00E-02
1967	9.40E+05	4.60E+03	-	-	-	-	-	<2.00E-02
Total To 12/31/79	1.90E+06	1.66E+04	1.05E+02	<1.00E-01	5.00E+01	<1.00E-01	<1.00E-01	<5.00E-02
Amount After Decay 12/31/79	1.90E+06	1.66E+04	<3.23E-01	<7.18E-02	4.51E-03	<7.33E-02	<1.69E-02	<5.00E-02
Radionuclide Inventory of 216-Z-1AC Tile Field								
1967	2.53E+05	2.39E+03	-	-	-	-	-	-
1968	1.00E+06	7.60E+03	-	-	-	-	-	-
1969	1.55E+05	8.16E+02	-	-	-	-	-	-
Total To 12/31/79	1.41E+06	1.08E+04	-	-	-	-	-	-
Amount After Decay 12/31/79	1.41E+06	1.08E+04	-	-	-	-	-	-

[a]References 9, 12.

WELL DATA: (19)*

Location of wells monitoring 216-Z-1 & 2 TF Crib and Tile Field are shown on Figure 4.

Well Number: 299-W18-6

Location: 200 West Area, approximately 111 ft southwest of 216-Z-1&2 TF; N-39212, W-76706

Description: 8 in. dia., 189 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W18-7

Location: 200 West Area, approximately 119 ft southeast of 216-Z-1&2 TF; N-39204, W-76491

Description: 8 in. dia., 213 ft deep
Depth to water: 203 ft
Open interval: 190-213 ft

Well Number: 299-W18-56

Location: 200 West Area, approximately 53 ft north of 216-Z-1&2 TF; N-39301, W-76615

Description: 8 in. dia., 150 ft deep
Depth to water: not to water
Open interval: 48-148 ft

Well Number: 299-W18-57

Location: 200 West Area, approximately 61 ft northeast of 216-Z-1&2 TF; N-39309, W-76587

Description: 8 in. dia., 150 ft deep
Depth to water: not to water
Open interval: 48-148 ft

Well Number: 299-W18-58

Location: 200 West Area, approximately 102 ft southwest of 216-Z-1&2 TF; N-39161, W-76651

Description: 8 in. dia., 150 ft deep
Depth to water: not to water
Open interval: none †

*See Table 4 for groundwater sample results.

Evaluation of Scintillation Probe Profiles:

In 1963 all scintillation probe profiles from wells monitoring the tile field showed background levels of radiation.

Radioactive contaminants were detected in Wells W18-56, W18-57 and W18-58 in 1965. The profiles show radioactive contamination from [38 to 70 ft] below the ground surface in Well W18-56, between [20 and 55 ft] and at the bottom of Well W18-57 and from [45 ft] decreasing in radiation intensity to near background at the bottom of Well W18-58. The radiation intensity increased in Wells W18-57 and W18-58 from 1965 to 1968 from continuing disposal to the tile field. The radiation intensity decreased between 1965 and 1973 (three years after discharges to the tile field were terminated) in Well W18-56 by radionuclide decay. Other than these three wells, near background levels of radiation are detected from wells in and around the 216-Z-1A Tile Field.

On the basis of the scintillation probe profiles the radioactive contaminants are held high in the sediment column beneath the tile field. The migration of radionuclides that has occurred is the result of effluent disposed to the ground via the 216-Z-1A Tile Field. These data indicate breakthrough to the groundwater has not occurred at this site.(3)

TABLE 4. Groundwater Sample Results from Wells Monitoring 216-Z-1 and 2 TF.[a]

Radionulcide[b] (pCi/ml)	Years Sampled									
	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Well 299-W18-6										
Total A	1.1E-2	-	-	1.5E-2	-	-	-	-	-	-
Total B	-	-	2.7E-1	1.5E-1	-	-	-	-	-	-
Well 299-W18-7										
Total A	1.1E-2	-	1.5E-2	1.5E-2	1.5E-2	1.5E-2	1.5E-2	1.5E-2	1.5E-2	7.5E-2
Total B	-	-	1.4E-1	1.5E-1	9.7E-2	7.5E-2	7.6E-2	7.7E-2	7.4E-2	7.4E-2

[a]See Reference 4.

[b]Some values are averages computed for the year.

Summary of the 216-Z-1A Crib Soil Study

An in-depth study of the plutonium/americium distribution beneath the 216-Z-1A Tile Field is reported in RHO-ST-17.[15] This report is based on the analysis of soil samples taken from numerous wells in and around the tile field. The conclusions reported in RHO-ST-17 are summarized below.

- Plutonium and americium distribution beneath 216-Z-1A are similar
- The highest plutonium concentrations were immediately beneath the main trunk. This may be due to filtering of PuO_2 particles by the soil
- Contaminant concentrations generally decrease with depth. An increased level of contamination at depth is generally associated with a boundary between sedimentary units or an elevated silt content of the sediments
- The bulk of the contamination is in the first 49 ft of sediments below the site bottom. The maximum depth of contamination (defined by the 10^{-2} nCi/g isopleth) is approximately 98 ft below the site bottom or 98 ft above the water table
- Waste was released near the main trunk of the tile field. Waste spread laterally along sedimentary unit interfaces creating a zone of contamination around the tile field. This zone is within 33 ft of the site perimeter
- The retention of contaminants may be the result of chemical reactions as well as physical mechanisms. The assumed chemical reactions may have raised the pH of the acidic waste.

LOCATION:

Hanford Coordinates: (D,1,5,6,7)*

N-39361
W-76495

N-39411
W-76545

Area Description of Location: (1)

200 West Area

1000 ft west of Camden Avenue and 250 ft south of 241-Z Retention Basin

STATUS: Retired

SITE: 216-Z-3 Crib

REFERENCE DWGS:
H-2-12292
H-2-24923
H-2-32528
M-2600 W #18

OTHER NAMES:
216-Z-3 Culvert
234-5 No. 3 and 4 Cribs
216-Z-8

ELEVATIONS & DEPTHS: (D,1,2,6,7)†

Ground: 676 ft above msl
Site Depth: 25 ft below grade
Water Table: 195 ft below grade

DESCRIPTION OF FACILITY: (D,1,5,6,7,14)†

The site is composed of three 4-ft-dia. by 22-ft-long, perforated, corrugated culverts placed end to end in a 5- by 70- by 25-ft-deep excavation (Figures 6 and 7). There is 17 ft of 2.5- to 3-in. gravel (1500 yd^3) with the culvert placed horizontally 15 ft above crib bottom. Two layers of asphalt roofing paper (5000 ft^2 each) cover the gravel; the excavation is backfilled to grade.

ASSOCIATED STRUCTURES: (D,14)

11 ft of 3-in. vent riser extending from 9 ft below to 2 ft above grade

48 ft of 8-in. Schedule (Sch) 40 test well, extending from 45 ft below grade to 3 ft above grade

A 4- by 6-ft, 4-in.-thick concrete slab to support the vent and test well

Two 16 ft^2 pieces of wire screen; one each welded to the ends of the culvert

30 ft of 8-in. vitrified clay pipe; 15 ft is the inlet line at one end of the culvert, 15 ft is the overflow pipe to 216-Z-1A Tile Field

40 ft of 8-in. Sch 40 pipe running horizontally, 12 ft below grade, from the downstream end of the culvert

Approximately 2000 ft^3 of sand below the crib bottom

150 ft of 0.5-in. purged air lines, tygon tubing

Four steel junction boxes, connecting the 0.5-in. tygon tubing

100 ft of 1.5-in. steel pipe containing the above tubing

Two 16-ft sections of 0.5-in. purged air line running vertically from tygon lines to crib bottom.

SERVICE DATES: (1,5,7,8,9,15)‡

From	To	Function
6/52	3/59	Received process waste, analytical and development laboratory wastes from the 234-5Z Bldg via the 241-Z Settling Tank
3/59	-	Retired

COMMENTS: (1,5)

Deactivation: Valved out the pipeline to the crib in diversion box No. 1. The line to 216-Z-1A Tile Field was plugged

Waste that overflowed 216-Z-3 Crib went to 216-Z-1A Tile Field

Waste description: Neutral/basic

In 1959, groundwater samples indicated alpha contamination in the water

See Table 5 for radionuclide data.

FOOTNOTES:

*This is a best estimate of the crib end points based on available information.

†Reference drawings show a culvert diameter of 3 ft 4 in. A note in Reference 14 says that according to a letter from V. W. Wood the diameter may be 4 ft. References 6 and 7 agree with the 4-ft diameter.

‡Seven documents agree with these service dates; Reference 7 incorrectly states first use in June 1949.

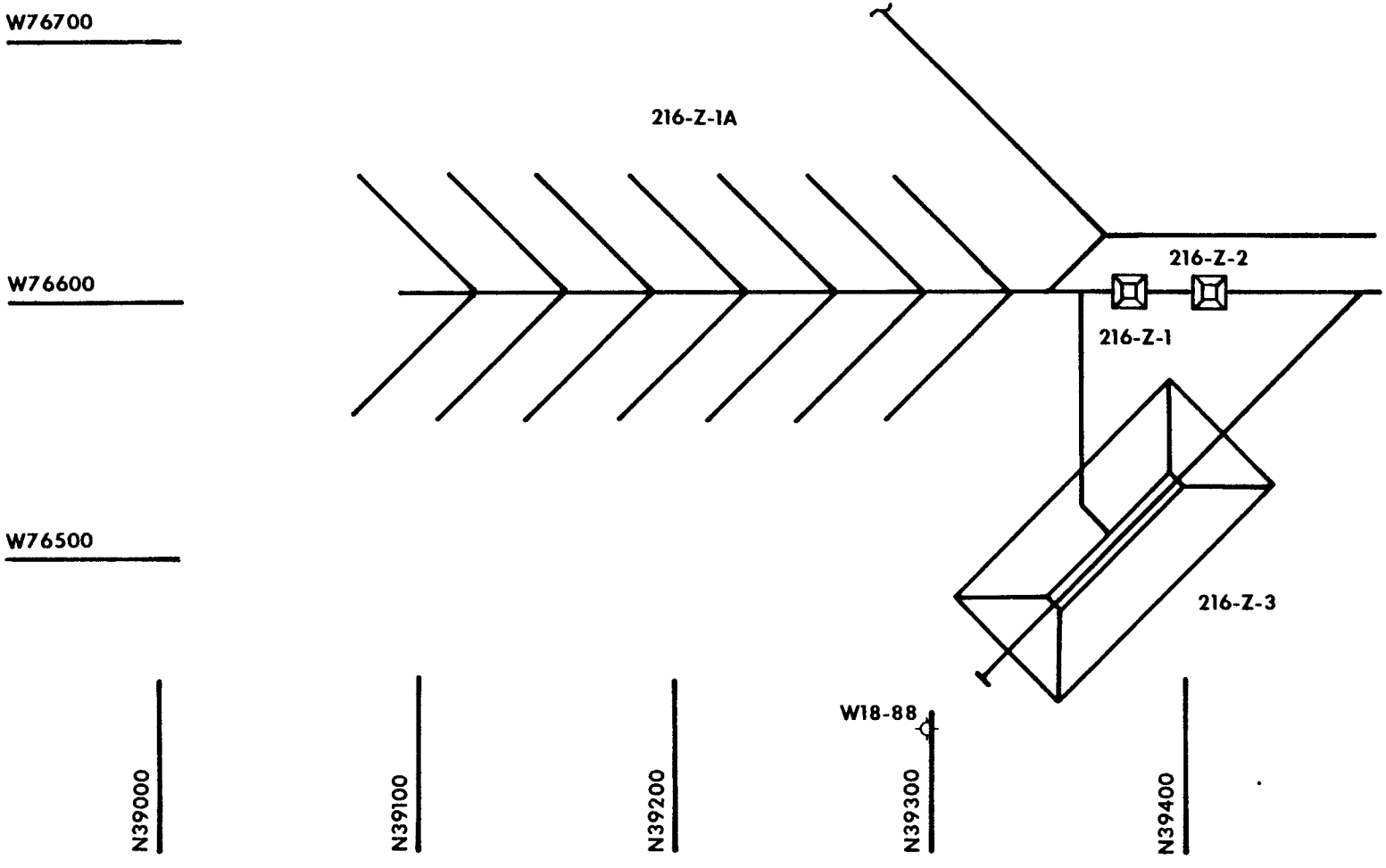


FIGURE 6. 216-Z-3 Crib Location.(3)

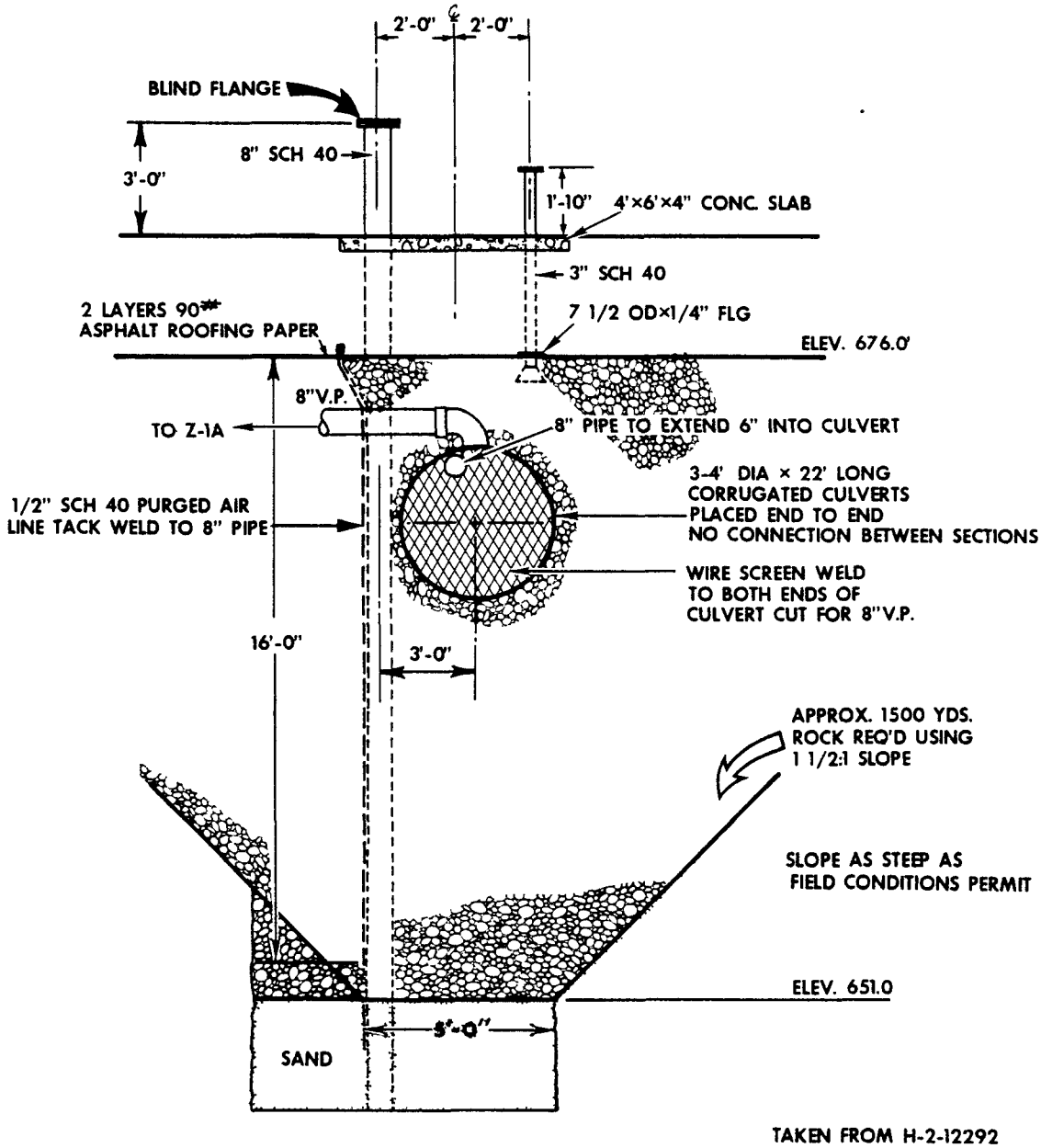


FIGURE 7. 216-Z-3 Crib Cross Section. (14)

TABLE 5. Radionuclide Inventory of 216-Z-3 Crib.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1952	9.90E+06	4.60E+01	-	-	-	-	-	<5.00E-03
1953	1.41E+07	9.80E+01	2.10E+00	-	1.00E+00	-	-	<5.00E-03
1954	1.44E+07	1.00E+02	2.10E+00	-	1.00E+00	-	-	<5.00E-03
1955	3.32E+07	4.40E+02	6.40E+00	-	3.00E+00	-	-	<5.00E-03
1956	2.91E+07	7.40E+02	1.02E+01	-	5.00E+00	-	-	<5.00E-03
1957	3.40E+07	1.77E+03	2.56E+01	-	1.20E+01	-	-	<1.00E-02
1958	3.50E+07	2.27E+03	3.40E+01	<1.00E-01	1.60E+01	<1.00E-01	<1.00E-01	<1.00E-02
1959	8.70E+06	2.39E+02	4.20E+00	-	2.00E+00	-	-	<5.00E-03
Total To 12/31/79	1.78E+08	5.70E+03	8.46E+01	<1.00E-01	4.00E+01	<1.00E-01	<1.00E-01	<5.00E-02
Amount After Decay 12/31/79	1.78E+08	5.70E+03	<2.43E-01	<5.89E-02	1.00E-05	<6.10E-02	<5.87E-03	<5.00E-02

[a]References 9, 12.

WELL DATA: (19)

Location of the well monitoring 216-Z-3 is shown on Figure 6.

Well Number: 299-W18-88

Location: 200 West Area, approximately 124 ft southeast of 216-Z-3; N-39298, W-76432

Description: 6 in. dia., 150 ft deep
Depth to water: not to water
Open interval: none

Evaluation of Scintillation Probe Profiles:

Well W18-88 monitors the 216-Z-3 Crib. The crib received mainly alpha activity and very little total beta. The scintillation probe profiles show background levels of radiation confirming the low total beta activity discharged to the 216-Z-3 Crib. These data indicate breakthrough to the groundwater has not occurred at this site.(3)

LOCATION:

Hanford Coordinates: (1,5,6,7)*

N-40875
W-76475

STATUS: Retired

SITE: 216-Z-4 Trench

REFERENCE DWGS:
H-2-32528
M-2600 W #15

OTHER NAMES:
231-W-3 Pit
231-W-3 Sump
231-W-3 Crib
216-Z-3
216-Z-4 Crib

Area Description of Location: (1)

200 West Area

250 ft east of the 231-Z and 500 ft north of the 2704-Z Office Bldg

ELEVATIONS & DEPTHS: (D,1,2,6)

Ground: 669 ft above msl
Site Depth: 15 ft below grade
Water Table: 192 ft below grade

DESCRIPTION OF FACILITY: (1,14,20)

This site is a trench. The excavation has bottom dimensions of 10 by 10 ft, and is 15 ft deep. This excavation was backfilled after use.†

ASSOCIATED STRUCTURES:

None

SERVICE DATES: (1,5)

From	To	Function
6/45	6/45	Received process and laboratory waste from the 231-Z Bldg‡
6/45	-	Retired

COMMENTS: (1,5)

Waste Description: Neutral/basic

Deactivation: The pipeline from the 231-Z Bldg to the trench was capped when the effluent flow exceeded the infiltration capacity and the excavation was backfilled

Trench was temporary and was used only during construction of 216-Z-5

See Table 6 for radionuclide data.

FOOTNOTES:

*Reference 6 originally gave these coordinates based on the description in Reference 20, "approximately 100 ft northeast of the 231-W dry well" (216-Z-10). This location may not be accurate.

†This information is carried in current documents. Past documents beginning with Reference 20 describe the site as a hole dug to temporarily receive 231-Z waste. These dimensions are probably inaccurate.

‡Reference 20 states that little is known about construction and period of use. Information given here is what past researchers determined to be most accurate.

TABLE 6. Radionuclide Inventory of 216-Z-4 Trench.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1945	<1.10E+04	2.00E+00	2.50E+00	<1.00E-01	1.00E+00	<1.00E-01	<1.00E-01	<5.00E-02
Total To 12/31/79	<1.10E+04	2.00E+00	2.50E-00	<1.00E-01	1.00E+00	<1.00E-01	<1.00E-01	<5.00E-02
Amount After Decay 12/31/79	<1.10E+04	2.00E+00	<1.73E-01	<4.28E-02	4.61E-11	<4.52E-02	<1.06E-03	<5.00E-02

[a]References 9, 12.

LOCATION:

Hanford Coordinates: (1,5,6,7)

N-40912
W-76600

N-40992
W-76600

Area Description of Location: (1)

200 West Area

150 ft east of the 231-Z Bldg, and 600 ft north of the 2704-Z Bldg

STATUS: Retired

SITE: 216-Z-5 Crib

REFERENCE DWGS:
H-2-346
H-2-32528
H-2-32682
M-2600 W #15

OTHER NAMES:
231-W Sumps
231-W-1 & 2 Cribs

ELEVATIONS & DEPTHS: (D,1,2,6,7)*

Ground: 671 ft above msl
Site Depth: 20 ft below grade
Water Table: 194 ft below grade

DESCRIPTION OF FACILITY: (D,1,5,14)†

The site consists of two wooden boxes, 12 ft square, 4 ft high, each in a 14-ft-square excavation (Figures 8 and 9). Excavations are 18 ft deep with 1:1 side slopes. Structures are 65 ft apart on center. Each box is constructed of approximately 800 linear ft of 6- by 6-in. timbers.

ASSOCIATED STRUCTURES: (D)

Two 18-ft lengths of 2-in. vent pipe, one rising from each crib box to 2 ft above grade

90 ft of 3-in. SS effluent pipe, placed horizontally approximately 11 ft below grade, and extending down to each crib

65 ft of 1.5-in. pipe, placed horizontally 13 ft below grade

91 ft of copper tubing inside above pipe

Two 8-ft lengths of 1-in. pipe rising from 1 ft above crib bottom to 12 ft below grade

Two 8-ft lengths of 0.5-in. SS tubing; one each in above pipes.

SERVICE DATES: (1,5,18)

From	To	Function
6/45	2/47	Received process waste from the 231-Z Bldg‡
2/47	-	Retired

COMMENTS: (1,5,20,21,22)

Deactivation: Capped the pipeline to the crib west of 231-W-151 Diversion Box

The sludge in the waste sealed the soil and made the site useless in February 1947

Reference 21 reports 3 kg of plutonium were disposed at this site, but suggests that this level is probably high due to detection levels. Eight wells drilled around the first box accounted for only 0.5 g plutonium; it is believed that most plutonium activity is in or directly below the crib. Reference 22 concurs that the 3 kg of plutonium inventory is high and estimates 340 g, but claims that even this estimate may be low by a factor of 2

See Table 7 for radionuclide data.

FOOTNOTES:

*Elevations vary from 670 to 672 ft above msl. The average, 671 ft, was used here because it is in most documents. References 1 and 7 report the depth as 24 ft; Reference 6 indicates the depth is 17 ft. Drawings indicate the depth reported here of 20 ft

†References 1 and 5 give a bottom dimension of 14 ft by 80 ft. Drawings indicate that two separate 14-ft^2 excavations were made. Excavation for piping between the two did not go the full depth.

‡According to Reference 18, this site received 300 Area laboratory wastes also.

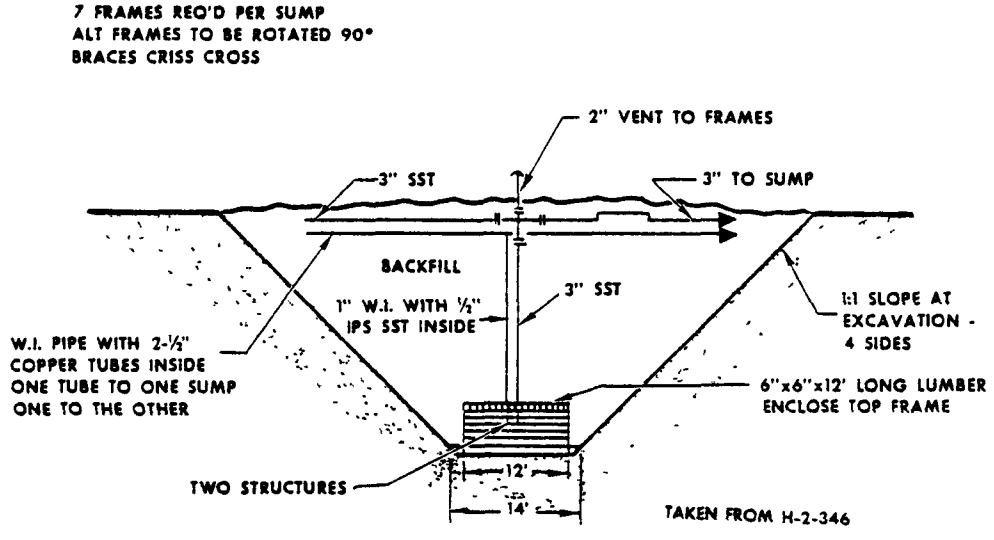


FIGURE 8. 216-Z-5 Crib Cross Section.(14)

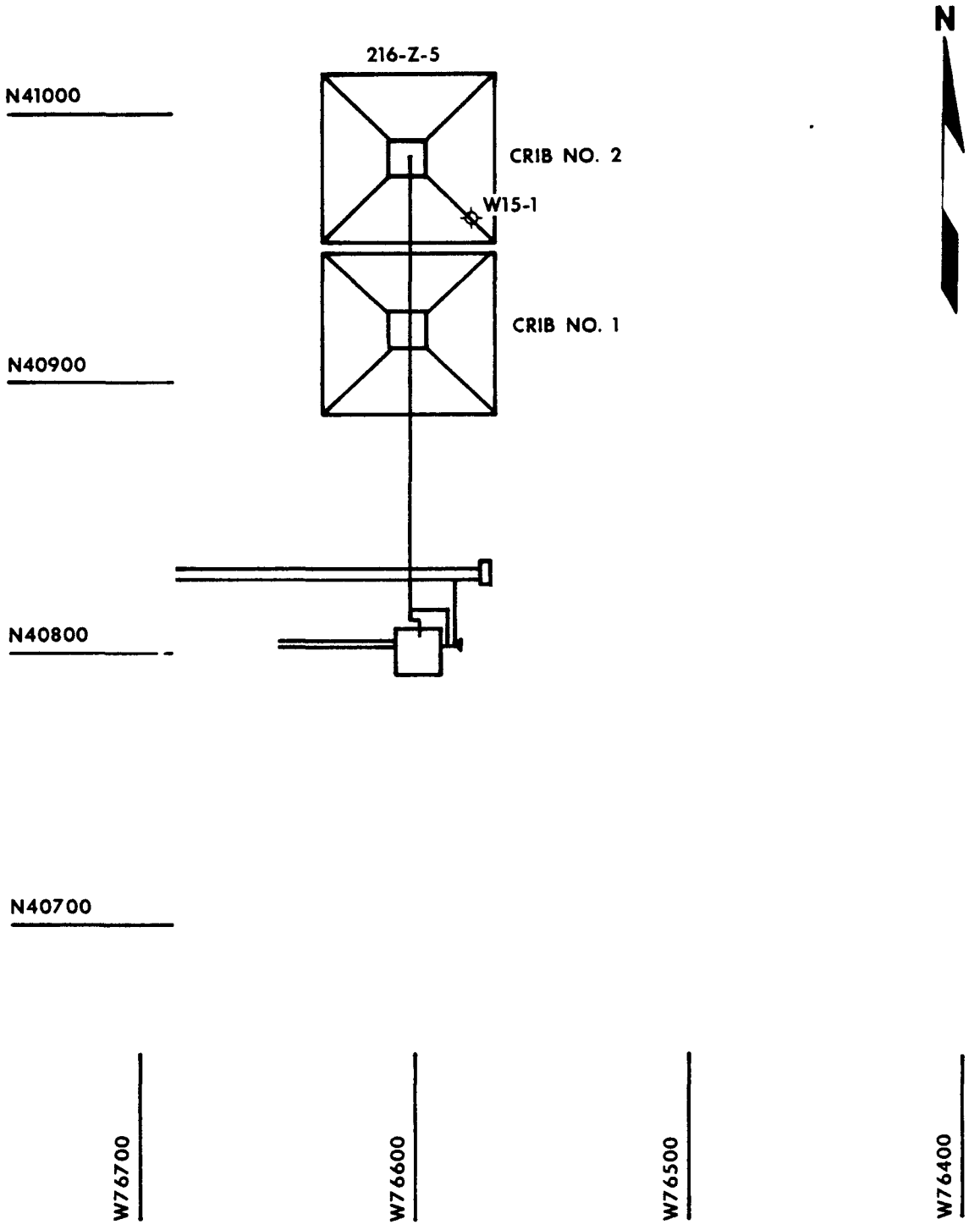


FIGURE 9. 216-Z-5 Crib Location. (3)

TABLE 7. Radionuclide Inventory of 216-Z-5 Crib.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1945	1.03E+07	1.13E+02	8.20E+01	2.00E+00	3.30E+01	3.00E+00	2.00E-01	<2.00E-02
1946	1.17E+07	1.95E+02	1.41E+02	3.00E+00	5.70E+01	6.00E+00	3.00E-01	<2.00E-02
1947	3.00E+06	3.20E+01	2.70E+01	-	1.00E+01	1.00E+00	-	<1.00E-02
Total To 12/31/79	3.10E+07	3.40E+02	2.50E+02	5.00E+00	1.00E+02	1.00E+01	5.00E-01	<5.00E-02
Amount After Decay 12/31/79	3.10E+07	3.40E+02	<1.32E+01	2.17E+00	8.59E-09	4.63E+00	5.73E-03	<5.00E-02

[a]References 9, 12, 22.

WELL DATA: (19)*

Location of the well monitoring 216-Z-5 is shown on Figure 9.

Well Number: 299-W15-1

Location: 200 West Area, approximately 26 ft northeast of 216-Z-5; N-40962, W-76576

Description: 8 in. dia., 295 ft deep
Depth to water: 202 ft
Open interval: 190-270 ft

Evaluation of Scintillation Probe Data:

Well W15-1 monitors the 216-Z-5 crib. Radioactive contaminants were detected in 1959 between [99 and 198 ft] below the ground surface. The well was logged to a depth of [198 ft]. The profile indicates the zone of contamination was not fully penetrated. The 1963 logging fully penetrated the zone of contamination which is between [110 - 202 ft] below the ground surface. The radiation intensity in the zone decreased over the four year period due to radionuclide decay.

On the basis of the scintillation probe profiles the contaminants have migrated downward [110 ft]. These data and waste inventory indicate breakthrough to the groundwater has not occurred at this site.(3)†

TABLE 8. Well 299-W15-1 Groundwater Sample Results.[a]

Radionuclide[b] (pCi/ml)	Years Sampled							
	1960	1971	1972	1973	1974	1975	1976	1977
Total A	-	1.5E-2	-	-	-	-	-	-
Total B	-	1.5E-1	1.6E-1	9.0E-2	7.4E-2	7.6E-2	7.5E-2	7.4E-2
^{90}Sr	8.2E-3	-	-	-	-	-	-	-

[a]See Reference 4.

[b]Some values are averages computed for the year.

*See Table 8 for groundwater sample results.

†This writeup does not make it clear that breakthrough has not occurred at this site. Reference 3 defines breakthrough as radionuclide concentrations in the groundwater exceeding 10% of the values established in ERDA MC-0524, Table II, Column 2. The claim of no breakthrough is based on this definition and the radionuclide inventory.

LOCATION:

Hanford Coordinates: (D,1,5)

N-40712
W-76480
N-40753
W-76508

STATUS: Retired

SITE: 216-Z-6 Crib

REFERENCE DWGS:
H-2-508
H-2-32528
H-2-32682
H-2-34762
M-2600W #15

OTHER NAMES:*
231-W-4 Crib
231-Z-6
216-Z-4
216-Z-6 & 6A Crib

Area Description of Location: (1)

200 West Area

300 ft east of the 231-Z Bldg and 200 ft north of 19th Street

ELEVATIONS & DEPTHS: (D,1,2,6,7)†

Ground: 670 ft above msl
Site Depth: 8 ft below grade
Water Table: 193 ft below grade

DESCRIPTION OF FACILITY: (D,1,5)‡

The site is a 50- by 6.5- by 2-ft high wooden box in an excavation approximately 52- by 8.5- by 8-ft deep (Figure 10). The box is constructed of timbers of the following dimensions: 500 linear ft of 2- by 12-in., 300 linear ft of 2- by 10-in., 325 linear ft of 2- by 8-in. and 35 linear ft of 4- by 4-in.

ASSOCIATED STRUCTURES: (D,14)

A 2-ft-square by 1-ft-high wooden vent box on the crib top, with 8.75 ft of 3-in. iron pipe size vent pipe rising to grade

8 ft of 3-in. iron pipe size effluent inlet pipe, angling from the northern end of the crib to grade

3 ft of 2- by 2-in. angle iron connecting the vent and inlet pipes

Two 0.25-in., 1-ft-square plates, supporting vent and inlet pipe at the crib

Approximately 425 ft^2 of tar paper used to cover the wood.

SERVICE DATES: (D,1,5,8)‖

From	To	Function
6/45	6/45	Received process waste from the 231-Z Bldg, via the 231-W-151 Sump Tank
6/45	-	Retired

COMMENTS: (1,5,20)

Deactivation: Capped the pipeline to the crib west of the 231-W-151 Diversion Box. Above-ground piping has been removed

Waste Description: Neutral/basic

Reference 20, written in 1953, is the first of a number of documents that report that the ground caved in over the crib

The trench was temporary and was used only during construction of 216-Z-5 Crib.

See Table 9 for radionuclide data.

FOOTNOTES:

*Reference 14 is the earliest document that reports a 6A disposal site as well as a 6. This refers to the 231-W-151 Diversion Box which is not a disposal site and not in the scope of this report.

†Crib dimensions are reported as 6 or 7 ft wide. These dimensions result from rounding the 6.5 ft given on drawings. Excavation dimensions are estimates based on crib size.

‡References 1, 6 and 7 give the site depth as 2 ft. They also list ground elevation as 664 ft. According to drawings and field inspection, this is a below-ground crib with the crib bottom at 662 ft, (References D, 6, 7). The estimated site depth is 8 ft.

‖Reference 8 states that the above-mentioned waste stream is "believed" to have been disposed at this site.

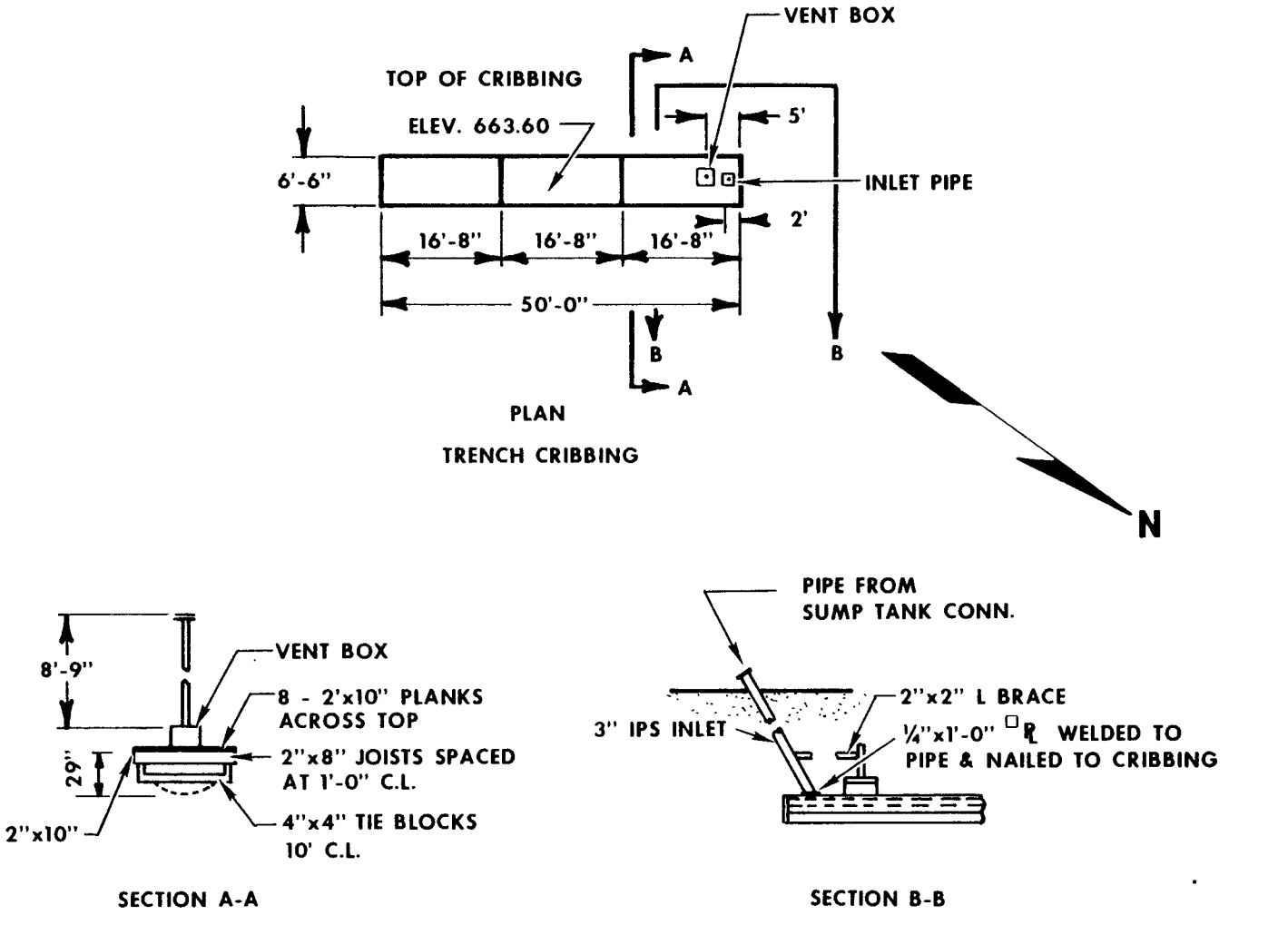


FIGURE 10. 216-Z-6 Crib Plan and Sections. (14)

TABLE 9. Radionuclide Inventory of 216-Z-6 Crib.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1945	<9.80E+04	5.00E+00	2.50E+00	<1.00E-01	1.00E+00	<1.00E-01	<1.00E-01	<5.00E-02
Total To 12/31/79	<9.80E+04	5.00E+00	2.50E+00	<1.00E-01	1.00E+00	<1.00E-01	<1.00E-01	<5.00E-02
Amount After Decay 12/31/79	<9.80E+04	5.00E+00	<1.73E-01	<4.28E-02	4.61E-11	4.52E+00	<1.06E-03	<5.00E-02

[a]References 9, 12.

LOCATION:

Hanford Coordinates: (D,1,5,6,7)*

N-40900
W-76000

N-40900
W-76210

Area Description of Location: (1)

200 West Area

500 ft east of 231-Z Bldg and
500 ft north of 19th Street

STATUS: Retired

SITE: 216-Z-7 Crib

REFERENCE DWGS:
H-2-511
H-2-32528
H-2-32682
M-2600 W #15

OTHER NAMES:
231-W Trench
231-W Crib
231-Z-6

ELEVATIONS & DEPTHS: (D,1,2,6,7,21)†

Ground: 664 ft above msl
Site Depth: 8 ft below grade
Water Table: 187 ft below grade

DESCRIPTION OF FACILITY: (D,1,5,6,7,8,21,23)†

This site consists of two wooden structures in parallel 150- by 5- by 2-ft-deep trenches within a 210- by 44- by 5-ft-deep excavation (Figures 11 and 12). Each wooden structure is 3-tiered and constructed of the following: 900 linear ft of 2- by 6-in. planking, 700 linear ft of 4-in. planking, 300 linear ft of 2-in. planking and 1800 linear ft of 3- by 6-in. assemblies (material unknown). A 150-ft-long, 3- or 4-in. perforated distribution pipe runs above the second tier. Each of the two trenches is covered by 1650 ft^2 of 2-in. planking, then tar paper. The large excavation is backfilled.±

ASSOCIATED STRUCTURES: (D)

Four 2-ft square wooden vent boxes, constructed of 2- by 10-in. lumber, one on each end of the cribs

40 ft of 3-in. iron pipe size vent pipe, rising 10 ft from each vent box to a flange above grade

500 ft of 3-in. iron pipe size effluent piping; 200 ft runs between the two trenches and ends in a flange (spare); the remainder feeds the disposal units

2100 ft^3 of gravel under edge of planking (see Figure 12)

A 3-in. gate valve controlling the flow to the spare pipe.

SERVICE DATES: (1,5,6)

From	To	Function
2/47	5/53	Received process waste from the 231-Z Bldg via the 231-W-151 Sump Tank
5/53	11/65	Received Hanford Laboratory waste from the 231-Z Bldg via the 231-W-151 Sump Tank
11/65	2/67	Received waste from Pacific Northwest Laboratory (PNL) operations in 231-Z Bldg and 300 Area laboratory waste from the 340 Retention and Neutralization Bldg
2/67	-	Retired

COMMENTS: (1,5,21,22,24)

Deactivation: Capped the pipeline west of the 231-W-151 Diversion Box

In 1948, after 10 months use and discharge of an estimated 10 g of plutonium in 1.2 x 10^6 gallons of waste, no plutonium was found in soil samples taken from wells 60 ft away. Reference 22 states that the 10 g of plutonium reported in Reference 21 should be 42 g

Reference 24 (1966) states that a groundwater sample from around 216-Z-7 showed beta activity of 1336 pCi/cc and alpha activity of 2.0 pCi/cc

See Table 10 for radionuclide data.

FOOTNOTES:

*These western coordinates given here differ from References 1 and 5. Drawings indicate that to include the whole excavation, the reported coordinates are more accurate.

†References 1, 5, 6, 7, and 21 report various dimensions which disagree with those reported here and in some cases, each other. The length is sometimes reported as 140 ft, and the width as 8 or 36 ft. The length reported here was taken from the drawings and references 6, 7, and 21. The 8-ft length could have been a top dimension of the trenches; the 36-ft measurement agrees with a width which includes both of the trenches. The width of 44 ft was taken from the drawing. The depth is reported as 2 ft and 36 ft. Based on drawings and Reference 6, this report carries the depth as 7 ft. It is unknown where the 36-ft depth originated, but this could significantly affect site management.

‡Reference 5 states that the site was backfilled in 1967 when it was retired. The drawings and Reference 8 state that the site was backfilled during use.

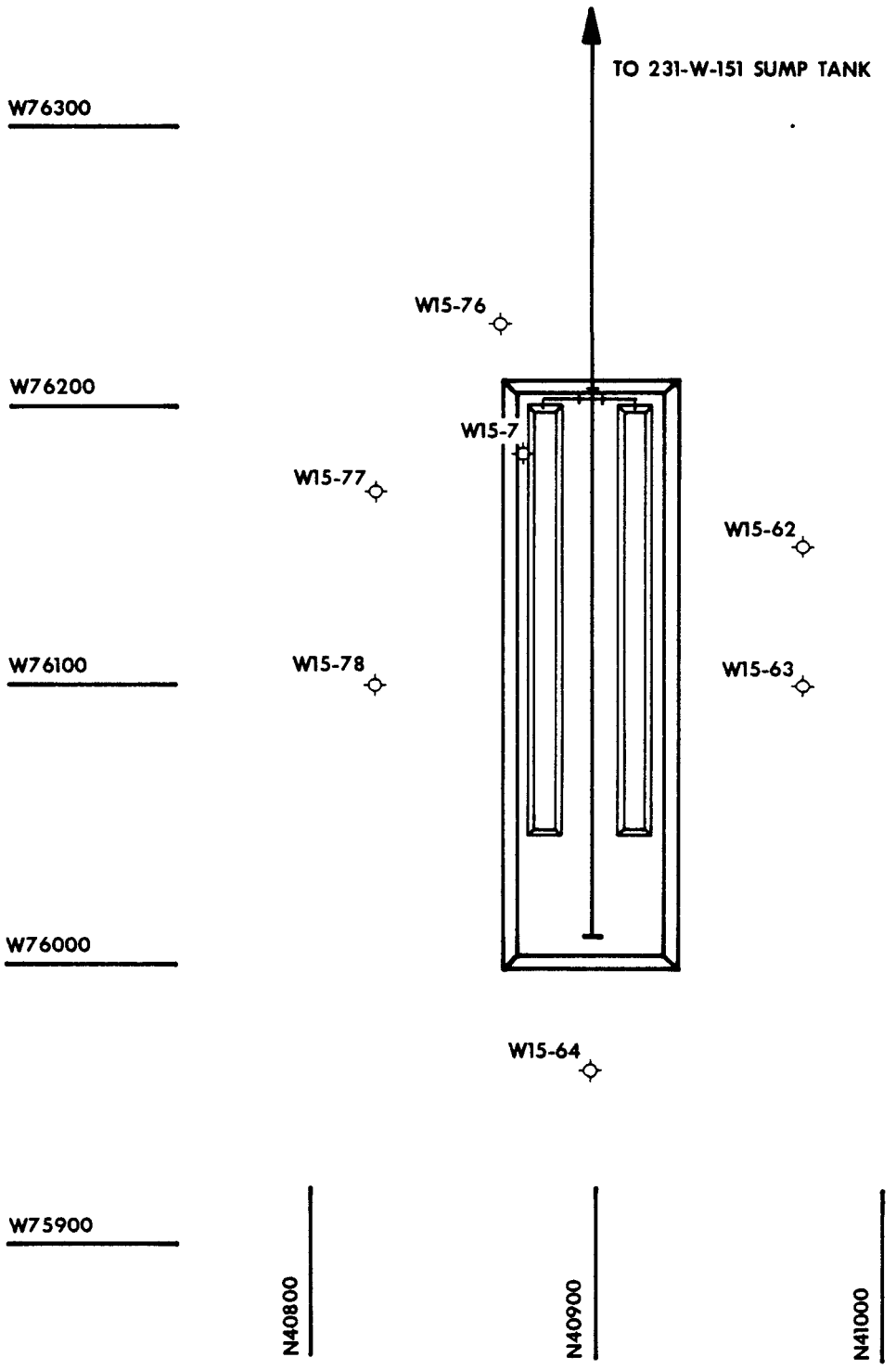
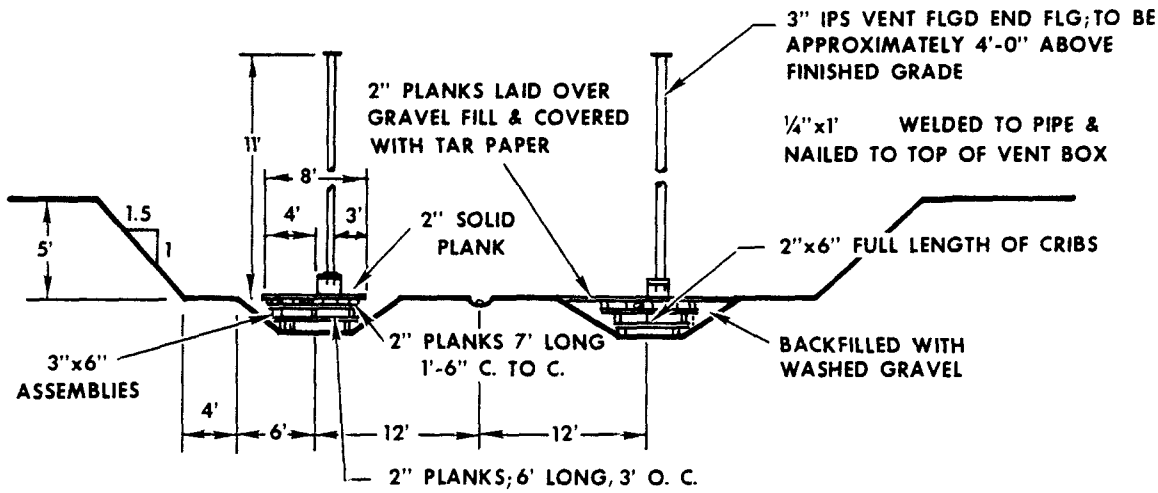
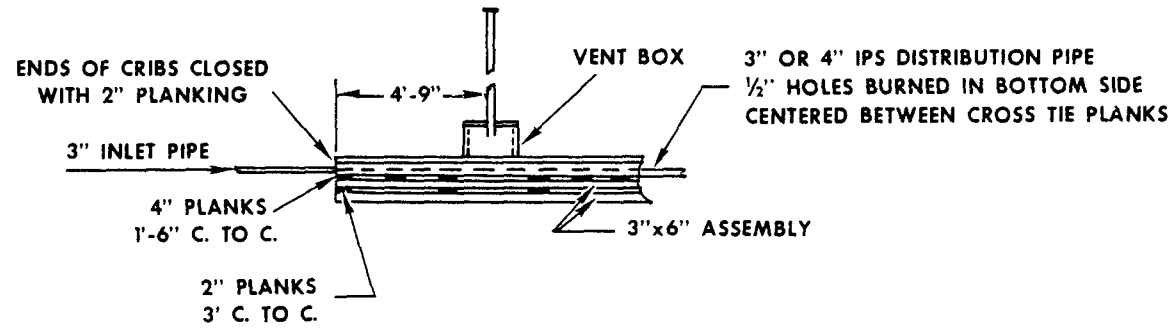


FIGURE 11. 216-Z-7 Crib Plan.(3)



CROSS SECTION



LONGITUDINAL SECTION

TAKEN FROM H-2-511

FIGURE 12. 216-Z-7 Cross and Longitudinal Section.(14)

TABLE 10. Radionuclide Inventory of 216-Z-7 Crib.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1947	1.20E+07	2.13E+02	-	-	-	-	-	2.00E-01
1948	1.30E+07	2.29E+02	-	-	-	-	-	2.00E-01
1949	1.30E+07	2.29E+02	-	-	-	-	-	2.00E-01
1950	1.30E+07	2.29E+02	-	-	-	-	-	2.00E-01
1951	1.30E+07	2.30E+02	-	-	-	-	-	2.00E-01
1952	7.20E+06	1.67E+02	-	-	-	-	-	2.00E-01
1953	9.00E+05	2.94E+02	-	-	-	-	-	2.00E-01
1954	3.00E+05	1.50E+01	-	-	-	-	-	2.00E-01
1955	5.30E+05	3.73E+02	-	-	-	-	-	2.00E-01
1956	6.30E+05	1.56E+01	-	-	-	-	-	2.00E-01
1957	4.00E+04	1.80E+00	-	-	-	-	-	2.00E-01
1965[b]	1.90E+06	2.00E-01	2.78E+02	4.10E+01	1.10E+01	4.00E+01	-	2.00E-01
1966	4.40E+06	3.40E+00	2.22E+03	3.29E+02	8.90E+01	3.20E+02	1.00E+00	2.10E+00
Total To 12/31/79	7.99E+07	2.00E+03	2.50E+03	3.70E+02	1.00E+02	3.60E+02	1.00E+00	4.50E+00
Amount After Decay 12/31/79	7.99E+07	2.00E+03	1.04E+03	2.65E+02	8.53E-03	2.63E+02	1.69E-01	4.50E+00

[a]References 5, 9, 12.
[b]Reference 5 does not mention any break in the service of this site.
If the site was used between 1957 and 1965, no record was found of the disposal inventory.

WELL DATA: (19)*

Locations of wells monitoring 216-Z-7 are shown in Figure 11.

Well Number: 299-W15-7

Location: 200 West Area, approximately 54 ft southwest of 216-Z-7; N-40880, W-76180

Description: 8 in. dia., 325 ft deep
Depth to water: 195 ft
Open interval: 182-350 ft

Well Number: 299-W15-62

Location: 200 West Area, approximately 78 ft northwest of 216-Z-7; N-40975, W-76150

Description: 8 in. dia., 150 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W15-63

Location: 200 West Area, approximately 81 ft northeast of 216-Z-7; N-40975, W-76100

Description: 8 in. dia., 150 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W15-64

Location: 200 West Area, approximately 165 ft east of 216-Z-7; N-40900, W-75965

Description: 8 in. dia., 150 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W15-76

Location: 200 West Area, approximately 101 ft southwest of 216-Z-7; N-40878, W-76229

Description: 8 in. dia., 103 ft deep
Depth to water: not to water
Open interval: none

*See Table 11 for groundwater sample results.

Well Number: 299-W15-77

Location: 200 West Area, approximately 89 ft southwest of 216-Z-7; N-40824, W-76170

Description: 8 in. dia., 72 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W15-78

Location: 200 West Area, approximately 82 ft southeast of 216-Z-7; N-40824, W-76100

Description: 8 in. dia., 74 ft deep
Depth to water: not to water
Open interval: none

Evaluation of Scintillation Probe Profiles:

> Wells W15-7, W15-62, W15-63, W15-64, W15-76, W15-77, and W15-78 monitor the 216-Z-7 Crib. Radioactive contaminants are detected in all profiles from these seven monitoring wells. Well W15-7, located immediately adjacent to the crib, shows contamination detected from [24 ft] to the water table, [195 ft] below ground surface. The contaminants spread laterally to the fringe wells which show zones of contamination between the [42 and 143- ft]depths.
>
> On the basis of the scintillation probe profiles from Well W15-7 the increase in groundwater contamination may be the result of soil drainage from the 216-Z-7 Crib. These data indicate breakthrough to the groundwater could have occurred at this site.(3)*

*Gross beta (as ^{106}Ru) concentration plumes shown in ERDA-1538 (Reference 18) show that the 0.1 pCi/ml isopleth from Z Plant is directly below 200 West Area. This 0.1 pCi/ml concentration is less than the concentration guide for uncontrolled release for both ^{90}Sr, the most restrictive fission product and, ^{106}Ru, the most mobile (excluding tritium) fission product.

TABLE 11. Well 299-W15-7 Groundwater Sample Results.[a]

Radionulcide[b] (pCi/ml)	Years Sampled											
	1966	1967	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Total A	-	-	1.1E-1	1.6E-1	1.6E-1	1.6E-1	1.6E-1	1.6E-1	1.6E-1	1.6E-1	1.6E-1	-
Total B	3.1E+3	2.6E+3	3.3E+1	-	3.8E+0	1.9E+0	8.0E-1	3.6E-1	5.7E-1	2.0E-1	1.8E-1	2.0E-1
^{90}Sr	-	1.2E-2	2.5E-2	-	2.5E-2	2.5E-2	2.5E-2	1.2E-2	3.6E-3	8.9E-3	2.7E-3	-
^{137}Cs	-	-	3.5E-1	-	1.8E-2	1.8E-2	2.3E-2	2.2E-2	2.9E-2	1.5E-1	1.4E-1	2.0E-1
^{60}Co	-	-	1.1E+1	-	3.1E+0	2.0E+0	1.7E+0	8.7E-1	2.0E+0	5.3E-1	3.5E-1	3.0E+0
^{106}Ru	-	-	-	-	7.8E-2	-	1.7E-1	2.0E-1	2.3E-1	-	1.5E-1	1.0E-1

[a]Reference 4.

[b]Some values are averages computed for the year.

LOCATION:

Hanford Coordinates: (1,5,7)

N-40000
W-76250

STATUS: Retired

SITE: 216-Z-8 French Drain

REFERENCE DWGS:
H-2-16653
H-2-32528
M-2600 W #15

OTHER NAMES:
216-Z-8 Crib
234-5 Recuplex French Drain
216-Z-9

Area Description of Location:(1)

200 West Area

300 ft east of the 234-5Z Bldg and 350 ft south of 19th Street

ELEVATIONS & DEPTHS: (D,1,2,7)

Ground: 667 ft above msl
Site Depth: 17 ft below grade
Water Table: 188 ft below grade

DESCRIPTION OF FACILITY: (D,1,7)

The site consists of two sections of 3-ft-dia. by 3-ft-high standard clay tile culverts stacked vertically underground (Figure 13). The culverts are filled with and sit on a 5-ft-square, 3-ft-deep bed of gravel. The culverts have a 4-in.-thick concrete top 8 ft below grade.

ASSOCIATED STRUCTURES: (D)

A 5-ft-square, 4-in.-thick concrete collar around the base of the French drain

A 4-in. steel effluent pipe leading from the storage tank to the top of the French drain

100 ft^3 of 1- to 3-in. gravel

25 ft^2 of 15-lb building paper over gravel bed and beneath top.

SERVICE DATES: (1,5,7,9)*

From	To	Function
7/55	4/62	Received filter backflush from the recuplex facility in 234-5Z Bldg via the overflow from the storage tank
4/62	-	Retired

COMMENTS: (1,5)

Waste Description: Neutral/basic

Deactivation: Disconnected the effluent piping in the 234-5Z Bldg

See Table 12 for radionuclide data.

The 216-Z-8 French drain was the subject of a recent study. A report, currently in preparation, will be issued as RHO-ST-41.

FOOTNOTES:

*Reference 9 reports disposal information for 1957 to 1961. Reference 7, written in 1956, states that the site was used since 1955. Though no data were found for this period, the documents current with this use are believed to be correct. It is believed that the effluent overflowed the storage tank in 1957, thus the French drain first received effluent. Reference 9 reports the last disposal in 1961. This suggests that the site was not used after 1961 and was officially retired in 1962.

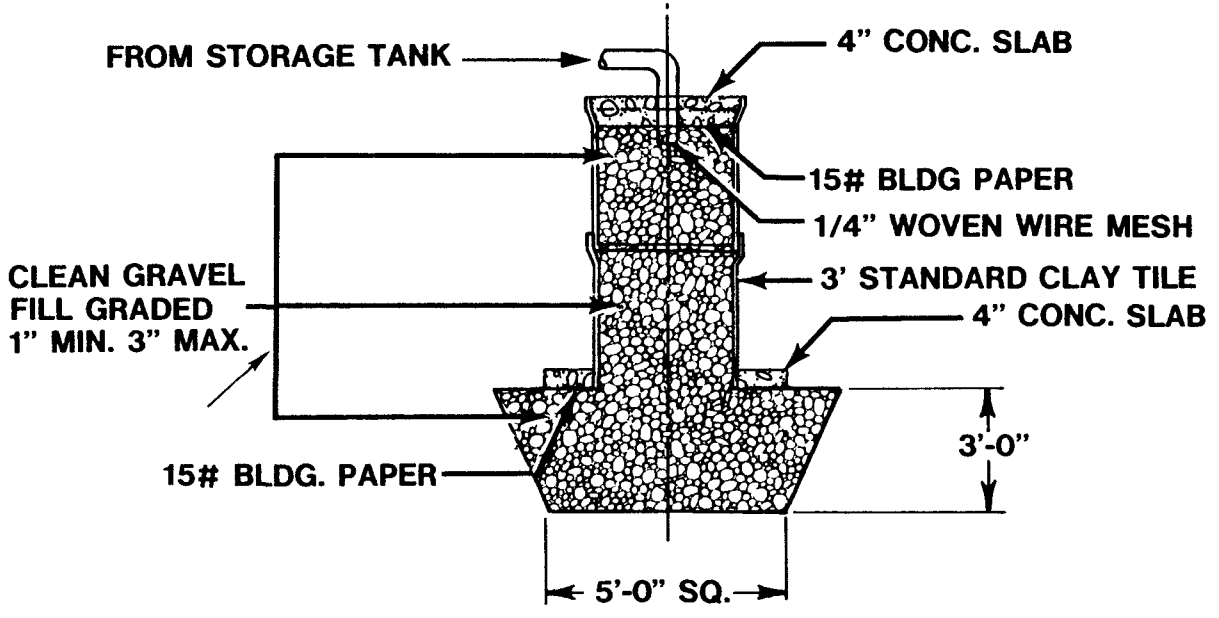


FIGURE 13. 216-Z-8 French Drain Cross Section. (14)

TABLE 12. Radionuclide Inventory of 216-Z-8 French Drain.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1957	9.60E+02	4.10E+00	-	-	-	-	-	-
1958	3.83E+03	2.05E+01	-	-	-	-	-	-
1959	1.80E+03	8.10E+00	-	-	-	-	-	-
1960	2.20E+03	1.22E+01	-	-	-	-	-	-
1961	8.00E+02	3.50E+00	-	-	-	-	-	-
Total To 12/31/79	9.59E+03	4.84E+01	-	-	-	-	-	-
Amount After Decay 12/31/79	9.59E+03	4.84+01	-	-	-	-	-	-

[a]References 9, 12.

LOCATION:

Hanford Coordinates: (D,1,5,6,7)*

N-39860
W-75910

STATUS: Retired

SITE: 216-Z-9 Trench

REFERENCE DWGS:
H-2-15491
H-2-15492
H-2-20986
H-2-26872
H-2-26873
H-2-27125
H-2-28588
H-2-32528
H-2-37953
H-2-38651
SK-2-22319

OTHER NAMES:
216-Z-9 Cavern
234-5 Recuplex Cavern
216-Z-10
216-Z-9 Crib

Area Description of Location: (1)

200 West Area

750 ft east of the 234-5Z Bldg and 500 ft south of 19th Street

ELEVATIONS & DEPTHS: (D,1,2,6,7)†

Ground: 660 ft above msl
Site Depth: 21 ft below grade
Water Table: 181 ft below grade

DESCRIPTION OF FACILITY: (D,1,14)†

The trench is a 60- by 30- by 21-ft-deep excavation (Figures 14 and 15). Two 1.5-in. SS pipes discharged liquid 17 ft above crib bottom.

ASSOCIATED STRUCTURES: (D,14)

A 120- by 90- by 0.75-ft-thick concrete trench cover at ground level

Six 23-ft-tall concrete columns supporting the cover

Six 9- by 9- by 1.75-ft concrete footings, 5 ft below crib bottom, one supporting each column

Six 6.5- by 6.5- by 2.25-ft-thick concrete headers, one at the top of each column.

Six 23-ft lengths of vitrified clay pipe (21 in. dia.) surrounding the columns

Approximately 11,000 ft^2 of acid-split brick covering all interior concrete surfaces except columns

Four 2.5- by 0.5- by 52-in.-long SS pipe hangers suspended from ceiling

Operating gallery, contaminated soil loadout facility and clam shell apparatus from 1976 to 1978 mining operations.

SERVICE DATES: (1,5,7,8,18,25)

From	To	Function
7/55	6/62	Received Recuplex high salt aqueous waste and organic waste from the 234-5Z Bldg
6/62	-	Retired (mining operation, 1976-78)

COMMENTS: (1,5,18,26,27,28)[‡]

Waste Description: Aqueous and organic waste, high salt, acidic

Deactivation: Effluent piping was disconnected in 234-5Z Bldg in 1962 when an established plutonium limit was reached.

In 1959, four samples of soil were taken from the trench bottom. The samples were extracted with nitric acid and the extractant analyzed for plutonium. The highest concentration was 1.5 mg Pu/cc. All samples had organic; one yielded an organic layer in the extractant which contained most of the plutonium for that sample. The plutonium content in the trench was estimated by integrating over the length of each soil sample and letting each sample represent one quarter of the crib. This method calculated 8 kg of plutonium compared to 13 kg according to disposal records. The disposal records were upgraded later based on better information.

Sampling in 1973 revealed that most of the plutonium was in the southern half of the crib. It is believed, contrary to design criteria, that the northern end is higher than the southern. Surface samples revealed 15-25 g Pu/L of soil in the southern half and 1-5 g Pu/L of soil in the northern half. A core sample in the area of highest concentration provided the following information:

Depth	g ^{239}Pu/L of soil
0-1 in.	13-20
1-3 in.	1-9
3-6 in.	0.1-3
6-9 in.	0.1-0.8
9-12 in.	0.1-0.3

Core samples from 1 to 8 ft below crib bottom had a concentration of about 0.1 g ^{239}Pu/L of soil.

Reference 1 reports that sediments a short distance beyond the crib are only slightly alpha-contaminated by lateral migration of waste

See Table 13 for radionuclide data.

FOOTNOTES:

*References 1 and 5 report the northern coordinate as 39830; earlier References, 6 and 7, and reference drawings report the coordinates provided here.

†References 6 and 7 report the original depth as 21 ft. It is believed that reference drawings and References 1 and 14 report the original depth correctly at 20 ft. Due to mining operations, the depth is now 21 ft.

‡Reference 1 reports that the organic phase did not contain DBBP. Reference 26 reports that there is DBBP in the organic phase. It is more likely that DBBP is present.

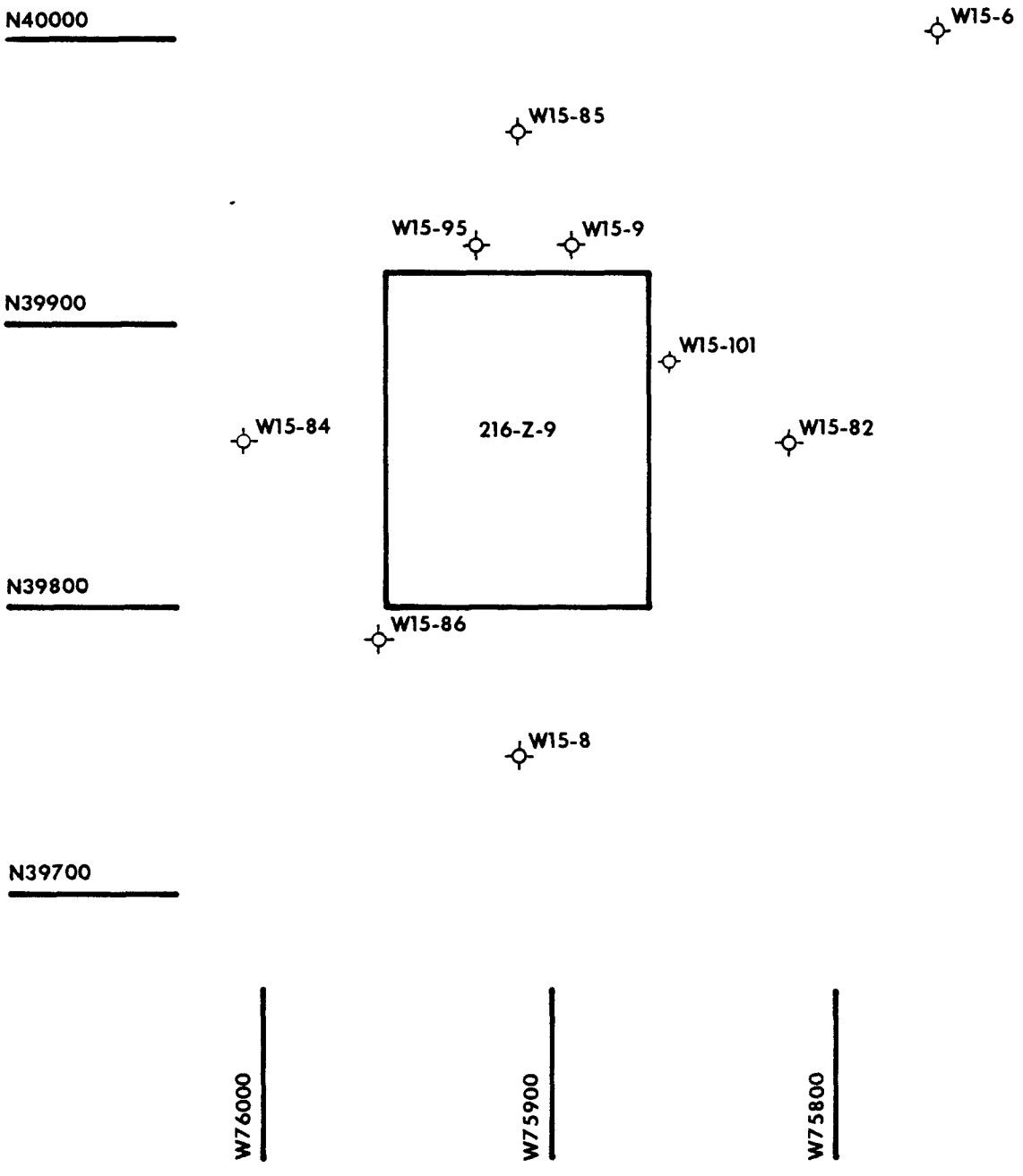
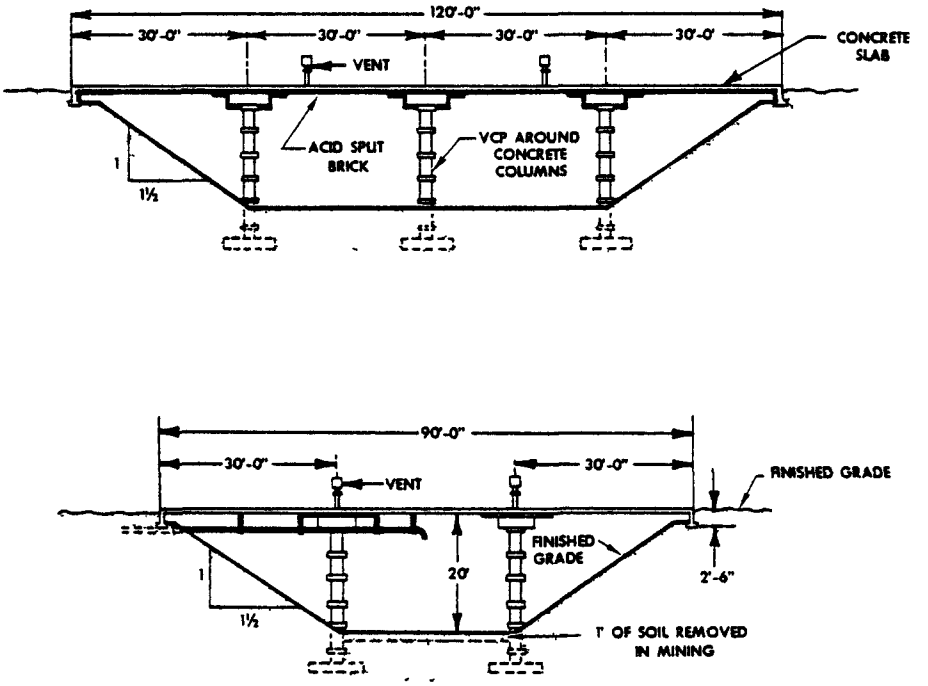


FIGURE 14. Location of Groundwater Wells Monitoring 216-Z-9 Trench.(14)



SITE CONTAINS ADDITIONAL EQUIPMENT FROM MINING OPERATIONS

TAKEN FROM H-2-15491
H-2-15492

FIGURE 15. 216-Z-9 Trench Cross Section.(D,14)

TABLE 13. Radionuclide Inventory of 216-Z-9 Trench.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1955	2.60E+05	6.45E+02	-	-	-	-	-	-
1956	4.60E+05	2.25E+03	2.20E+00		1.00E+00	-	-	-
1957	5.40E+05	5.19E+03	6.40E+00	-	3.00E+00	-	-	<1.00E-02
1958	7.00E+05	7.04E+03	8.40E+00	-	4.00E+00	-	-	<1.00E-02
1959	5.60E+05	5.34E+03	6.40E+00	-	3.00E+00	-	-	<1.00E-02
1960	6.20E+05	5.68E+03	6.40E+00	-	3.00E+00	-	-	<1.00E-02
1961	7.70E+05	8.79E+03	9.10E+00	<1.00E-01	4.00E+00	<1.00E-01	<1.00E-01	<1.00E-02
1962	1.80E+05	3.42E+03	4.20E+00	-	2.00E+00	-	-	-
Total To 12/31/79	4.09E+06	3.83E+04	4.31E+01	<1.00E-01	2.00E+01	<1.00E-01	<1.00E-01	<5.00E-00
Amount After Decay 12/31/79	4.09E+06	4.80E+04[b]	<2.65E-01	<6.39E-00	3.74E-05	<6.57E-02	<9.02E-01	<5.100E-00

[a]References 9, 12, 25, 29.

[b]The value presented here is based on data from the Z-9 mining operation as described in Reference 25. Reference 29 carries a conservatively high estimate of 150 kg of plutonium in 216-Z-9 before removal of 58 kg during Z-9 mining. Reference 12 estimates a total inventory of 38.3 kg of plutonium prior to removal of the 58 kg, so is obviously incorrect.

WELL DATA: (19)*

Location of wells monitoring 216-Z-9 Trench are shown on Figure 14.

Well Number: 299-W15-6

Location: 200 West Area, approximately 205 ft northeast of 216-Z-9; N-40005, W-75765

Description: 6 in. dia., 370 ft deep
Depth to water: 190 ft
Open interval: 175-370 ft

Well Number: 299-W15-8

Location: 200 West Area, approximately 110 ft south of 216-Z-9; N-39750, W-75910 (approximate)

Description: 8 in. dia., 203 ft deep
Depth to water: 196 ft
Open interval: none

Well Number: 299-W15-9

Location: 200 West Area, approximately 73 ft northeast of 216-Z-9; N-39930, W-75890

Description: 8 in. dia., 191 ft deep
Depth to water: 190 ft
Open interval: none

Well Number: 299-W15-82

Location: 200 West Area, approximately 95 ft east of 216-Z-9; N-39860, W-75815

Description: 8 in. dia., 101 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W15-84

Location: 200 West Area, approximately 95 ft west of 216-Z-9; N-39860, W-76005 (estimated coordinates)

Description: 8 in. diameter, 100 ft deep
Depth to water: not to water
Open interval: none

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*See Table 14 for groundwater sample results.

WELL DATA: (19) (Continued)

Well Number: 299-W15-85

Location: 200 West Area, approximately 120 ft north of 216-Z-9; N-39980, W-75910 (estimated coordinates)

Description: 8 in. dia., 106 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W15-86

Location: 200 West Area, approximately 85 ft southwest of 216-Z-9; N-39790, W-75958

Description: 8 in. dia., 144 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W15-95

Location: 200 West Area, approximately 72 ft northwest of 216-Z-9; N-39930, W-75925

Description: 8 in. dia., 110 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W15-101

Location: 200 West Area, approximately 58 ft east of 216-Z-9; N-39890, W-75860

Description: 6 in. dia., 46 ft deep
Depth to water: not to water
Open interval: none

Evaluation of Scintillation Probe Profiles:

Wells W15-6, W15-8, W15-9, W15-82, W15-84, W15-85, W15-86 and W15-95 monitor the 216-Z-9 Crib. Radioactive contaminants were detected in the two wells south of the 216-Z-9 Crib, W15-8, and W15-86, [50-125 ft] below ground surface. The remaining profiles show near background levels of radiation.

On the basis of the scintillation probe profiles no detectable movement of radionuclides beneath the 216-Z-9 Crib is detected. Radiation intensity has decreased due to radionuclide decay. These data indicate breakthrough to the groundwater has not occurred at this site.(3)

TABLE 14. Groundwater Sample Results from Wells Monitoring 216-Z-9 Crib.[a]

Radionuclide[b] (pCi/ml)	Years Sampled								
	1966	1971	1972	1973	1974	1975	1976	1977	1978
Well 299-W15-6									
Total A	-	1.6E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2
Total B	5.7E+0	1.3E-1	1.3E-1	9.5E-2	7.5E-2	7.5E-2	7.5E-2	7.3E-2	1.5E-1
^{3}H	-	-	-	-	8.0E+0	5.5E-0	2.5E+0	4.9E+0	-
Well 299-W15-8									
Total A	-	1.7E-2	1.7E-2	1.7E-2	1.7E-2	-	-	-	-
Total B	-	1.7E-1	1.4E-1	8.4E-2	7.7E-2	-	-	-	-
Well 299-W15-9									
Total A	-	1.4E-2	1.4E-2	1.4E-2	1.4E-2	-	-	-	-
Total B	-	1.3E-1	1.6E-2	9.5E-2	8.6E-2	-	-	-	-

[a]See Reference 4.

[b]Some values are averages computed for the year.

RECUPLEX INPUTS TO THE 216-Z-9 TRENCH(26)

Listed below are quantity estimates of substances in the Z-9 covered trench during recuplex processing:

- Aluminum as $Al(NO_3)_3$, $Al(OH)_3$, $AlF(OH)_2$; small amounts of Al_2O_3, Al_3, $Al_3(SO_4)_2$ and AlC_3 - 91 t
- Nitrate - total 1360 t
- Magnesium as $Mg(NO_3)_2$, $Mg(OH)_2$; possibly some $MgSO_4$, $MgCO_3$, and $MgCl_2$ - 32 t
- Calcium as $Ca(NO_3)_2$, $Ca(OH)_2$, CaF_2; small amounts of $CaSO_4$ and $CaSO_3$ - 27 t
- Iron as $Fe(NO_3)_3$, $Fe(OH)_3$, FeF_3; small amounts of $Fe_2(CO_3)_3$ and $Fe_2(SO_4)_3$ - 23 t
- Chromium, rubidium, and nickel as nitrates and hydroxides - 1.8 t
- Cadium as $Cd(NO_3)_2$, $Cd(OH)_2$ - 800 kg
- Organic as 15-25% TBP in CCl_4, DBBP and trace MBP - 109 t
- Organic as lard oil (CCl_4-50% and lard oil-50%) - 54 t*
- Chlorine as CCl_4 deteriorating to HCl, CO and CO_2 - 91 t
- Fluorine as AlF^{+2} - 27 t
- Solids as SiO_2, Al_2O_3, $Fe_2(DBP)_3$, $CaSO_4$, $Al_2(CO_3)_3$, $MgSiO_2$, carbonaceous material and other metallic DBPs such as chromium - 5.4 t
- Sulfate as $CaSO_4$, $Al_2(SO_4)_3$ and $Pu(SO_4)_2$ - 1.8 t
- Plutonium as PuO_2, $PU(SO_4)_2$, $Pu(OH)_4$, $Pu(OH)_x$, PuF_4, $PuCl_4$, $Pu(CO_3)_2$, and $Pu(NO_3)_4$ - approximately 100 kg
- Americium as Am_2O_3, $Am(NO_3)_3$ and $Am(OH)_3$ - approximately 2.5 kg

*In comments on this document, D. T. Crawley identified the makeup as 75% CCl_4 and 25% lard oil.

LOCATION:

Hanford Coordinates: (1,5,6,7)

N-40804
W-76535

STATUS: Retired

SITE: 216-Z-10 Reverse Well

REFERENCE DWGS:
H-2-32528
H-2-32682
HW-76419

OTHER NAMES:
231-W Reverse Well
231-W-150 Dry Well or Reverse Well
216-Z-2

Area Description of Location: (1)*

200 West Area

100 ft east of the 231-Z Bldg and 400 ft north of 19th Street

ELEVATIONS & DEPTHS: (D,1,2,7,21)†

Ground: 670 ft above msl
Site Depth: 150 ft below grade
Water Table: 193 ft below grade

DESCRIPTION OF FACILITY: (D,1,5,6,7,21)†

This site is a 150-ft-deep reverse well made of 6-in.-dia. Sch. 40 steel pipe (Figure 16). The well extends approximately 1 ft above grade to a blind flange.

ASSOCIATED STRUCTURES: (D,14)

Three 3-in. inlet pipes, entering the well 5, 6, and 7 ft below grade (Figure 16)

One 0.5-in. copper tube extending from surface to 2 ft below grade where it enters the reverse well. Reference 14 suggests that this tubing extends to the well bottom (150 ft).

SERVICE DATES: (1,5,7,8)

From	To	Function
2/45	6/45	Received process and laboratory wastes from the 231-Z Bldg
6/45	-	Retired

COMMENTS: (1,5,8,21,22)

Waste description: Neutral/basic

Deactivation: Capped the pipeline to the reverse well west of the 231-W-151 Diversion Box when the reverse well plugged with sludge

Received an estimated 50 g of plutonium in 260,000 gallons of waste‡

No other radionuclides reported

Three wells were dug 15 ft from this site in 1947. The 175-ft wells yielded soil samples every 5 ft, none of which showed any contamination

See Table 15 for radionuclide data.

FOOTNOTES:

*Reference 1 places the site east of 234-5Z Bldg. The site is east of 231-Z Bldg

†Some references give the depth as 151 ft. The first documents reporting this site give the depth as 150 ft, so it is believed to be accurate.

‡Reference 21 reports the disposal of 100 g plutonium at this site. Reference 22 states that the 100 g plutonium inventory was based on 29 samples, 28 of which were below the detection limit. Therefore, the sample was overestimated and could be as low as 1, but no greater than 50 g plutonium.

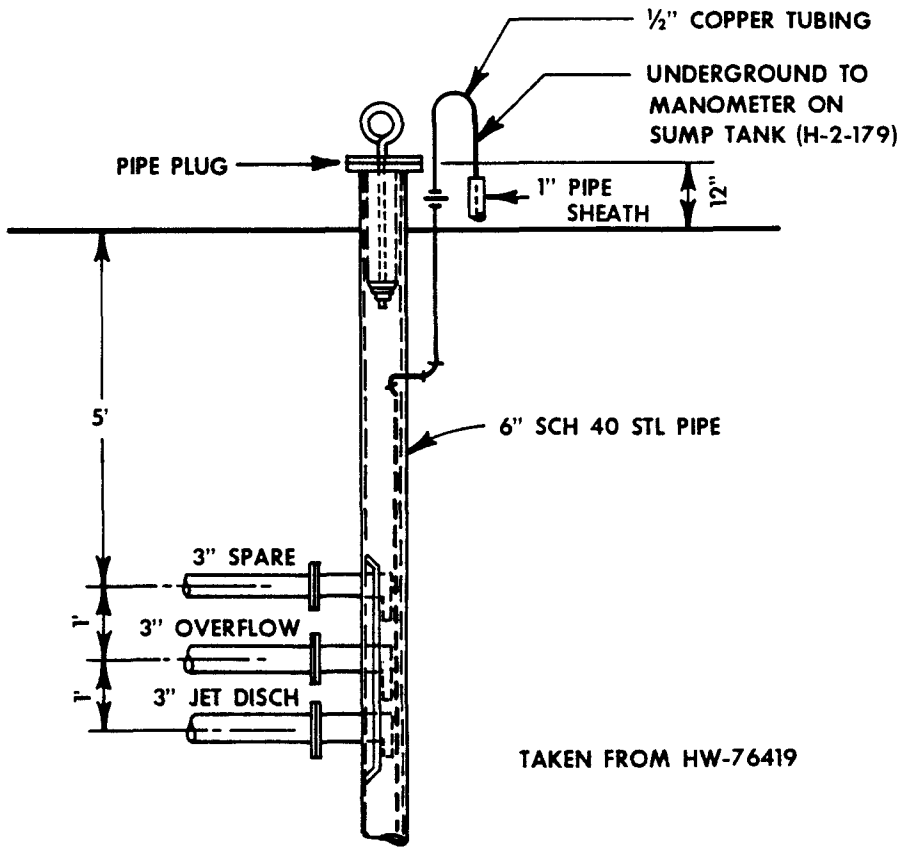


FIGURE 16. 216-Z-10 Reverse Well Cross Section.(14)

TABLE 15. Radionuclide Inventory of 216-Z-10 Reverse Well.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1945	1.00E+06	5.00E+01	-	-	-	-	-	-
Total To 12/31/79	1.00E+06	5.00E+01	-	-	-	-	-	-
Amount After Decay 12/31/79	1.00E+06	5.00E+01	-	-	-	-	-	-

[a]References 9, 12, 21, 22.

LOCATION:

Hanford Coordinates: (D,1,5)

N-39420
W-75991

N-37050
W-76950

STATUS: Retired

SITE: 216-Z-11 Ditch

REFERENCE DWGS:
H-2-576
H-2-10011
H-2-16421
H-2-32528
M-2600 W #18
M-2904 W #18

OTHER NAMES:
216-Z-1 Ditch
Z Plant Ditch

Area Description of Location: (D)

200 West Area

This ditch started east of the 216-Z-1A Tile Field and flowed south to the 216-U-10 Pond

ELEVATIONS & DEPTHS: (D,2)

Ground: 666-661 ft above msl
Site Depth: Minimum of 2 ft
Water Table: 185-180 ft below grade

DESCRIPTION OF FACILITY: (D,1,5,8)

This site is a 2,615-ft-long ditch with a 4-ft-wide bottom and a minimum depth of 2 ft. The ditch was backfilled in 1971. The southernmost 665 ft (N-37495, W-76460 to N-37050, W-76950) was part of the previously used 216-Z-1 Ditch. The first 120 ft of the ditch (starting at N-39420, W-75991) is common with 216-Z-1 and 216-Z-19. For a short time in 1971, 216-Z-19 Ditch flowed through a 900-ft section of 216-Z-11 (N-37720, W-76400 to N-37050, W-76950) which includes the 665-ft section mentioned above.

ASSOCIATED STRUCTURES: (D)

A 12-in.-dia. vitrified clay pipe the effluent flowed through as it passed under 16th Street.

Timber headwalls constructed north and south of 16th Street.

SERVICE DATES: (5,18)*

From	To	Function
3/59	11/65	Received process cooling water and steam condensate from the 234-5Z Bldg, the cooling and seal water from the 291-Z Bldg, and Hanford Laboratory waste from 231-Z Bldg
11/65	5/71	Received the process cooling water and steam condensate from the 234-5Z Bldg, the cooling seal water from the 291-Z Bldg, and the cooling water from PNL operations in the 231-Z Bldg
5/71	-	Retired

COMMENTS: (1,5)

Radionuclide inventory is reported as part of the 216-U-10 Pond inventory (see Table 1)

The first 120 ft of 216-Z-11 is common with 216-Z-1 and 216-Z-19. The last 665 ft of this ditch was common with 216-Z-1 Ditch.

FOOTNOTES:

*Reference 18 states that 216-Z-11E ditch was in use from June 1949 to May 1971. This is the only reference to a 216-Z-11E ditch found. The use of the ditch from 1949 to 1959 probably refers to the old 216-Z-1 ditch. Dates for the last use of the 216-Z-11 ditch vary between April and May, 1971.

LOCATION:

Hanford Coordinates: (D,1,5)*

N-39100
W-77200
N-39400
W-77200

STATUS: Retired

SITE: 216-Z-12 Crib

REFERENCE DWGS:
H-2-20986
H-2-20987
H-2-20988
H-2-32528
M-2600 W #18

OTHER NAMES: None

Area Description of Location: (1)

200 West Area

530 ft southwest of the 234-5Z Bldg

ELEVATIONS & DEPTHS: (D,1,2)

Ground: 680 ft above msl
Site Depth: 19 ft below grade
Water Table: 199 ft below grade

DESCRIPTION OF FACILITY: (D,1)†

The site is a 300- by 20- by 19-ft-deep excavation with 5 ft of gravel (11,250 ft^3) in the bottom and backfilled to grade. A 12-in.-dia., perforated, vitrified clay pipe runs the length of the crib, 4 ft above crib bottom (Figures 17 and 18). In July 1968 a 6-in.-dia. Sch 10 pipe was run parallel to and 30 ft west of the original line. The new line bypasses 110 ft of the original line. The original line is plugged upstream from the junction of the two lines.

ASSOCIATED STRUCTURES: (D)

Two 8-in. Sch. 10 carbon steel gage wells, extending 22 ft from the crib bottom to 3 ft above grade

Two 16- by 16-by 8-in. concrete pads, on which the gage wells rest

17 ft of 12-in. vitrified clay pipe vent, extending from the dispersion pipe to 3 ft above grade

A 3600-ft^2 polyethylene barrier separating the gravel fill from the backfill

Six 6-in. test wells, extending 19-26 ft below grade

A 16-in. Sch 40 Stevens recorder well, extending 23 ft from 2 ft below the crib bottom to a Stevens recorder 3 ft above grade

A 2-ft square by, 1-ft-thick concrete pad under the above well

A sensing bulb well made of 23 ft of 1.5 in. Sch 40 pipe, extending vertically from 2.5 ft above grade

Wells 299-W18-70 to W18-75 (see following pages on Well Data).

SERVICE DATES: (1,5,18)

From	To	Function
3/59	5/73	Received process waste, analytical and development lab waste from the 234-5Z Bldg via the 241-Z-361 Settling Tank
5/73	-	Retired

COMMENTS: (D,1,18,30,31)

Waste Description: The slightly acidic, low-salt waste was adjusted to a pH of 8-10 before disposal

Deactivation: Blanked the pipeline in the 241-Z Facility

Sediments beyond the site boundary show only slight alpha contamination, indicating that there has been little lateral spread

See Table 16 for radionuclide data.

The 216-Z-12 Crib was recently studied to determine the plutonium and americium distribution below the crib. The report will be issued as RHO-ST-44.

FOOTNOTES: (D,1)

* Reference 1 reports the north coordinates as N-39480 and N-39400 allowing for a site only 80 ft long. These coordinates do not agree with those in drawings and Reference 5 and are considered incorrect.

† Drawing H-2-20987 supports the depths given in the description. Drawing H-2-20988 shows the gravel bed to be 3.5 ft deep. Reference 1 and H-2-32528 indicate the depth is 20 ft. The 19-ft depth and 5 ft of gravel correlate better with the elevation and construction data available.

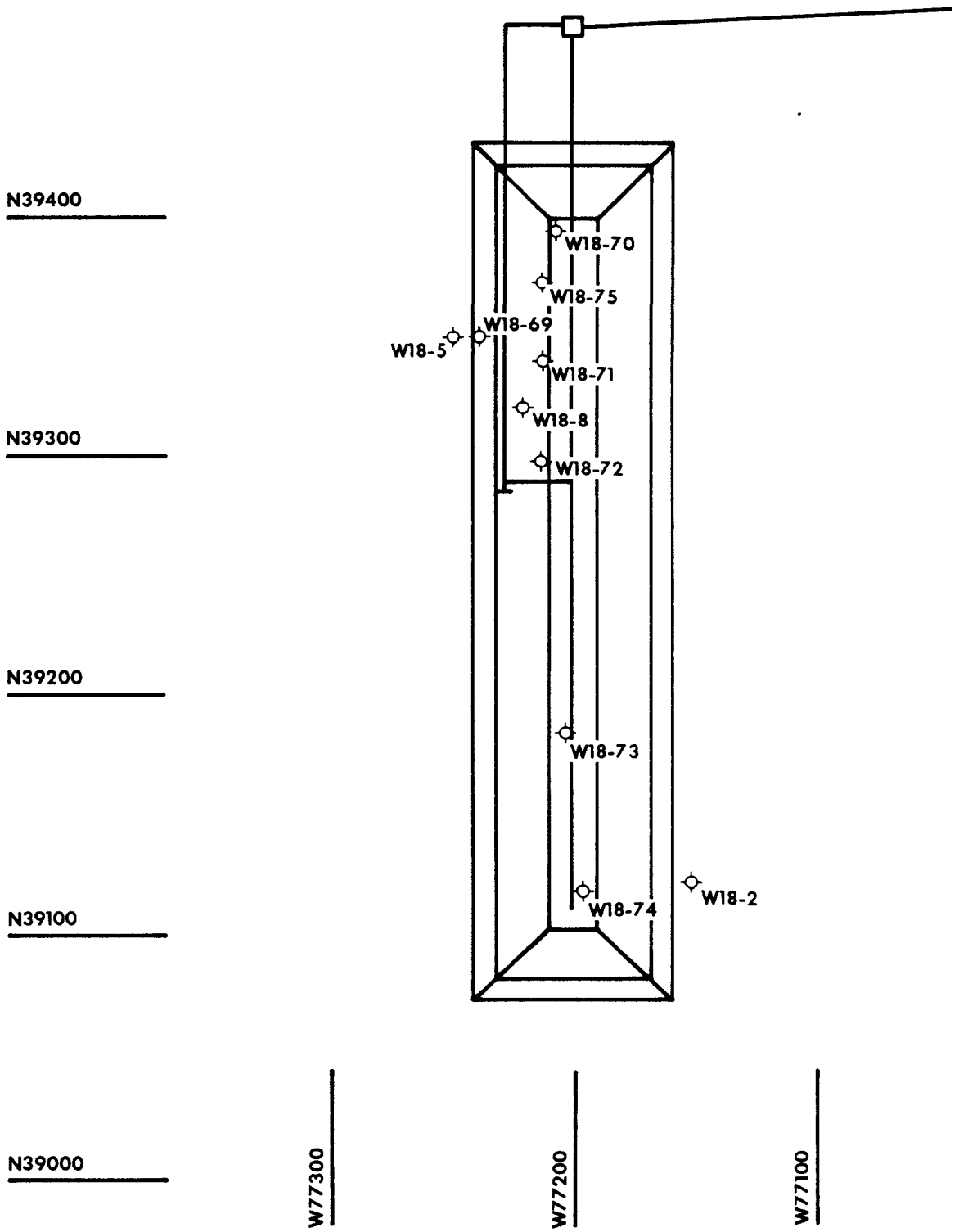
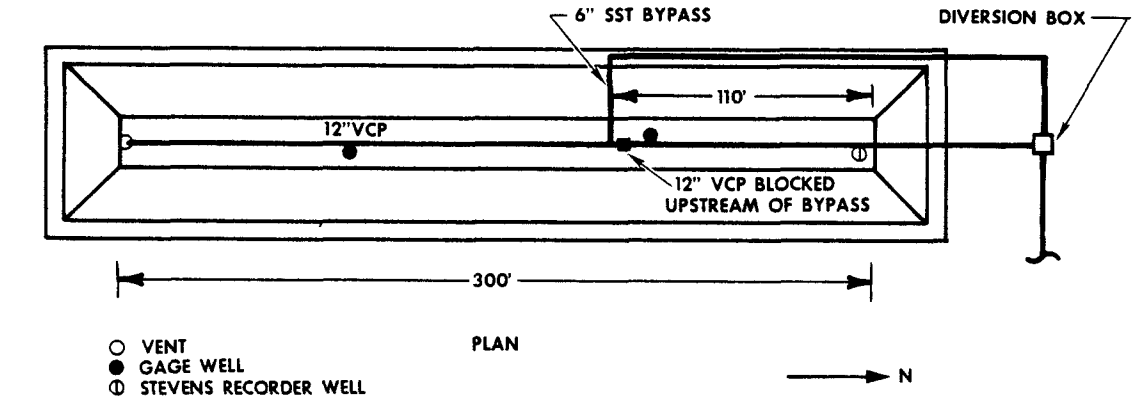
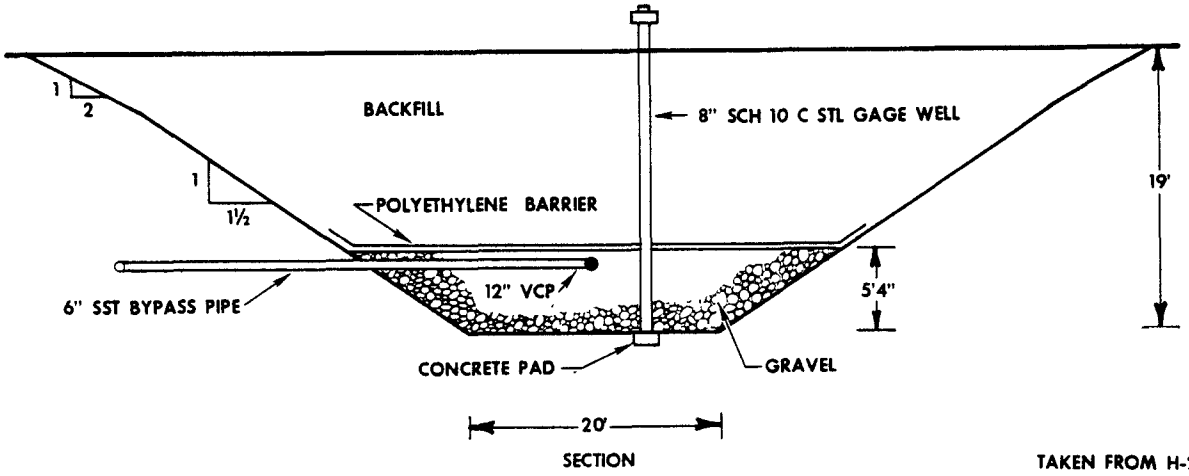


FIGURE 17. Location of Groundwater Wells Near 216-Z-12 Crib (3)





TAKEN FROM H-2-20986
H-2-20987

FIGURE 18. 216-Z-12 Crib Plan and Cross Section. (14)

TABLE 16. Radionuclide Inventory of 216-Z-12 Crib.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1959	4.24E+07	1.28E+03	1.30E+01	-	6.00E+00	-	-	1.00E-02
1960	4.48E+07	2.51E+03	2.66E+01	-	1.30E+01	-	-	1.00E-02
1961	4.23E+07	3.59E+03	3.78E+01	-	1.80E+01	-	-	1.00E-02
1962	2.55E+07	2.86E+03	2.94E+01	-	1.40E+01	-	-	1.00E-02
1963	2.31E+07	3.84E+03	4.06E+01	<1.00E-01	1.90E+01	<1.00E-01	<1.00E-01	1.00E-02
1964	1.92E+07	3.20E+03	3.36E+01	-	1.60E+01	-	-	-
1965	1.75E+07	1.86E+03	2.10E+01	-	1.00E+01	-	-	-
1966	1.53E+07	7.66E+02	8.40E+00	-	4.00E+00	-	-	-
1967	1.19E+07	1.04E+03	-	-	-	-	-	-
1968	5.87E+06	6.80E+02	-	-	-	-	-	-
1969	6.43E+06	5.17E+02	-	-	-	-	-	-
1970	3.45E+06	6.50E+02	-	-	-	-	-	-
1971	8.19E+06	1.07E+03	-	-	-	-	-	-
1972	1.17E+07	9.39E+02	-	-	-	-	-	-
1973	3.47E+06	3.27E+02	-	-	-	-	-	-
Total To 12/31/79	2.81E+08	2.51E+04	2.10E+02	1.00E-01	1.00E+02	1.00E-01	1.00E-01	5.00E-02
Amount After Decay 12/31/79	2.81E+08	2.51E+04	2.92E-01	6.67E-02	1.55E-03	6.84E-02	<1.14E-02	5.00E-02

[a]References 9, 12.

WELL DATA: (D,1,19)*

Location of wells monitoring 216-Z-12 Crib is shown on Figure 17.

Well Number: 299-W18-2

Location: 200 West Area, approximately 139 ft southeast of 216-Z-12; N-39120, W-77150

Description: 8 in. dia, 246 ft deep
Depth to water: 208 ft
Open interval: 200-246 ft

Well Number: 299-W18-5†

Location: 200 West Area, approximately 112 ft northwest of 216-Z-12; N-39350, W-77250

Description: 8 in. diameter, 272 ft deep
Depth to water: 211 ft
Open interval: 195-274 ft

Well Number: 299-W18-8

Location: 200 West Area, approximately 80 ft north of 216-Z-12; N-39327, W-77221

Description: 6 in. dia., 77 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W18-69

Location: 200 West Area, approximately 103 ft northwest of 216-Z-12; N-39350, W-77225

Description: 6 in. dia., 50 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W18-70

Location: 200 West Area, approximately 145 ft north of 216-Z-12; N-39395, W-77206

Description: 6 in. dia., 20 ft deep
Depth to water: not to water
Open interval: none

*See Table 17 for groundwater sample results.
†In comments on this document, R. B. Kasper of Geological Services stated that this well is 212 ft deep.

WELL DATA: (D,1,19)*

Well Number: 299-W18-71

Location: 200 West Area, approximately 97 ft north of 216-Z-12; N-39346, W-77213

Description: 8 in. dia., 20 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W18-72

Location: 200 West Area, approximately 49 ft north of 216-Z-12; N-39298, W-77209

Description: 8 in. dia., 26 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W18-73

Location: 200 West Area, approximately 48 ft south of 216-Z-12; N-39202, W-77204

Description: 8 in. dia., 25 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W18-74

Location: 200 West Area, approximately 142 ft south of 216-Z-12; N-39108, W-77196

Description: 6 in. dia., 25 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W18-75

Location: 200 West Area, approximately 126 ft north of 216-Z-12; N-39375, W-77213

Description: 6 in. dia., 21 ft deep
Depth to water: not to water
Open interval: none

*See Table 17 for groundwater sample results.

Evaluation of Scintillation Probe Profiles:

Wells W18-2, W18-5, W18-8, W18-69, W18-71, W18-73 and W18-74 monitor the 216-Z-12 Crib. Radioactive contaminants have been detected near the head end of the crib in wells W18-5, W18-8, W18-69 and W18-71 at the [22-ft] depth since logging of these wells started in 1967. Minor radioactive contaminants detected at the ground surface in 1967 have decreased to background. Only background levels of radiation are detected in three wells towards the south end of the crib.

On the basis of the scintillation probe profiles minor redistribution of contaminants have occurred from discharges during crib operations. The data indicate breakthrough to the groundwater has not occurred at this site.(3)

Sampling Results:

1966 - Analyses of groundwater samples from either 299-W18-2 or 299-W18-5 yielded the following: (24)

Filtered material: 8 pCiPu/g
Filtrate: 7.0×10^{-3} pCiPu/cc

1966 - Drilling of the 212-ft-deep well 299-W18-5A (299-W18-69) revealed 45 d/m/g alpha contamination at 135 ft; well 299-W18-5B (299-W18-8) revealed 23 d/m/g at 50 ft. No other contamination was detected.(1)

1967 - Six wells were drilled until contamination was encountered or a few feet past a depth where contamination was expected.(16)

Wells with Contamination	Depth	Activity
299-W18-70	19 ft	220,000 d/m (by Juno)
299-W18-71	19.6 ft	>40,000 d/m (by poppy)
299-W18-75	19 ft	5,000 d/m (by poppy)
299-W18-75	20.5 ft	>40,000 d/m (by poppy)

Wells without Contamination	Depth
299-W18-72	26 ft
299-W18-73	25 ft
299-W18-74	25 ft

1968 - Well 299-W18-70 was sampled at 2-ft intervals down to 16 ft. At 2 ft, 5×10^{-8} g Pu/g soil was found. No other contamination was found.(31)

TABLE 17. Groundwater Sample Results from Wells Monitoring 216-Z-12 Crib.[a]

Radionuclide[b] (pCi/ml)	Years Sampled						
	1971	1972	1973	1974	1975	1976	1977
	Well 299-W18-2						
Total A	1.5E-2	1.5E-2	1.5E-2	1.5E-2	1.5E-2	1.7E-2	1.5E-2
Total B	1.3E-1	1.4E-1	8.9E-2	7.4E-2	7.7E-2	7.9E-2	7.3E-2

	Well 299-W18-5									
	1967	1969	1971	1972	1973	1974	1975	1976	1977	1978
Total A	-	1.1E-2	1.4E-2	1.4E-2	1.4E-2	1.4E-2	1.4E-2	1.4E-2	1.4E-2	1.4E-2
Total B	3.7E+0	-	1.3E-1	1.9E-1	1.0E-1	7.6E-2	1.1E-1	7.3E-2	7.3E-2	7.3E-2
^{90}Sr	1.1E-2	-	-	-	-					
^{3}H	-	-	-	-	1.4E+1	1.7E+1	7.7E+0	2.3E+0	-	-

[a]Reference 4.

[b]Some values are averages computed for the year.

LOCATION:

Hanford Coordinates: (1,5)

N-39769
W-76762

STATUS: Active

SITE: 216-Z-13 French Drain

REFERENCE DWGS:
H-2-16412
H-2-32528
H-2-34762
M-2600 W #15

OTHER NAMES:
234-5 Dry Well #1
216-Z-13 Dry Well

Area Description of Location: (1,20)

200 West Area

190 ft south of the 234-5Z Bldg approximately 50 ft northeast of the 291-Z-1 Stack

ELEVATIONS & DEPTHS: (D,1,2)

Ground: 669 ft above msl
Site Depth: 15 ft below grade
Water Table: 188 ft below grade

DESCRIPTION OF FACILITY: (D,1,5)

The site consists of two 3-ft-dia., by 3-ft-high tile culverts, placed vertically end to end 13 ft below grade (Figure 19). The French drain is filled with coarse gravel.

ASSOCIATED STRUCTURES: (D)

A 2-in wooden plank cover

Two 6-ft lengths of 4-in. effluent pipes, entering the French drain approximately 14 ft below grade

Approximately 40 ft^3 of coarse gravel.

SERVICE DATES: (1,5,8,20)

From	To	Function
6/49	-	Receives steam condensate from the turbine for the ET-8 exhaust fan and floor drainage from the 291-Z Bldg

COMMENTS: (1)

Radionuclide content is unknown; low levels are assumed.

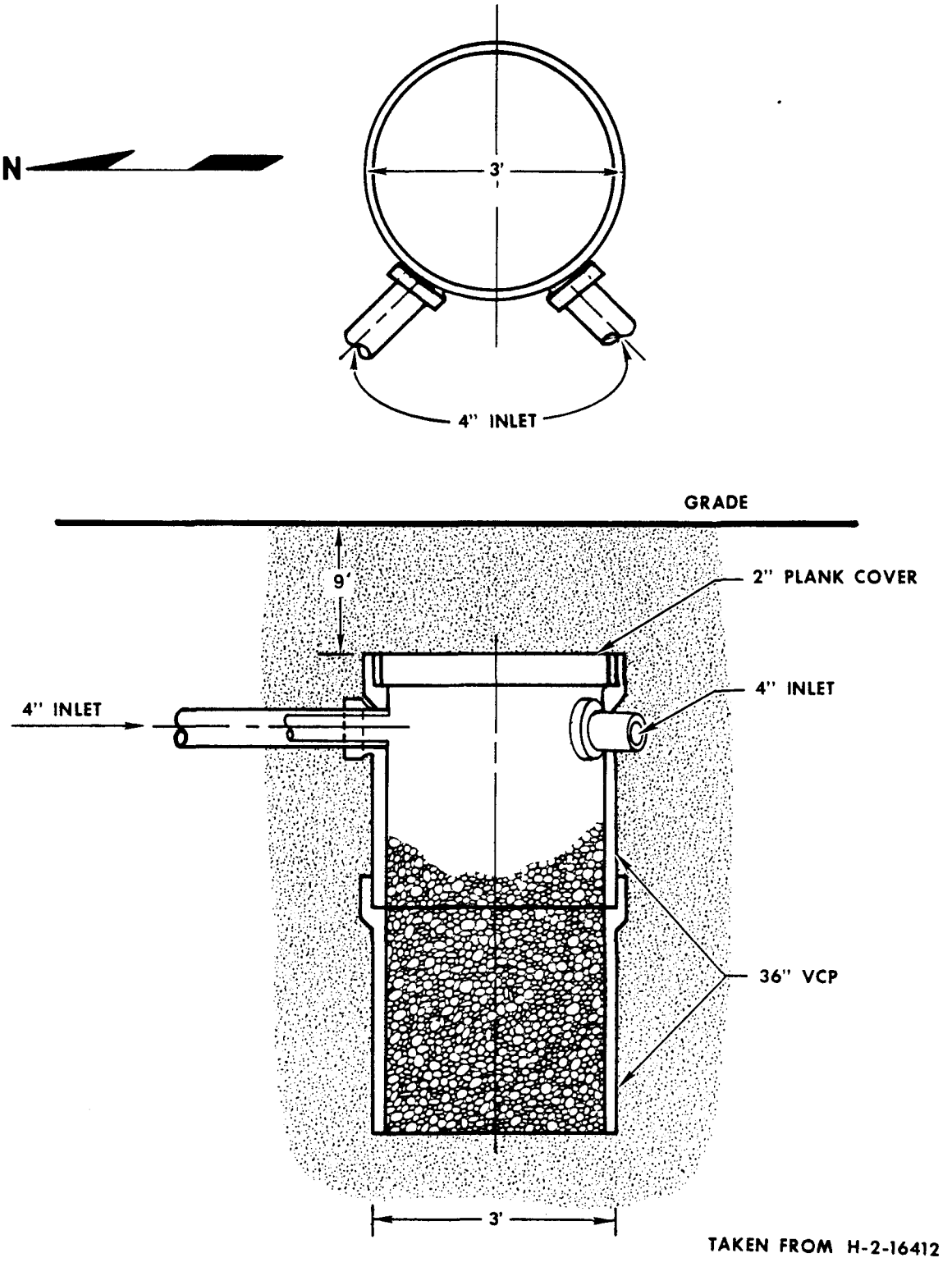


FIGURE 19. 216-Z-13 French Drain Plan and Section. (D)

LOCATION:

Hanford Coordinates: (1,5)

N-39774
W-76822

STATUS: Active

SITE: 216-Z-14 French Drain

REFERENCE DWGS:
H-2-16412
H-2-32528
H-2-34762
M-2600 W #15

OTHER NAMES:
234-5 Dry Well #2
216-Z-14 Dry Well

Area Description of Location: (1,20)

200 West Area

190 ft south of te 234-5Z Bldg, approximately 50 ft northwest of the 291-Z-1 Stack

ELEVATIONS & DEPTHS: (D,1,2)

Ground: 669 ft above msl
Site Depth: 15 ft below grade
Water Table: 188 ft below grade

DESCRIPTION OF FACILITY: (D,1,5)

The site consists of two 3-ft-dia., 3-ft-high tile culverts placed vertically end to end 13 ft below grade (Figure 20). The French drain is filled with coarse gravel.

ASSOCIATED STRUCTURES: (D)

A 2-in. wooden cover

6 ft of 4-in.-dia. effluent pipe, entering the French drain approximately 14 ft below grade

Approximately 40 ft^3 of coarse gravel.

SERVICE DATES: (1,5,8,20)

From	To	Function
6/49	-	Receives steam condensate from the turbine for the ET-9 exhaust fan in the 291-Z Bldg

COMMENTS: (1)

Radionuclide content is unknown; low levels are assumed.

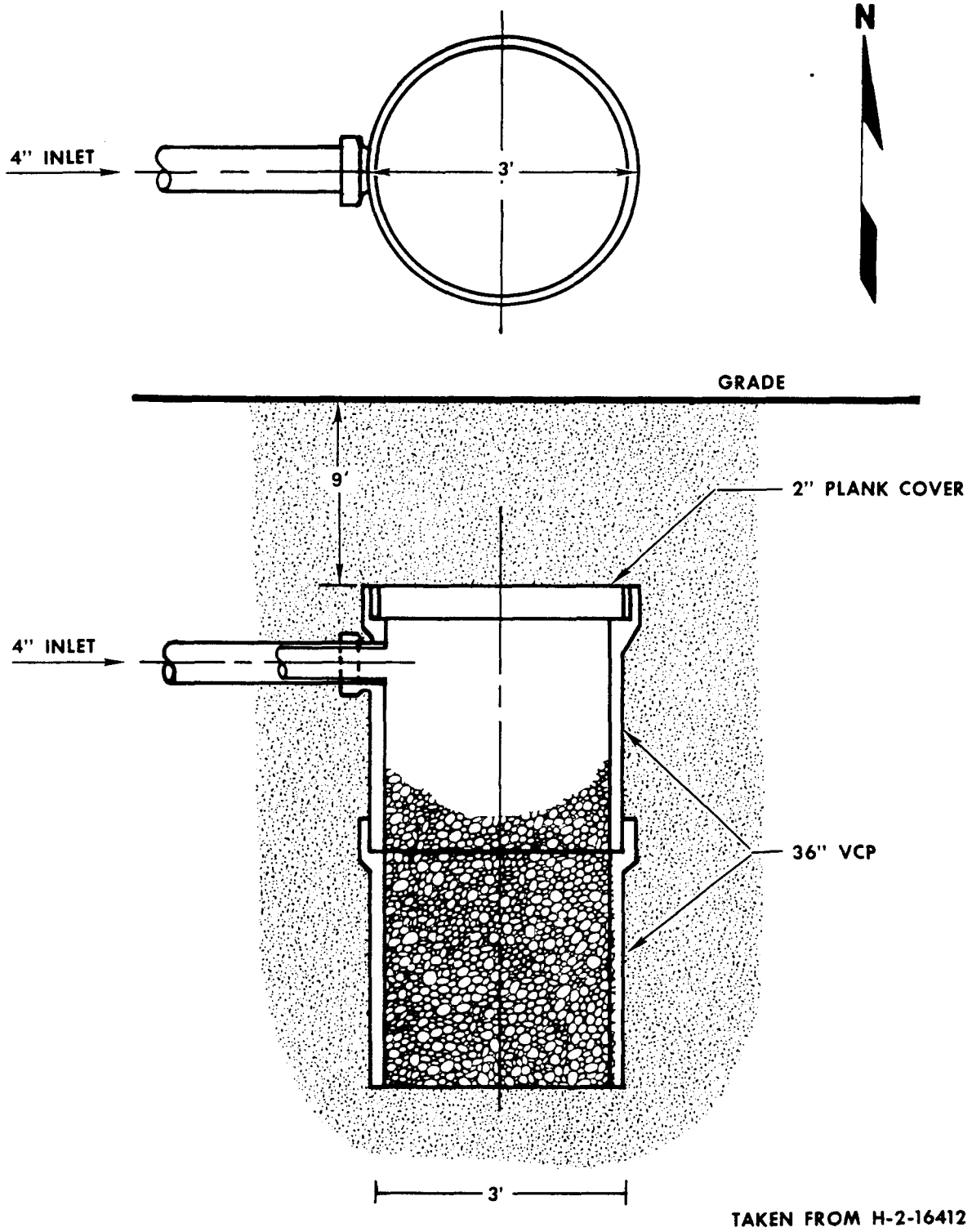


FIGURE 20. 216-Z-14 French Drain Plan and Section.(D)

LOCATION:

Hanford Coordinates: (1,5)

N-39911
W-76810

STATUS: Active

SITE: 216-Z-15 French Drain

REFERENCE DWGS:
H-2-16412
H-2-32528
H-2-34762
M-2600 W #15

OTHER NAMES:
234-5 Dry Well #3
216-Z-14 Dry Well

Area Description of Location: (D)

200 West Area

50 ft south of the 234-5Z Bldg, next to the north end of the 291-Z Bldg

ELEVATIONS & DEPTHS: (D,1,2)

Ground: 676 ft above msl
Site Depth: 22 ft below grade
Water Table: 196 ft below grade

DESCRIPTION OF FACILITY: (D,1,5)

The site consists of two 3-ft-dia., 3-ft-high tile culverts placed vertically end to end 13 ft below grade (Figure 21). The French drain is filled with coarse gravel.

ASSOCIATED STRUCTURES: (D)

A 2-in wooden cover

6 ft of 4-in.-dia. effluent pipe, entering the French drain approximately 14 ft below grade

Approximately 40 ft^3 of coarse gravel.

SERVICE DATES: (1,5,8,20)

From	To	Function
6/49	-	Receives drainage from the S-12 Evaporator Cooler in the 291-Z Bldg

COMMENTS: (1)

Radionuclide content is unknown; low levels are assumed.

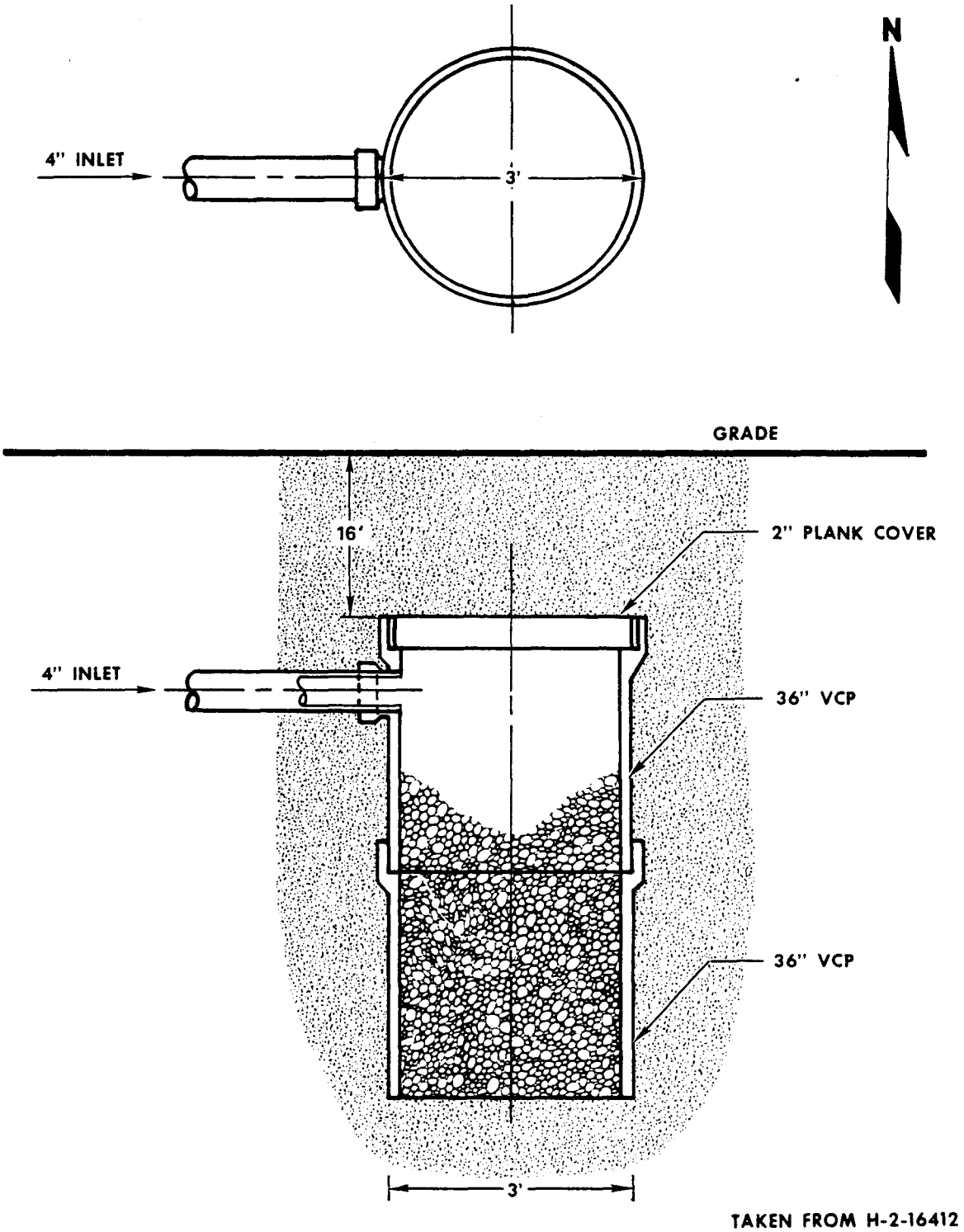


FIGURE 21. 216-Z-15 French Drain Plan and Section.(D)

LOCATION:

Hanford Coordinates: (D,1,5)

N-41113
W-76892

N-41113
W-77072

Area Description of Location: (D)

200 West Area

250 ft northwest of the 231-Z Bldg

STATUS: Retired

SITE: 216-Z-16 Crib

REFERENCE DWGS:
H-2-26074
H-2-26075
H-2-32528
M 2600 W #15
SK-2-21718

OTHER NAMES: None

ELEVATIONS & DEPTHS: (D,1,2)

Ground: 673 ft above msl
Site Depth: 15 ft below grade
Water Table: 197 ft below grade

DESCRIPTION OF FACILITY: (D,1,5)*

The site consists of an excavation 180- by 10- by 15-ft deep, with 5 ft of gravel (4500 yd^3) in the bottom (Figures 22 and 23). A 4-in.-dia. PVC pipe with an 0.3-in. hole every 3 ft runs down the crib center, 4 ft above the bottom. Over the gravel is a membrane barrier (4140 ft^2), 4 in. of sand 1200 yd^3) and earth backfill to grade.

ASSOCIATED STRUCTURES: (D)

Eleven 21-ft-tall monitoring wells, with 6-in. PVC pipe extending from 2 ft below crib bottom to 3 ft above grade

An 18-ft gage well, with an 8-in. vitrified clay pipe extending from the bottom of the crib to 3 ft above grade

A 2- by 2- by 1-ft concrete block on which the gage well rests

14 ft of 4-in.-dia. PVC vent pipe rising from the distribution pipe to 3 ft above grade.

SERVICE DATES: (1,5,12)

From	To	Function
3/68	1/77	Received waste from PNL operations in the 231-Z Bldg
1/77	-	Retired

COMMENTS: (1)

Waste description: Neutral/basic

See Table 18 for radionuclide data.

FOOTNOTES:

*One of the two drawings of the crib shows the distributor pipe is vitrified clay. On a more detailed drawing of the crib, the pipe is PVC. The pipe is believed to be PVC.

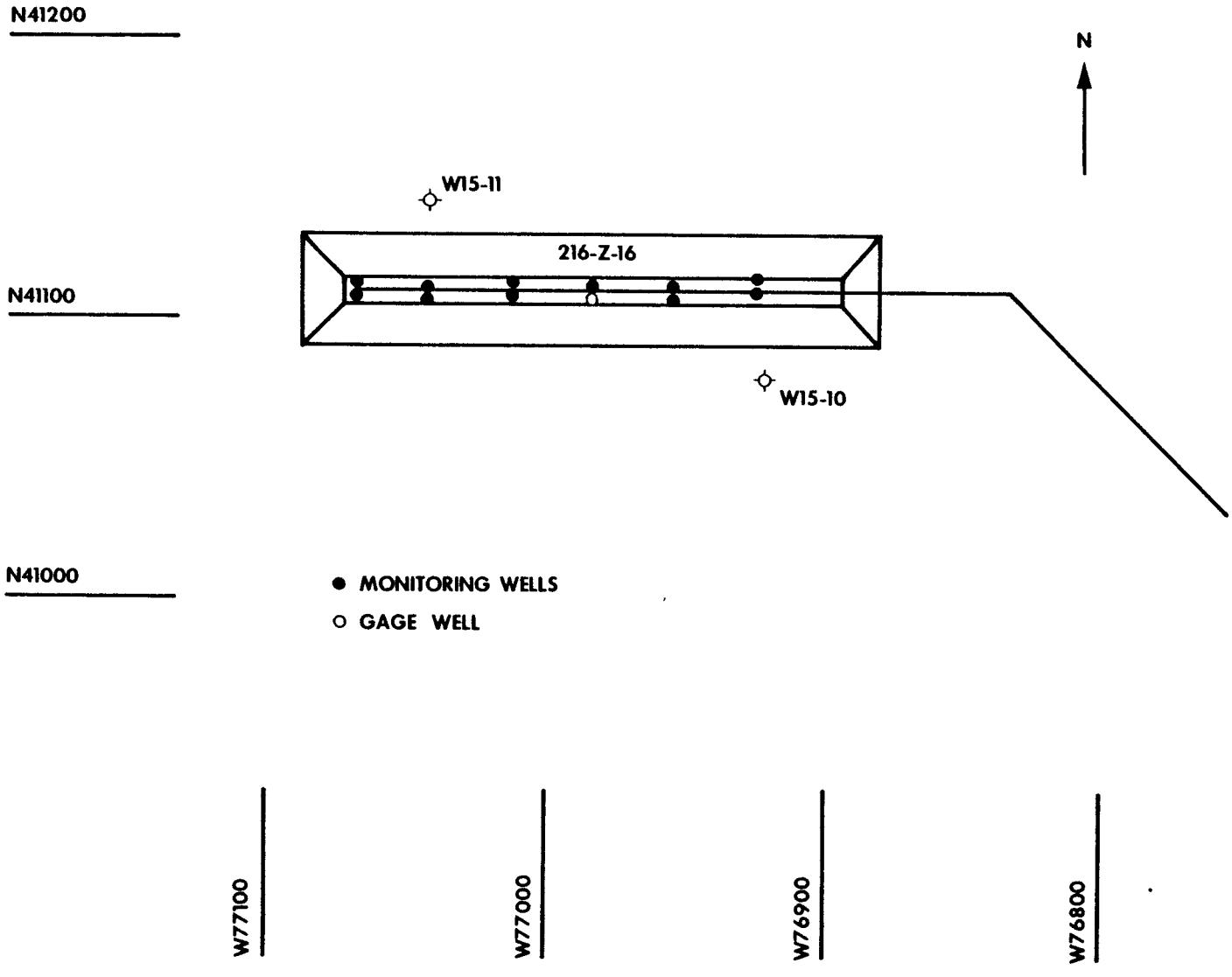


FIGURE 22. 216-Z-16 Crib Plan.(3)

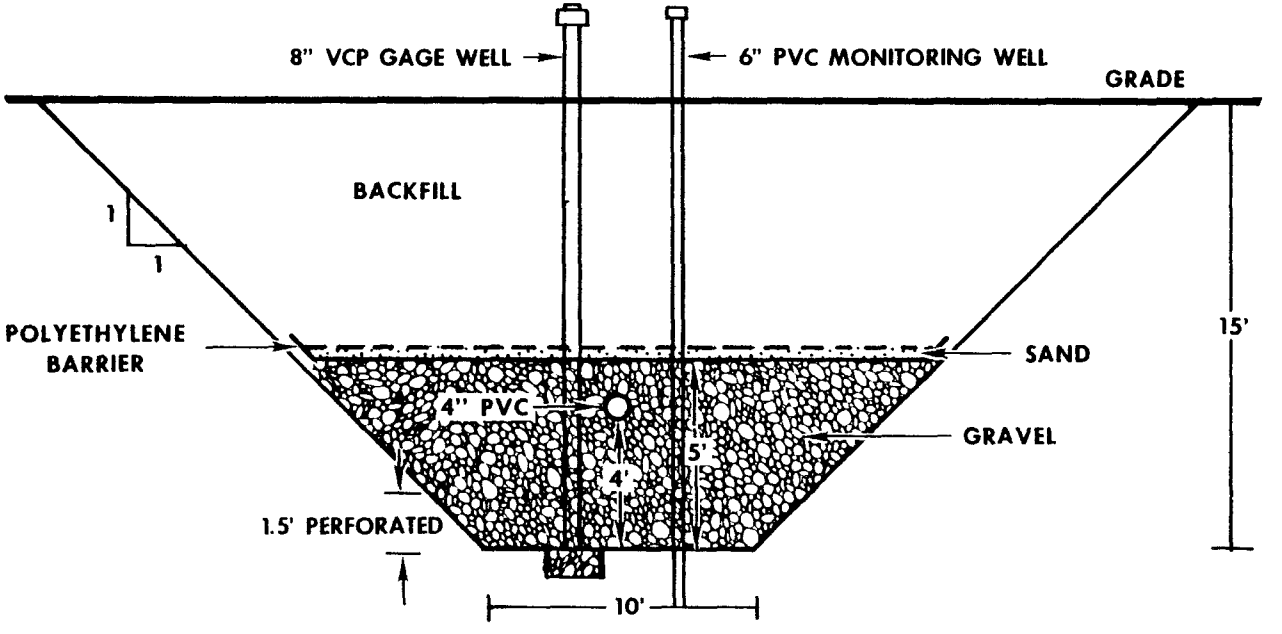


FIGURE 23. 216-Z-16 Crib Section.(D)

TABLE 18. Radionuclide Inventory of 216-Z-16 Crib.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1968	1.54E+07	1.20E+00	2.01E-01	-	-	-	-	-
1969	2.14E+07	5.18E+00	1.43E-01	-	-	-	-	-
1970	1.93E+07	<3.10E+00	<7.80E-02	-	-	-	-	-
1971	1.87E+07	6.38E+00	1.65E-01	-	-	-	-	-
1972	9.76E+06	4.86E+01	2.00E-01	-	-	-	-	-
1973	9.33E+06	6.24E+00	2.02E-01	-	-	-	-	-
1974	3.30E+06	5.20E-01	4.71E-03	-	-	-	-	-
1975	3.10E+06	2.72E-01	1.04E-03	-	-	-	-	-
1976	1.60E+06	9.97E-02	6.74E-04	-	-	-	-	-
1977	7.63E+04	-	-	-	-	-	-	-
Total To 12/31/79	1.02E+08	7.16E+01	9.96E-01	-	-	-	-	-
Amount After Decay 12/31/79	1.02E+08	7.16E+01	<1.05E-02	-	-	-	-	-

[a]References 9, 10, 12, 13.

WELL DATA: (19)*

Locations of wells monitoring 216-Z-16 are shown on Figure 22.

Well Number: 299-W15-10

Location: 200 West Area, approximately 70 ft southwest of 216-Z-16; N-41080, W-76920

Description: 8 in. dia., 298 ft deep
Depth to water: 205 ft
Open interval: 183-297 ft

Well Number: 299-W15-11

Location: 200 West Area, approximately 66 ft northwest of 216-Z-16; N-41145, W-77040

Description: 8 in. dia., 300 ft deep
Depth to water: 207 ft
Open interval: 183-297 ft

Evaluation of Scintillation Probe Profiles:

Wells W15-10 and W15-11 monitor the 216-Z-16 crib. The scintillation probe data verify the small waste inventory of total beta as only background levels of radiation are detected in the two monitoring structures. These data indicate breakthrough to the groundwater has not occurred at this site.(3)

TABLE 19. Groundwater Sample Results from Wells Monitoring 216-Z-16 Crib.[a]

Radionuclide[b] (pCi/ml)	Years Sampled							
	1971	1972	1973	1974	1975	1976	1977	1978
Well 299-W15-10								
Total Alpha	1.5E-2	1.5E-2	1.6E-2	1.5E-2	1.5E-2	1.5E-2	2.5E-2	1.5E-2
Total Beta	1.4E-1	1.5E-1	8.4E-2	7.4E-2	7.3E-2	7.7E-2	7.3E-2	7.3E-2
Well 299-W15-11								
Total Alpha	1.4E-2	1.4E-2	1.4E-2	1.4E-2	1.4E-2	1.4E-2	1.4E-2	1.4E-2
Total Beta	1.3E-1	1.3E-1	9.2E-2	7.4E-2	7.6E-2	7.6E-2	7.6E-2	7.3E-2

[a]Reference 4.

[b]Some values averages computed for the year.

*See Table 19 for groundwater sample results.

LOCATION:

Hanford Coordinates: (1,5)*

N-40595
W-76435

N-40795
W-76435

Area Description of Location: (1)

200 West Area

250 ft north of 19th Street and 300 ft east of 231-Z Bldg

STATUS: Retired

SITE: 216-Z-17 Trench

REFERENCE DWGS:
H-2-32528
H-2-32682
M-2600 W #15

OTHER NAMES:
216-Z-17 Ditch

ELEVATIONS & DEPTHS: (D,1,2)†

Ground: 670 ft above msl
Site Depth: 8 ft below grade
Water Table: 191 ft below grade

DESCRIPTION OF FACILITY: (D,1,5)†

The site is an 8-ft-deep trench with 200- by 10-ft bottom dimensions (Figure 24). The excavation was backfilled after use (see comments).

ASSOCIATED STRUCTURES: (D)

A 6-ft square, 4-in.-thick concrete pad

A 1.5- by 1.5- by 2-ft metering box constructed of 12-gauge steel. The box is located 30 ft from the north end of the trench. It may have been removed when the trench was backfilled

7 ft of 3-in. Sch 40 carbon steel effluent pipe that feeds into the metering box.

SERVICE DATES: (1,5)

From	To	Function
2/67	2/68	Received waste from PNL operations in the 231-Z Bldg
2/68	-	Retired

COMMENTS: (D,1,5)

Waste description: Neutral/basic

Deactivation: Capped the pipeline at the trench, valved out the line west of the 231-W-151 Sump Tank, and backfilled the trench.

This trench is parallel and 40 ft west of 216-Z-1 Ditch

See Table 20 for radionuclide data.

FOOTNOTES:

*Reference 1 reports the coordinates of this site to be N-40563, W-76372 to N-40563, W-76435. These indicate the site is 63 ft long, running east-west. This is believed to be incorrect based on Reference 5 and drawings.

†The trench is estimated to be 200 ft long and 8 ft deep based on the coordinates and drawings. The 300-ft length reported in References 1, 5, and 18 contradicts the coordinates believed to be accurate; no coordinates or drawings have been found to support the 300-ft length. The reported depth as 15 ft in Reference 1 does not agree with the drawings.

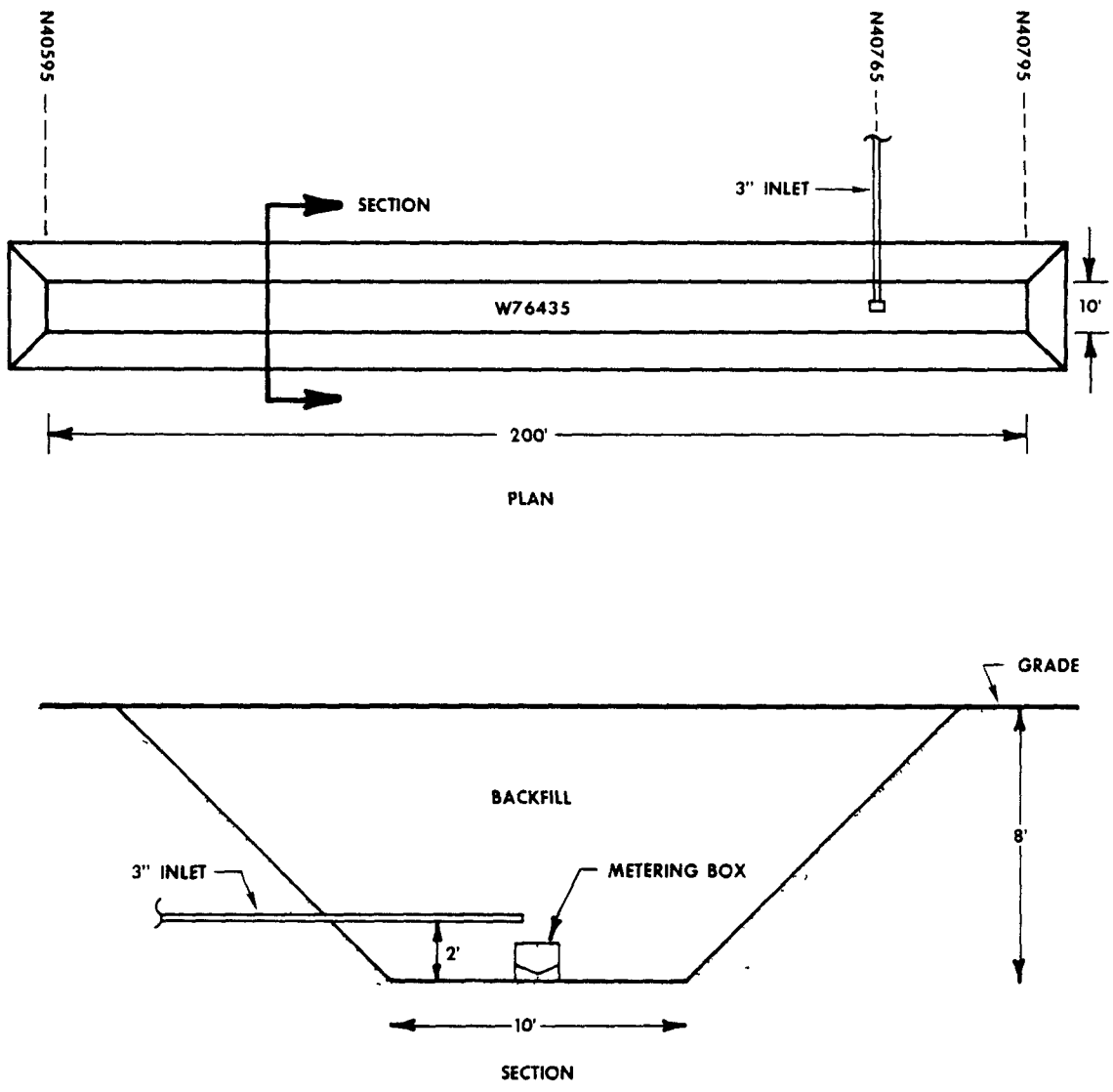


FIGURE 24. 216-Z-17 Trench Plan and Section. (D)

TABLE 20. Radionuclide Inventory of 216-Z-17 Trench.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1967	3.07E+07	4.92E+01	8.00E-01	-	-	-	-	-
1968	6.10E+06	1.00E+00	2.40E-01	-	-	-	-	-
Total To 12/31/79	3.67E+07	5.02E+01	1.04E+00	-	-	-	-	-
Amount After Decay 12/31/79	3.67E+07	5.02E+01	<3.94E-03	-	-	-	-	-

[a]References 9, 12.

LOCATION:

Hanford Coordinates: (D,1,5)*

N-38922 N-38679
W-76807 W-77103

N-38679 N-38922
W-76807 W-77103

STATUS: Retired

SITE: 216-Z-18 Crib

REFERENCE DWGS:
H-2-26093
H-2-26094
H-2-27503
H-2-32528
H-2-36551 Sh. 1 & 2
M-2600 W #18
SK-2-21808

OTHER NAMES: None

Area Description of Location: (1)

200 West Area

1000 ft southwest of the 234-5Z Bldg

ELEVATIONS & DEPTHS: (D,1,2)
Ground: 680 ft above msl
Site Depth: 18 ft below grade
Water Table: 196 ft below grade

DESCRIPTION OF FACILITY: (D,1,5,18)

The site consists of five parallel excavations, 207- by 10- by 18-ft deep (Figure 25). A 300-ft-long, 3-in.-dia. steel pipe runs east and west, bisecting the length of each excavation. Two 100-ft-long, 3-in.-dia. perforated, fiberglass-reinforced epoxy pipes exit each side of the above line in each excavation (two lines north, two lines south). The distribution pipes are 1 ft above the crib bottom in a 2-ft-thick bed of 1.5- to 3-in. gravel (5200 ft^3 per excavation). The excavation is backfilled to grade.

ASSOCIATED STRUCTURES: (D)

Five 4-in.-dia. vitrified clay vent risers with vents. This is an inverted T with 8 ft of perforated pipe placed horizontally 2 ft above the crib bottom and 20 ft rising to 4 ft above grade (Figure 26).

Five 1- by 1- by 2-ft concrete pedestals, one each supporting the above vents

Five 4-in. ball valves in each excavation, one to control flow beyond that excavation and one to each distribution line

3200 ft^2 of membrane barrier to cover the gravel in each excavation

1000 ft^3 of sand to cover the membrane barrier in each excavation

Twenty-five 17-ft-long sections of 8-in. Sch 40 pipe, one each from valve to grade

Twenty-five caps for above pipes, 9-in. OD by 0.5 in. thick, with a hole for a valve handle.

Twelve test wells, each consisting of 23 ft of 6-in. fiberglass-reinforced epoxy, beginning 2 ft below crib bottom

Three 220-ft-deep, 6-in.-dia. perforated groundwater wells; one 80-ft and one 140-ft-deep, 6-in.-dia. dry well

630 ft of cathodic protection positive cable with two anodes.

280 ft of cathodic protection negative cable.

SERVICE DATES: (1,18,20,32,33)

From	To	Function
4/69	5/73	Received waste from the 236-Z and 242-Z Bldgs
5/73	-	Retired

COMMENTS: (1,30,32,33)

Waste Description: High salt, acidic

Deactivation: Blanked the pipeline in the 241-Z Facility

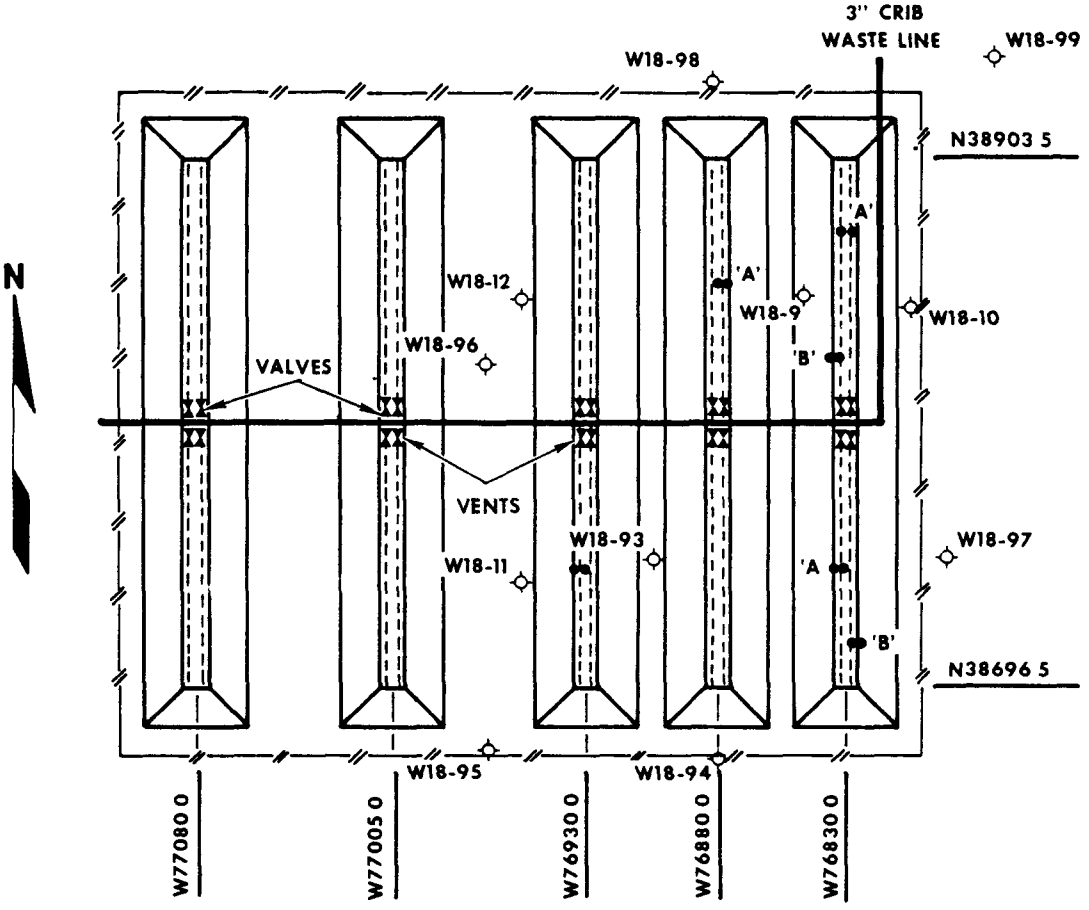
If the five trenches are numbered from east to west, they individually received waste as follows:

Trench 1	North Section	04/28/72	to	09/29/72
	South Section	11/30/71	to	04/28/72
Trench 2	North Section	07/31/70	to	03/31/71
	South Section	03/31/71	to	11/30/71
Trench 3	North Section	12/05/69	to	07/31/70
	South Section	04/04/69	to	12/05/69
Trench 4	North Section	09/29/72	to	02/28/73
	South Section	02/28/73	to	05/15/73
Trench 5	Never used			

See Table 21 for radionuclide data.

FOOTNOTES:

*These coordinates were taken from drawings and are assumed to be accurate. They do not agree exactly with the coordinates in References 1 and 5.



216-Z-18 CRIB PLOT PLAN

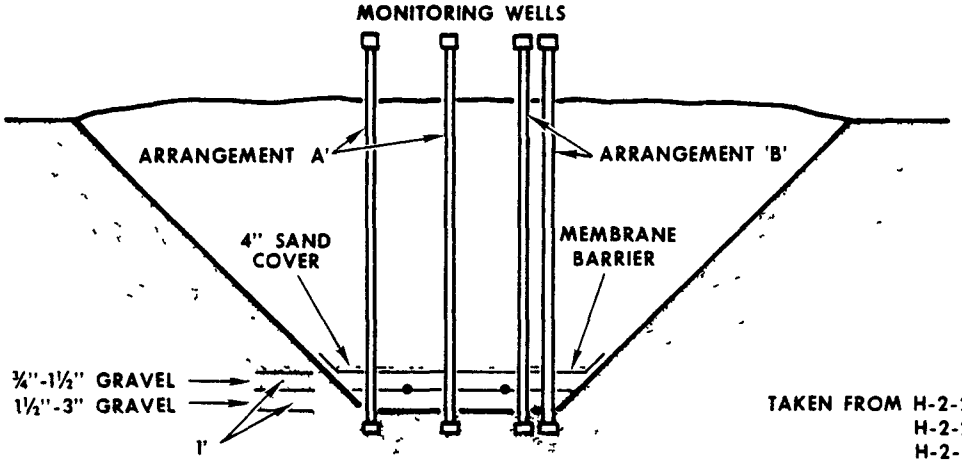
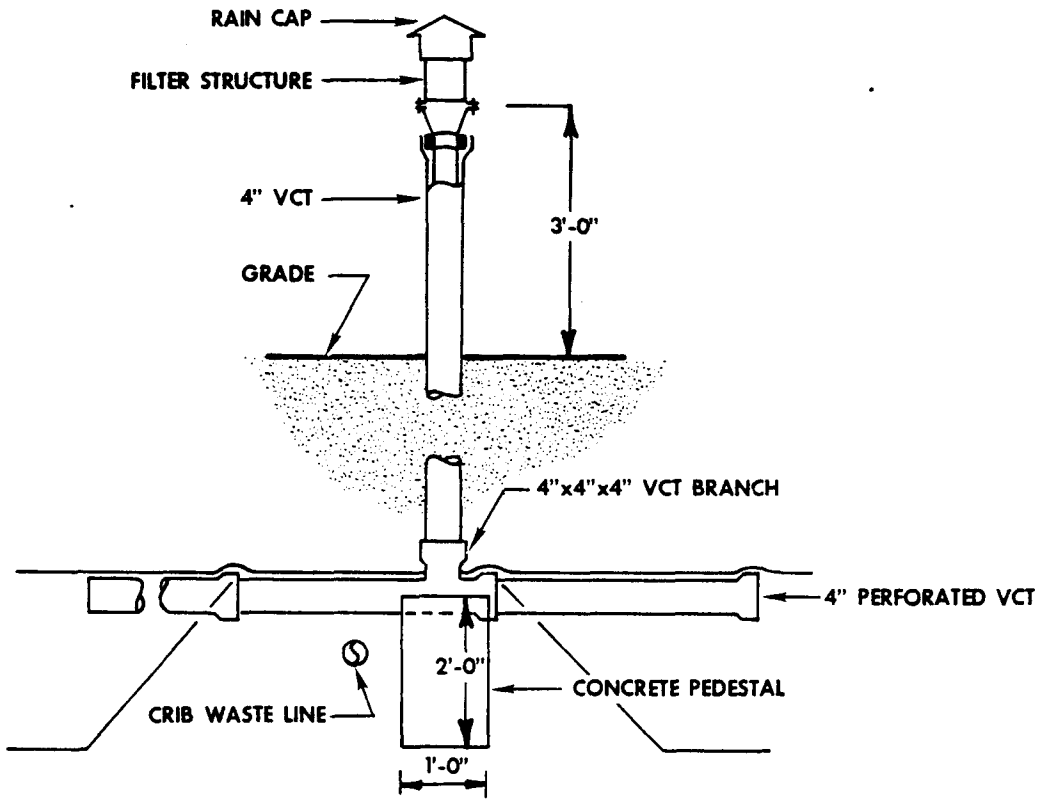
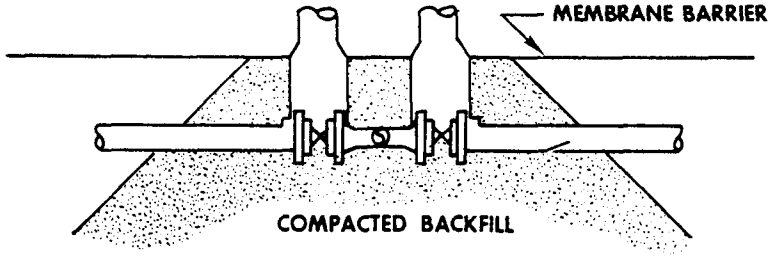


FIGURE 25. 216-Z-18 Crib Plan and Section.(D)



VENT STRUCTURE



TYPICAL SECTION AT DISTRIBUTION

FIGURE 26. Details of 216-Z-18 Crib. (D)

TABLE 21. Radionuclide Inventory of 216-Z-18 Crib.[a]

Year	Volume (L)	Pu (g)	Beta (Ci)	^{90}Sr (Ci)	^{106}Ru (Ci)	^{137}Cs (Ci)	^{60}Co (Ci)	U (kg)
1969	5.72E+05	4.27E+03	-	-	-	-	-	-
1970	7.99E+05	5.01E+03	-	-	-	-	-	-
1971	8.84E+05	5.53E+03	-	-	-	-	-	-
1972	1.24E+06	6.87E+03	-	-	-	-	-	-
1973	3.66E+05	1.27E+03	-	-	-	-	-	-
Total To 12/31/79	3.86E+06	2.29E+04	-	-	-	-	-	-
Amount After Decay 12/31/79	3.86E+06	2.29E+04	-	-	-	-	-	-

[a]References 9, 12.

WELL DATA: (19)*

Locations of well monitoring 216-Z-18 are shown on Figure 25.

Well Number: 299-W18-9

Location: 200 West Area, approximately 121 ft northeast of 216-Z-18; N-38852, W-76846

Description: 6 in. dia., 217 ft deep
Depth to water: 208 ft
Open interval: 180-217 ft

Well Number: 299-W18-10

Location: 200 West Area, approximately 159 ft northeast of 216-Z-18; N-38847, W-76803

Description: 6 in. dia., 218 ft deep
Depth to water: 207 ft
Open interval: 180-218 ft

Well Number: 299-W18-11

Location: 200 West Area, approximately 65 ft south of 216-Z-18; N-38735, W-76955.

Description: 6 in. dia., 220 ft deep
Depth to water: 208 ft
Open interval: 190-220 ft

Well Number: 299-W18-12

Location: 200 West Area, approximately 50 ft north of 216-Z-18; N-38850, W-76955

Description: 6 in. dia., 214 ft deep
Depth to water: 208 ft
Open interval: 190-214 ft

Well Number: 299-W18-93

Location: 200 West Area, approximately 75 ft southeast of 216-Z-18; N-38744, W-76905

Description: 6 in. dia., 140 ft deep
Depth to water: not to water
Open interval: none

*See Table 22 for groundwater sample results.

Well Number: 299-W18-94

Location: 200 West Area, approximately 157 ft southeast of 216-Z-18; N-38662, W-76880

Description: 6 in. dia., 80 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W18-95

Location: 200 West Area, approximately 136 ft south of 216-Z-18; N-38665, W-76970

Description: 6 in. dia., 80 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W18-96

Location: 200 West Area, approximately 29 ft north of 216-Z-18; N-38825, W-76970

Description: 6 in. dia., 80 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W18-97

Location: 200 West Area, approximately 174 ft southeast of 216-Z-18; N-38745, W-76790

Description: 6 in. dia., 85 ft deep
Depth to water: not to water
Open interval: none

Well Number: 299-W18-98

Location: 200 West Area, approximately 159 ft northeast of 216-Z-18; N-38940, W-76880

Description: 6 in. dia., 80 ft deep
Depth to water: not to water
Open interval: none

Well Number 299-W18-99

Location: 200 West Area, approximately 239 ft northeast of 216-Z-18; N-38949, W-76768

Description: 3 in. dia., 135 ft deep
Depth to water: not to water
Open interval: none

Evaluation of Scintillation Probe Profiles:

Wells W18-9, W18-10, W18-11, W18-12, W18-93, W18-94, W18-95, W18-96, W18-97, W18-98 and W18-99 monitor the 216-Z-18 Crib. Minor increases in radiation intensity occur in wells W18-9 and W18-10 between 1973 when the crib was taken out of service and 1976. The zone of contamination has increased in intensity and width in the 3 year period. The radioactive contaminants are found at the [25 to 60 ft] depths from the ground surface. The remaining profiles from wells in and around the crib show near background or low levels of radiation. The overall gamma-emitting contamination beneath the 216-Z-18 Crib is very minor as indicated by the scintillation probe profiles.

On the basis of the scintillation probe profiles migration of minor concentrations of gamma-emitting radionuclides is occurring beneath the 216-Z-18 as the system equilibrates. These data indicate breakthrough to the groundwater has not occurred at this site.(3)

TABLE 22. Groundwater Sample Results from Wells Monitoring 216-Z-18 Crib.[a]

Radionuclide (pCi/ml)[b]	Years Sampled									
	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Well 299-W18-9										
Total Alpha	1.2-2	-	-	-	-	-	-	-	-	-
Total Beta	-	-	-	-	-	-	-	-	-	-
Well 299-W18-10										
Total Alpha	1.1E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2	-
Total Beta	-	-	3.0E-1	1.5E-1	9.5E-2	7.5E-2	7.5E-2	7.6E-2	2.6E-1	-
Well 299-W18-11										
Total Alpha	1.1E-2	-	1.6E-2	1.6E-2	1.6E-2	1.6E-2	-	-	-	-
Total Beta	-	-	5.8E-1	1.4E-2	8.6E-2	7.4E-2	-	-	-	-
Well 299-W18-12										
Total Alpha	1.2E-2	-	-	1.6E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2	1.6E-2
Total Beta	-	-	-	1.5E-1	9.5E-2	7.4E-2	7.5E-2	7.6E-2	7.3E-2	7.3E-2

[a]Reference 4.

[b]Some values are averages computed for the year.

LOCATION:

Hanford Coordinates: (1,5)

N-39420
W-75991
N-37050
W-76950

STATUS: Active

SITE: 216-Z-19 Ditch

REFERENCE DWGS:
H-2-14035
H-2-32528
H-2-34762

OTHER NAMES:
Z Plant Ditch
216-U-10 Ditch

Area Description of Location: (D)

200 West Area

Starts east of the 216-Z-1A Tile Field and flows south to the 216-U-10 Pond

ELEVATIONS & DEPTHS: (D,2)

Ground: 666-661 ft above msl
Site Depth: Nominal 4 ft below grade
Water Table: 186-180 ft below grade

DESCRIPTION OF FACILITY: (D,1,5)*

The site is a 2765-ft-long ditch with a 4-ft-wide bottom and a nominal depth of 4 ft. Approximately 550 ft of the head end of the ditch is common with the 216-Z-1 Ditch; the first 120 ft is also common with 216-Z-11 Ditch.

ASSOCIATED STRUCTURES: (D)

Two concrete head walls where the ditch passes under 16th Street

Culvert under 16th Street

One concrete headwall each where effluents from the 231-Z and 234-5Z Buildings enter the ditch.

SERVICE DATES: (1,5)

From	To	Function
5/71	-	Receives process cooling water and steam condensate from the 234-5Z Bldg, cooling and seal water from the 291-Z Bldg and cooling water from PNL operations in the 231-Z Bldg.

COMMENTS: (D,1,34)*

Radionuclide inventory is reported as part of 216-U-10 Pond inventory (see Table 1)

During the excavation of 216-Z-19, a 425-ft section of the previously buried 216-Z-1 Ditch was exposed at the head end

The first 120 ft of 216-Z-19 is common with 216-Z-1 and 216-Z-11

COMMENTS (Continued): (D,1,34)

In March 1976 an estimated 30-60 g of alpha contamination was released from 234-5Z Bldg. The discharge volume was subsequently reduced. Three earth dams were constructed to impound the water and allow contaminants to settle. Sprinklers were used to keep the downstream sections from drying and blowing. The dams were removed in June 1978

Soil sample results from 216-Z-19 Ditch are shown on Table 23.

FOOTNOTES:

*References 1 and 34 report the ditch length as 2765 ft. Only one document, Reference 4, reported the length of 2675 ft. The lengths of ditch common to other Z ditches is estimated from drawings.

TABLE 23. Soil Sample Results from the 216-Z-19 Ditch in March and April 1976.[a]

Soil Sample Location	Date	^{241}Am	^{239}Pu	$^{89,90}Sr$	^{137}Cs	^{226}Ra	^{40}K	^{139}Ce	^{154}Eu
West Bank Head End	3/24/76	770	21,000	198	1.6	0.43	11.1	0.12	*
West Bank 500 ft Downstream	3/24/76	2,300	5,200	402	1.1	0.47	12.1	*[d]	*
East Bank 100 ft North of 16th Street	3/24/76	898	-[c]	-	1.0	0.42	12.3	*	*
East Bank 200 ft of 16th Street	3/24/76	260	4,900	56	1.1	0.53	13.0	*	*
N.W. Bank at U-10 Inlet	3/24/76	844	-	114	19.1	0.52	11.5	*	*
Ditch at Outfall	4/21/76	563	33,000	-	0.7	0.40	11.0	0.40	0.40
Ditch Near 16th Street	4/21/76	630,000	8.8	-	3,800	5,200	130,000	1,400	4,300
Ditch at Entrance	4/21/76	8,200,000	-	-	120,000	5,000	130,000	*	4,900

[a]Reference 34

[b]All units are pCi/gram dry weight.

[c] "-" indicates no analyses were performed.

[d] "*" indicates no radionuclides were detected.

REFERENCES

1. K. M. Harmon, et al., Resource Book - Disposition (D&D) of Retired Contaminated Facilities at Hanford, BNWL-MA-88, Appendix I, (unclassified), Battelle-Northwest Laboratory, Richland, Washington (August, 1975).

2. 200 West Area Water Table Maps, Hydrologic Sciences Unit, Environmental Analysis and Monitoring Group, Health, Safety and Environment, RHO-H-2-38397 Rev 5, Sheet 5, Rockwell Hanford Operations, Richland, Washington (December 1979).

3. K. R. Fecht, G. V. Last and K. R. Price, Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells, Volume II, ARH-ST-156 (unclassified), Atlantic Richfield Hanford Company, Richland, Washington (June 1977).

4. D. R. Friendrichs, Comprehensive Information Retrieval and Model Input Sequence (CIRMIS), BNWL-2235 and 2236, Battelle-Northwest Laboratory, Richland, Washington (April 1977).

5. L. L. Lundgren, Radioactive Liquid Waste Disposal Facilities 200 West Area, ARH-2155, (unclassified), Atlantic Richfield Hanford Company, Richland, Washington (August 31, 1971).

6. H. V. Clukey, Tabulation of Radioactive Liquid Waste Disposal Facilities, HW-33305, (unclassified), General Electric Company, Richland, Washington (October 8, 1954).

7. H. V. Clukey, Tabulation of Radioactive Liquid Waste Disposal Facilities, HW-43121, (unclassified), General Electric Company, Richland, Washington (May 10, 1956).

8. K. F. Baldridge, Unconfined Underground Radioactive Waste and Contamination in the 200 Areas - 1959, HW-60807, (unclassified), General Electric Company, Richland, Washington (July 15, 1957).

9. J. D. Anderson, Input and Decayed Values of Radioactive Liquid Wastes Discharged to the Ground in the 200 Areas Through 1975, ARH-CD-745, Atlantic Richfield Hanford Company, Richland, Washington (July 8, 1976).

10. J. D. Anderson and B. E. Poremba, Radioactive Liquid Wastes Discharged to Ground in the 200 Areas During 1977, RHO-CD-34-40, Rockwell Hanford Operations, Richland, Washington (March 20, 1978).

11. J. D. Anderson and B. E. Poremba, Radioactive Liquid Wastes Discharged to Ground in the 200 Areas During 1978, RHO-CD-78-34-4Q, Rockwell Hanford Operations, Richland, Washington (March 26, 1979).

12. G. J. Sliger, Radioactive Liquid Wastes Discharged to Ground in the 200 Areas During 1979, RHO-CD-79-34 4Q, Rockwell Hanford Operations, Richland, Washington (March 6, 1980).

13. J. E. Mirabella, Radioactive Liquid Wastes Discharged to Ground in 200 Areas During 1976, ARH-CD-743 4Q, Atlantic Richfield Hanford Company, Richland, Washington (May 9, 1977).

14. E. Doud, Index of CPD Crib Building Numbers Designs of CPD Radioactive Liquid Waste Disposal Sites, HW-55176, Pt. II, General Electric Company, Richland, Washington (October 22, 1959).

15. S. M. Price, et al., Distribution of Plutonium and Americium beneath the 216-Z-1A Crib: A Status Report, RHO-ST-17, Rockwell Hanford Operations, Richland, Washington (February 1979).

16. D. T. Crawley, "Use of Z-1A Tile Field and Z-12 Crib," Letter to R. E. Olson, (November 20, 1967).

17. R. J. Sloat, Hanford Low-Level Waste Management Reevaluation Study, ARH-231, deleted, Atlantic Richfield Hanford Company, Richland, Washington (December 29, 1967).

18. U.S. ERDA, Waste Management Operations, Hanford Reservation, Vol. 1 and 2, ERDA-1538, (December 1975).

19. V. L. McGhan and D. W. Damschen, Hanford Wells, PNL-2894, Pacific Northwest Laboratory, Richland, Washington (May 1979).

20. H. G. Ruppert, Unconfined Underground Radioactive Waste and Contamination in the 200 Areas, HW-28471, General Electric Company, Richland, Washington (July 1, 1953).

21. R. E. Brown and H. G. Ruppert, Underground Waste Disposal at Hanford Works, HW-9671, (unclassified), General Electric Company, Richland, Washington (May 3, 1948).

22. J. M. Smith, Audit of Radioactive Waste to Ground Through the 231-Z-Dry Well and Cribs, February 1945 through December 1948, HW-12468, (unclassified), General Electric Company, Richland, Washington (February 9, 1949).

23. R. E. Brown and H. G. Clukey, The Underground Disposal of Liquid Wastes at the Hanford Works, Washington, HW-17088, (unclassified), General Electric Company, Richland, Washington (February 1, 1950).

24. J. R. Eliason, Earth Sciences Waste Disposal Investigations January through June, 1966, BNWL-CC-887 (unclassified), Battelle-Northwest Laboratory, Richland, Washington (November 1, 1966).

25. J. D. Ludowise, Report on Plutonium Mining Activities at 216-Z-9, RHO-ST-21, Rockwell Hanford Operations, Richland, Washington (September 1978).

26. L. E. Bruns, "Recuplex Inputs to Z-9 Crib," Letter to R. E. Issacson (April 10, 1973).

27. A. E. Reissenauer, 216-Z-9 Core Sampling Data, HW-61787, RD, (unclassified), General Electric Company, Richland, Washington (September 3, 1959).

28. A. E. Smith, Nuclear Reactivity Evaluations of 216-Z-9 Enclosed Trench, ARH-2915, Atlantic Richfield Hanford Company, Richland, Washington (December 1973)

29. M. C. Jacobs and D. L. Uebelacker, Radioactive Liquid Wastes Discharged to Ground in the 200 Areas During 1970, ARH-2015, Pt. 3, Atlantic Richfield Hanford Company, Richland, Washington (April 7, 1971).

30. K. W. Owens, Personal Communication to D. T. Crawley (February 13, 1980).

31. D. T. Crawley, Plutonium-Americium Soil Penetration at 234-5 Building Crib Sites, ARH-1278, Atlantic Richfield Hanford Company, Richland, Washington (June 10, 1969).

32. K. W. Owens Personal Communication to D. T. Crawley (May 2, 1980).

33. R. E. Olson, "Diversion of Waste Within 216-Z-18 Disposal Site," Letter to C. J. Francis (February 28, 1973).

34. R. E. Wheeler, "Assessment of 216-Z-19 Crib," Letter to J. V. Panesko (September 8, 1977).

APPENDIX A

LETTER REFERENCES

Atlantic Richfield Hanford Company

Date: April 10, 1973

To: R. E. Isaacson

From: L. E. Bruns ORIGINAL SIGNED BY L. E. BRUNS by jmb

Subject: RECUPLEX INPUTS TO Z-9 CRIB

The following material is estimated to have gone into the Z-9 covered trench in the course of Recuplex processing:

Al as $Al(NO_3)_3$, $Al(OH)_3$, $AlF(OH)_2$; small amounts of Al_2O_3, $Al_3(SO_4)_2$ and $AlCl_3$ - 100 tons

NO_3 - total 1,500 tons

Mg as $Mg(NO_3)_2$, $Mg(OH)_2$; possibly some $MgSO_4$, $MgCO_3$, and $MgCl_2$ - 35 tons

Ca as $Ca(NO_3)_2$, $Ca(OH)_2$, CaF_2; small amounts of $CaSO_4$ and $CaCO_3$ - 30 tons

Fe as $Fe(NO_3)_3$, $Fe(OH)_3$, FeF_3; small amounts of $Fe_2(CO_3)_3$ and $Fe_2(SO_4)_3$ - 25 tons

Cr, Pb, Ni, etc., as nitrates and hydroxides - 2 tons

Cd as $Cd(NO_3)_2$, $Cd(OH)_2$ - 0.9 tons

Organic as 15-25% TBP in CCl_4, DBBP and trace MBP 120 tons

Organic as lard oil (CCl_4-50 percent and lard oil 50 percent) - 60 tons

Cl as CCl_4 deteriorating to HCl, CO and CO_2 - 100 tons

F as AlF^{++} - 30 tons

Solids as SiO_2, Al_2O_3, $Fe_2(DBP)_3$, $CaSO_4$, $Al_2(CO_3)_3$, $MgSiO_2$, carbonaceous material and other metallic DBP's such as Cr - 6 tons

SO_4 as $CaSO_4$, $Al_2(SO_4)_3$ and $Pu(SO_4)_2$ - 2 tons

Pu as PuO_2, $Pu(SO_4)_2$, $Pu(OH)_4$, $Pu(OH)_x$, PuF_4, $PuCl_4$, $Pu(CO_3)_2$, and $Pu(NO_3)_4$ - approximately ~~100~~ kilograms

Am as Am_2O_3, $Am(NO_3)_3$ and $Am(OH)_3$ - approximately 2.5 kilograms

The fact that the specific gravity of the soil increased little signifies that the less soluble metals such as Ca, Al, and Cd did not remain in the top soil but disseminated downward. Hence, it is doubtful that any significant cadmium concentration is left in the area of highest plutonium concentrations.

Apparently, trapped CCl_4, TBP, DBP and MBP broke down with time to free Cl ions and phosphoric acid, and it is conceivable that "activity" has taken place since Recuplex shutdown. Leaching of plutonium by Cl^- and $PO_4^{\equiv}$ to an equilibrium concentration with the soil is possible with time.

LEB:jmh

cc: LI Brecke
DJ Brown
MH Curtis
RE Felt
RD Fox
LM Knights
TR McKenzie
MC Metz

DATE: November 20, 1967

TO: R. E. Olson

FROM: D. T. Crawley

D. T. Crawley

SUBJECT: USE OF Z-1A TILE FIELD AND Z-12 CRIB

Calculations of the rate of flow of waste to the Z-1A tile field and Z-12 crib indicate that only a fraction of each site is actually being used for waste disposal. In order to confirm these calculations, shallow wells were drilled at each site to determine the actual distribution within the site. The purpose of this letter is to report the results.

In March, 1967, six shallow wells were drilled at each disposal site. The wells were drilled until alpha contamination was encountered, or a few feet below where it could be expected to be encountered. In all cases, a portable poppy was used to detect the alpha soil contamination. Attached are pertinent details of each disposal site (table I), the results of each well (table II), and sketches of each well location (figures 1 and 2). The outlet end of the pipe to the Z-1A tile field was extended 100 feet down the center trunk in June, 1966. The abandoned portion of Z-1A was used to determine the distribution pattern. The wells are all cased with 6-inch carbon steel. The well drilling confirmed the prior calculations that only a fraction of each disposal site was being used. About one-third of both Z-1A and Z-12 have been used.

DTC:cmb

Attachments

cc: LI Brecke
DJ Brown
LE Bruns
DW Corbell
WA Haney
WP Ingalls
LM Knights
ME Muller
GC Oberg
RJ Sloat
JA Teal
RE Van der Cook
File
Extras - 3

TABLE I

CRIB DETAILS

216-Z-12 Crib

One long, perforated, vitreous clay tile pipe laid on top of 4 feet of gravel and backfilled to grade level.

Diameter of pipe:	12 inches
Length of pipe:	300 feet
Width of bottom of excavation:	20 feet
Area of crib bottom:	6000 square feet

In use since March 12, 1959.

216-Z-1A Tile Field

A herringbone pattern of clay pipe laid on top of 4 feet of gravel and backfilled with about 5 feet of spoil for a frost blanket.

Diameter of pipe:	8 inches
Length of individual laterals:	70 feet
Length of center trunk line:	260 feet
Total pipe length:	1240 feet
Width of bottom of trench excavation:	4 feet
Area of tile field bottom:	~ 4800 square feet

First 100 feet of tile field in use from May, 1964, through May, 1966. Entrance line extended 100 feet down trunk like at end of May, 1966. Entrance line extended 75 additional feet down trunck line on October 5, 1967.

TABLE II

WELL DRILLING RESULTS (MARCH, 1967)

DETERMINATION OF PLUTONIUM DISTRIBUTION IN CRIBS

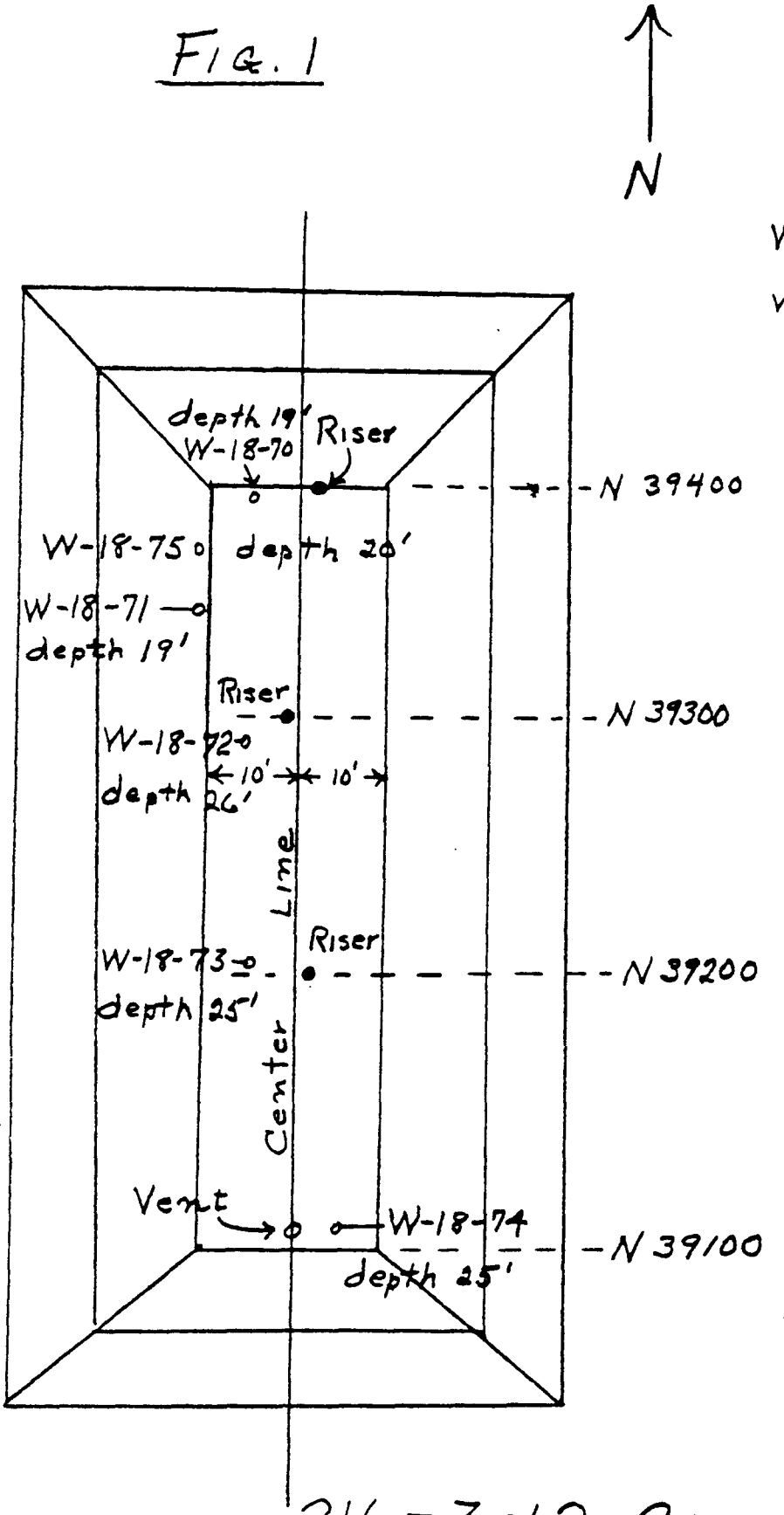
216-Z-12 (~ 20 feet to bottom of crib)

Well No.	Depth Drilled Feet	Contamination Encountered
W-18-70	19	220,000 d/m by Juno in fine sand.
W-18-71	19-2/3	> 40,000 d/m by poppy.
W-18-72	26	None
W-18-73	25	None
W-18-74	25	None
W-18-75	19	5,000 d/m by poppy.
	20.5	> 40,000 d/m by poppy.

216-Z-1A (~ 9 feet to bottom of crib)

W-18-76	19.5	> 40,000 d/m by poppy.
W-18-77	25	None
W-18-78	17	40,000 d/m
W-18-79	23	30,000 d/m
W-18-80	21.5	20,000 d/m
W-18-81	16.5	5,000 d/m
	25	10,000 d/m
	32	25,000 d/m

FIG. 1



W-18-70 7'6" west of riser

W-18-71 46' north of 39300
13' west of center line

W-18-72 2'4" south of N39300
6'8" west of riser

W-18-73 2' north of N 39200
6' west of riser

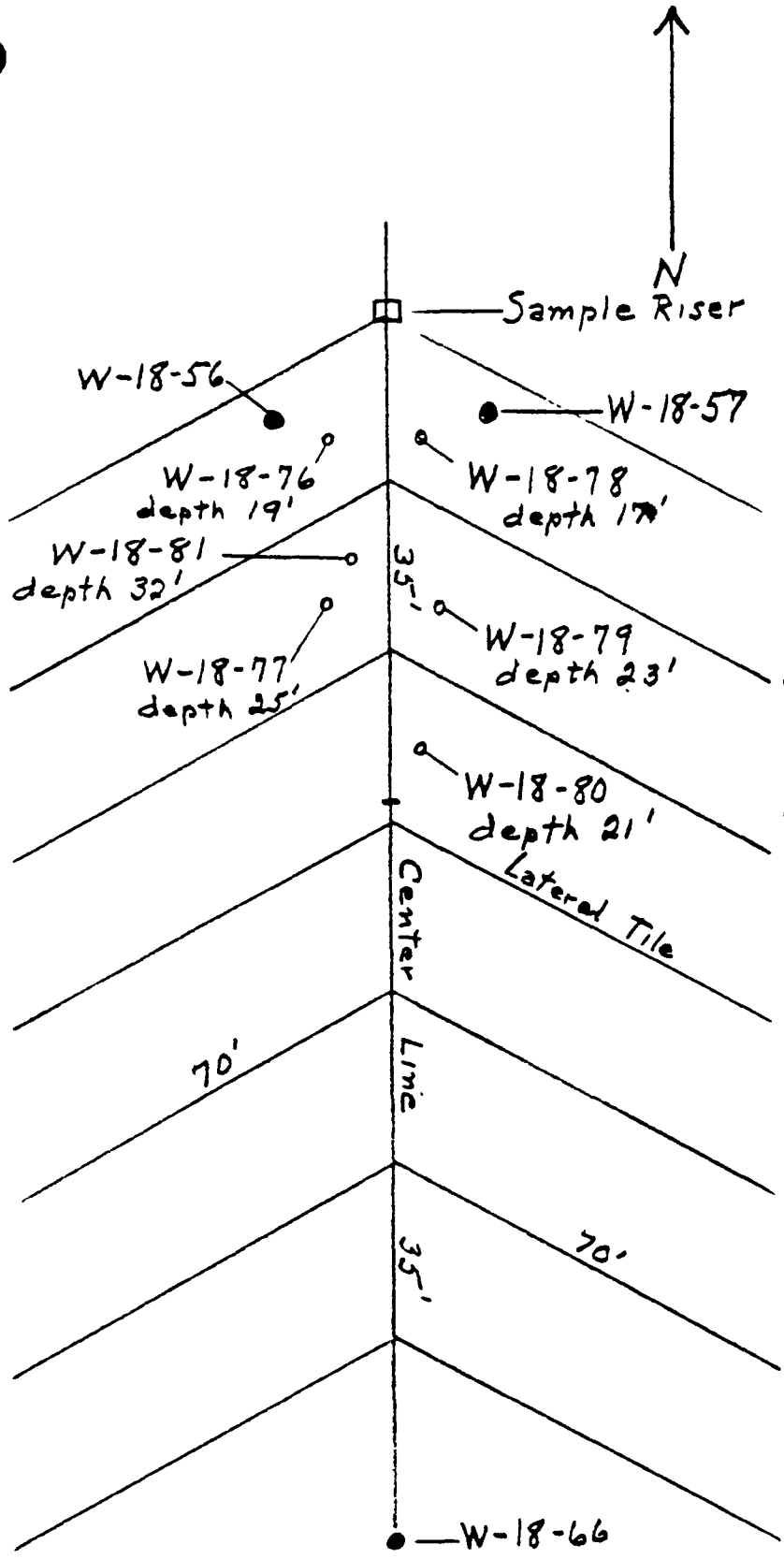
W-18-74 4'6" east of vent

W-18-75 25' south of N 39400
13' west of center line

DRAWING NOT TO SCALE

216-Z-12 CRIB

FIG. 1



W-18-76 26'6" South of sample riser
10' West of center Line

W-18-77 61' South of sample riser
8' West of center Line

W-18-78 26'6" South of sample riser
4'6" east of center line

W-18-79 60' South of sample riser
6'6" east of center line

W-18-80 88' South of sample riser
4' East of center Line

W-18-81 51' South of sample riser
4'6" West of center Line

DRAWING NOT TO SCALE

FIG 2

216 Z-1A TILE FIELD

.tic Richfield Hanford Company

Date: February 28, 1973

To: C. J. Francis

From: R. E. Olson

Subject: DIVERSION OF WASTE WITHIN 216-Z-18 DISPOSAL SITE

Reference: Letter, February 6, 1973, C. J. Francis to R. E. Olson, "Specific Retention Volume to 216-Z-18 Disposal Site"

The original 216-Z-18 disposal site for liquid wastes contained six sections, with a capacity of 134,000 gallons per section. The last section was filled on September 29, 1972.

Four sections with the same capacities were added to the site in June 1972.

The first additional section, A-NE, was filled on February 28, 1973, and the waste stream was diverted to section A-SE.

Present Status

Section	Use Dates
Southwest	4-04-69 to 12-05-69
Northwest	12-05-69 to 7-31-70
South	7-31-70 to 3-31-71
North	3-31-71 to 11-30-71
Southeast	11-30-71 to 4-28-72
Northeast	4-28-72 to 9-29-72
A-NE	9-29-72 to 2-28-73
A-SE	2-28-73 to 5-15-73
A-NW	
A-SW	NEVER USED (D.T. Crawley, 5-2-80)

Reference drawings: H-2-26093, H-2-26094 and H-2-36551

REO:DWC:ph

cc: LI Brecke, DJ Brown, DW Corbell, DT Crawley, JE Hammelman, MC Jacobs, GR Kiel, LM Knights, BJ McMurray, DC Nelson, RE Olson (2), PW Smith

Internal Letter

Rockwell International

Date · September 8, 1977

No · 72330-77-082

TO (Name, Organization, Internal Address)
· J. V. Panesko
·
·

FROM (Name, Organization, Internal Address, Phone)
· R. E. Wheeler
·
·
· 2-2928

Subject · Assessment of 216-Z-19 Ditch

The attached report is my assessment of the radioactivity in the 216-Z-19 ditch.

The assessment is based on recent surveys of the Z-19 ditch, Environmental Surveillance data, personal interviews with Radiation Monitoring and Laboratory personnel, Battelle-Northwest and Rockwell Hanford Operations documents on special environmental studies, and Environmental Protection annual reports. After reviewing and evaluating this information, conclusions were made with respect to:

1. Quantity of Pu discharged to the environment by way of Z-19.
2. Location of the higher contamination levels in the ditch.
3. Resuspension potential for the Plutonium and Americium in the ditch.
4. The level of Plutonium reaching the water table.

Altnough not included as part of the report, the following recommendations are made:

1. Animal species that are resident around the Z-19 ditch be sampled to determine if radionuclides are being transported by the fauna.
2. The Radiation Monitoring Environmental Surveillance group performs more routine radiation surveys of Z-19 ditch to track contamination.
3. The Environmental Surveillance Program should include more extensive sampling of the water and sediment in the ditch.
4. Additional testwells should be drilled closer to the Z-19 ditch to provide the means for more intensive groundwater surveillance around the ditch.
5. Additional ambient air sample station should be established around the Z-19 ditch to monitor resuspension of radionuclides from the ditch.
6. Additional evaluation be performed to determine the distribution of contamination in the ditch with respect to depth.

I have plans to include recommendations 1, 2, 3, and 5 as part of the Environmental Surveillance Program. The Research Department will be consulted on recommendation 4. I have been advised that information that can aid in the evaluation mentioned in recommendation 6 may be available within the company.

R. E. Wheeler

REW/kkc

Att.

cc:
G. C. Owens
EPS Staff

1 ATTACHMENT I

ASSESSMENT of 216-Z-19 DITCH

INTRODUCTION

The 216-Z-19 ditch in the 200-West area receives low level radioactive liquid waste from the 231-Z and 234-5Z complex. Although low level, the continuous flow of radioactive liquid from the plutonium processing plant over the years and the several upsets in the plant have delivered multigram quantities of plutonium to the environment by way of the Z-19 ditch.

Because of the toxicity of the radioisotopic contaminants in the ditch, questions have been raised as to the impact the 216-Z-19 ditch has on its surrounding environment. How much plutonium has been discharged to the environment by way of Z-19 ditch? Where is the contamination accumulating in the Z-19 ditch? What is the resuspension potential for plutonium and Americium in the Z-19 ditch? Is plutonium reaching the water table and if so to what levels?

Assessment of 216-Z-19 Ditch

OBSERVATIONS

1. Physical Description

   a) Dimensions - 2,765 ft. by 4 ft. (Includes 665 ft. of the old 216-Z-1 ditch and 235 ft. of the old 216-Z-11 ditch.)

   b) Location - Starts 760 ft. southeast of the 234-5 Building, 450 ft. west of Camden Avenue and runs in a southwesterly direction to the 216-U-10 Pond.

   c) Elevations - Ground: 673 ft. above sea level
      Water Table: 475 ft. above sea level (1973)

   d) Estimated flow into ditch - 1×10^7 gallons/month

2. Function

   a) Service Dates - 5/71 to Present.

   b) Receives and transports low level liquid radioactive waste to 216-U-10 Ponds from the following:

      1) Process cooling water, steam condensate, roof and sink drain water, and vacuum pump seal and compressor cooling water from the 234-5Z Plant complex.

      2) Cooling water from Battelle laboratory operations in the 231-Z Building.

3. Plutonium Discharges to the 216-Z-19 Ditch
   (Based on Z-Plant and 231-Z Discharge Data)

Year	Pu (grams)	
1971	< 34.9	(includes data on Z-11 ditch from 1/71 to 5/71)
1972	< 56.4	
1973	< 8.3	
1974	< 3.3	
1975	< 3.0	
1976	< 74.8	
1977 (1st qtr.)	< 14.8	
	<195.5 grams discharged from January 1971 through March 1977	

4. Radioisotopic Analyses of Environmental Surveillance Samples from 216-Z-19 Ditch

a) Mud, water and aquatic vegetation samples from head end of ditch. (Table A)

b) Special soil and vegetation samples from specific locations around the ditch. (Table B)

c) Various vegetation samples from inside the ditch. (Table C)

d) Aerial Radiation Survey of U-Pond and Z-19 Ditch showing ^{241}Am Concentration (Figure I).

TABLE A

Mud, Water and Aquatic Vegetation Samples from the Head End of the Z-19 Ditch

Units Are pCi/gram Dry Weight unless otherwise noted

Year		^{241}Am	^{239}Pu
1974	Water		
	Mud	4,230	
	Vegetation	10,200	
1975	Water		< 0.1 pCi/ml (Annual Average by Z-19 grab sampl
	Mud	610	
	Vegetation		
1976	Water		7.2 pCi/ml (Annual Average by Z-19 grab sampl
	Mud	780	1300
	Vegetation		370
1977	Water		84 pCi/ml (First Quarter Avera by 2904-Z A samples)
	Mud	38,100	

TABLE B

SPECIAL SOIL AND VEGETATION SAMPLES FROM
Z-19 DITCH IN MARCH AND APRIL 1976

All Units are pCi/gram Dry Weight

Sample Location	*Material	Date	^{241}Am	^{239}Pu	$^{89\ 90}Sr$	^{137}Cs	^{226}Ra	^{40}K	^{139}Ce	^{154}Eu
West Bank head end	Soil	3/24/76	770	21,000	198	1.6	.43	11.1	.12	
	Veg. dry	"	1,800	153		3	.91	12.4	.42	
West Bank 500 ft. Downstream	Soil	3/24/76	2,300	5,200	402	1.1	.47	12.1		
	Veg. dry	"	1,100	26.2		1.3	.79	11.6		
East Bank 100 ft. North of 16th St.	Soil	3/24/76	898			1	.42	12.3		
	Veg. dry	"	880	27		1.6	.72	12.1	.1	
East Bank 200 ft. South of 16th St.	Soil	3/24/76	260	4,900	56	1.1	.53	13		
	Veg. dry	"	720	32		1.1	.71	9.2	.11	
N.W. Bank at U-10 Inlet	Soil	3/24/76	844		114	19.1	.52	11.5		
	Veg. dry	"	170	71.6		2.6	1.3	10.6	.33	
From Ditch at Outfall	Soil	4/21/76	563	33,000		.7	.4	11	.4	.4
From Ditch Near 16th St.	Soil	4/21/76	630,000	8.8		3,800	5,200	130,000	1,400	4,300
From Ditch at Entrance to U-10	Soil	4/21/76	8,200,000			120,000	5,000	130,000		4,900

* The dry vegetation samples were separated from the soil samples by sieving and analyzed as a separate phase.

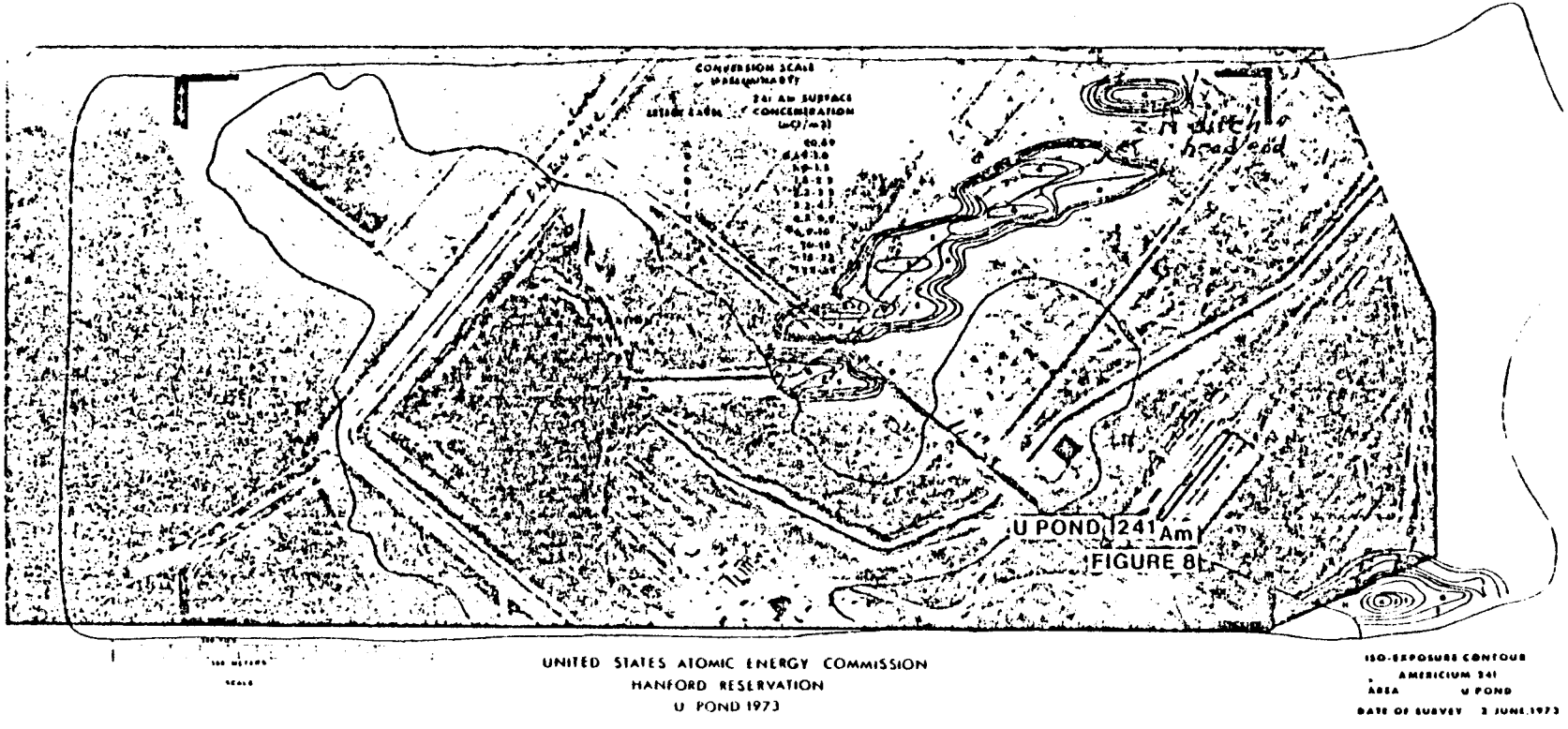
TABLE C

VARIOUS VEGETATION SAMPLES FROM
216-Z-19 DITCH

All Units are pCi/gram Dry Weight

Common Name	Date Sampled	^{241}Am	^{137}Cs	^{40}K	^{141}Ce	^{228}Th	No Pu Analyses
Algae	11/10/76	1400				4.5	
Cattail	11/19/76	4.4	5.4	11.6			
Asparagus	11/19/76	1.5	20.4	26.1	3.2		
Peach Leaf Willow	11/19/76	4.1	8.2	8			
Bullbrush	11/19/76	53.6	16.3				
Thistle	11/19/77	2.3	9	25.8	4		
Smart Weed	11/19/77	5.8	8.6	18.5			

Figure 1


U POND 241 Am
FIGURE 8L
UNITED STATES ATOMIC ENERGY COMMISSION
HANFORD RESERVATION
U POND 1973

5. Groundwater Studies

Groundwater samples taken since 1971 from testwells A299W-15-5 which is located approximately 100 ft. north of the Z-19 ditch head end and A299W-18-7 which is located approximately 400 ft. west of the ditch head end show gross alpha activity <.017 pCi/ml. ERDA Manual Chapter 0524 Table II limits are 5 pCi/ml for ^{239}Pu and 4 pCi/ml for ^{241}Am.

6. Radiation Surveys

A radiation survey by RM on June 29, 1977 revealed an open area, 25 to 50 ft.^{2}, in the Z-19 ditch about 75 yards upstream from the entrance to U-10 Pond that had a maximum reading of 18,000 dpm with a portable alpha meter.

7. Protective Barriers

a) In March, 1976, a series of three dams were placed in the Z-19 ditch to backup water in the upper end of the ditch to cover contamination along the banks. The dams also created ponds in the ditch in which contaminants could precipitate out and settle to the bottom rather than be carried to the U-10 Pond.

b) A thick growth of vegetation has developed in and along the banks of the Z-19 ditch over the years. This vegetation forms a protective barrier which prevents sediments form blowing out of the ditch.

c) There are no barriers to prevent local animals from eating and drinking from the Z-19 ditch.

8. Resuspension Study

Battelle Northwest conducted experiments from 1972 to 1975 at the Z-19 ditch and other sites to determine whether radioactive particles from the sites were resuspended and transported by wind. During the course of the study, the maximum observed air concentration for ^{239}Pu was 8×10^{-15} $\mu Ci/cm^3$ and 3×10^{-15} $\mu Ci/cm^3$ for ^{241}Am. The maximum permissible airborne concentrations (MPC 40hr) for ^{239}Pu and ^{241}Am are 2×10^{-12} $\mu Ci/cm^3$ and 6×10^{-12} $\mu Ci/cm^3$ respectively. Fallout level in the air for Plutonium in this area is approximately 1×10^{-17} $\mu Ci/cm^3$.

DATA EVALUATION

1. Table A of Observation 4 indicates that the average ^{239}Pu concentration of the water in the Z-19 ditch is below ERDA Manual Chapter 0524 Table I limits of 100 pCi/ml.

2. Table A, B, and C, indicates appreciable amounts of ^{239}Pu and ^{241}Am in sediments and soil in the Z-19 ditch.

3. Table B shows that the highest concentration of ^{239}Pu in the soil is at the head end of the Z-19 ditch while the highest concentrations of ^{241}Am and other outstanding radioisotopes are further downstream, near the ditch inlet to the U-10 Pond.

4. Figure 1 indicates that the higher concentrations of ^{241}Am in the Z-19 ditch are near the U-10 Pond inlet. Unfortunately, the ^{241}Am information is masked by high ^{137}Cs count rate from U-10 Pond as the Z-19 ditch crosses 16th Street and approaches the pond.

5. Table C shows algae as being the vegetation sample from the ditch with the highest concentration of ^{241}Am (1400 pCi/gram) which is more than 20 times higher than any other identified vegetation sample.

6. Analysis of groundwater samples from testwells near the Z-19 ditch indicates that the ratios of alpha concentration in the water to 0524 Table II limits are 0.003 for ^{239}Pu and .004 for ^{241}Am.

7. The Battelle Northwest resuspension study shows maximum observed airborne concentration to MPC 40hr ratios of 0.004 for ^{239}Pu and .0005 for ^{241}Am.

CONCLUSION

1. The estimate maximum amount of Plutonium discharged to the environment via the Z-19 ditch is 196 grams for the period January, 1971, through March, 1977.

2. Based on soil and sediment analyses, the majority of the Plutonium contamination discharged to the Z-19 ditch is accumulating around the head end of the ditch while the Americium contamination is migrating toward the ditch inlet to U-Pond.

3. There is no significant levels of Plutonium or Americium contamination reaching the groundwater. The concentration of alpha emitting isotopes in testwell samples indicate the level to be less than .003 and .004 of the ERDA Manual Chapter 0524 limits for water in an uncontrolled area for ^{239}Pu and ^{241}Am respectively.

4. Based on Battelle Northwest resuspension studies, airborne concentration for ^{239}Pu and ^{241}Am are substantially less than the maximum permissible concentrations (0.004 of MPC 40hr for ^{239}Pu and 0.0005 of MPC 40hr for ^{241}Am) but greater than fallout levels. The series of dams and the thick growth of vegetation in the 216-Z-19 ditch have contributed to the reduction of airborne contamination.

APPENDIX B

PERSONAL COMMUNICATIONS REFERENCES

Rockwell International

Atomics International Division
Rockwell Hanford Operations

No. 65463-80-003

COPIES TO

B. N. Anderson
D. T. Crawley
G. D. Forehand
H. E. McGuire
D. E. McKenney
J. A. Thies

TELEPHONE CONFERENCE

Time: 2:55 PM
Date: May 2, 1980

☐ Incoming ☒ Outgoing

With: D. T. Crawley
Representing: Plant Engineering

With: K. W. Owens
Representing: Environmental Engineering Group
Rockwell Hanford Operations

Commitment Made ☐ Yes ☒ No

File

Purpose Of Telecon

To obtain information about the 216-Z-18 liquid waste disposal site.

Text Of Telecon

Reference: Letter, February 28, 1973, R. E. Olson to C. J. Francis, "Diversion of Waste within 216-Z-18 Disposal Site"

The above letter reports the periods of use for the various sections of the 216-Z-18 disposal site. The western-most sections (designated A-NW and A-SW) have no period of use recorded. Mr. Crawley was questioned about the use of these sections and confirmed that they had not been used for waste disposal.

Additionally, Mr. Crawley reported that under present operating philosophy of tanking Z-Plant waste, the site will not be used in the future.

K W Owens
(Signature)

5-6-80
(Date)

Rockwell International

Atomics International Division
Rockwell Hanford Operations

RHO-LD-114

No. 65463-80-017

COPIES TO		TELEPHONE CONFERENCE
		Time: 11:30 AM; Date: Feb. 13, 1970
D. T. Crawley		☐ Incoming ☒ Outgoing
G. D. Forehand AMA		With: D. T. Crawley
H. E. McGuire		Representing: Plant Engineering
		With: K. W. Owens
		Representing: Environmental Engineering Group

Commitment Made ☐ Yes ☒ No

File

Purpose Of Telecon

To obtain information regarding the retirement of the 216-Z-12 and 216-Z-18 Cribs

Text Of Telecon

Mr. Crawley was contacted to obtain information concerning the deactivation of the 216-Z-12 and 216-Z-18 cribs. Whereas most of the 216-Z sites have been retired for quite some time and their deactivation documented in ARH-2155, "Radioactive Liquid Waste Disposal Facilities, 200 West Area", these two sites were active when that document was written.

Pertinent information obtained from this conference follows:

- Though both waste streams (to 216-Z-12 and to 216-Z-18) went through the 241-Z collecting facility, only the 216-Z-12 waste stream went through a settling facility; 216-Z-18 waste was cribbed without sending it through a settling facility.
- Both sites were removed from service in May, 1973. Waste which was previously discharged to these sites was rerouted to a tank farm as part of a project to discontinue ground disposal of Pu waste (Project 669).
- As an isolation measure, the line to each crib was blanked in the 241-Z Facility.

Kirk W Owens (Signature) 6-2-80 (Date)

Rockwell International

Atomics International Division
Rockwell Hanford Operations

RHO-LD-114

65463-80-017 (Addendum)
No.

COPIES TO

D. T. Crawley

G. D. Forehand DAF

H. E. McGuire

File/LB

TELEPHONE CONFERENCE

Time | Date

☐ Incoming ☐ Outgoing

With
D. T. Crawley

Representing

With
K. W. Owens

Representing

Commitment Made ☐ Yes ☐ No

File

Purpose Of Telecon

To obtain information regarding the retirement of the 216-Z-12 and 216-Z-18 Cribs.

Text Of Telecon

The following change should be made to the telephone conference report of the above number, dated February 13, 1980:

Waste going to 218-Z-18 did not go through a collection facility; waste was discharged directly to the crib. Waste routed to 216-Z-12 did go through a settling tank in the 241-Z collecting facility.

Kirk W. Owens
(Signature)

6-6-80
(Date)

MEETING MINUTES

SUBJECT:

TO: S. Catlow J. A. Thies G. D. Forehand G. J. Sliger	BUILDING 222-S/200 W
FROM: K. W. Owens	CHAIRMAN K. W. Owens

DEPARTMENT-OPERATION-COMPONENT	AREA	SHIFT	DATE OF MEETING	NUMBER ATTENDING
Analytical Labs, Quality Assurance	200W	2	May 5, 1980	2
Environmental Engineering, S.E.	200E			

The following changes should be made to the meeting minute report bearing this number and dated April 21, 1980.

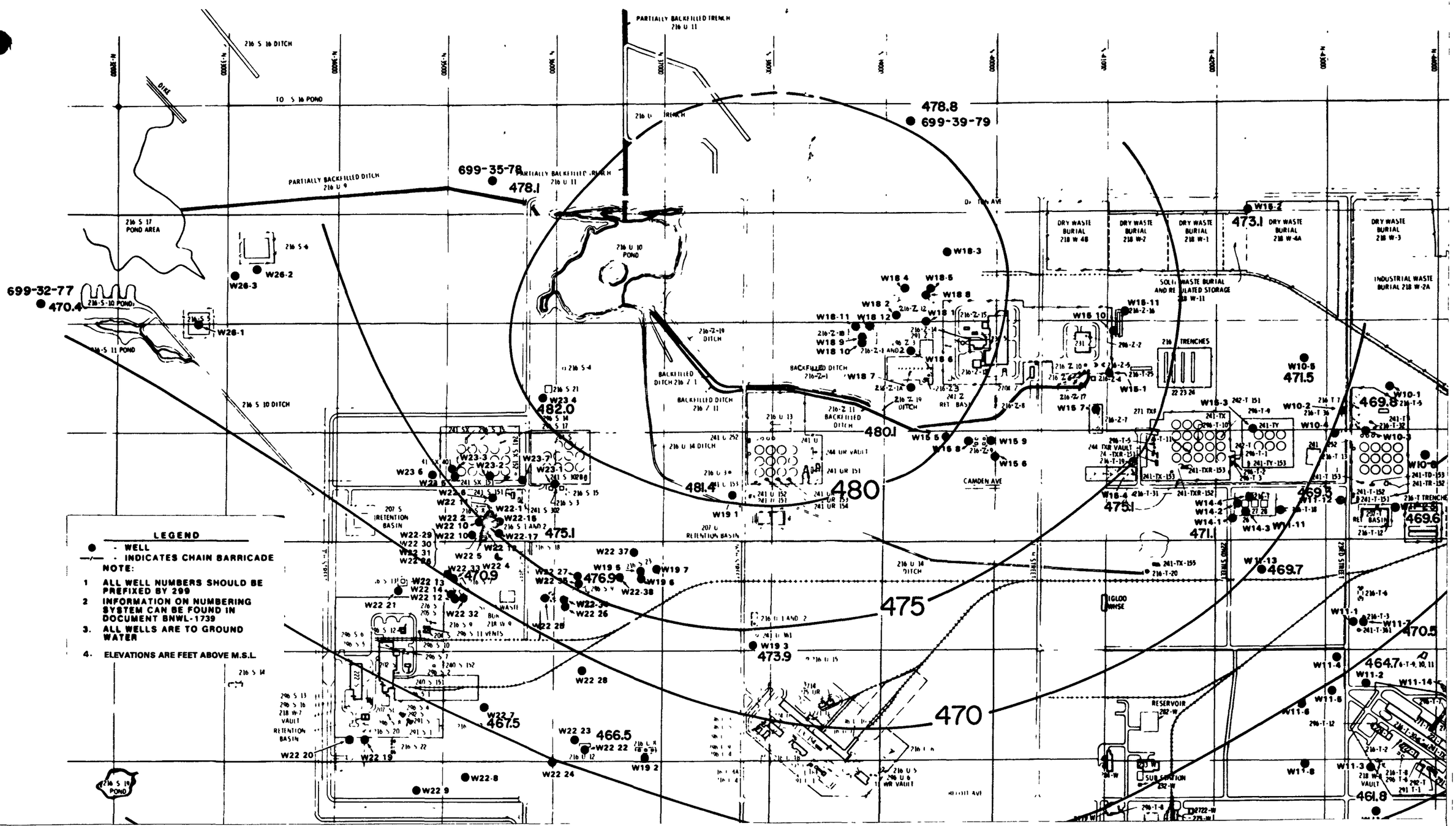
Under the fifth bullet (o) delete "4 x 10^{-3} uCi/l on".

Under the first bullet (o) on the second page delete "3 x 10^{-3} uCi/l on".

54-3000-100 (4 -58)

APPENDIX C

200 WEST AREA WATER TABLE MAP (2)



LEGEND

- ● - WELL
- —/— - INDICATES CHAIN BARRICADE

NOTE:

1. ALL WELL NUMBERS SHOULD BE PREFIXED BY 299
2. INFORMATION ON NUMBERING SYSTEM CAN BE FOUND IN DOCUMENT BNWL-1739
3. ALL WELLS ARE TO GROUND WATER
4. ELEVATIONS ARE FEET ABOVE M.S.L.

200 West Area Water Table Map (2)

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