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Results of the Separations Area Ground-Water Monitoring Network for 1984

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EXECUTIVE SUMMARY

The purpose of this report is to present a summary of the results for calendar year 1984 of the Rockwell Hanford Operations (Rockwell) ground-water monitoring program for the Separations Area of the Hanford Site. This monitoring program is in partial fulfillment of the U.S. Department of Energy (DOE) requirement that all radioactivity in the environment shall be monitored.

The objectives of the monitoring program are to 1) evaluate the quality of ground water for compliance with Rockwell and DOE guidelines, 2) assess the performance of disposal and storage sites in the Separations Area, 3) determine the impact of waste disposal operations on the ground water, and 4) provide data for hydrologic analyses and model application.

The 1984 Separations Area unconfined aquifer monitoring network included 127 wells. Water samples were collected monthly, quarterly, or semiannually from the wells in the network. These samples were selectively analyzed for total alpha, total beta, tritium, ^{90}Sr, ^{137}Cs, ^{60}Co, ^{106}Ru, uranium, and nitrate. Average radionuclide concentrations in monitoring wells for 1984 were similar to 1983.

Water levels were measured in 224 wells to produce water table maps of the Separations Area (annually) and of the Hanford Site (semiannually).

Radionuclide concentrations in the ground water within the Separations Area are compared with the Rockwell internal guidelines of RHO-MA-139, Environmental Protection Manual, Part L, and the Table II concentration guidelines of DOE Order 5480.1, Attachment XI-1, the latter being applicable at the Hanford Site boundary. The comparisons with Table II are conservative for the Separations Area since concentrations would be reduced by sorption, dispersion, dilution, and decay by the time flow reached the site boundary. Tritium, which is controlled on the basis of discharge concentrations, did not exceed the radioactivity specified in RHO-MA-139. Guidelines were exceeded at active liquid waste disposal facilities in the following cases.

- The average ^{90}Sr concentration in three wells at the 216-A-25 pond exceeded RHO-MA-139 guidelines in 1984, and in one of these wells the concentration exceeded Table II guidelines. This contamination was localized. Deactivation of the 216-A-25 pond was initiated during 1984.

- Concentrations of ^{234}U and ^{238}U exceeded RHO-MA-139 guidelines in three wells at the 216-B-62 crib, although Table II guidelines were not exceeded.

- The concentration of ^{238}U also exceeded RHO-MA-139 guidelines in three wells at the 216-U-10 pond, but was below Table II guidelines. The 216-U-10 pond was deactivated in 1984.

For inactive disposal facilities, guidelines were exceeded in the following cases.

- At the 216-B-5 reverse well, ^{90}Sr and ^{137}Cs concentrations exceeded RHO-MA-139 guidelines, and ^{90}Sr also exceeded Table II guidelines. The average ^{90}Sr concentration in this well for 1984 was similar to the concentration reported for 1983.
- The ^{90}Sr concentration also exceeded RHO-MA-139 guidelines in one well at the inactive 216-S-1 and -2 crib, although concentrations were similar to 1983.
- An investigation was initiated at the inactive 216-U-1,2 crib when the last sample of 1984 indicated total alpha concentration was above RHO-MA-139 guidelines.

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R. C. Routson provided technical guidance to the monitoring program.

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1.0 INTRODUCTION

1.1 BACKGROUND

The U.S. Department of Energy (DOE) Hanford Site is located in southeastern Washington State, approximately 170 mi (270 km) southeast of Seattle and 125 mi (200 km) southwest of Spokane (fig. 1). The Hanford Site is used for nuclear reactor operation, reprocessing of spent fuel, management of radioactive waste. The fuel reprocessing and radioactive waste management facilities in the 200 East and 200 West Areas are operated by Rockwell Hanford Operations (Rockwell).

Because the influence of liquid waste disposal activities extends beyond the 200 Areas, the Separations Area (see appendix A.3) has been designated as the area of interest for ground-water monitoring purposes. Rockwell maintains a ground-water monitoring program for the Separations Area as part of its waste management responsibility. This monitoring program, based on the requirements of DOE Order 5484.1, Environmental Protection, Safety, and Health Protection Information Reporting Requirements, focuses on evaluating the impact on the aquifer of liquid waste discharged to ground, as specified in DOE Order 5480.1, Environmental Protection, Safety, and Health Protection Program for DOE Operations, chapter XII, "Prevention, Control and Abatement of Environmental Pollution."

Radionuclide concentrations in the ground water are compared with Rockwell internal guidelines, as defined in RHO-MA-139, Environmental Protection Manual, Part L, and with the Table II concentration guidelines of DOE Order 5480.1, Attachment XI-1. The Rockwell RHO-MA-139 guidelines have been established with the goals of keeping contaminants in the ground water as low as reasonably achievable (ALARA) and meeting drinking water standards at the end of institutional control (assumed to be in 300 years). These guidelines are more restrictive than the DOE Table II guidelines. The DOE Table II guidelines are applicable as annual averages at the Hanford Site boundary, the Columbia River.

The Rockwell ground-water monitoring program for the Separations Area is coordinated with the Hanford Site ground-water monitoring program conducted by Pacific Northwest Laboratory (PNL). The PNL program is responsible for estimating and evaluating the impact on the ground water from operations at the Hanford Site.

1.2 PURPOSE AND OBJECTIVES

The purpose of this report is to present ground-water data collected during calendar year (CY) 1984 and to interpret the impacts of Rockwell processing operations on the unconfined aquifer.

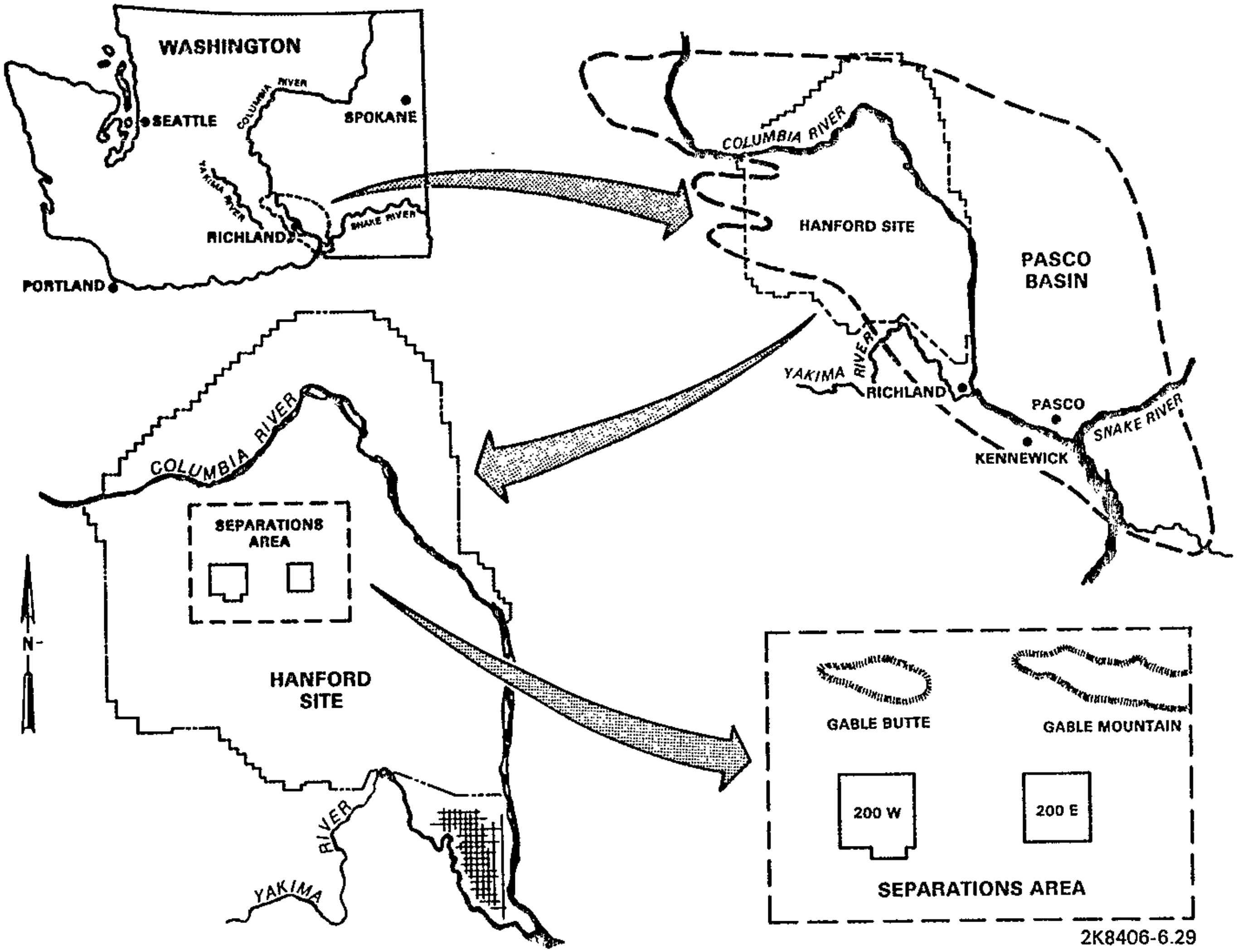

Figure 1. Separations Area Location Map.

The objectives of the Rockwell ground-water monitoring program are as follows:

- Evaluate the quality of ground water for compliance with guidelines
- Assess the performance of Rockwell's disposal and storage sites
- Determine the impact of waste disposal operations on the ground water
- Provide data for hydrologic analysis and model application. To complement the water quality data obtained by sampling and analyses, water table contour maps are developed to provide basic information on the directions and rates of ground-water flow.

The Plutonium and Uranium Extraction (PUREX) Plant and associated facilities continued in operation in 1984 after being restarted in late 1983. Operation of these process plants and support facilities had little impact on the quality of the ground water during CY 1984. This annual report will discuss each of the active cribs and provide average contaminant concentrations in the ground water for CY 1984.

1.3 HYDROGEOLOGY

Detailed documentation of the geology and hydrology of the Separations Area is reported in Geology of the Separation Areas (Tallman et al. 1979), Hydrology of the Separations Area (Graham et al. 1981), and in Hydrologic Studies within the Columbia Plateau, Washington: An Integration of Current Knowledge (Gephart et al. 1979). These reports are summarized in the following paragraph.

The Hanford Site is located within the Pasco Basin, a structural and topographic basin (see fig. 1) with boundaries defined by anticlinal structures of the basalt. There are three main geologic units beneath the Hanford Site, which are, in ascending order, the Columbia River Basalt Group, the Ringold Formation, and the glaciofluvial sediments. The Columbia River Basalt Group, composed of the Grande Ronde Formation, the Wanapum Formation, and the Saddle Mountains Formation, is a thick sequence of basalt flows extruded from fissures during the Miocene epoch. The Ringold Formation, a Pliocene fluvial sedimentary unit, overlies the Columbia River Basalt group except in areas where erosion has removed these sediments. The Ringold Formation is subdivided into four units on the basis of texture, which are, in ascending order, the basal Ringold unit (sand and gravel), the lower Ringold unit (clay, silt, and fine sand with lenses of gravel), the middle Ringold unit (occasionally cemented sand and gravel), and the upper Ringold unit (silt and fine sand). The glaciofluvial sediments, informally named the Hanford formation, were deposited on top of the Columbia River Basalt Group and the Ringold Formation during the Pleistocene epoch.

1.3.1 Occurrence of Ground Water

The unconfined aquifer is affected by disposal of waste from surface and subsurface disposal sites. The depth to ground water varies from 180 to 310 ft (55 to 95 m) on the 200 Area plateau. The unconfined aquifer is contained within the Ringold Formation and the overlying Hanford formation. Beneath the unconfined aquifer is a confined aquifer system consisting of sedimentary interbeds or interflow zones that occur between dense basalt flows or flow units. The bottom of the unconfined aquifer is the uppermost basalt surface or, in some areas, a clay zone of the Ringold Formation. The thickness of the unconfined aquifer in the Separations Area varies from less than 50 to 200 ft (15 to 61 m).

The sources of natural recharge to the unconfined aquifer are rainfall from areas of high relief to the west of the Hanford Site and the ephemeral streams, Cold Creek and Dry Creek. From the recharge areas, the ground water flows downgradient and discharges into the Columbia River (see Plate 1). This general flow pattern is modified by basalt outcrops and subcrops in the Separations Area and by artificial recharge from the Separations Area.

The unconfined aquifer beneath the Separations Area receives artificial recharge from liquid disposal areas. Cooling water disposed to ponds forms ground-water mounds beneath three high-volume disposal sites: U Pond in 200 West Area, B Pond east of 200 East Area, and Gable Mountain Pond north of 200 East Area (fig. 2). The water table has risen approximately 65 ft (20 m) under U Pond and 30 ft (9 m) under B Pond compared with pre-Hanford conditions (Newcomb et al. 1972). During 1984, U Pond was deactivated and part of Gable Mountain Pond was backfilled in preparation for deactivation.

1.3.2 Aquifer Properties

Large differences in aquifer properties are evident between the Hanford formation and the middle member of the Ringold Formation, the major units of the unconfined aquifer. Hydraulic conductivities range from 10 to 230 ft/day (3 to 70 m/day) for the middle Ringold unit and from 2,000 to 10,000 ft/day (610 to 3050 m/day) for the Hanford formation. Transmissivity increases from the 200 West Area to the 200 East Area. This transmissivity increase is a result of two factors: an increase in saturated thickness of the aquifer (the result of a drop in the basalt surface), and more of the unconfined aquifer is contained within the more permeable Hanford formation.

1.3.3 Flow Dynamics

Ground-water flow is perpendicular to the water table contours delineated in figure 2. Flow patterns are dominated by ground-water mounds under U Pond and B Pond. Flow from 200 West Area is primarily toward the east. The flow system in 200 East Area is complex due to changes in aquifer thickness and hydraulic properties, the influence of B Pond, and the basalt subcrops and structures of Gable Mountain and Gable Butte. The flow from

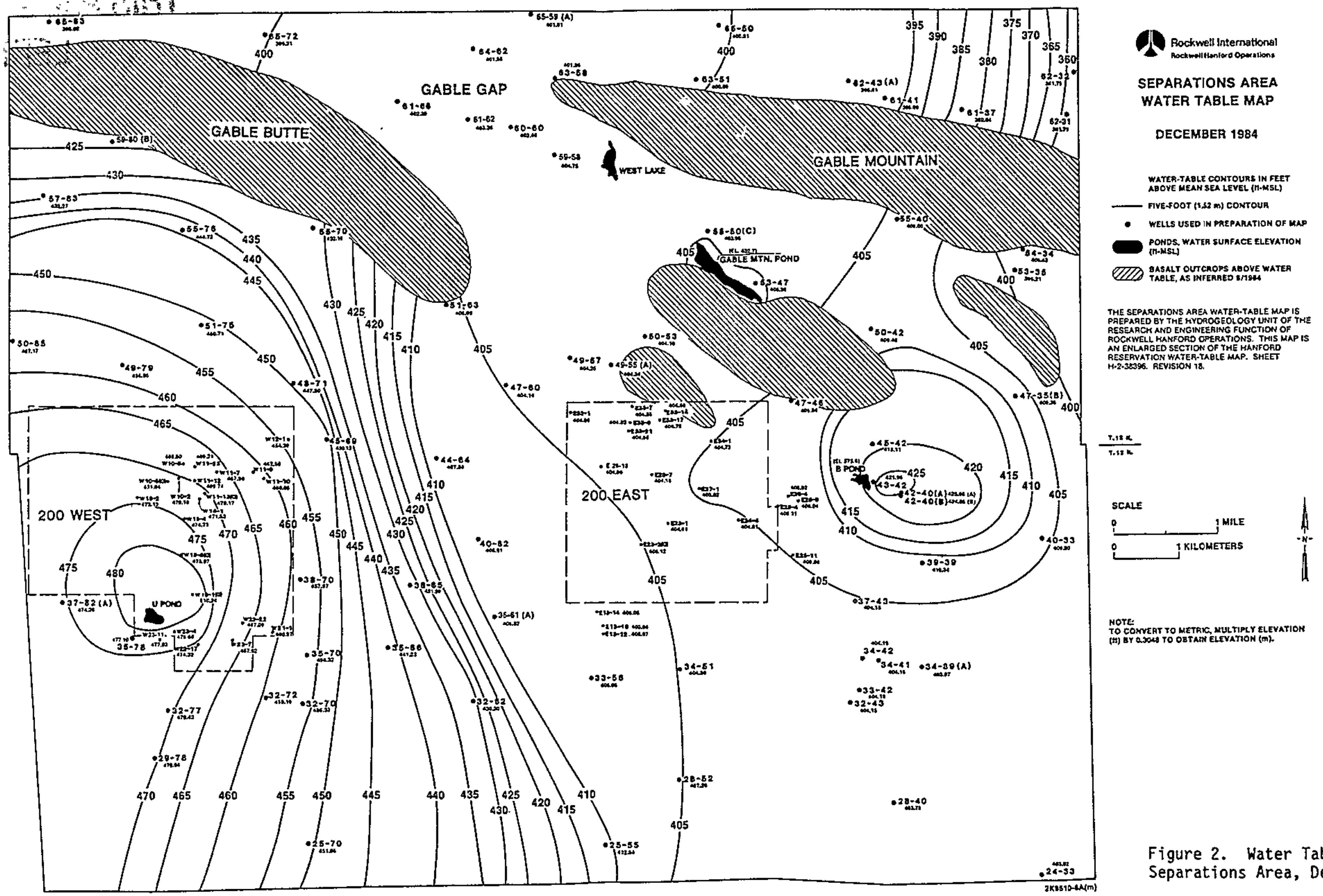

Figure 2. Water Table Map for the Separations Area, December 1984.

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200 East Area and environs is northward through Gable Gap (between Gable Butte and Gable Mountain) and southeasterly toward the Columbia River. Radial flow from the mound under B Pond is eastward toward the Columbia River, in addition to its combining with the northern and southeastern flow from 200 East Area.

1.3.4 Contaminant Transport

Contaminants in ground water move along flow paths that are perpendicular to water table contours. Migration of contaminants may be attenuated by factors within the geohydrologic system: sorption, dispersion, dilution, and radioactive decay.

Sorption is the process by which contaminants are chemically bound to the surface of sediment particles in the subsurface environment. A measure of sorption is the distribution coefficient, K_d, which describes the partitioning of a solute between liquid and solid phases in the subsurface environment.

The K_d may be defined as the mass of solute on the solid phase per unit mass of solid phase divided by the concentration of solute in solution expressed in mL/g (Freeze and Cherry 1979). Thus, if K_d = 0 mL/g, the solute would move with ground water, i.e., the solute would be very mobile. A large value of K_d would denote that the solute is essentially immobile, i.e., it would be sorbed on the sediment particles.

A term to better quantify the effect of sorption in relation to ground-water flow is the retardation factor, RF:

$$RF = 1 + (\rho_b/n)K_d \qquad (1)$$

where ρ_b is the bulk mass density of the soil and n is the porosity (Freeze and Cherry 1979). To obtain approximate values for Hanford, typical values of ρ_b and n are 1.65 g/cm^3 and 0.35, respectively. Therefore a reasonable relationship for Hanford would be

$$RF = 1 + 4.7K_d \qquad (2)$$

Equation 2 may be interpreted as follows: if K_d = 0 mL/g, then RF = 1 and the solute is not retarded, i.e., it moves at the same velocity as the ground water; if K_d = 1 mL/g, then RF = 5.7 and the solute is retarded relative to the ground-water velocity by a factor of 5.7. The larger the value of RF, the greater the retardation of the solute because of sorption on the sediment particles.

The distribution coefficient is a function of the ion involved, the mineralogy of the sediments, and the chemistry of the solution. Tritium and nitrates are considered mobile, because neither is sorbed by the soil.

Dispersion is the process whereby individual contaminant particles are slowed down along the flow path by spreading caused by sediment particles that serve as obstacles to flow. Dispersion is primarily a mechanical process.

The process of dilution occurs when water containing contaminants encounters volumes of cleaner water and the combination of the two waters results in a decrease in contaminant concentration.

In the case of radioactive contaminants, the concentration of contaminants in a plume may be reduced over time by the natural decay of the radioisotopes. The half-life of a radioisotope is the time required for a quantity of radioactive material to decay to one half of its activity. The concentration of a radioisotope will be reduced to one percent of the original concentration in less than 7 half-lives.

The attenuation mechanisms of sorption, dispersion, dilution, and radioactive decay serve as controls for the radionuclides disposed to the sediments at Hanford. Thus, concentrations of contaminants at the site boundary are much lower than when disposed in a liquid waste site.

2.0 SEPARATIONS AREA GROUND-WATER MONITORING PROGRAM

The ground-water monitoring network was established to observe the quality of the ground water beneath waste storage and disposal facilities in the Separations Area. The network is composed of one or more wells located downgradient from active and inactive waste sites. Two primary concerns in the operation of the monitoring program are the collection of representative ground-water samples and the identification of any condition that could enhance the migration of contaminants.

2.1 WELL NETWORK

There are 127 wells in the unconfined aquifer water quality monitoring network for CY 1984 (see appendix B), a net increase of 15 wells over the 112 wells listed in the 1983 Annual Report (Law and Allen 1983, appendix B). Table 1 gives the well number and site monitored for each of the 19 wells added and the 4 wells deleted in CY 1984. A brief discussion of the well numbering and facility numbering systems is presented in appendix A, in addition to a map identifying the perimeter of the Separations Area as used in this report, and maps showing well locations.

Monitoring wells are constructed of carbon steel casing and are normally 6 or 8 in. (15.2 or 20.3 cm) in diameter. All new wells are grouted in a manner similar to that described in section 2.1.1 to prevent migration of contaminants down the outside of the well casing. Older wells are perforated and newer wells screened in the upper 30 to 40 ft (9 to 12 m) of the aquifer to collect water from the surrounding formation.

2.1.1 Well Renovation

To ensure the integrity of wells, a program of well renovation was continued in 1984. This work addresses older wells that do not have an adequate surface seal and are located within 300 ft (91 m) of liquid waste disposal sites. Without the protection of an adequate surface seal, voids around the well casing can provide a possible pathway for surface or subsurface contamination to reach the ground water. Twenty wells were repaired in CY 1984 (table 2).

The renovation process is comprised of three steps (fig. 3). First, the existing casing is perforated to a depth of at least 100 ft (30 m). Second, a liner casing of smaller diameter is placed into the well. The bottom end of the liner contains a packer, and is flared to be flush with the outer casing to reduce the probability of pumps or down-hole tools catching on the lip during removal from the well. Finally, the annulus between the well and liner casings is pressure grouted. The perforations in the old casing allow the grout to flow into any voids surrounding the well, thus reducing the possibility of contaminant migration down the outside casing of the well.

Table 1. List of Changes to Well Monitoring Network in CY 1984.

Wells added		Wells deleted	
New wells constructed			
Well no.	Waste site	Well no.	Waste site
299-W19-13	216-U-16	299-E23-2	200 East
299-W19-14	216-U-16	299-E33-27	241-BX
299-W27-1	216-S-26	299-W11-13	200 West
699-53-47B	216-A-25	299-W22-27	216-S-9,18
699-53-48A	216-A-25		
699-53-48B	216-A-25		
699-54-48	216-A-25		
699-54-49	216-A-25		
Existing wells added			
Well no.	Waste site		
299-E26-6	401-A Cooling		
299-E27-7	241-C		
299-E33-7	216-B-48,49,50		
299-E33-10	216-B-35,41		
299-W26-6	216-S-5		
699-50-42	216-A-25		
699-55-50C	216-A-25		
699-55-50D	216-A-25		
699-56-51	216-A-25		
699-59-58	600 Area		
699-63-58	600 Area		

Table 2. List of Wells Renovated in CY 1984.

299-E13-7	299-E13-15	299-E28-13
299-E13-8	299-E13-16	299-E28-18
299-E13-9	299-E13-17	299-E28-19
299-E13-10	299-E13-18	299-E28-20
299-E13-11	299-E13-19	299-E28-21
299-E13-12	299-E28-9	299-E33-10
299-E13-14	299-E28-12	

Wells that have undergone renovation work are fitted with a cement collar at the ground surface. A brass plate bearing the well number is embedded in the collar to prevent misidentification.

2.2 SAMPLING

The following criteria are used to determine sampling frequencies.

- Wells monitoring active liquid waste disposal sites are sampled monthly.
- Wells monitoring inactive liquid waste disposal sites that contain radionuclides with a high potential for being remobilized are sampled monthly.
- Wells monitoring inactive liquid waste disposal sites that contain radionuclides with a low potential for being remobilized are sampled monthly or quarterly, depending upon the level and trend of concentration.
- Wells yielding samples indicating background concentrations are sampled semiannually.

The 1985 sampling schedule is listed in appendix C.

Monitoring wells with dedicated sampling pumps are pumped to remove stagnant water from the well before a sample is collected (fig. 4). Wells which do not produce enough water to support a pump are sampled by bailing.

2.3 ANALYSES

The samples are analysed selectively for the following constituents: total alpha, total beta, tritium, uranium, ^{90}Sr, ^{137}Cs, ^{60}Co, ^{106}Ru, and nitrate. The constituent analyses conducted for each well are listed in

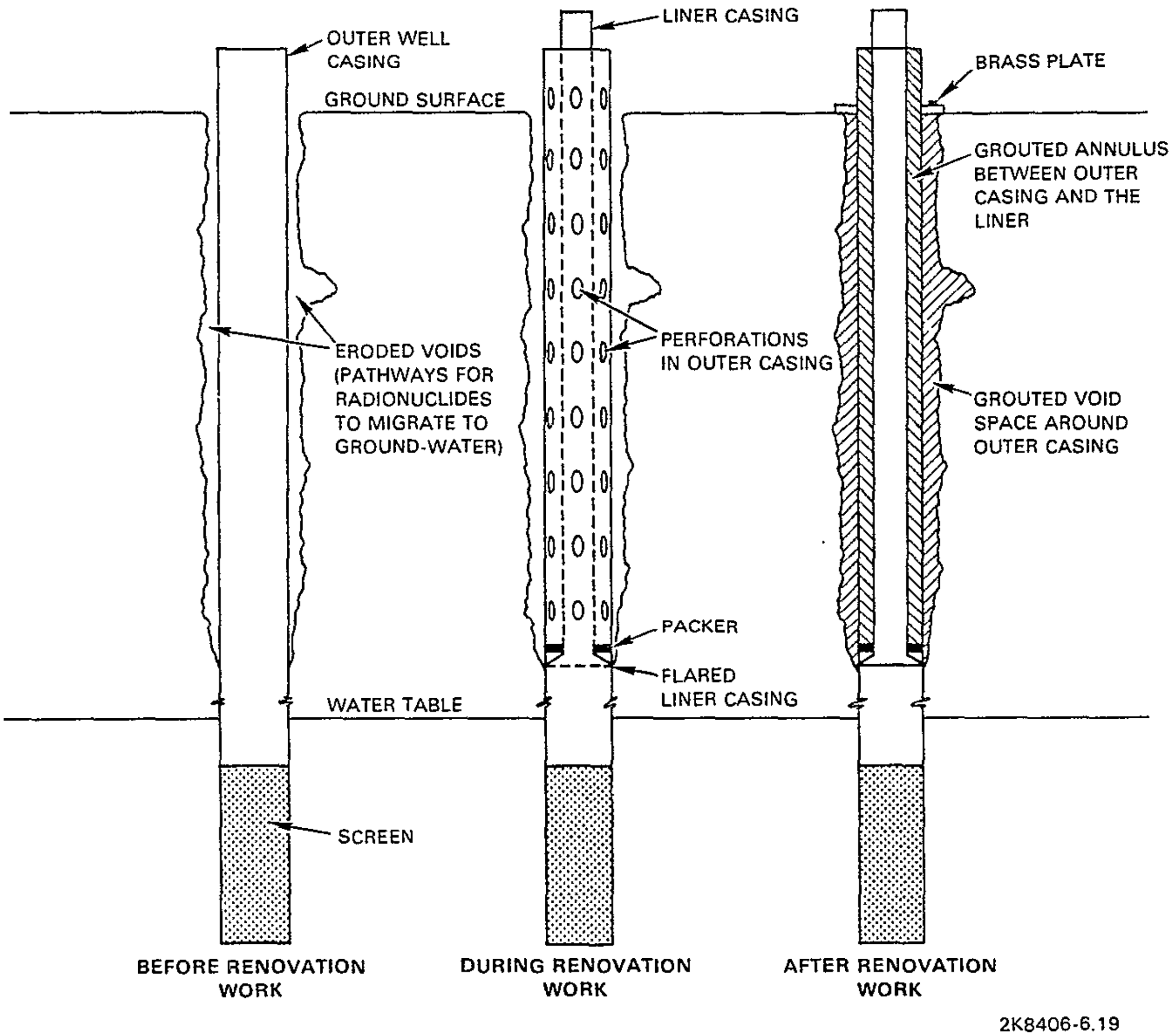

Figure 3. Idealized Cross-Sectional Views of a Well Casing Depicting the Renovation of a Well.

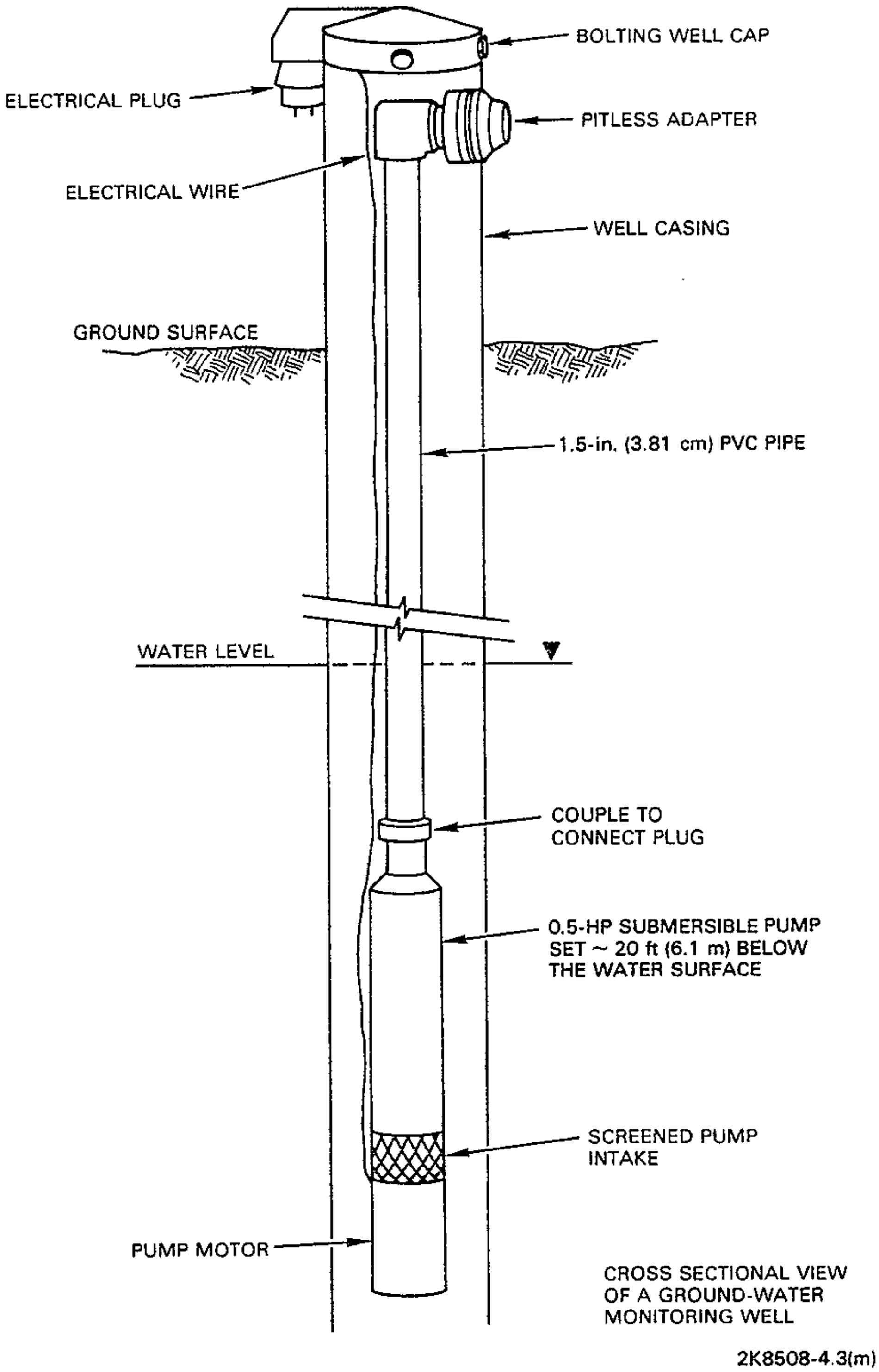

Figure 4. Cross-Sectional View of a Ground-Water Monitoring Well with Pump.

appendix C. The selection of these parameters is based on the waste disposal history of each site. The analyses are performed by U.S. Testing in accordance with their procedures (U.S. Testing 1980).

2.4 WATER-LEVEL MEASUREMENTS

Water-level measurements are made in 224 shallow wells to produce water table maps of the Hanford Site and the Separations Area. The water table maps of the Hanford Site are constructed semiannually; Plate 1 (in packet) is the water table map for December 1984. The water table map of the Separations Area (see fig. 2) is produced annually.

2.5 DATA INTERPRETATION, REPORTING, AND STORAGE

Data are received from the laboratory in the form of a computer printout. The data are reviewed in the context of the concentration history of the well to establish the validity, and are also examined for trends that may suggest modification of the sampling frequency or require other action. The data are stored in the PNL computerized Comprehensive Information Retrieval and Modeling Input Sequence system for retrieval.

The radionuclide data are compared with RHO-MA-139 guidelines (Rockwell internal guidelines) and DOE Table II guidelines. These guidelines are listed in table 3. The RHO-MA-139 guidelines, which are applicable at each waste disposal site, have been established with the goals of keeping contaminants in the ground water as low as reasonably achievable (ALARA) and meeting drinking water standards at the end of institutional control (assumed to be in 300 years).

Uranium is determined as the combination of ^{234}U, ^{235}U, and ^{238}U. In some cases, isotopic uranium is determined and is then reported by isotope.

Nitrate is treated as a tracer because of its mobility in ground water. The nitrate concentrations are compared with Environmental Protection Agency (EPA) drinking water standard (EPA 1976) of 45 mg/L for reference purposes only. These drinking water standards are not applicable to the Hanford Site because there is no public drinking water supply.

2.6 QUALITY ASSURANCE

Quality assurance is included in all aspects of the monitoring program: well maintenance, sampling, analytical procedures, and data interpretation, storage and reporting. A quality control plan is in place and is being administered. The monitoring program is subject to external audits by the Rockwell Quality Program Assessment Group and to internal audits by the Rockwell Hydrogeology Unit.

Table 3. Radionuclide Concentration Guidelines.

Radionuclide	Table II concentration guideline[a] (pCi/mL)	RHO-MA-139 concentration guideline[b] (pCi/mL)
Tritium (^{3}H)	3,000	c
^{60}Co	30	30
^{90}Sr	0.3	0.03
^{106}Ru	10	10
^{129}I	0.06	0.06
^{137}Cs	20	2.0
^{234}U	4	0.032
^{235}U	4	0.032
^{238}U	0.6	0.0048

[a]DOE Order 5480.1, attachment XI-1, Table II.

[b]RHO-MA-139, section L.30 (C).

[c]Annual tritium discharge to ground water from Rockwell facilities shall not exceed 2.0 E+05 Ci.

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3.0 ACTIVE DISPOSAL SITES

Low-level radioactive liquid wastes generated in the processing facilities in the 200 Areas are discharged to ground for disposal. Cooling water is disposed to surface ditches and ponds. Other liquid wastes containing low-level radioactive constituents are disposed to subsurface facilities designated as cribs. The surface ponds are discussed in section 3.1; subsurface facilities are discussed in section 3.2.

RHO-MA-139 limits the release of tritium in liquid waste streams from plant facilities to 2.0 E+05 Ci (table 3). During 1984, a total of 8.5 E+03 Ci of tritium were released from Rockwell facilities (Bihl et al. 1985).

3.1 SURFACE LIQUID DISPOSAL SITES

Three major ponds were in operation during 1984 for the disposal of waste water, primarily cooling water: 216-A-25 (Gable Mountain Pond), 216-B-3 (B Pond), and 216-U-10 (U Pond). The location of these ponds is shown in figure 2.

In the 200 East Area in 1984, a total of 5.59 E+09 gal (2.11 E+10 L) of liquid effluent was discharged to ponds from the following effluent streams:

- PUREX Cooling Water (CWL)
- B Plant Cooling Water (CBC)
- 242-A Evaporator Cooling Water (ACW)
- 242-A Evaporator Steam Condensate (ASC)
- 244-AR Vault Cooling Water (CAR)
- 241-A Tank Farm Cooling Water (CA8)
- PUREX Chemical Sewer (CSL).

These streams can be routed to either Gable Mountain or the B Pond system, with the exception of the CSL effluent stream, which goes directly to B Pond.

3.1.1 216-A-25 (Gable Mountain) Pond

Gable Mountain Pond, consisting of a main pond and an overflow pond totaling about 71 acres (29 hectare), is located north of 200 East Area and south of Gable Mountain (see fig. 2). This pond received an estimated volume of 2.6 E+09 gal (9.92 E+09 L) of effluent during 1984.

During 1984, the pond was reduced in size by about 10 acres (4 hectare) by filling in the southeastern end of the pond in the first phase of a project to deactivate the pond. This report will address results of routine monitoring of the pond followed by discussion of an incident of ground-water contamination by ^{90}Sr.

3.1.1.1 Routine Monitoring. Gable Mountain Pond has been in operation since 1957 and is monitored by well 699-53-47A. The monitoring results for this well are given in table 4. Total beta results are elevated because of ^{90}Sr, which averaged 7.27 E-02 pCi/mL during 1984. The pond received ^{90}Sr in 1964 when a cooling water coil broke in PUREX. In-plant monitoring and automatic diversion are now in place to preclude such an event. The concentration of ^{90}Sr exceeds the RHO-MA-139 guideline of 3 E-02 pCi/mL, but is below the Table II guideline of 3 E-01 pCi/mL. Other radioisotopes are below guidelines and similar to the 1983 results (Law and Allen 1984).

3.1.1.2 Strontium-90 Contamination. Rockwell's annual ground-water monitoring report for 1983 (Law and Allen 1984) noted an increasing trend of ^{90}Sr in well 699-53-47A which monitors Gable Mountain Pond. Figure 5 updates the concentration history graph from the 1983 report with the ^{90}Sr data for 1984. Although the ^{90}Sr concentration was below Table II guidelines, Rockwell's more restrictive internal guidelines required that an investigation be initiated when 10% of Table II was exceeded.

The pond is located in a northwest-southeast trending topographic low near the northeast perimeter of the 200 Area plateau (fig. 6) and is the only Rockwell liquid waste disposal facility not located on the plateau. Units of the Hanford formation and Ringold Formation overlie the Elephant Mountain Basalt member of the Columbia River Basalt Group within the study area.

3.1.1.2.1 Investigation. Five new wells were drilled on the northeast side of Gable Mountain Pond to supplement existing information on the geology of the area and to define the extent of contamination in the ground water and sediments. Figure 6 shows the location of all wells associated with the investigation.

Figures 7 and 8 are geologic cross sections of the Gable Mountain Pond area. Locations of the cross sections are depicted in figure 6. Basalt bedrock is within 20 to 30 ft (6 to 9 m) of the ground surface at the southeast end of Gable Mountain Pond and 90 to 100 ft (27 to 30 m) at the northwest end. The basalt outcrops above the water table southwest of Gable Mountain Pond, thus artificial recharge from Gable Mountain Pond to the water table is prevented from moving in a southwesterly direction.

Table 5 contains a listing of analytical results for all wells sampled as part of this investigation.

Well 699-53-47B confirmed the elevated concentration of ^{90}Sr in the adjacent well 699-53-47A. Wells 699-53-48A and 699-53-48B, about 300 ft (91 m) north of the first two wells, are a pair of wells completed below and above, respectively, a 5-ft-thick (1.5-m-thick) silt layer. Concentrations of ^{90}Sr in well 699-53-48B are above the RHO-MA-139 guideline of

Table 4. Concentrations of Radiological Parameters in Ground Water Near the 216-A-25 (Gable Mountain) Pond in 1984.

Well		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
6 53 47A	MAX	8.75 E-03[a]	1.29 E-01			1.09 E-01	5.40 E-03	7.08 E-03	5.91 E-02	
	AVE	2.74 E-03	8.78 E-02	NA[b]	NA[b]	7.27 E-02	2.10 E-03	1.92 E-03	1.49 E-02	NA[b]
	MIN	0.00 E-01[c]	2.48 E-02			3.84 E-02	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	

[a]8.75 E-03 is equivalent to 0.00875.
[b]NA--no analysis for this constituent.
[c]Negative analytical values appear as zeroes.

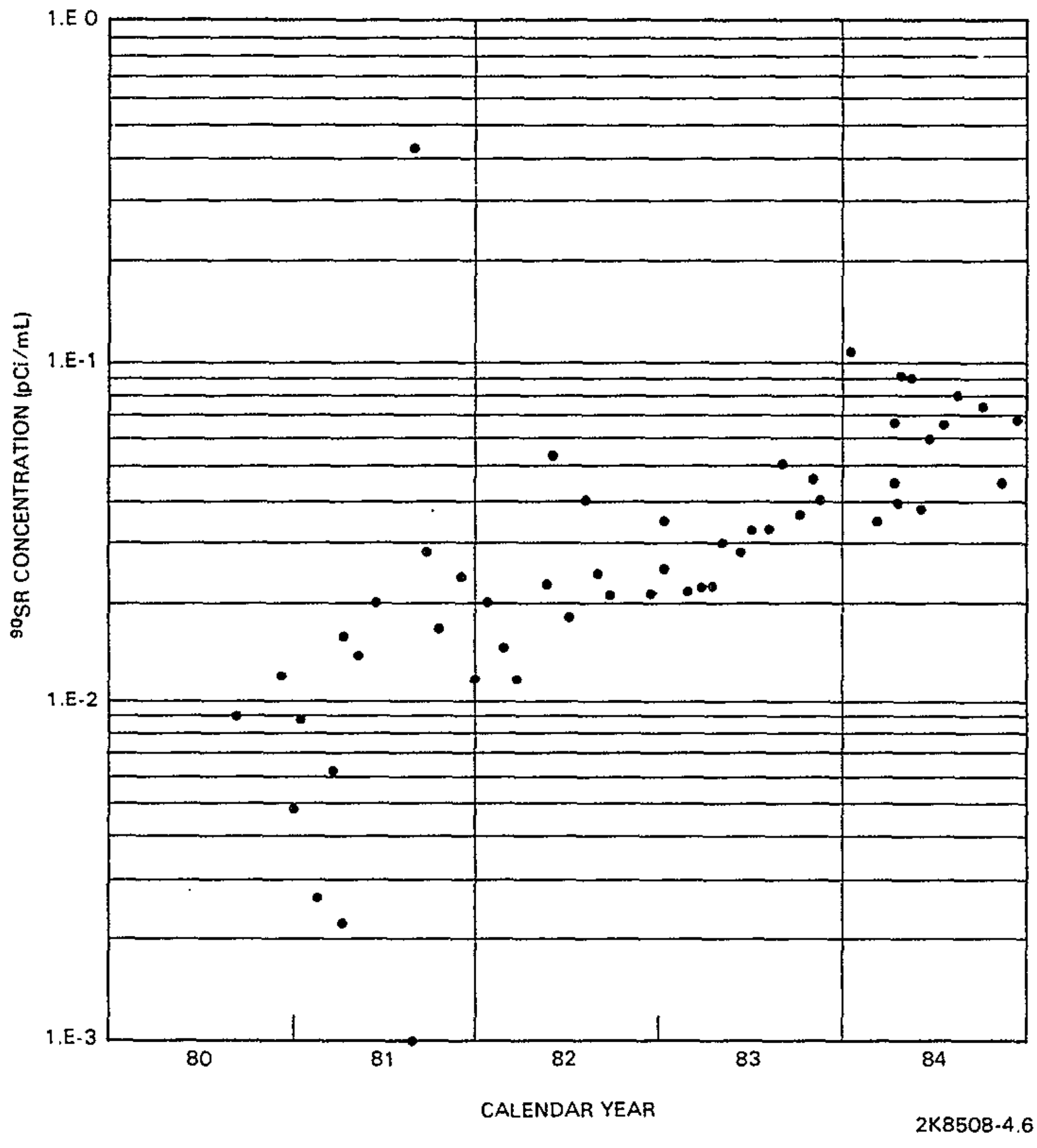

Figure 5. Concentration History of Strontium-90 in Well 699-53-47A.

9 2 1 2 3 5 6 1 3 1 7

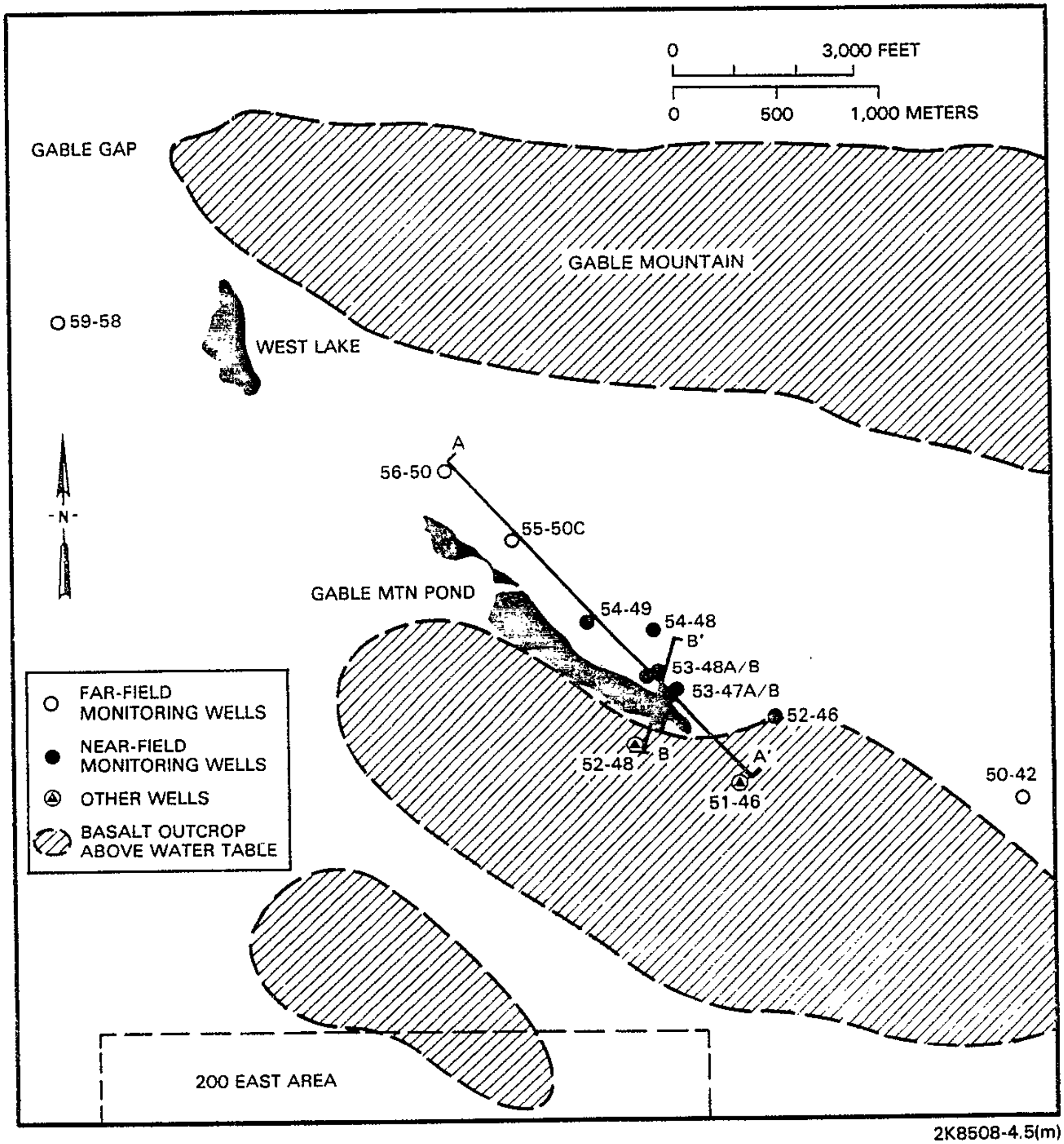

Figure 6. Gable Mountain Pond and Vicinity.

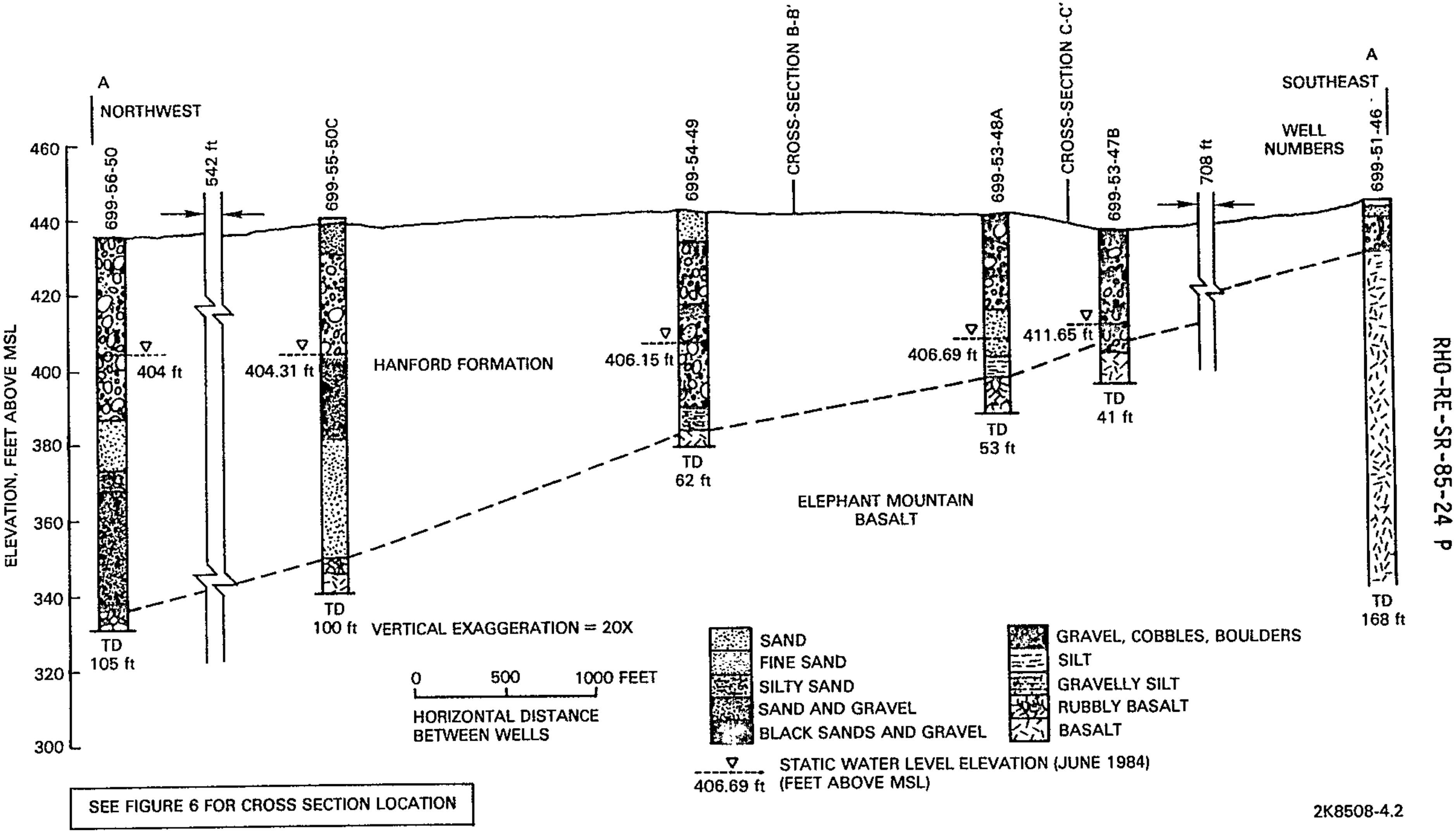

Figure 7. Gable Mountain Pond Area, Cross-Section A-A'.

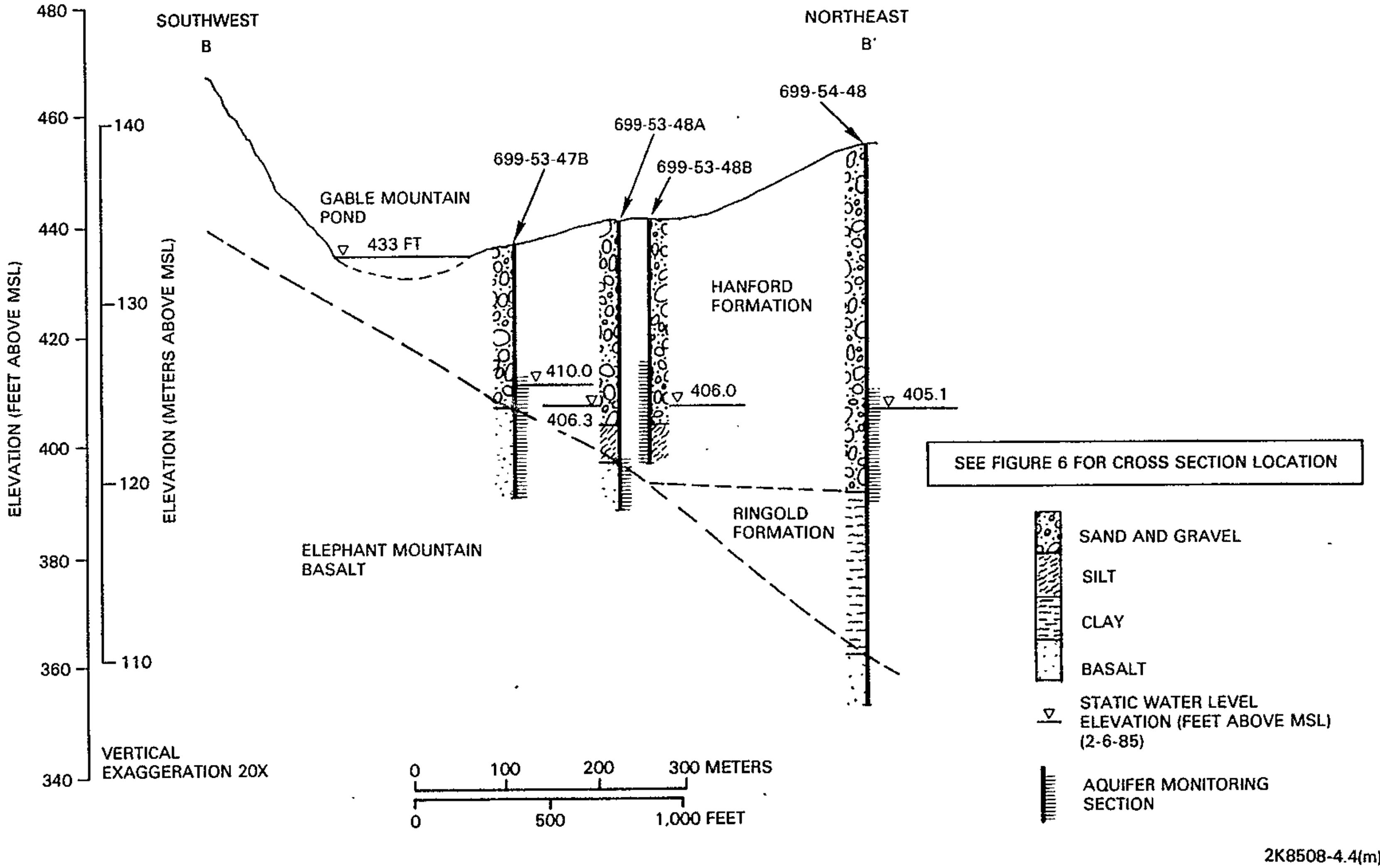

Figure 8. Gable Mountain Pond Area, Cross Section B-B'.

Table 5. Strontium-90 Analytical Concentrations (pCi/mL) for Wells Near Gable Mountain Pond in CY 1984. (sheet 1 of 2)

Well number	Date	Concentration
Near-field wells		
699-53-47A	01-09-84	0.109
	02-07-84	0.035
	02-21-84	0.0704
	04-11-84	0.0675
	04-18-84	0.0447
	04-26-84	0.0916
	05-08-84	0.0409
	05-14-84	0.0903
	06-07-84	0.0384
	07-11-84	0.0593
	07-19-84	0.0642
	08-15-84	0.0805
	10-03-84	0.0746
	11-13-84	0.0448
	12-12-84	0.0684
699-53-47B	02-07-84	0.0685
	04-11-84	0.0629
	04-18-84	0.0394
	04-26-84	0.0848
	05-08-84	0.0398
	05-14-84	0.0775
	06-05-84	0.0423
	07-11-84	0.0575
	07-19-84	0.0506
	10-03-84	0.0811
	11-13-84	0.0709
	12-12-84	0.0731
699-53-48A	03-28-84	0.591
	04-06-84	0.0383
	04-18-84	0.00738
	05-08-84	0.00320
	07-11-84	0.00098
	09-05-84	0.00111
	10-03-84	<0.00083
699-53-48B	03-30-84	0.562
	04-05-84	0.481
	04-18-84	0.367
	05-08-84	0.362
	07-11-84	0.774
	09-05-84	0.804
	10-03-84	0.906

Table 5. Strontium-90 Analytical Concentrations (pCi/mL) for Wells Near Gable Mountain Pond in CY 1984. (sheet 2 of 2)

Well number	Date	Concentration
699-54-48	03-27-84	0.00241
	04-18-84	0.00378
	05-08-84	<0.00565
	07-11-84	0.00668
	09-05-84	0.0116
	10-03-84	0.0153
699-54-49	07-11-84	0.0719
	09-05-84	0.0172
	10-03-84	0.0164
	Upgradient wells	
699-50-42	04-19-84	<0.00057
	05-08-84	<0.00063
	07-11-84	<0.00056
	09-05-84	<0.00208
	10-03-84	<0.00105
	Downgradient wells	
699-55-50C	01-06-84	<0.00665
	01-17-84	0.00883
	02-10-84	0.00129
	02-21-84	<0.0145
	04-11-84	<0.00792
	04-18-84	0.00150
	04-26-84	0.00947
	05-08-84	<0.00057
	05-14-84	<0.0129
	06-05-84	<0.00732
	07-11-84	0.00096
	07-19-84	<0.00723
	09-05-84	<0.00034
	10-03-84	<0.00079
	10-10-84	<0.00731
	12-11-84	0.00063
699-56-50	08-15-84	<0.00040
	09-05-84	<0.00973
	10-03-84	<0.00094
699-59-58	04-19-84	<0.00068
	05-08-84	<0.00104
	07-11-84	<0.00080
	09-05-84	<0.00033
	10-03-84	<0.00095

3 E-02 pCi/mL and the Table II concentration guideline of 3 E-01 pCi/mL (table 5). The initial sample in the other well, 699-53-48A, was also above RHO-MA-139 and Table II guidelines, but subsequent results (see table 5) are low and below RHO-MA-139 guidelines. The initial high concentration was due to contamina-tion from the zone of coarser sediments above the silt layer, which was removed during well development and subsequent sampling.

Wells 699-54-48 and 699-54-49 were drilled downgradient from the pond to further define the extent of contamination. Analytical results presented in table 4 show low concentrations in well 699-54-48. The initial sample from well 699-54-49 was elevated, but subsequent samples are low. A possible explanation for the initial elevated sample result is that well development was not complete when the first sample was collected.

Strontium-90 analyses were run on samples collected from wells upgradient and downgradient from Gable Mountain Pond to verify that the contamination was localized. As shown in table 4, concentrations were low with several "less than" values in the upgradient well 699-50-42 and the three downgradient wells 699-55-50C, 699-56-50, and 699-59-58.

3.1.1.2.2 Transport Controls. Section 1.3.4 discussed several controls on the transport of contaminants in ground water. Information collected as part of this investigation provides an example of sorption as a mechanism of control.

Distribution coefficients, K_d, were determined in the laboratory for sediment samples collected from wells 699-53-48A and 699-54-48. Table 6 is a listing of the results of this work, where the K_d represents the mean of three replicate analyses of each sample. The high K_d associated with the 40-ft (12.2-m) sample from well 699-53-48A is due to a silt layer and illustrates how sorption is related to sediment particles. Review of the data in table 6 suggests that selection of K_d = 25 mL/g would provide conservative results.

Table 6. Strontium-90 Distribution Coefficients for Sediment Samples.

Well No.	Depth of sample (ft)	(m)	Distribution coefficient, K_d (mL/g)
699-53-48A	15	4.6	28.0
	30	9.1	21.9
	40	12.2	95.1
699-54-48	20	6.1	24.5
	40	12.2	26.2
	55	16.8	26.7
	65	19.8	54.8

Recalling the earlier discussion of the retardation factor, RF, as embodied in equation 2, ^{90}Sr is retarded by a factor of about 120 in comparison with the ground-water flow. The retardation factor in silt layers would be about 450. Thus it is evident that there are significant natural controls restricting the movement of ^{90}Sr in the ground water at Hanford.

The water table map (see fig. 2) shows that ground water from the Gable Mountain Pond area flows northwest through Gable Gap. The travel time to the Columbia River along this path has been estimated to be 42 yr (Friedrichs et al. 1977). Using K_d = 25 mL/g, as conservatively estimated in the previous paragraph, the estimated travel time of ^{90}Sr to the Columbia River is approximately 5,000 yr. This analysis neglects the effects of dispersion, which would tend to increase the travel time. Consideration of the radioactive decay provides a perspective, as the 28.1 yr half-life would result in the present worst case condition, 0.906 pCi/mL in well 699-53-48B, being reduced to 0.007 pCi/mL in 7 half-lives, or 197 yr. Thus it may be concluded that there will be no significant impact at the Hanford Site boundary from the ^{90}Sr concentrations in the ground water adjacent to Gable Mountain Pond.

3.1.2 216-B-3 (B Pond) System

The B Pond system is composed of the 34-acre (14-hectare) main pond, 216-B-3, and two 11-acre (4-hectare) expansion ponds, 216-B-3A and 216-B-3B, which went into operation in 1983. The pond system received an estimated 2.96 E+09 gal (1.12 E+10 L) of effluent in 1984.

The pond system is monitored by wells 699-42-40A and 699-42-40B (see fig. 2). Concentrations of radionuclides, listed in table 7, are below RHO-MA-139 guidelines and similar to 1983 results.

3.1.3 216-U-10 (U Pond)

U Pond received an estimated 4.54 E+08 gal (1.72 E+09 L) of water in CY 1984, most of which was make-up water added to maintain pond levels to keep contaminated pond bottom sediments wetted. Other contributing streams included UO_3 Plant cooling water and steam condensate for part of the year and powerhouse waste water.

U Pond is monitored by wells 299-W18-15, 299-W23-11, and 699-35-78A (see fig. 2). Table 8 provides the 1984 monitoring results. Because of the elevated results for total alpha, isotopic uranium analyses were run on two samples from each of the three monitoring wells. These results are listed in table 9. The results for ^{238}U exceed RHO-MA-139 guidelines of 4.80 E-03 pCi/mL, but are below Table II guidelines of 6.0 E-02 pCi/mL. The results for ^{234}U and ^{235}U are below the RHO-MA-139 guidelines of 3.2 E-02 pCi/mL.

U Pond was deactivated in the fall of 1984 to conserve water and to remove the driving force acting on the contaminated pond bottom sediments.

Table 7. Concentrations of Radiological Parameters and Nitrate in Ground Water Near the 216-B-3 (B Pond) System in 1984.

Well		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
6 42 40A	MAX	NA[a]	3.73 E-02	2.12 E+01	6.64 E+00	8.77 E-03	8.68 E-03	7.33 E-03	6.34 E-02	3.09 E-03
	AVE		9.54 E-03	7.81 E+00	3.73 E+00	3.36 E-03	2.29 E-03	1.61 E-03	1.88 E-02	2.07 E-03
	MIN		0.00 E-01[b]	3.71 E-01	1.88 E+00	0.00 E-01[b]	0.00 E-01[b]	0.00 E-01[b]	0.00 E-01[b]	1.52 E-03
6 42 40B	MAX	NA[a]	3.65 E-02	9.68 E+00	1.28 E+01	1.51 E-02	7.57 E-03	6.34 E-03	6.45 E-02	
	AVE		1.65 E-02	5.41 E+00	8.14 E+00	3.73 E-03	1.68 E-03	2.18 E-03	2.57 E-02	5.31 E-03[c]
	MIN		0.00 E-01[b]	1.84 E+00	5.58 E+00	0.00 E-01[b]	0.00 E-01[b]	0.00 E-01[b]	0.00 E-01[b]	

[a]NA--no analysis for this constituent.
[b]Negative analytical values appear as zeroes.
[c]Three values or less, no maximum or minimum calculated.

9 2 1 2 4 5 5 1 3 2 6

Table 8. Concentrations of Radiological Parameters and Nitrate in Ground Water Near the 216-U-10 (U Pond) System in 1984.

Well		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
2W 18 15	MAX	8.91 E-02	6.82 E-02	2.00 E+00	2.14 E+00		4.15 E-03	8.45 E-03	4.61 E-02	
	AVE	5.38 E-02	3.30 E-02	4.55 E-01	6.98 E-01	1.03 E-04[a]	1.12 E-03	2.61 E-03[b]	7.06 E-03	7.11 E-02[a]
	MIN	6.99 E-03	4.78 E-03	4.24 E-02	4.00 E-02		0.00 E-01[b]	0.00 E-01[b]	0.00 E-01[b]	
2W 23 11	MAX	2.12 E-02	3.66 E-02	1.56 E+01	NA[c]	NA[c]	4.82 E-03	8.59 E-03	1.87 E-02	
	AVE	1.20 E-02	1.16 E-02	9.15 E+00			6.85 E-04	2.53 E-03	4.21 E-03	NA[c]
	MIN	3.49 E-03	0.00 E-01[b]	5.47 E+00			0.00 E-01[b]	0.00 E-01[b]	0.00 E-01[b]	
6 35 78A	MAX	5.85 E-02	5.04 E-02	1.64 E+01	2.32 E+00		5.40 E-03	6.73 E-03	3.80 E-02	5.78 E-02
	AVE	3.69 E-02	2.37 E-02	1.94 E+00	1.19 E+00	7.12 E-04[a]	2.24 E-03	3.20 E-03	1.08 E-02	4.16 E-02
	MIN	1.06 E-02	0.00 E-01[b]	0.00 E-01[b]	4.43 E-01		0.00 E-01[b]	0.00 E-01[b]	0.00 E-01[b]	3.42 E-02

[a]Three values or less, no maximum or minimum calculated.
[b]Negative analytical values appear as zeroes.
[c]NA--no analysis for this constituent.

Table 9. Isotopic Uranium Concentration in Monitoring Wells Near the 216-U-10 Pond.

Well No.	Sample date	^{234}U (pCi/mL)	^{235}U (pCi/mL)	^{238}U (pCi/mL)
299-W18-15	October 1984	2.81 E-02	1.08 E-03	2.86 E-02
	November 1984	2.72 E-02	1.08 E-03	2.64 E-02
299-W23-11	October 1984	4.78 E-03	1.70 E-04	4.75 E-03
	November 1984	4.98 E-03	2.54 E-04	5.16 E-03
699-35-78A	October 1984	1.57 E-02	6.74 E-04	1.60 E-02
	November 1984	1.33 E-02	5.33 E-04	1.31 E-02

Several minor surface liquid waste disposal facilities which receive low volumes of effluent are not discussed: the 216-B-63 trench in 200 East Area, which receives B Plant Chemical Sewer effluent; the 216-S-10 ditch and 216-S-11 ponds for the Redox Chemical Sewer; the 216-S-19 and 216-S-26 ponds, which receive waste water from the 222-S Laboratory (the 216-S-26 crib replaced the 216-S-19 pond during the year); the 216-T-1 ditch, which receives waste from the T Plant drain flush and head-end wastes; and the 216-T4-2 ditch and 216-T-4-2 pond, which receive chemical drain and compressor wastes from 221-T Building.

3.2 SUBSURFACE LIQUID DISPOSAL SITES

Low-level radioactive liquid wastes from processing operations are disposed to subsurface cribs. A typical crib (fig. 9) consists of a long, trapezoidal, rock-filled trench covered with a sheet of plastic and several feet of backfill. A perforated distributor pipe disperses the waste throughout the length of the crib. Vents are placed to allow gases to escape, and liquid-level gauges are emplaced to evaluate the functioning of the crib.

There were 11 effluent streams in 1984 discharging to 12 active cribs, as indicated in table 10. Ground-water samples were collected from monitoring wells near these active crib sites (crib locations are shown in fig. 10 and 11).

In the following discussions of the 11 specific sites, tables are included to list data on effluent radionuclide concentrations (Bihl et al. 1985) and volumes. The average, maximum, and minimum constituent concentrations are tabulated for each ground-water monitoring well. Nitrate concentrations of effluent streams (Aldrich 1985) are also included in the tables. Nitrate results are reported in terms of nitrate, rather than in terms of nitrogen. For comparison, the drinking water standard for nitrate is 45 ppm when reported as nitrate and 10 ppm when reported as nitrogen. The 1984 results are also compared with 1983 results (Law and Allen 1984).

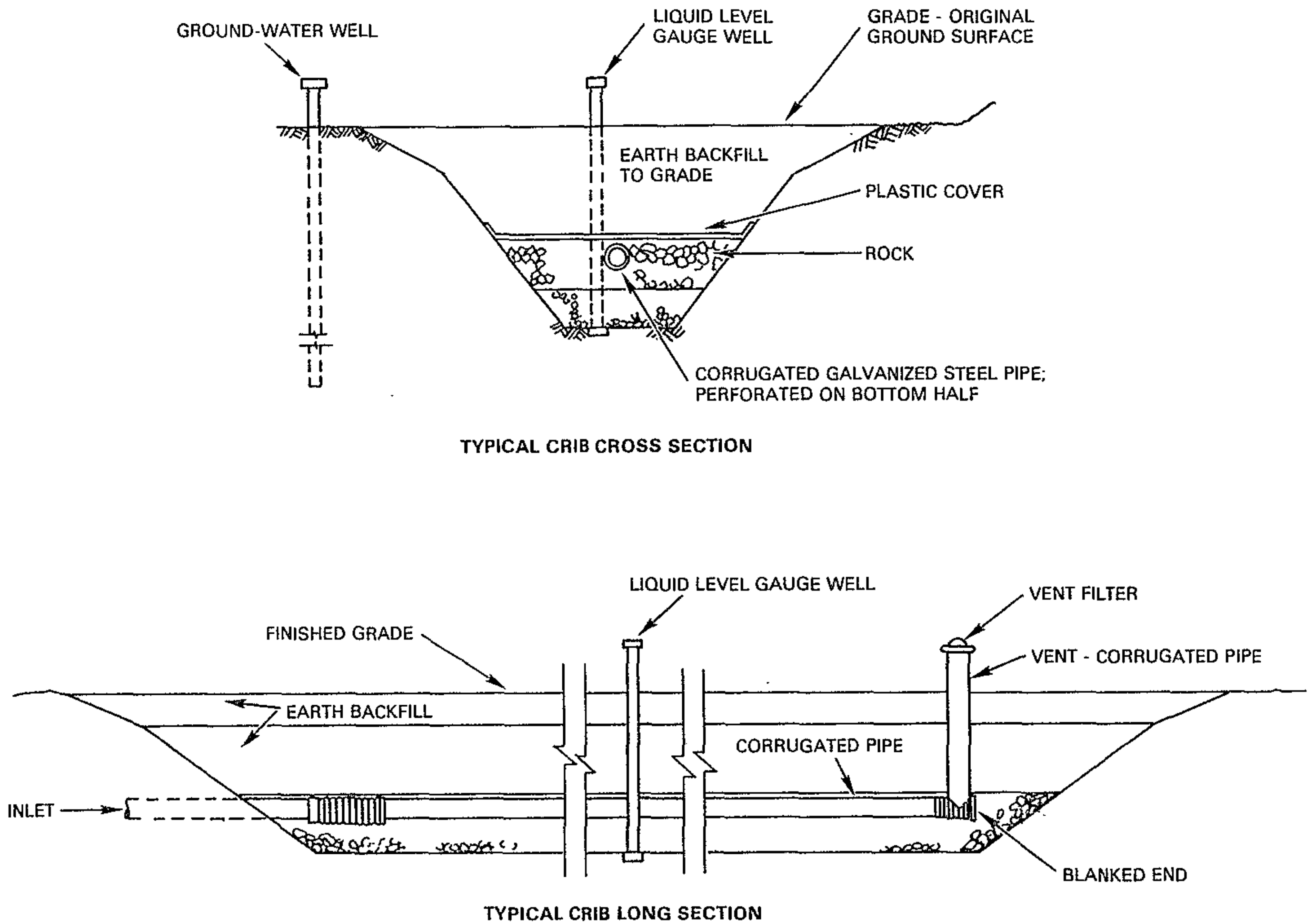

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Figure 9. Typical Subsurface Liquid Waste Disposal Crib.

Table 10. Active Cribs in CY 1984.

Crib	Description of waste
216-A-8	241-A, AX, AY Tank Farms Steam Coil Condensate (A8)
216-A-10	PUREX Process Condensate (PDD)
216-A-30 216-A-37-2	PUREX Steam Condensate (SCD)
216-A-36B	PUREX Ammonia Scrubber Waste (ASD)
216-A-37-1	242-A Evaporator Process Condensate (AFPC)
216-B-55	B Plant Steam Condensate (BCS)
216-B-62	B Plant Process Condensate (BCP)
216-U-12	UO_3 Plant Process Condensate (U-12)
216-U-16	UO_3 Plant Steam Condensate, Cooling Water, and Chemical Sewer
216-W-LWC	Laundry Waste Water (LWC)
216-Z-20	Waste Water from 231-Z and 234-5Z (231-Z and 2904-ZA)

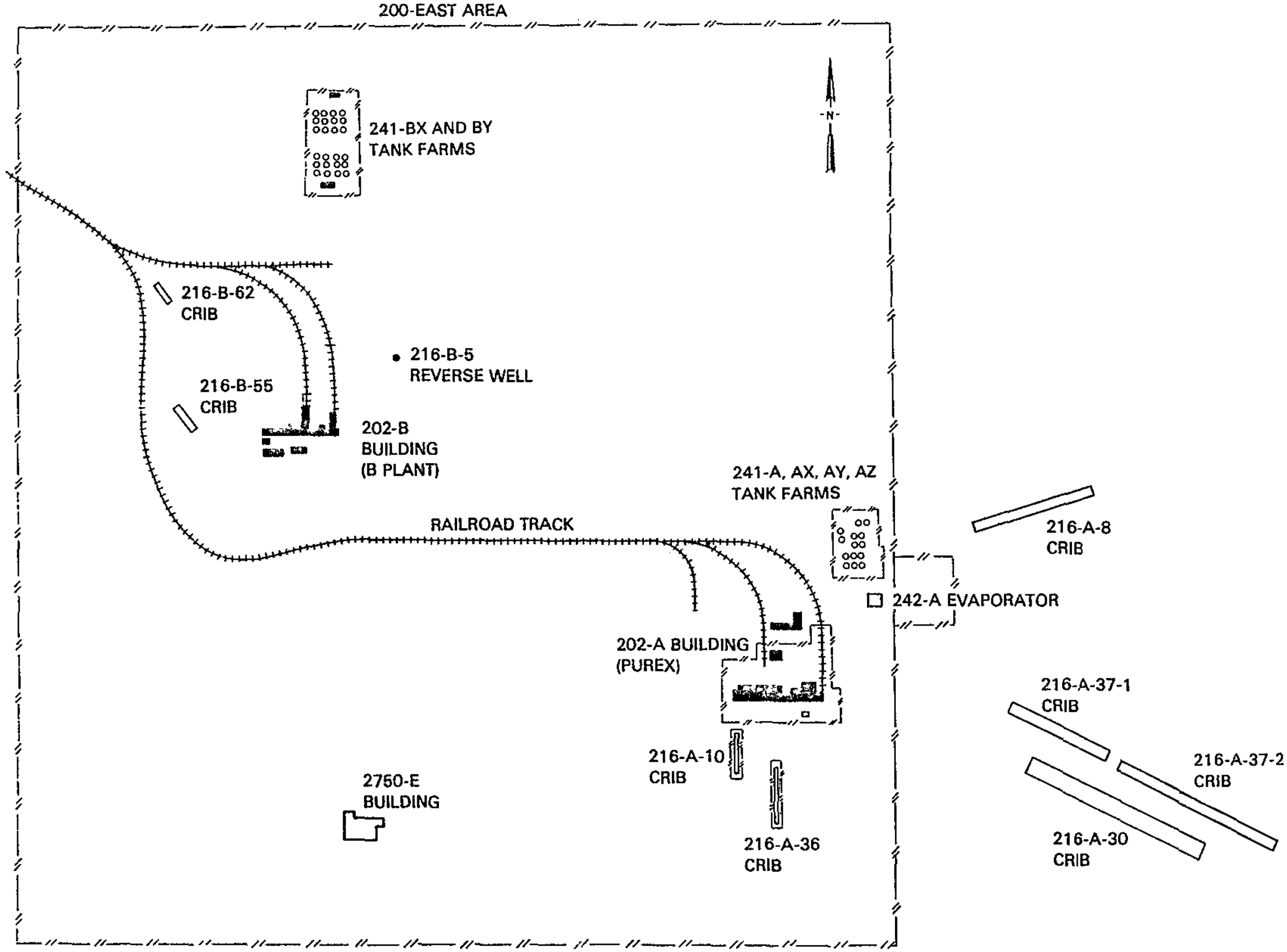

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Figure 10. Location Map for Selected Liquid Waste Disposal Sites in 200 East Area.

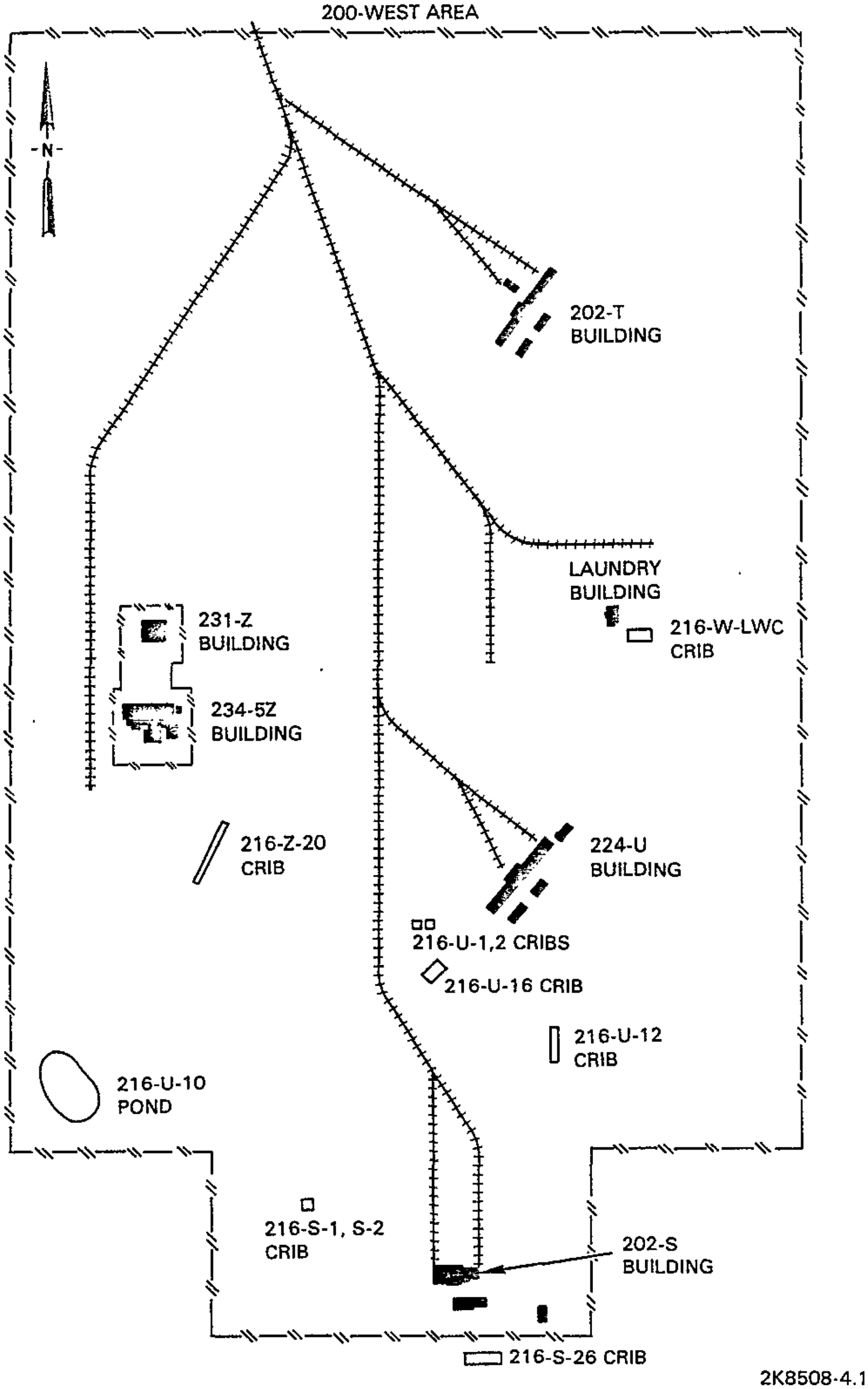

Figure 11. Location Map for Selected Liquid Waste Disposal Sites in 200 West Area.

Graphs depicting long-term concentration histories of selected constituents in the effluent stream and monitoring wells are presented in appendix D for cribs receiving waste water from the 202-A Building (PUREX) and associated facilities, and the 221-B Building (B Plant). Effluent concentrations are shown on the concentration history graphs only for years that disposal occurred. Ground-water data points are shown for all years that data are available. Consecutive years are connected by a solid line, while a dashed line is drawn between data points when there is no data for the intervening years.

3.2.1 216-A-8 Crib

The 216-A-8 crib receives condensate waste (A8) from the 241-A, -AX, -AY, -AZ Tank Farms. The crib is located east of the 241-AX Tank Farm outside the 200 East Area perimeter fence (see fig. 10). The crib was in operation during 1955 to 1958, 1966 to 1976, 1978, and 1983 to 1984. The crib received 2.85 E+05 gal (1.08 E+06 L) of effluent during 1984.

Wells 299-E25-6 and 299-E25-9 monitor this crib. Average concentrations of ^{90}Sr, ^{137}Cs, ^{60}Co, and ^{106}Ru are below RHO-MA-139 guidelines. The concentrations determined in 1984 (see table 11) were similar to the results for 1983.

Long-term concentration histories for the monitoring wells of 216-A-8 crib are shown in figures D-1 and D-2 in appendix D. Total beta, tritium, and nitrate concentrations for 1984 are in good general agreement with the long-term trend.

3.2.2 216-A-10 Crib

The 216-A-10 crib is located south of PUREX in the 200 East Area (see fig. 10). The crib receives process condensate (PDD) waste from PUREX and was operated from 1961 to 1973, sporadically operated in 1977 and 1978, and was reactivated in 1981. During 1984, 2.83 E+07 gal (1.07 E+08 L) of liquid were discharged to the crib.

The ground water beneath this crib is monitored by wells 299-E17-1 and 299-E24-2. Average concentrations of constituents monitored in these wells are listed in table 12. The radiological parameters of ^{90}Sr, ^{137}Cs, ^{60}Co, ^{106}Ru, and total uranium are below RHO-MA-139 guidelines. Concentrations of tritium and nitrate have increased during 1984 as depicted in figures 12 and 13, which reflects the operation of PUREX.

) 2 1 2 4 5 5 1 8 3 3

Table 11. Concentrations of Radiological Parameters and Nitrate for the Effluent and for Ground Water Near the 216-A-8 Crib in 1984.

		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
					Waste Stream					
A, AX, AY, AZ (A8)	AVE	<6.00 E-03	2.00 E+01	5.00 E+00	NA[a]	1.00 E+00	9.00 E+00	NA[a]	BDL[b]	BDL[b]
					Well					
2E 25 6	MAX	1.08 E-02	3.75 E-02	1.34 E+02	5.90 E+00	8.23 E-03	7.57 E-03	7.07 E-03	3.77 E-02	NA[a]
	AVE	3.40 E-03	1.43 E-02	3.45 E+01	2.90 E+00	2.24 E-03	2.06 E-03	2.11 E-03	1.07 E-02	
	MIN	0.00 E-01[c]	2.41 E-03	1.35 E+01	3.19 E-01	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
2E 25 9	MAX	2.77 E-02	3.77 E-02	1.08 E+01	9.80 E+00	2.18 E-02	5.57 E-03	4.23 E-03	5.64 E-02	NA[a]
	AVE	6.71 E-03	1.11 E-02	7.88 E+00	6.28 E+00	4.05 E-03	1.79 E-03	2.14 E-03	1.80 E-02	
	MIN	0.00 E-01[c]	0.00 E-01[c]	5.44 E+00	4.65 E+00	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	

[a]NA--no analysis for this constituent.
[b]BDL--below detection limit.
[c]Negative analytical values appear as zeroes.

Table 12. Concentrations of Radiological Parameters and Nitrate for the Effluent and for Ground Water Near the 216-A-10 Crib in 1984.

		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
Waste Stream										
PUREX (PPD)	AVE	4.00 E+09	6.00 E+01	8.00 E+04	1.69 E+02	8.00 E-01	1.00 E+00	NA[a]	3.00 E+01	<2.00 E-02
Well										
2E 17 1	MAX	NA[a]	5.81 E-02	1.77 E+03	6.48 E+01	3.88 E-02	6.40 E-03	4.72 E-03	5.38 E-02	
	AVE		3.67 E-02	1.15 E+03	4.78 E+01	7.07 E-03	1.78 E-03	1.38 E-03	1.09 E-02	1.69 E-03[b]
	MIN		2.38 E-02	5.66 E+02	2.66 E+01	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
2E 24 2	MAX									
	AVE	1.59 E-03[b]	1.45 E-02[b]	2.24 E+02[b]	2.93 E+01[b]	4.26 E-03[b]	5.46 E-03[b]	6.15 E-04[b]	1.64 E-02[b]	2.27 E-03[b]
	MIN									

[a]NA--no analysis for this constituent.
[b]Three values or less, no maximum or minimum calculated.
[c]Negative analytical values appear as zeroes.

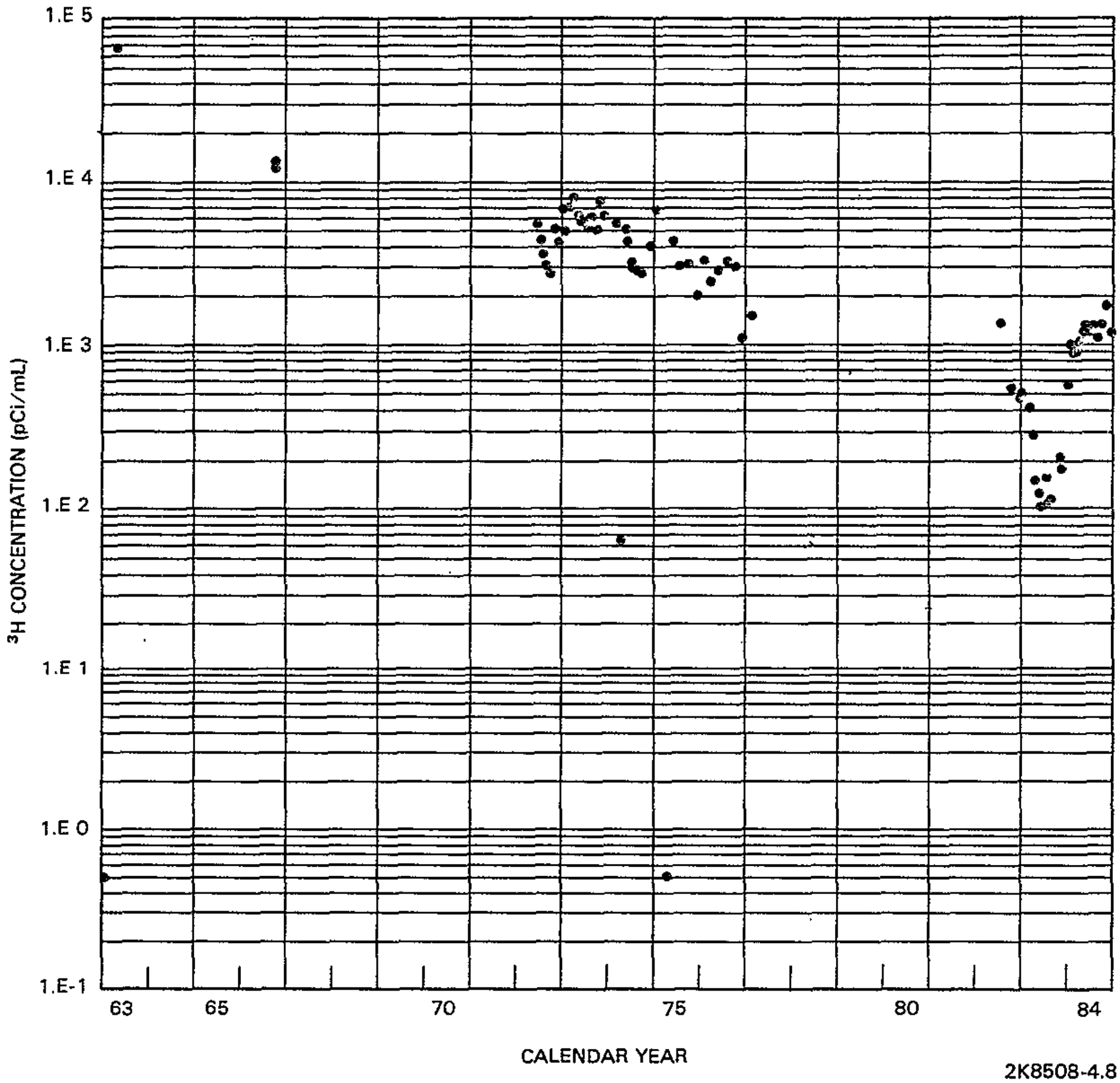

Figure 12. Tritium Concentration History in Well 299-E17-1 at the 216-A-10 Crib.

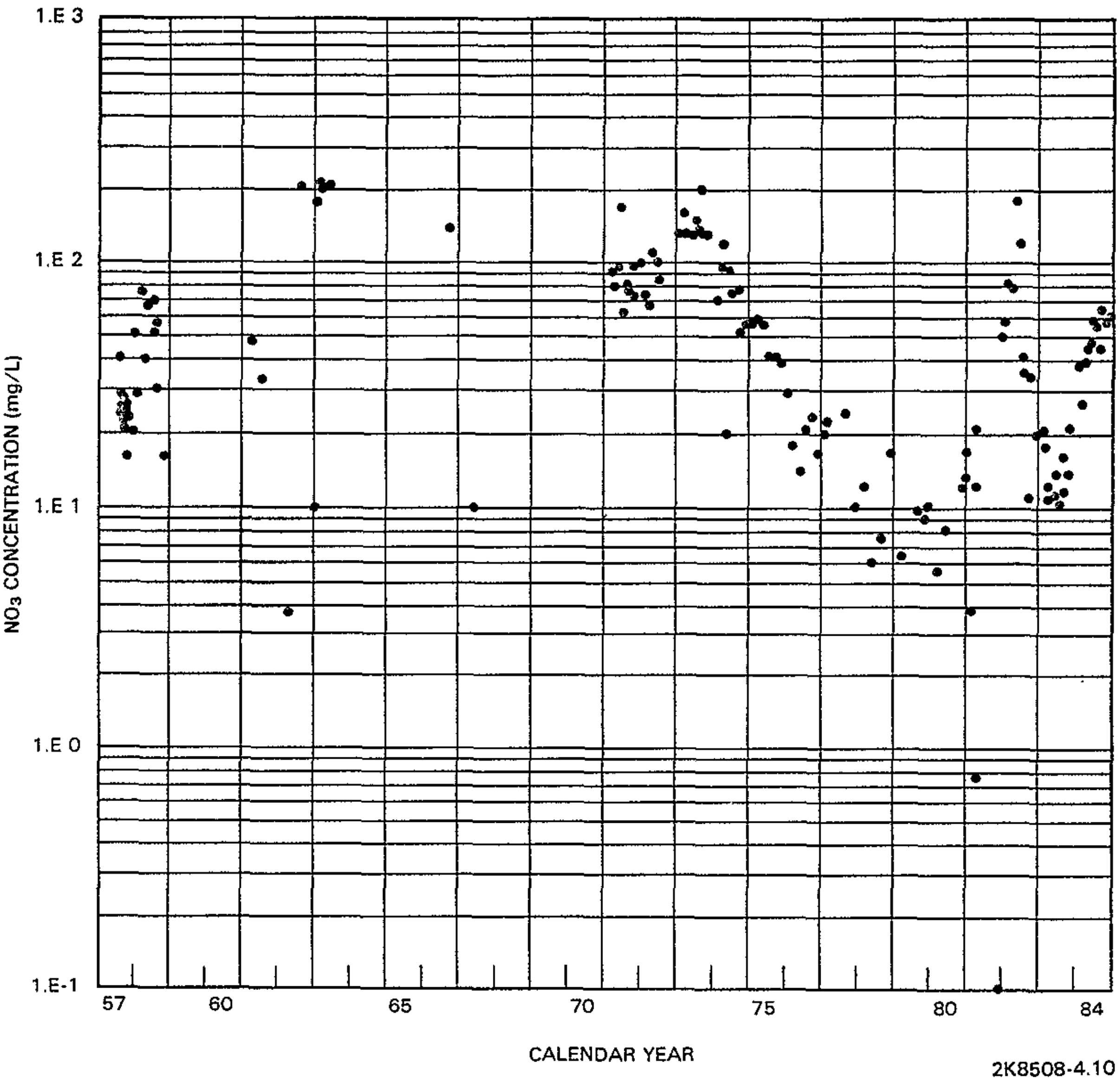

Figure 13. Nitrate Concentration History in Well 299-E17-1 at the 216-A-10 Crib.

Long-term concentration histories for the wells at the 216-A-10 crib are shown in figures D-3 and D-4 in appendix D. The increases in tritium and nitrate due to PUREX operation are apparent, but concentrations are in agreement with the established trend.

The PUREX Environmental Impact Statement (DOE 1982) notes that the operation of PUREX will release tritium to the ground water, but predicts that the concentrations in the Columbia River (eastern boundary of Hanford) upstream and downstream from Hanford would show no statistical difference.

Data relating to tritium concentrations during 1984 in wells near the Columbia River is contained in Cline, et al., 1985.

3.2.3 216-A-30 Crib and 216-A-37-2 Crib

The 216-A-30 crib and 216-A-37-2 crib, located just east of the 200 East Area, receive steam condensate (SCD) waste from PUREX. The 216-A-30 crib has been in continuous operation since 1961, with the exception of 1974 and 1975. The 216-A-37-2 crib began operation in 1983 with the restart of PUREX. The SCD waste stream discharged 1.17 E+08 gal (4.43 E+08 L) to these cribs during 1984. The effluent can be routed to either or both cribs, although there is no provision for measuring the volume to each individual crib. It is estimated that during normal operation about two-thirds of the flow is disposed to the 216-A-30 crib.

The 216-A-30 crib is monitored by wells 299-E16-2 and 299-E25-11. The 216-A-37-2 crib is monitored by four wells, 299-E25-21 through 299-E25-24. Monitoring results for 1984 are listed in table 13. A comparison with results from the previous year indicates that results are similar for the two years. All constituents are below RHO-MA-139 guidelines.

The long-term concentration histories for wells 299-E16-2 and 299-E25-11 are shown in figures D-5 and D-6 of appendix D. Concentrations for 1984 are observed to fall within established trends.

3.2.4 216-A-36B Crib

Ammonia scrubber waste (ASD) discharged from PUREX is received by the 216-A-36B crib (see fig. 10), which is located just south of the PUREX Building. This disposal facility was active from 1966 to 1972, and was activated again in 1982. During 1984, 1.29 E+07 gal (4.88 E+07 L) of liquid waste were discharged to this crib.

Wells 299-E17-5 and 299-E17-9 monitor the 216-A-36B crib. Data for 1984 are presented in table 14. The average tritium concentration in well 299-E17-9 is about one-half that of 1983, but the concentration is just above the Table II guideline of 3,000 pCi/mL (fig. 14). The RHO-MA-139 guideline for tritium is a discharge guideline, which was not exceeded in 1984 (see section 3.0). As noted in the discussion for the 216-A-10 crib,

Table 13. Concentrations of Radiological Parameters and Nitrate for the Effluent and for Ground Water Near the 216-A-30 Crib and 216-A-37-2 Crib in 1984.

		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
Waste Stream										
PUREX (SCD)	AVE	<4.00 E-02	7.00 E-01	7.00 E+00	<1.2 E+00	<1.00 E-01	<1.00 E-01	NA[a]	BDL[b]	BDL[b]
Wells at 216-A-30 Crib										
2E 16 2	MAX	NA[a]	2.52 E-02	7.75 E+00	7.48 E+00	1.74 E-02	6.06 E-03	5.90 E-03	6.95 E-02	NA[a]
	AVE		1.36 E-02	3.94 E+00	3.14 E+00	3.70 E-03	1.26 E-03	2.54 E-03	2.72 E-02	
	MIN		0.00 E-01[c]	4.12 E-01	4.38 E-01	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
2E 25 11	MAX	NA[a]	5.05 E-02	4.51 E+01	8.37 E+00	5.00 E-03	4.27 E-03	5.30 E-03	8.67 E-02	NA[a]
	AVE		1.93 E-02	2.78 E+01	5.68 E+00	2.13 E-03	1.50 E-03	1.18 E-03	1.45 E-02	
	MIN		0.00 E-01[c]	1.50 E+01	4.03 E-01	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
Wells at 216-A-37-2 Crib										
2E 25 21	MAX	NA[a]	5.22 E-02	2.82 E+01	2.21 E+01	8.75 E-03	3.44 E-03	4.24 E-03	0.00 E-01[c]	NA[a]
	AVE		1.98 E-02	1.39 E+01	7.95 E+00	4.34 E-03	1.31 E-03	1.93 E-03	0.00 E-01[c]	
	MIN		4.20 E-03	8.19 E+00	2.08 E+00	1.16 E-03	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
2E 25 22	MAX	NA[a]	4.65 E-02	6.94 E+02	1.17 E+02	5.72 E-03	2.49 E-03	4.88 E-03	3.22 E-02	NA[a]
	AVE		1.60 E-02	1.17 E+02	2.71 E+01	2.92 E-03	1.08 E-03	1.34 E-03	1.28 E-02	
	MIN		0.00 E-01[c]	1.10 E+01	7.75 E+00	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
2E 25 23	MAX	NA[a]	3.84 E-02	4.55 E+00	2.36 E+01	2.98 E-02	4.80 E-03	4.92 E-03	2.93 E-02	NA[a]
	AVE		1.26 E-02	1.36 E+00	3.32 E+00	9.69 E-03	1.60 E-03	1.35 E-03	9.15 E-03	
	MIN		0.00 E-01[c]	4.24 E-01	4.78 E-01	3.07 E-04	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
2E 25 24	MAX	NA[a]	1.76 E-02	6.92 E+00	3.58 E+00	1.01 E-02	5.70 E-03	4.48 E-03	8.86 E-02	NA[a]
	AVE		7.01 E-03	2.30 E+00	1.86 E+00	6.04 E-03	3.07 E-03	1.42 E-03	3.67 E-02	
	MIN		0.00 E-01[c]	0.00 E-01[c]	4.43 E-01	2.67 E-03	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	

[a]NA--no analysis for this constituent.
[b]BDL--below detection limit.
[c]Negative analytical values appear as zeroes.

Table 14. Concentrations of Radiological Parameters and Nitrate for the Effluent and for Ground Water Near the 216-A-36B Crib in 1984.

		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
						Waste Stream				
PUREX (ASD)	AVE	<9.00 E-02	3.00 E+02	5.00 E+03	1.62 E+01	7.00 E-01	8.00 E+00	NA[a]	2.00 E+02	BDL[b]
						Well				
2E 17 5	MAX	1.03 E-02	9.93 E-02	2.49 E+03	7.92 E+01	1.00 E-02	6.26 E-03	7.82 E-03	6.42 E-02	1.15 E-02
	AVE	4.45 E-03	5.95 E-02	1.06 E+03	4.47 E+01	3.31 E-03	1.35 E-03	1.75 E-03	1.97 E-02	5.15 E-03
	MIN	0.00 E-01[c]	1.58 E-02	5.17 E+02	3.03 E+01	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	1.26 E-03
2E 17 9	MAX	NA[a]	7.67 E-02	3.87 E+03	9.52 E+01	2.50 E-02	8.54 E-03	2.84 E-02	9.96 E-02	NA[a]
	AVE		4.05 E-02	3.03 E+03	7.33 E+01	6.75 E-03	1.98 E-03	6.51 E-03	2.69 E-02	
	MIN		1.58 E-02	2.53 E+03	6.25 E+01	6.37 E-01	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	

[a]NA--no analysis for this constituent.
[b]BDL--below detection limit.
[c]Negative analytical values appear as zeroes.

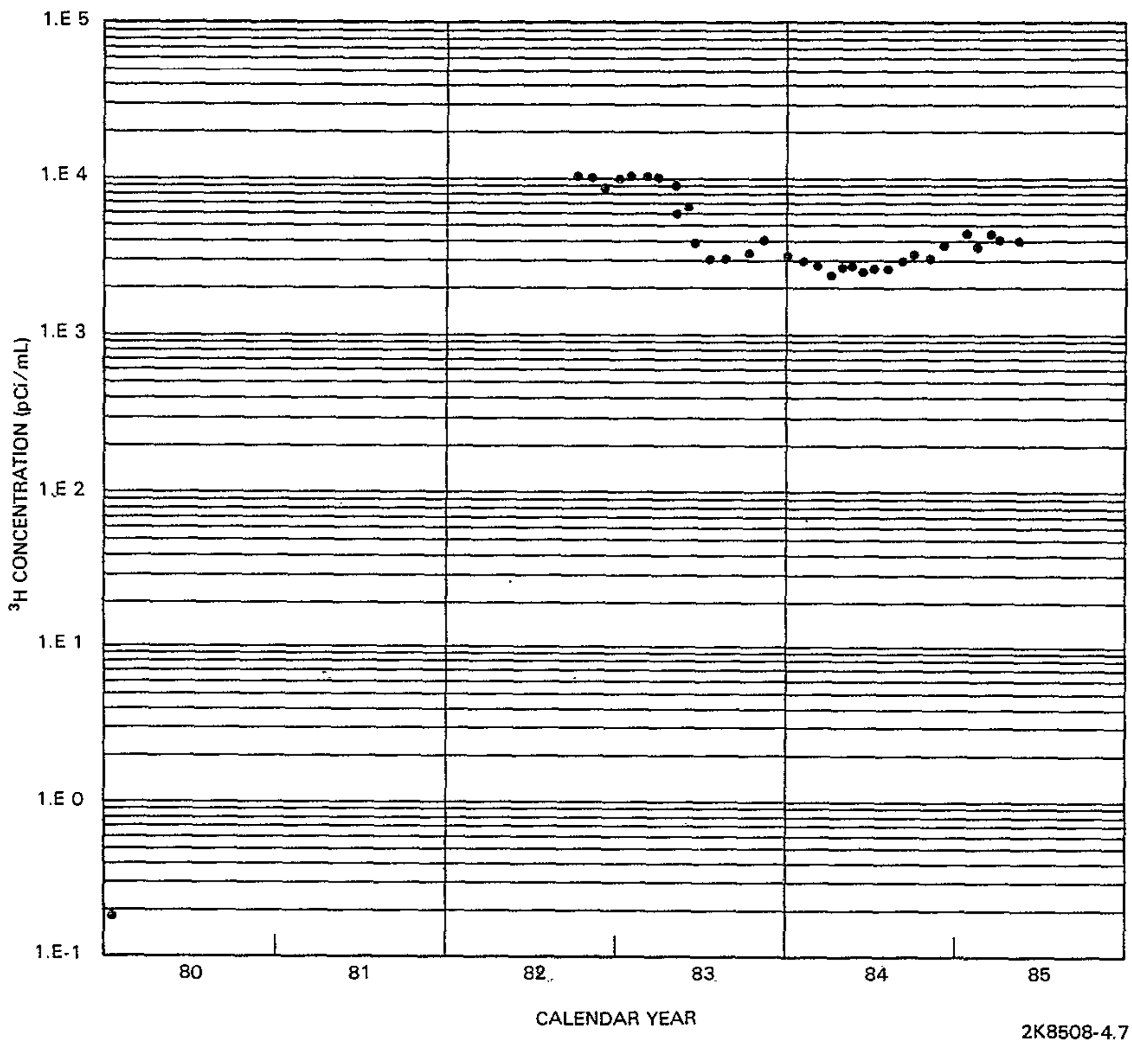

Figure 14. Tritium Concentration History in Well 299-E17-9 at the 216-A-36B Crib.

operation of PUREX is expected to increase tritium concentrations in ground water, but the impact at the site boundary is not expected to be significant. Results for other radionuclides are similar to those for 1983.

Isotopic uranium analyses were run on two samples from the monitoring wells near the crib. Results are listed in table 15 with concentrations of ^{234}U, ^{235}U, and ^{238}U below the RHO-MA-139 guidelines of 3.2 E-02 pCi/mL, 3.2 E-02 pCi/mL and 4.8 E-03 pCi/mL, respectively.

The long-term concentration histories for the two monitoring wells at the 216-A-36B crib, shown in figures D-7 and D-8 of appendix D, indicate the results for 1984 are reasonable when compared with previous data.

Table 15. Isotopic Uranium Concentrations in Monitoring Wells Near the 216-A-36B Crib.

Well No.	Sample date	^{234}U (pCi/mL)	^{235}U (pCi/mL)	^{238}U (pCi/mL)
299-E17-5	October 1984	3.29 E-03	1.16 E-04	3.27 E-03
	November 1984	3.88 E-03	1.19 E-04	3.87 E-03
299-E17-9	October 1984	1.26 E-03	4.71 E-05	1.03 E-03
	November 1984	1.33 E-03	4.50 E-05	1.16 E-03

3.2.5 216-A-37-1 Crib

Process condensate from the 242-A Evaporator (AFPC) is disposed to the 216-A-37-1 crib after diversion and monitoring in the concrete 207-A Retention Basin. The crib is located outside the 200 East Area, just east of the evaporator. The waste stream has been active since 1977, and in 1984 a total of 1.41 E+07 gal (5.34 E+07 L) of effluent was disposed to the crib.

The crib is monitored by four wells, 299-E25-17 through 299-E25-20. The monitoring results for 1984 are contained in table 16. Concentrations of radionuclides are below RHO-MA-139 guidelines and are similar to 1983 results.

Figure 15 shows the history of tritium concentration in well 299-E25-19 for the past 5 yr and reflects the startup of PUREX in 1984. Long-term concentration histories for the effluent and ground water are shown in figures D-9 through D-12 in appendix D. Increases in tritium concentrations are apparent, but within the pattern of past operations.

3.2.6 216-B-55 Crib

The 216-B-55 crib is located west of B Plant in the northwestern part of 200 East Area (see fig. 10). Steam condensate waste (BCS) from B Plant has been disposed to the crib since 1967. The volume of effluent released in 1984 was 8.98 E+06 gal (3.40 E+07 L).

Table 16. Concentrations of Radiological Parameters and Nitrate for the Effluent and for Ground Water Near the 216-A-37-1 Crib in 1984.

		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
					Waste Stream					
242-A (AFPC)	AVE	<1.00 E-02	4.00 E-01	2.00 E+03	<4.2 E+00	<9.00 E-02	<2.00 E-01	NA[a]	BDL[b]	BDL[b]
					Well					
2E 25 17	MAX	NA[a]	2.89 E-02	1.58 E+02	2.55 E+01	1.01 E-02	4.55 E-03	1.80 E-03	3.23 E-02	NA[a]
	AVE		9.24 E-03	6.12 E+01	5.61 E+00	4.31 E-03	2.17 E-03	5.90 E-04	1.18 E-02	
	MIN		0.00 E-01[c]	3.51 E+01	2.21 E-01	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
2E 25 17	MAX	NA[a]	3.33 E-02	3.21 E+02	3.29 E+01	7.32 E-03	2.24 E-03	3.62 E-03	6.53 E-02	NA[a]
	AVE		9.11 E-03	2.08 E+02	2.44 E+01	2.02 E-03	9.05 E-04	1.24 E-03	3.61 E-02	
	MIN		0.00 E-01[c]	1.05 E+02	8.37 E+00	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
2E 25 19	MAX	NA[a]	4.83 E-02	1.11 E+03	4.05 E+02	2.68 E-03	3.98 E-03	7.33 E-03	4.72 E-02	NA[a]
	AVE		2.19 E-02	8.54 E+02	2.37 E+02	1.18 E-03	1.86 E-03	3.03 E-03	1.63 E-02	
	MIN		1.93 E-03	1.30 E+02	1.28 E+00	0.00 E-01	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
2E 25 20	MAX	NA[a]	6.29 E-02	1.31 E+03	4.06 E+02	8.62 E-03	7.67 E-03	4.04 E-03	6.45 E-02	NA[a]
	AVE		2.40 E-02	4.89 E+02	1.57 E+02	3.46 E-03	2.00 E-03	2.29 E-03	2.86 E-02	
	MIN		0.00 E-01[c]	2.53 E+02	9.93 E+01	0.00 E-01[c]	0.00 E-01[c]	1.12 E-03	5.85 E-03	

[a]NA--no analysis for this constituent.
[b]BDL--below detection limit.
[c]Negative analytical values appear as zeroes.

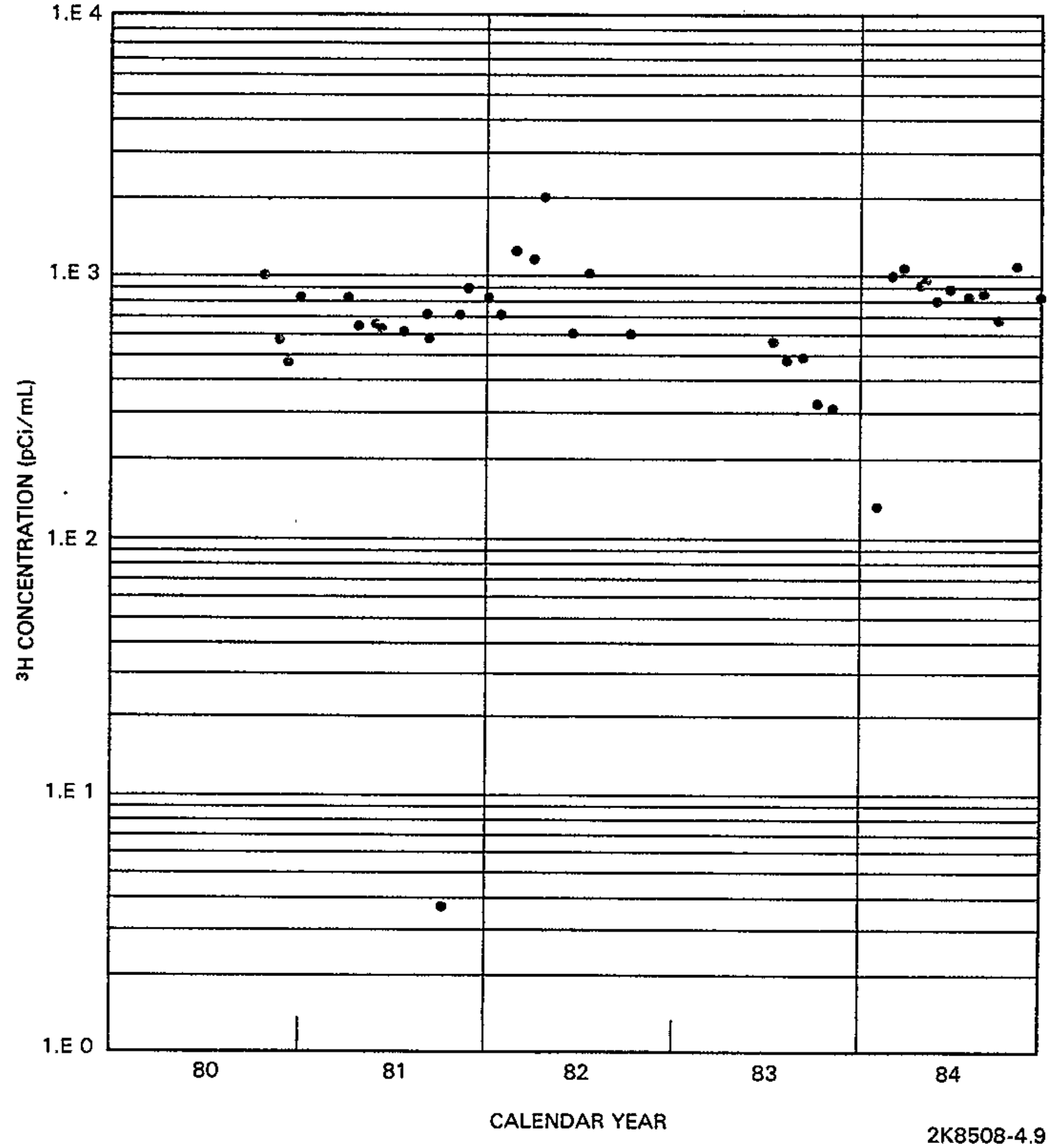

Figure 15. Tritium Concentration History in Well 299-E25-19 at the 216-A-37-1 Crib.

Wells 299-E28-12 and 299-E28-13 monitor this crib. Results of the monitoring for 1984 are listed in table 17. Concentrations of all radionuclides are observed to be below RHO-MA-139 guidelines. These results are typical for this crib as may be noted from the long-term concentration history graphs shown in figures D-13 and D-14 of appendix D.

3.2.7 216-B-62 Crib

Process condensate from B Plant (BCP) has been routed to the 216-B-62 crib, which is located northwest of B Plant, since 1973. In 1984, the effluent volume was 1.85 E+06 gal (7.00 E+06 L).

Wells 299-E28-18 and 299-E28-21 provide monitoring capability for this crib. Table 18 summarizes the data obtained during 1984. Total alpha concentrations in wells at this crib are elevated in comparison with other 200 Area wells (appendix B.1). Since total alpha is used as a screening parameter, special sampling was conducted to determine the source of the alpha. Isotopic plutonium and isotopic uranium analyses were performed, with no plutonium being detected and uranium isotopes accounting for the alpha concentration (table 19). The analyses for ^{234}U and ^{238}U exceed Rockwell's more restrictive internal guidelines of 3.2 E-02 and 4.8 E-03 pCi/mL, respectively, but concentrations of all isotopes of uranium are below Table II guidelines at the crib, without any consideration of attenuation before reaching the site boundary.

Long-term concentration history graphs for this crib, shown in figures D-15 and D-16 of appendix D, indicate that 1984 concentrations are consistent with previous data.

3.2.8 216-U-12 Crib

The UO_3 Plant in 200 West Area supports the operation of PUREX. The process condensate effluent stream (U-12) from this plant is discharged to the 216-U-12 crib (see fig. 11). The volume of effluent in 1984 was 1.45 E+06 gal (5.50 E+06 L).

Well 299-W22-22 monitors this crib. Average concentrations of radionuclides in this well (table 20) are below RHO-MA-139 guidelines. These concentrations are similar to those reported in 1983.

Long-term concentration history for this crib, shown in figure D-17 in appendix D, provides a comparison with previous operation of the crib.

3.2.9 216-U-16 Crib

Steam condensate waste, chemical sewer waste, and cooling water from 244-U and 271-U Plants were routed to the 216-U-16 crib instead of 216-U-10 pond in July 1984. The volume of waste totaled 9.88 E+07 gal (3.74 E+08 L).

Table 17. Concentrations of Radiological Parameters and Nitrate for the Effluent and for Ground Water Near the 216-B-55 Crib in 1984.

		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
					Waste Stream					
β Plant (BCS)	AVE	<1.00 E-02	<2.00 E+00	<5.00 E-01	<1.10 E+00	2.00 E-01	3.00 E-01	NA[a]	BDL[b]	NA[a]
					Well					
2E 28 12	MAX	NA[a]	5.23 E-02	2.53 E+02	NA[a]		7.95 E-03	9.65 E-03	5.98 E-02	NA[a]
	AVE		2.12 E-02	1.04 E+02		0.00 E-01[c]	2.06 E-03	2.29 E-03	1.59 E-02	
	MIN		0.00 E-01[c]	7.94 E+00			0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
2E 28 13	MAX	NA[a]								
	AVE		0.00 E-01[c]	8.21 E+00[d]	NA[a]	NA[a]	7.58 E-03[d]	2.24 E-03[d]	1.58 E-02[d]	NA[a]
	MIN									

[a]NA--no analysis for this constituent.
[b]BDL--below detection limit.
[c]Negative analytical values appear as zeroes.
[d]Three values or less, no maximum or minimum calculated.

Table 18. Concentrations of Radiological Parameters and Nitrate for the Effluent and for Ground Water Near the 216-B-62 Crib in 1984.

		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
					Waste Stream					
B Plant (BCP)	AVE	9.00 E-01	6.00 E+03	9.00 E-01	<1.3 E+00	2.00 E+03	2.00 E+02	NA[a]	BDL[b]	NA[a]
					Well					
2E 28 18	MAX	2.17 E-01	1.08 E-01	4.83 E+01	1.52 E+02	1.69 E-02	4.87 E-03	1.00 E-02	5.43 E-02	NA[a]
	AVE	1.68 E-01	5.83 E-02	3.16 E+01	1.25 E+02	4.39 E-03	1.23 E-03	2.81 E-03	1.85 E-02	
	MIN	6.15 E-04	2.73 E-02	1.93 E+01	8.76 E+01	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	
2E 28 21	MAX	2.12 E-01	7.78 E-02	5.42 E+01	1.79 E+02	8.91 E-03	7.83 E-03	4.48 E-03	5.37 E-02	NA[a]
	AVE	1.33 E-01	5.44 E-02	3.89 E+01	1.28 E+02	1.89 E-03	2.29 E-03	1.67 E-03	1.19 E-02	
	MIN	6.00 E-03	3.50 E-02	1.84 E+01	6.02 E+01	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	

[a]NA--no analysis for this constituent.
[b]BDL--below detection limit.
[c]Negative analytical values appear as zeroes.

Table 19. Isotopic Uranium Concentrations in Monitoring Wells Near the 216-B-62 Crib.

Well No.	Sample date	^{234}U (pCi/mL)	^{235}U (pCi/mL)	^{238}U (pCi/mL)
299-E28-18	July 1984	1.275 E-01	5.21 E-03	1.353 E-01
	October 1984	9.08 E-02	2.90 E-03	9.00 E-02
	November 1984	1.025 E-01	3.42 E-03	1.05 E-01
299-E28-21	October 1984	7.78 E-02	2.22 E-03	7.99 E-02
	November 1984	9.03 E-02	2.58 E-03	8.98 E-02

Wells 299-W19-13 and 299-W19-14 monitor the crib. The monitoring results (table 21) indicate that concentration of all constituents are below RHO-MA-139 guidelines.

3.2.10 216-W-LWC Crib

Liquid wastes from the laundry building are directed to the 216-W-LWC crib in 200 West Area (see fig. 11). This crib was placed into operation in 1981 and during 1984 received 2.28 E+07 gal (8.62 E+07 L) of effluent.

Well 299-W14-10 monitors this crib. Average concentrations of radionuclides and the effluent streams are listed in table 22. Concentrations were below RHO-MA-139 guidelines and similar to last year.

3.2.11 216-Z-20 Crib

The 216-Z-20 crib receives effluent (2904-ZA and 231-Z waste streams) from the 231-Z and 234-5Z buildings. The crib is located south of the 234-5Z Building in 200 West Area (see fig. 11), and became operational in 1981. The discharge to the crib was 2.35 E+08 gal (8.90 E+08 L) during 1984.

The 216-Z-20 crib has four ground-water monitoring wells along the length of the crib, identified as 299-W18-17 through 299-W18-20. Results of the analyses for 1984 (table 23) are all below RHO-MA-139 guidelines and similar to the low values for 1983.

Table 20. Concentrations of Radiological Parameters and Nitrate for the Effluent and for Ground Water Near the 216-U-12 Crib in 1984.

		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
					Waste Stream					
UO_3 Plant (U-12)	AVE	<6.00 E-01	<4.00 E+00	NA[a]	1.60 E+03	BDL[b]	<6.00 E-02	NA[a]	BDL[b]	2.00 E-01
2W 22 22	MAX	8.11 E-03	5.62 E-02	4.09 E+00	6.51 E+00	9.58 E-03	6.88 E-03	6.06 E-03	4.77 E-02	3.44 E-03
	AVE	3.10 E-03	1.30 E-02	2.87 E+00	2.22 E-00	2.61 E-03	1.86 E-03	1.45 E-03	1.44 E-02	1.45 E-03
	MIN	0.00 E-01[c]	0.00 E-01[c]	2.13 E+00	4.43 E-01	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	3.08 E-04

[a]NA--no analysis for this constituent.
[b]BDL--below detection limit.
[c]Negative analytical values appear as zeroes.

Table 21. Concentrations of Radiological Parameters and Nitrate for the Effluent and for Ground Water Near the 216-U-16 Crib in 1984.

	Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
				Waste Stream					
UO_3 Plant Steam Condensate	<2 E-2	<9 E-2	NA[a]	NA[a]	<9 E-2	<5 E-2	NA[a]	BDL[b]	<1 E-2
				Well					
2W 19 13 MAX AVE MIN	1.22 E-02[c]	2.54 E-02[c]	6.50 E-01[c]	2.92 E+01[c]	0.00 E-01[d]	0.00 E-01[d]	3.04 E-03[c]	0.00 E-01[d]	4.92 E-03[c]
2W 19 14 MAX AVE MIN	0.00 E-01[d]	3.33 E-02[c]	3.56 E-01[c]	2.54 E+00[c]	1.14 E-03[c]	2.88 E-03[c]	4.05 E-03[c]	0.00 E-01[d]	1.77 E-03[c]

[a]NA--no analysis for this constituent.
[b]BDL--below detection limit.
[c]Three values or less, no maximum or minimum calculated.
[d]Negative analytical values appear as zeroes.

Table 22. Concentrations of Radiological Parameters and Nitrate for the Effluent and for Ground Water Near the 216-W-LWC Crib in 1984.

		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
					Waste Stream					
Laundry (LWC)	AVG	<3.00 E-02	9.00 E-01	NA[a]	NA[a]	2.00 E-01	2.00 E-01	NA[a]	BDL[b]	7.00 E-03
					Well					
2W 14 10	MAX	1.46 E-02	3.60 E-02	NA[a]	2.63 E+02	8.95 E-03	5.67 E-03	4.95 E-03	6.41 E-02	NA[a]
	AVE	6.74 E-03	6.75 E-03		1.69 E+02	3.80 E-03	1.43 E-03	1.96 E-03	1.93 E-02	
	MIN	0.00 E-01[c]	0.00 E-01[c]		1.13 E+02	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	0.00 E-01[c]	

[a]NA--no analysis for this constituent.
[b]BDL--below detection limit.
[c]Negative analytical values appear as zeroes.

Table 23. Concentrations of Radiological Parameters and Nitrate for the Effluent and for Ground Water Near the 216-Z-20 Crib in 1984.

		Total alpha (pCi/mL)	Total beta (pCi/mL)	Tritium (pCi/mL)	Nitrate (mg/L)	^{90}Sr (pCi/mL)	^{137}Cs (pCi/mL)	^{60}Co (pCi/mL)	^{106}Ru (pCi/mL)	Uranium (pCi/mL)
Waste Stream										
234-5 Z (2904-AZ) 231-Z (231-Z)	AVG	2.00 E+00	2.00 E-01	NA[a]	7.40	<3.00 E-02	BDL[b]	NA[a]	BDL[b]	NA[a]
Well										
2W 18 17	MAX	3.18 E-03	3.02 E-02	9.44 E-01		NA[a]	6.41 E-03	7.36 E-03	2.53 E-02	NA[a]
	AVE	7.95 E-04	1.70 E-02	4.65 E-01	9.98 E-01[c]		1.60 E-03	3.02 E-03	6.32 E-03	
	MIN	0.00 E-01[d]	4.84 E-03	1.55 E-01			0.00 E-01[d]	0.00 E-01[d]	0.00 E-01[d]	
2W 18 18	MAX	6.15 E-03	9.29 E-02	3.57 E-01		NA[a]	3.44 E-03	6.75 E-03	1.61 E-02	NA[a]
	AVE	3.38 E-03	2.74 E-02	2.03 E-01	1.06 E+00[c]		1.15 E-03	1.94 E-03	6.38 E-03	
	MIN	1.16 E-03	0.00 E-01[d]	0.00 E-01[d]			0.00 E-01[d]	0.00 E-01[d]	0.00 E-01[d]	
2W 18 19	MAX	1.18 E-02	2.83 E-02	8.10 E+00	2.58 E+01	NA[a]	6.41 E-03	7.36 E-03	4.38 E-02	NA[a]
	AVE	2.66 E-03	1.18 E-02	2.36 E+00	7.36 E+00		2.11 E-03	1.20 E-03	1.30 E-02	
	MIN	0.00 E-01[d]	0.00 E-01[d]	0.00 E-01[d]	1.15 E-01		0.00 E-01[d]	0.00 E-01[d]	0.00 E-01[d]	
2W 18 20	MAX	1.13 E-02	2.94 E-02	2.16 E+00	5.93 E+00	NA[a]	6.82 E-03	6.11 E-03	4.74 E-02	NA[a]
	AVE	3.59 E-03	9.73 E-03	3.91 E-01	1.45 E+00		2.16 E-03	1.86 E-03	1.73 E-02	
	MIN	0.00 E-01[d]	0.00 E-01[d]	6.50 E-03	6.60 E-02		0.00 E-01[d]	0.00 E-01[d]	0.00 E-01[d]	

[a]NA--no analysis for this constituent.
[b]BDL--below detection limit.
[c]Three values or less, no maximum or minimum calculated.
[d]Negative analytical values appear as zeroes.

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4.0 SEPARATIONS AREA WATER-USE BALANCE

Water for processing, sanitary use, and power generation is obtained from the Columbia River and pumped to treatment and storage facilities in 200 East Area and 200 West Area. Summaries of water use versus volume of water pumped to each area are provided in tables 24 and 25. These tables also indicate the disposal facility for each waste stream. Sanitary water is disposed to ground via septic tank drainage systems near the plant buildings. Water-use data was obtained from facility processing records and estimates and from powerhouse records.

Water-use data for 200 East Area are listed in table 24. The difference between water pumped and water disposed is about 9%, which is within the accuracies of the metering equipment and estimation techniques.

The water-use data for 200 West Area are listed in table 25. The estimated makeup water for maintaining water levels in U Pond is listed separately, because it is added from fire hydrants. Data indicates that about 27% more water is pumped to 200 West Area than is disposed to ground via cribs and ponds. This discrepancy is greater than desired and is being evaluated.

Table 24. Water-Use Balance for 200 East Area During CY 1984.

Water use	Disposal facility No.	Volume	
		(gal)	(L)
202-A Process Condensate (PDD)	216-A-10	2.83 E+07	1.07 E+08
202-A Steam Condensate (SCD)	216-A-30 216-A-37-2	1.17 E+08	4.43 E+08
202-A Ammonia Scrubber Waste (ASD)	216-A-36B	1.29 E+07	4.88 E+07
242-A Process Condensate (AFPC)	216-A-37-1	1.41 E+07	5.34 E+07
241-AY, AZ Tank Farm Coil Condensate (A08)	216-A-8	2.85 E+05	1.08 E+06
PUREX Chemical Sewer (CSL)	216-B-3	3.43 E+08	1.30 E+09
PUREX Cooling Water (CWL) 242-A Cooling Water (ACW) 242-A Steam Condensate (ASC) 244-AR Vault Cooling Water (CAR) 241-A Tank Farm Cooling Water (CA8) B Plant Cooling Water (CBC)	216-B-3 216-A-25	5.15 E+09	1.95 E+10
B Plant Chemical Sewer (BCE)	216-B-63	7.98 E+07	3.02 E+08
B Plant Steam Condensate (BCS)	216-B-55	8.98 E+06	3.40 E+07
B Plant Process Condensate (BCP)	216-B-62	1.85 E+06	7.00 E+06
Powerhouse and Water Treatment Facility	216-A-25 216-B-3	9.11 E+07	3.45 E+08
Powerhouse Ash Sluice	Ash Pit	6.76 E+06	2.56 E+07
Sanitary Water	Misc. Tile Fields	2.40 E+07	9.10 E+07
U.S. Ecology		4.57 E+05	1.73 E+06
Total Water Use in 200 East in 1984		5.88 E+09	2.23 E+10
Total Volume of Raw Water Pumped from the Columbia River to 200 East Area in 1984		6.47 E+09	2.45 E+10

Table 25. Water-Use Balance for 200 West Area During CY 1984.

Water use	Disposal facility No.	Volume (gal)	Volume (L)
Redox Chemical Sewer	216-S-11	5.26 E+07	1.99 E+08
222-S Lab Pond	216-S-19 216-S-26	9.35 E+06 3.06 E+06	3.54 E+07 1.16 E+07
242-S Steam Condensate (RCI)	216-U-10	5.65 E+06	2.14 E+07
UO_3 Plant Process Condensate (U-12)	216-U-12	1.45 E+06	5.50 E+06
UO_3 Plant Steam Condensate, Chemical Sewer, Cooling Water	216-U-10 216-U-16	8.51 E+07 9.88 E+07	3.22 E+08 3.74 E+08
231-Z Cooling Water (231-Z) 234-5Z Liquid Waste (2904-ZA)	216-Z-20	2.35 E+08	8.90 E+08
Laundry (LWC)	216-W-LWC	2.28 E+07	8.62 E+07
Powerhouse and Water Treatment Facility	216-U-10 Powerhouse Pond	4.62 E+07 2.91 E+07	1.75 E+08 1.10 E+08
Powerhouse Ash Sluice	Ash Pit	4.49 E+06	1.70 E+07
Sanitary Water	Misc. Tile Fields	2.47 E+07	9.36 E+07
T Plant Drain Flush and Head-End Wastes	216-T-1	1.11 E+06	4.21 E+06
221-T Cold Chemical Drain and Compressor	216-T-4-2	1.46 E+06	5.54 E+06
Make-up Water for U Pond	216-U-10	3.17 E+08	1.20 E+09
Total Water Use in 200 West Area in 1984		9.38 E+08	3.55 E+09
Total Volume of Raw Water Pumped from the Columbia River to the 200 West Area in 1984		1.29 E+09	4.89 E+09

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5.0 INACTIVE DISPOSAL SITES

Liquid waste disposal sites which no longer receive wastes are monitored for changes that would indicate a potential problem. While there are no concentration guidelines for inactive sites, concentrations of ground-water samples are compared with RHO-MA-139 guidelines for reference purposes. Historically, samples from two disposal sites, the 216-B-5 reverse well and the 216-S-1 and S-2 crib, yield concentrations greater than the Table II guidelines. Elevated uranium levels in the vicinity of the 216-U-1, 2 cribs were observed in the last sample collected in 1984 and presently are under investigation. Results will be reported in the 1985 ground-water monitoring report.

5.1 216-B-5 REVERSE WELL

A reverse well at Hanford is a well that received liquid waste for disposal to ground. There are currently no active reverse wells. All reverse wells discharged waste into the vadose zone except the 216-B-5 well, which discharged waste to the water table from 1945 to 1947. This reverse well is located northeast of the 221-B Building in 200 East Area, and received waste from this building.

A characterization study (Smith 1980) determined the concentration and distribution of radionuclides in the sediments surrounding the well. This study, in addition to gamma logs in various wells, indicates that the contamination is localized. No significant changes were observed in the result of ground-water monitoring of well 299-E28-23 in 1984. Quarterly monitoring yielded an average ^{90}Sr concentration of 12.11 pCi/mL versus 12.0 pCi/mL in 1983 (Law and Allen 1984), and a ^{137}Cs average concentration of 3.86 pCi/mL versus 3.66 pCi/mL in 1983. The RHO-MA-139 guidelines are 0.03 pCi/mL for ^{90}Sr and 2 pCi/mL for ^{137}Cs. Table II concentration guidelines for ^{90}Sr and ^{137}Cs are 0.3 pCi/mL and 20 pCi/mL, respectively.

5.2 216-S-1 AND S-2 CRIB

The 216-S-1 and S-2 crib received waste from the 202-S Building from 1952 to 1956. Elevated ^{90}Sr concentrations have been observed since that period. A study (Van Luik and Smith 1982) of the concentration and distribution of contaminants indicated that the contaminants were held on sediments near the bottom of the crib. This investigation also concluded that the contamination was due to a break in a well casing within the crib. Strontium-90 has been decreasing with time and the concentrations from quarterly sampling of well 299-W22-1 averaged 0.273 pCi/mL in 1984. This average concentration is above the RHO-MA-139 guideline of 0.03 pCi/mL but below the Table II guideline of 0.3 pCi/mL, and also below the the 1983 average of 0.304 pCi/mL. The ^{90}Sr concentrations were two orders of magnitude higher during the 1970s.

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6.0 CONCENTRATION PLUME MAPS

Isopleth maps have been prepared to illustrate the average concentration of several ground-water constituents in relation to processing facilities in the Separations Area. Two sets of maps have been prepared: one set focuses on the Separations Area, the other addresses the region that is influenced by waste disposal operations, termed the affected area. Rockwell data has been supplemented with PNL data in the 600 Area for the construction of the maps (Cline et al. 1985).

Plume maps have been prepared for average concentrations of tritium and nitrate, since the high mobilities will indicate the maximum extent of contaminant migration. A map of the extent of total beta contamination has been prepared for the Separations Area only. The total beta concentration has decayed downgradient from the Separations Area, thus an affected area map was not appropriate.

6.1 TOTAL BETA

The total beta map for the Separations Area (fig. 16) shows the 0.1, 1.0, and 10.0 pCi/mL isopleths. Total beta is restricted to a few locations within the 200 East and 200 West Areas. In 200 East, total beta is greater than 1.0 pCi/mL near the 241-BX Tank Farm and the 216-BY cribs, and greater than 10 pCi/mL at the 216-B-5 reverse well site. In the 200 West Area, total beta concentrations greater than 0.1 pCi/mL but less than 1 mCi/mL are located around the 216-S, 216-T, 216-U, and 216-Z-20 cribs. Of these cribs, only the 216-Z-20 crib in 200 West Area is active.

6.2 TRITIUM

Maps depicting tritium concentrations of the Separations Area and the affected area are shown in figures 17 and 18, respectively. Tritium isopleths for 30, 300, and 3,000 pCi/mL are shown in these figures.

The tritium plume map for the Separations Area (fig. 17) shows tritium emanating from six sources: the inactive 216-S and 216-U cribs and the active 216-U-12 crib in 200 West Area; and the active 216-A, 216-B-55, and 216-B-62 cribs in 200 East Area.

In 200 West Area, the plume from the 216-S crib area is moving eastward and the plume from the 216-T Crib area is moving north, both of which are caused by radial flow from U Pond (see fig. 2). Elevated tritium concentrations in the southeast corner of 200 East Area, around the 216-A crib area south of PUREX, reflect recent operations. The tritium plume from prior operations in 200 East Area has moved eastward and divided into two lobes: one moving eastward to the Columbia River and the other moving southeasterly toward the 400 Area (fig. 18).

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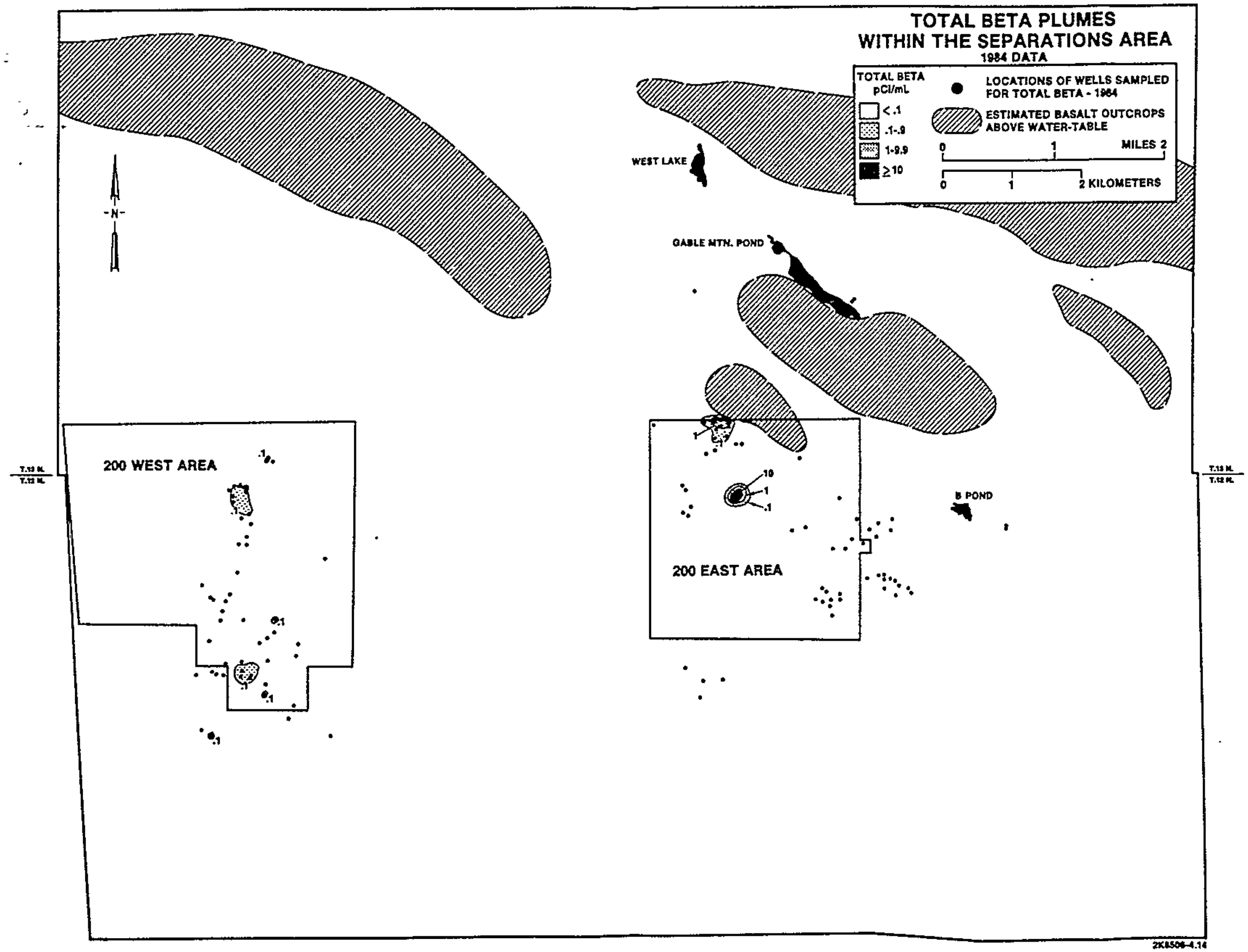

Figure 16. Total Beta Plume Map for the Separations Area, 1984.

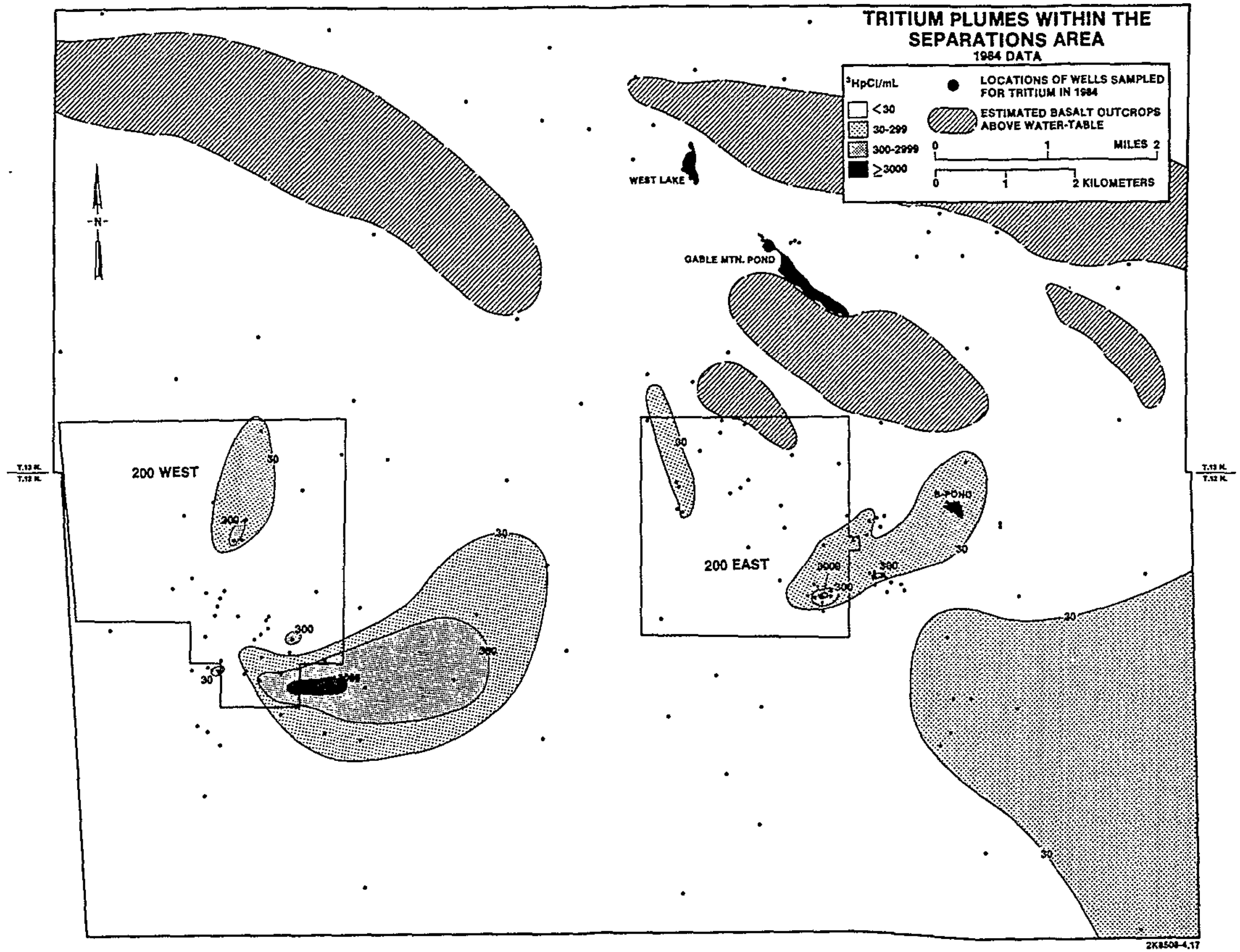

Figure 17. Tritium Plume Map for the Separations Area, 1984.

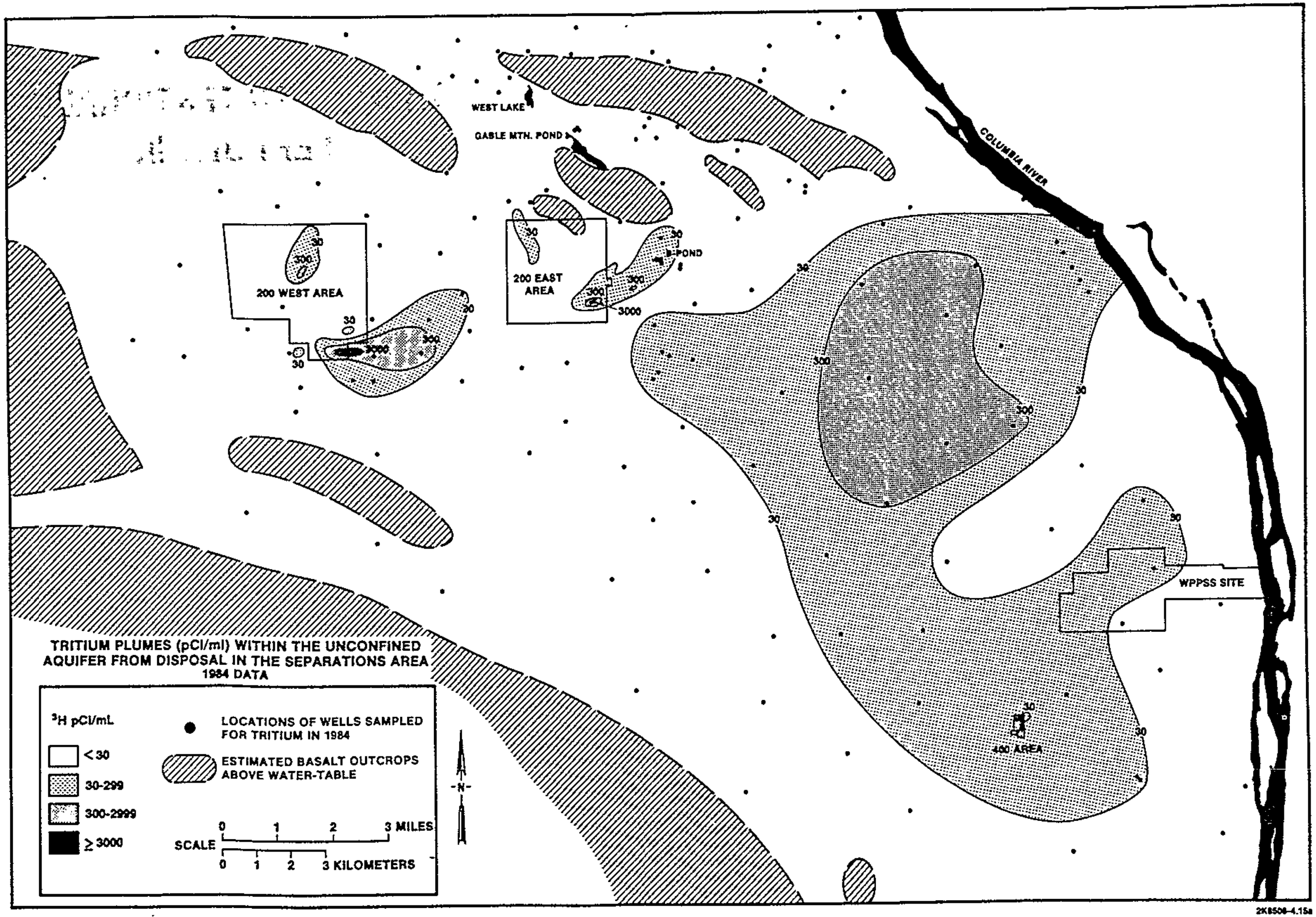

Figure 18. Tritium Plume Map for the Affected Area, 1984.

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6.3 NITRATE

Figures 19 and 20 show the nitrate plumes for the Separations Area and the affected area. Nitrate (reported as nitrate) isopleths have been constructed for 5, 10, 20, and 45 mg/L. The greatest concentrations of nitrate surround the 216-A cribs, 216-B-62 crib and the 216-BY cribs in 200 East Area, and the 216-T and 216-Z cribs and the 216-W-LWC crib in 200 West Area. The general flow pattern of the nitrate plume from the 200 Areas conforms to the general tritium plume flow pattern. The distribution of nitrate for the affected area is also similar to the corresponding tritium distribution.

The nitrate plumes depicted in this report are in general agreement with those presented in the PNL ground-water monitoring report for the Hanford Site (Cline et al. 1985). However, some differences exist due to different analytical methods used in determining nitrate concentrations. Rockwell used the phenoldisulfonic acid method to determine nitrate concentrations; PNL used both the phenoldisulfonic acid method and a specific ion probe. In interpreting the data in the Separations Area, Rockwell used the phenoldisulfonic acid method results for consistency.

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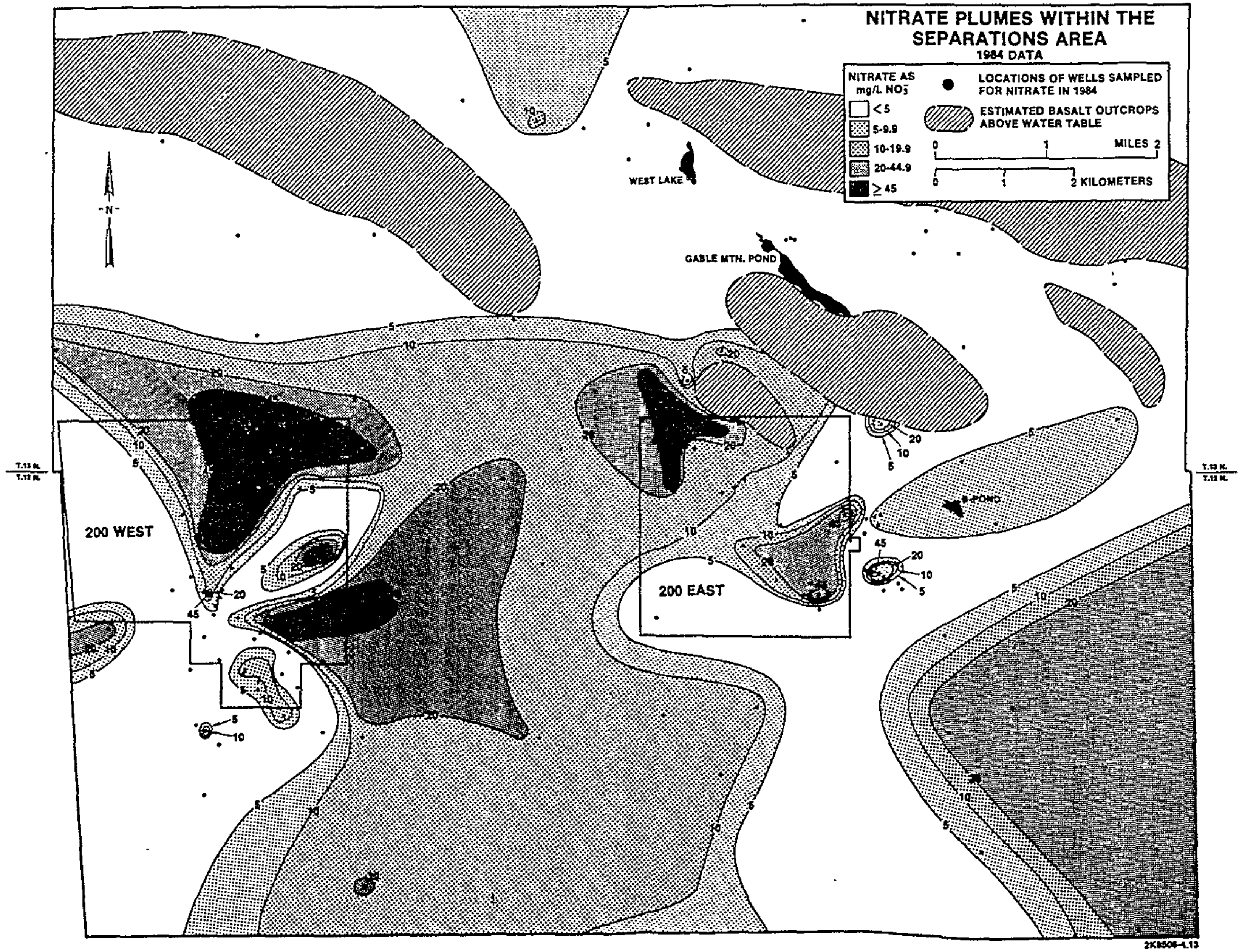

Figure 19. Nitrate Plume Map for the Separations Area, 1984.

9 2 1 2 4 6 6 1 3 6 7

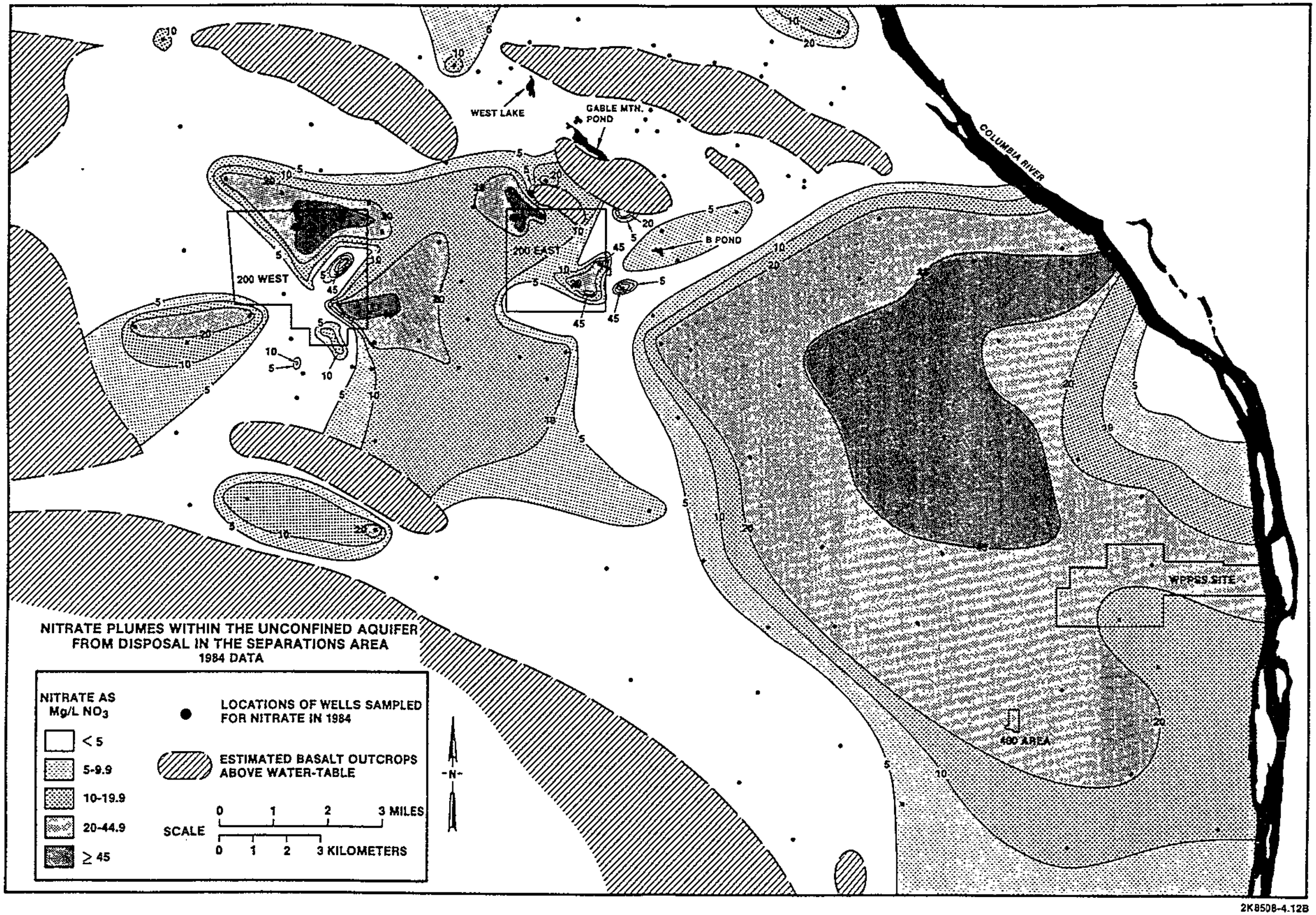

Figure 20. Nitrate Plume Map for the Affected Area, 1984.

9 2 1 2 4 5 6 1 8 6 8

7.0 SPECIAL GROUND-WATER SAMPLE ANALYSES

Exploratory sampling was conducted for ^{129}I in ground water near disposal facilities associated with PUREX. Analyses were performed by the PNL radiochemistry section using neutron activation analysis techniques.

The ^{129}I concentration in well 299-E17-1 at the 216-A-10 crib was 2.24 E-02 pCi/mL in a sample collected in September 1984. At the 216-A-36B crib, samples from well 299-E17-9 collected in November 1983 and September 1984 yielded ^{129}I concentrations of 8.2 E-03 pCi/mL and 2.20 E-02 pCi/mL, respectively. The concentrations at the 216-A-37-1 crib collected from well 299-E25-20 were 1.3 E-03 pCi/mL and 3.4 E-03 pCi/mL for samples obtained in November 1983 and September 1984. These results are below the RHO-MA-139 and Table II guidelines of 6.0 E-02 pCi/mL for ^{129}I, even before considering travel times to the site boundary and mitigation by dispersion and dilution.

On the basis of these exploratory results, sampling for ^{129}I is continuing in 1985.

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8.0 AQUIFER INTERCOMMUNICATION

The Elephant Mountain Member, the uppermost basalt in the Saddle Mountains Formation, serves as the bottom of the unconfined aquifer and the confining layer of the underlying Rattlesnake Ridge interbed. This sedimentary interbed is considered to be the uppermost confined aquifer in the Separations Area at Hanford.

A report (Graham et al. 1984) identifies areas of complete erosion of the Elephant Mountain basalt near West Lake and well 699-54-57, and suspected erosion near well 699-47-50 (see fig. 21). A potential for downward migration of water from the unconfined aquifer to the confined aquifer, or aquifer intercommunication, exists if the water table of the unconfined aquifer is above the potentiometric surface of the confined aquifer and if the confining stratum is permeable or missing.

Aquifer intercommunication could result in contamination being introduced into the Rattlesnake Ridge confined aquifer. The report by Graham et al. (1984) concluded that a downward gradient in the eroded areas did not exist in June 1982.

Monitoring of water levels in the unconfined and confined aquifer continued in 1984, along with sample collection and analyses for the tracer constituents tritium and nitrate.

Results of the confined aquifer sampling program are given in appendix B.2. Well locations are shown in figure 21. Nitrate concentrations are low, with the maximum of 2.16 ppm in well 699-47-50 and the minimum 0.02 ppm. Tritium concentrations are also low, ranging from 2.21 pCi/mL in well 299-E33-12 to 0.162 pCi/mL. These tritium results are not directly comparable with those of Graham et al. (1984), since the analytical methods employed for the routine analysis reported herein are not as sensitive as those employed for the previous investigation. There is no indication of aquifer intercommunication during CY 1984.

A comparison of the water table of the unconfined aquifer and the potentiometric surface of the confined aquifer, based on December 1984 measurements, is depicted in figure 21. The area with a downward hydraulic gradient east of 200 East Area is larger than that reported for June 1982 (Graham et al. 1984) due to the greater volume of waste water currently being disposed to the B Pond system.

An increase in the water table elevation causes a response in the potentiometric surface of the confined aquifer. Figure 22 is a comparison of well hydrographs of an unconfined well (699-42-40A, see figure A.2 in appendix A for location) with the nearby confined well (699-42-40C) for the period June 1983 through December 1984. These wells are located near the high point of the ground-water mound and therefore represent the extreme

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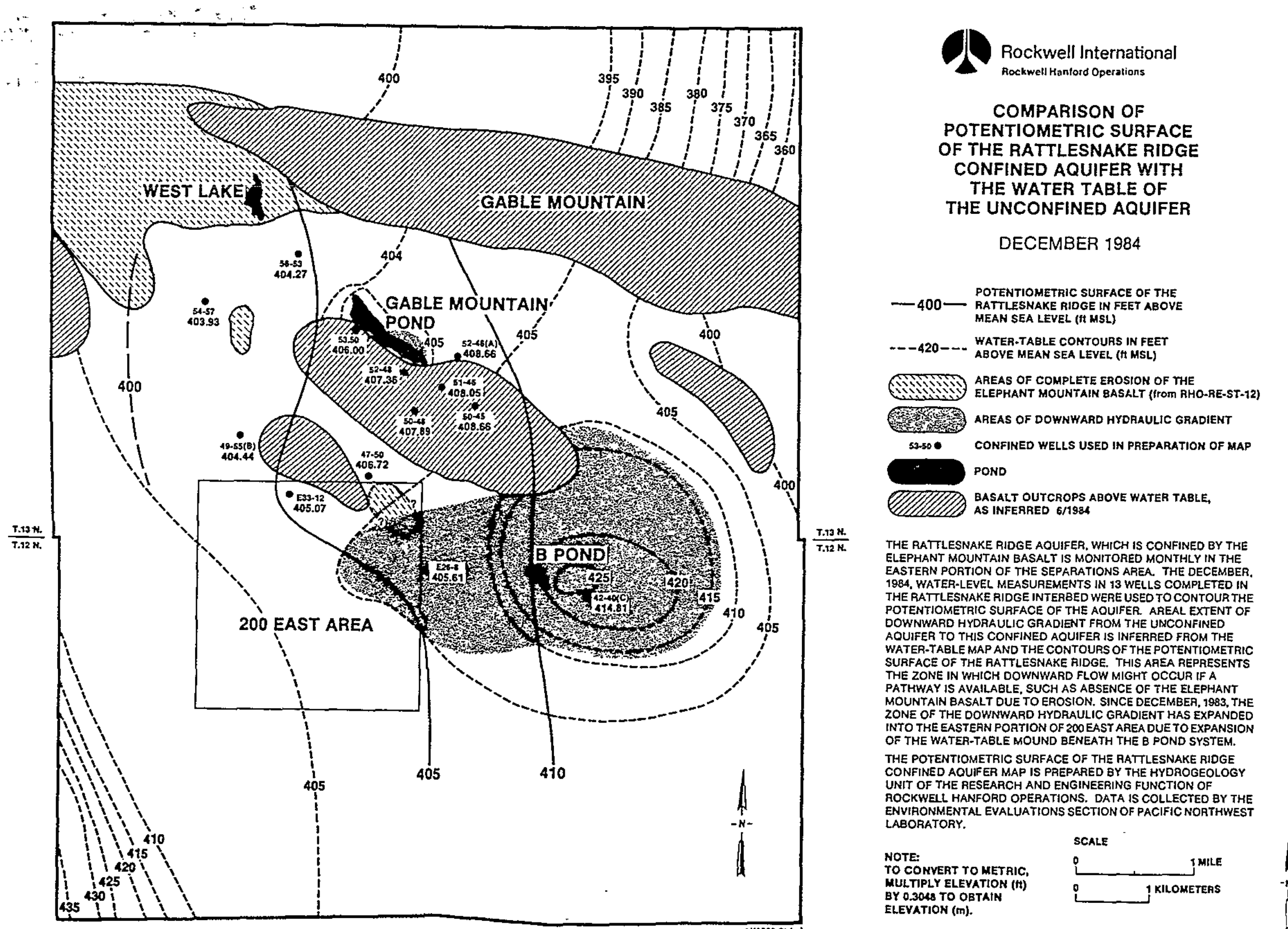

Figure 21. Comparison of Potentiometric Surface of the Rattlesnake Ridge Confined Aquifer with the Water Table of the Unconfined Aquifer.

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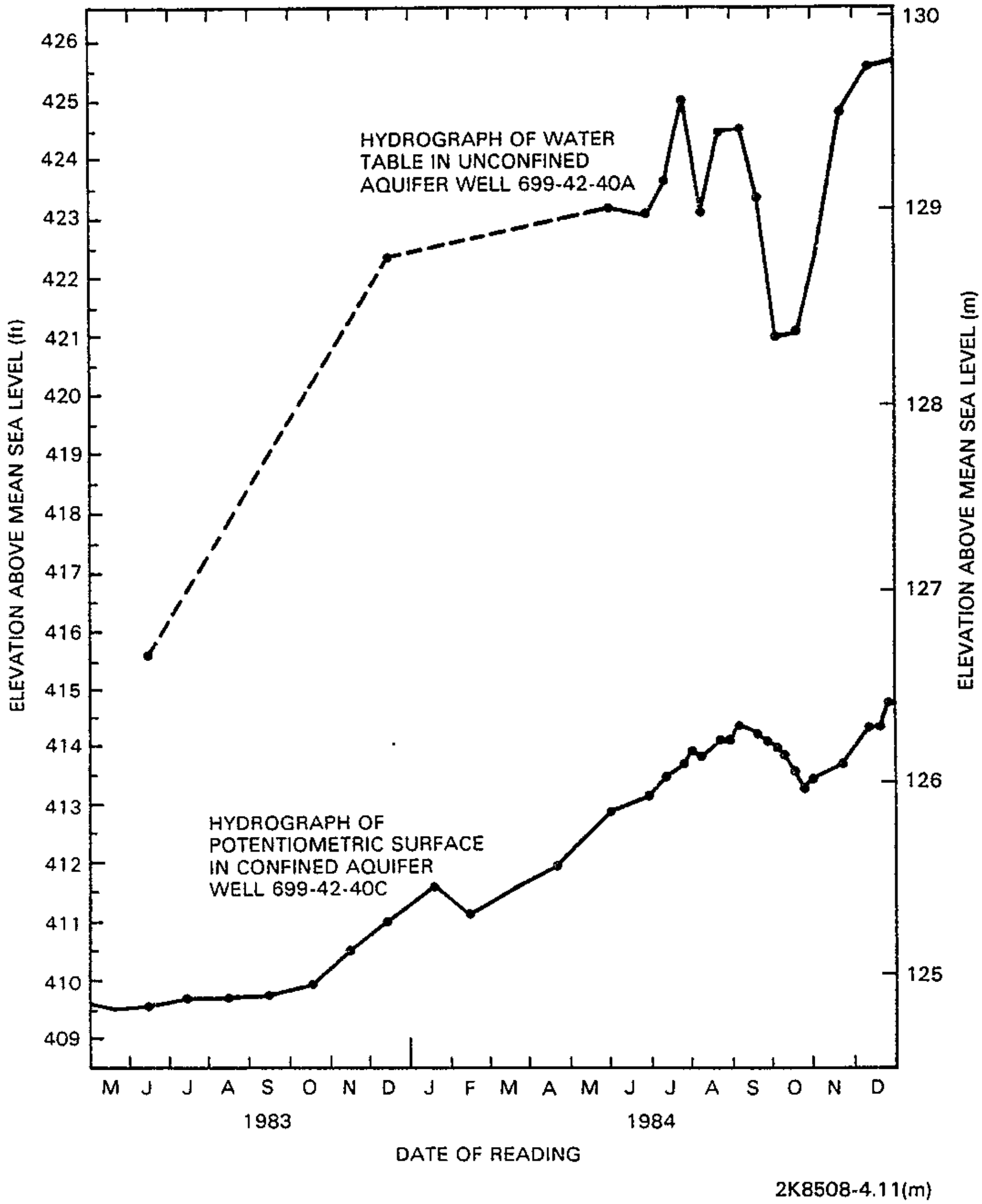

Figure 22. Hydrographs for Wall 699-42-40A and 699-42-40C.

condition. The unconfined aquifer water table increased 11 ft (3.4 m) (from 415.6 ft to 426.6 ft) (126.7 m to 130.0 m) in this 18-month period, while the potentiometric surface of the Rattlesnake Ridge confined aquifer rose 5 ft (1.5 m) (from 409.6 ft to 414.6 ft) (124.8 m to 126.4 m).

The impact of mounding is reduced near the eastern boundary of the 200 East Area. Confined aquifer data is available for well 299-E26-8. The nearest unconfined aquifer data is for well 299-E26-4 (see fig. 2), which is about 1,300 ft (396 m) to the southeast, but similarly located with respect to B Pond. The water table in well 299-E26-4 rose 2.75 ft (0.84 m) (from 403.17 ft to 405.92 ft) (122.89 m to 123.72 m) between June 1983 and December 1984. The corresponding rise in the confined aquifer potentiometric surface in well 299-E26-8 was 2.5 ft (0.8 m) (from 403.1 ft to 405.6 ft) (122.9 m to 123.6 m).

9.0 SUMMARY

The Separations Area ground-water monitoring network for CY 1984 consisted of 127 wells. New wells that were drilled during the year were added to the network as the wells were completed.

Samples from wells in the monitoring network were collected on a monthly, quarterly, or semiannual schedule, depending on the history of the liquid waste disposal site. Samples were analyzed selectively for total alpha, total beta, tritium, ^{90}Sr, ^{137}Cs, ^{60}Co, ^{106}Ru, total uranium and nitrate. The results of ground-water monitoring indicate that average concentrations of contaminants in most wells were essentially the same in 1984 as in 1983.

The RHO-MA-139 guidelines for ^{90}Sr were exceeded in three wells near the 216-A-25 Pond, with the concentration in one well also exceeding Table II guidelines. Investigation revealed the contamination is localized and will not pose a problem at the site boundary. Deactivation of the pond was also initiated in 1984. The RHO-MA-139 guidelines for ^{238}U were exceeded in three wells at the 216-U-10 Pond (which was deactivated in late 1984), and for ^{234}U and ^{238}U in two wells at the 216-B-62 Crib. However, these concentrations did not exceed Table II guidelines.

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APPENDIX A

WELL NUMBERING SYSTEM, FACILITY NUMBERING SYSTEM, DEFINITION OF THE SEPARATIONS AREA, WELL LOCATION MAPS

CONTENTS

A.1 Well Numbering System A-3

A.2 Facility Numbering System A-5

A.3 Definition of the Separations Area A-7

A.4 Well Location Maps A-11

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A.2 Selected Sampling Wells in the Separations Area A-11
A.3 Selected Sampling Wells in the Affected Area A-13

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APPENDIX A.1

WELL NUMBERING SYSTEM

A detailed description of the well numbering system is given in McGhan, et al. (1985). The numbering system used for well identification in the 200 Areas is a three-part system, comprised of seven digits and one letter separated by dashes (i.e., 299-E25-21). The first set of digits (299) identifies it as a well in one of the 200 Areas. The second part contains the prefix E or W for 200 East or 200 West Area, and is followed by a two-digit block number (E25). These block numbers are denoted on pages 10 and 11 of McGhan et al. (1985) for the 200 East and 200 West Areas. The third part (21) represents the consecutive numbering of a well constructed in a given block. For example, well 299-E25-21 is identified as the 21st well drilled in block 25 of 200 East Area. Computer-drawn graphs and tables from the Comprehensive Information Retrieval and Modeling Input Sequence (CIRMIS) system presented in this report use a modification of the preceding numbering system (i.e., well 299-E25-21 is identified as 2E-25-21).

Wells in the 600 Area use a different coding system. The well identification number contains three parts. The first part (699) identifies it as a well (99) in the 600 Area. The second and third parts represent the north and west Hanford coordinates of a well expressed in 10,000 ft. For example, well 699-35-70 has the coordinates of N034523 and W069988 (McGhan et al. 1985). Letters are added when more than one well in a zone is described by the same coordinates, such as 699-42-40A and 699-42-40B. The CIRMIS system uses the format 6 35 78 to represent well 699-35-78.

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APPENDIX A.2

FACILITY NUMBERING SYSTEM

The facility numbering system is a five- or six-digit, one-letter system separated with dashes (e.g., 216-A-37-2). Liquid waste disposal facilities (crib facilities, ponds, and ditches) are identified as 216-sites; Tank Farms as 241-sites.

The letter in the second part of the number represents a zone: A, B, C, E are zones in 200 East Area, and S, T, U, W, Z are zones in 200 West Area. The third part of the number represents consecutive numbering within a zone. In some cases, an additional identification tag has been included. For example, site 216-A-37-2 is the 37th liquid waste disposal site in Zone A of the 200 East Area. The (-2) differentiates this facility from 216-A-37-1. In other cases, a letter is added. For example, site 216-A-36B represents the 36th facility in block A of 200 East Area.

The facility number may be modified for use at Tank Farms. For example, 241-A Tank Farm, 241-AX Tank Farm, 241-AY Tank Farm, or 241-AZ Tank Farm. The third part of the Tank Farms numbering system is defined as the number assigned to that tank within the farm, such as 241-A-103 Tank.

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APPENDIX A.3

DEFINITION OF THE SEPARATIONS AREA

For the purpose of ground-water monitoring the Separations Area is defined on the basis of the U.S. Public Land System and is comprised of 80 sections of land in 6 townships as follows:

- T12N, R25E:* Sections 1, 2, 11, 12, 13, 14, 23, 24
- T12N, R26E: Sections 1 through 24
- T12N, R27E: Sections 5, 6, 7, 8, 17, 18, 19, 20
- T13N, R25E: Sections 13, 14, 23, 24, 25, 26, 35, 36
- T13N, R26E: Sections 13 through 36
- T13N, R27E: Sections 17, 18, 19, 20, 29, 30, 31, 32

These townships are referenced to the Williamette meridian. The location of these townships and sections with respect to the 200 East and 200 West Areas and other Hanford Site features is depicted in figure A.1.

*Read as "township 12 north, range 25 east."

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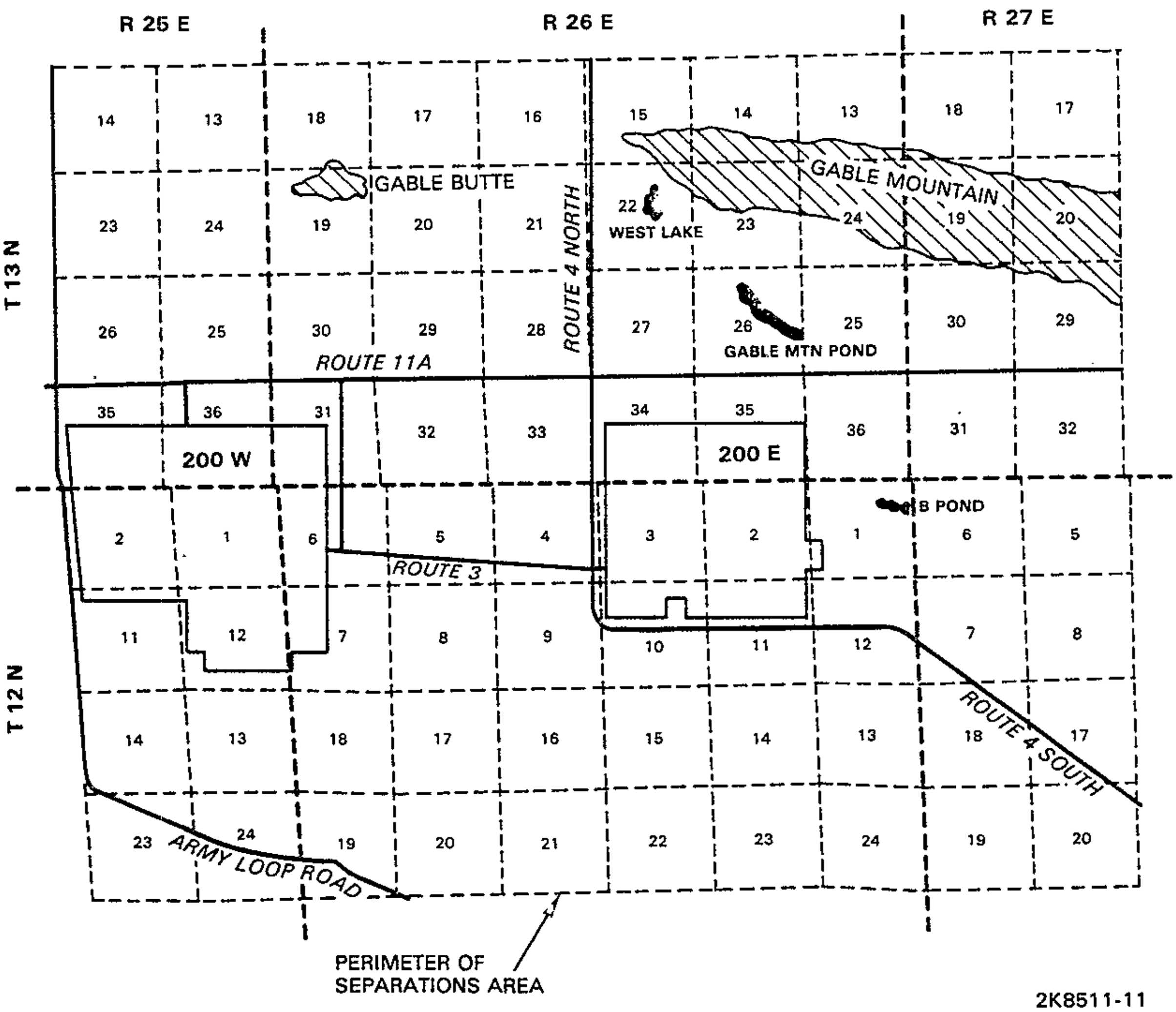

Figure A.1. Definition of the Separations Area.

APPENDIX A.4

WELL LOCATION MAPS

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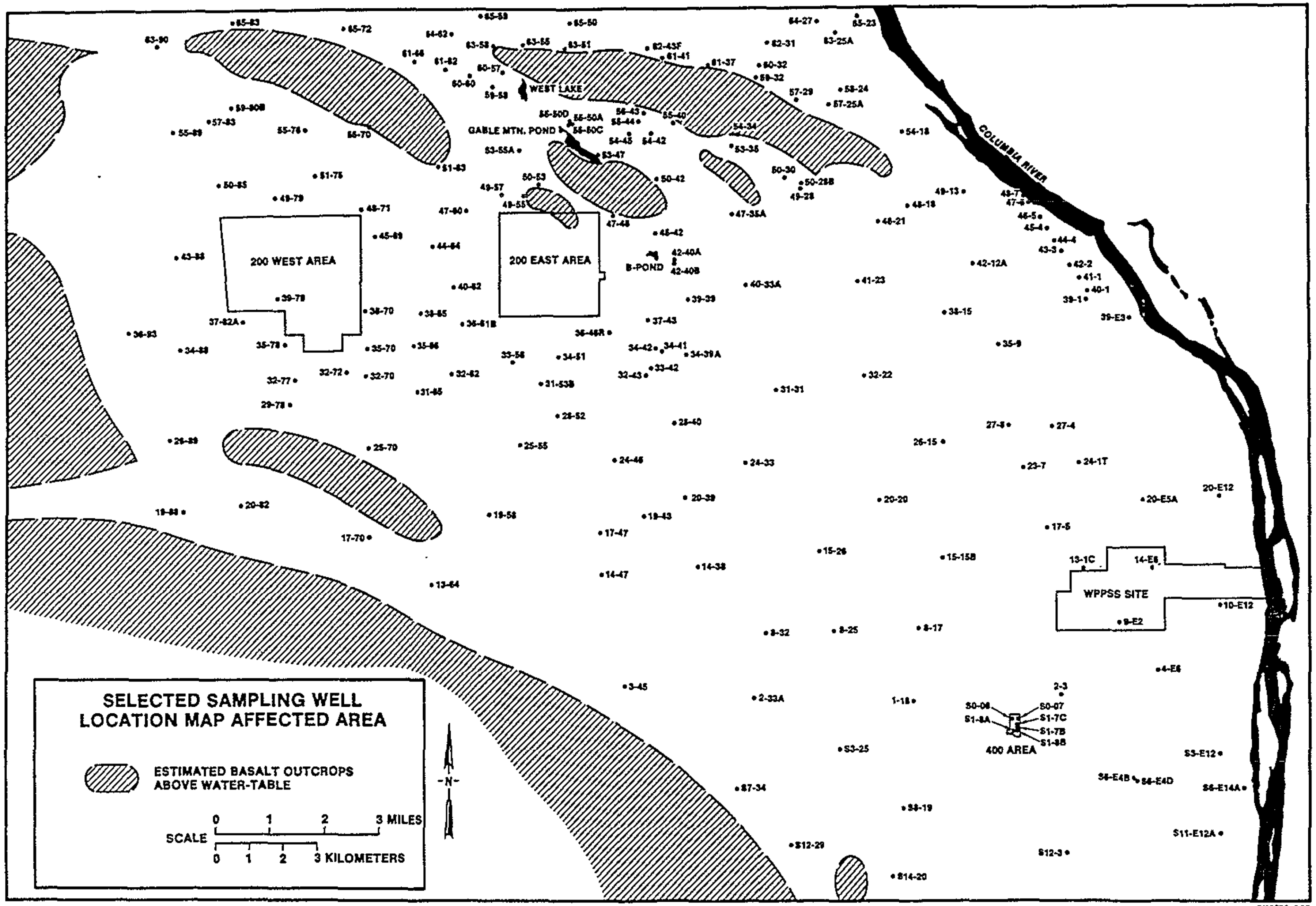

Figure A.3. Selected Sampling Wells in the Affected Area.

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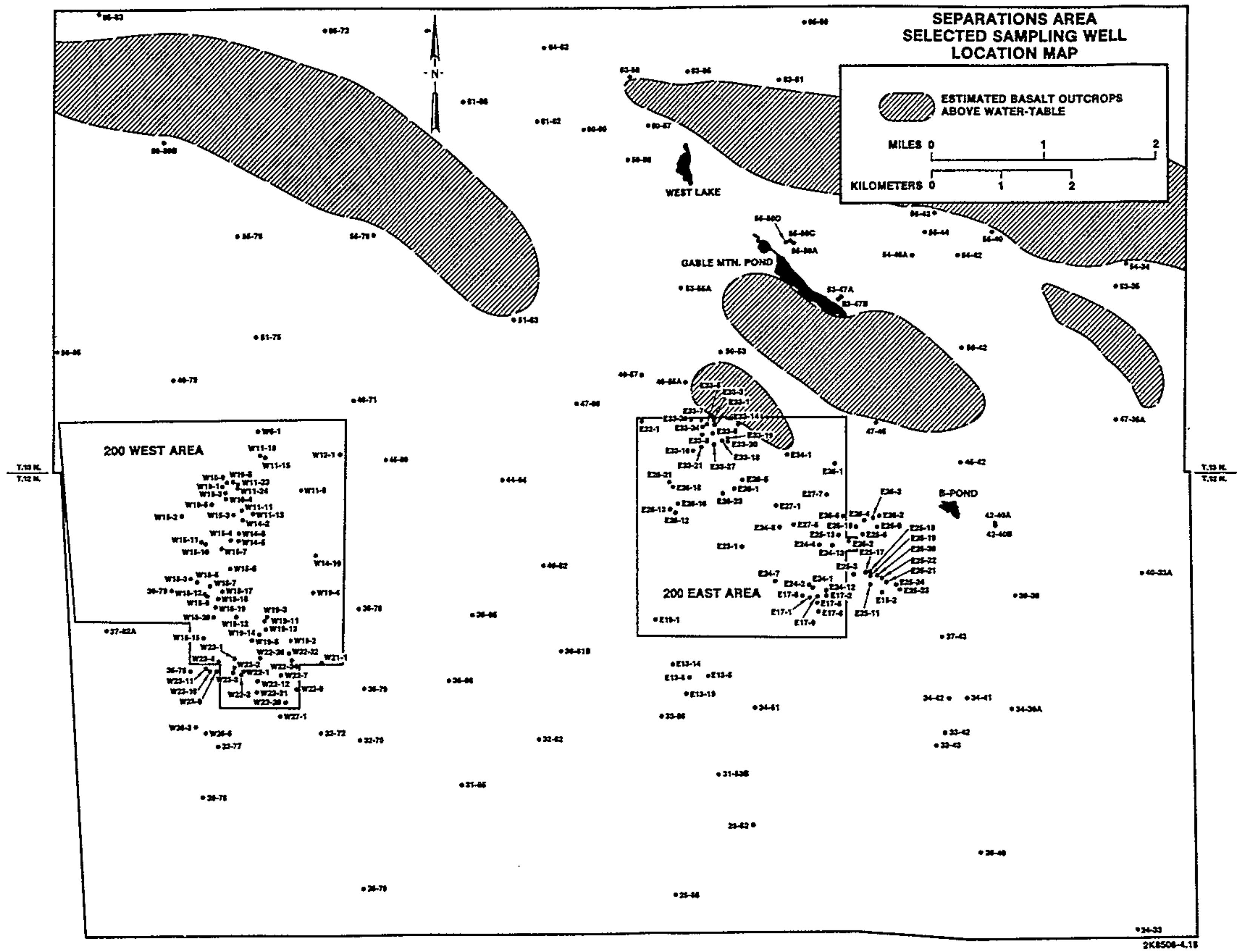

Figure A.2. Selected Sampling Wells in the Separations Area.

APPENDIX B

RESULTS OF THE UNCONFINED AND CONFINED AQUIFER GROUND-WATER MONITORING NETWORKS IN CY 1984

CONTENTS

B.1 Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984 .... B-3
B.2 Results of the Confined Aquifer Ground-Water Monitoring Network in CY 1984 .... B-15

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Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984. (sheet 1 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX		1.54E-02	9.03E+00						
2E 13 5	AVE		7.18E-03	2.88E+00						
(216-B-18)	MIN		0.00E-01**	0.00E-01**						
	MAX		2.20E-02				4.98E-03	4.05E-03	4.70E-02	
2E 13 8	AVE		1.15E-02				1.62E-03	1.01E-03	2.78E-02	
(216-B-21)	MIN		0.00E-01**				0.00E-01**	0.00E-01**	6.46E-03	
	MAX		1.91E-02							
2E 13 14	AVE		1.32E-02							
(216-B-29)	MIN		1.80E-03							
	MAX		4.59E-02							
2E 13 19	AVE		2.78E-02							
(216-B-28)	MIN		0.00E-01**							
	MAX		2.52E-02	7.75E+00	7.48E+00	1.74E-02	6.06E-03	5.90E-03	6.95E-02	
2E 16 2	AVE		1.36E-02	3.94E+00	3.14E+00	3.70E-03	1.26E-03	2.54E-03	2.72E-02	
(216-A-30)	MIN		0.00E-01**	4.12E-01	4.38E-01	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		5.81E-02	1.77E+03	6.48E+01	3.88E-02	6.40E-03	4.72E-03	5.38E-02	
2E 17 1	AVE		3.67E-02	1.15E+03	4.78E+01	7.07E-03	1.78E-03	1.38E-03	1.09E-02	1.69E-03*
(216-A-10)	MIN		2.38E-02	5.66E+02	2.66E+01	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX	9.72E-02	1.14E-01	6.34E+02	1.77E+02					
2E 17 2	AVE	3.24E-02	8.25E-02	3.45E+02	7.39E+01					
(216-A-27)	MIN	5.82E-04	4.49E-02	8.74E+01	1.52E+01					
	MAX	1.03E-02	9.93E-02	2.49E+03	7.92E+01	1.00E-02	6.26E-03	7.82E-03	6.42E-02	1.15E-02
2E 17 5	AVE	4.45E-03	5.95E-02	1.06E+03	4.47E+01	3.31E-03	1.35E-03	1.75E-03	1.97E-02	5.15E-03
(216-A-36B)	MIN	0.00E-01**	1.58E-02	5.17E+02	3.03E+01	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	1.26E-03
	MAX		3.49E-02	3.32E+00	1.57E+00					
2E 17 6	AVE		1.00E-02	2.06E+00	7.45E-01					3.98E-04*
(200 East)	MIN		0.00E-01**	7.21E-01	2.08E-01					
	MAX		6.49E-02	3.17E+02	1.07E+02	1.36E-02	8.34E-03	8.26E-03	5.08E-02	
2E 17 8	AVE		2.75E-02	1.94E+02	2.09E+01	5.58E-03	2.34E-03	3.74E-03	1.27E-02	
(216-A-38)	MIN		0.00E-01**	8.54E+00	5.31E+00	2.67E-03	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		7.67E-02	3.87E+03	9.52E+01	2.50E-02	8.54E-03	2.84E-02	9.96E-02	
2E 17 9	AVE		4.05E-02	3.03E+03	7.33E+01	6.75E-03	1.98E-03	6.51E-03	2.69E-02	
(216-A-36A,B)	MIN		1.58E-02	2.53E+03	6.25E+01	6.37E-05	0.00E-01**	0.00E-01**	0.00E-01**	

*— 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984. (sheet 2 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX		8.59E-02	2.98E+02	3.18E+01	4.31E-02	5.85E-03	4.51E-03	3.79E-02	
2E 24 1	AVE		4.51E-02	1.69E+02	1.75E+01	1.59E-02	2.85E-03	3.89E-03	1.67E-02	
(216-A-5)	MIN		4.25E-03	8.98E+01	1.02E+01	0.00E-01**	3.44E-04	2.97E-03	0.00E-01**	
	MAX									
2E 24 2	AVE	1.59E-03*	1.45E-02*	2.24E+02*	2.93E+01*	4.26E-03*	5.46E-03*	6.15E-04*	1.64E-02*	2.27E-03*
(216-A-10)	MIN									
	MAX		5.17E-02	8.60E+01	1.73E+02	3.94E-02	1.72E-03	3.69E-03	8.74E-03	
2E 24 4	AVE		1.89E-02	4.41E+01	2.17E+01	9.85E-03	6.02E-04	9.23E-04	2.93E-03	
(216-A-9)	MIN		0.00E-01**	2.79E+01	2.21E+00	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		5.13E-02	1.23E+01	7.92E+00		6.88E-03	4.83E-03	5.39E-02	
2E 24 8	AVE		1.77E-02	8.34E+00	4.97E+00		1.87E-03	1.91E-03	1.41E-02	
(216-C-3,4,5)	MIN		0.00E-01**	3.76E+00	2.13E+00		0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		1.15E-01	1.32E+03	5.53E+01					
2E 24 12	AVE		8.04E-02	1.07E+03	4.33E+01					
(216-A-21,31)	MIN		4.61E-02	7.15E+02	1.76E+01					
	MAX		4.06E-02							
2E 24 13	AVE		2.20E-02							
(241-A)	MIN		6.07E-03							
	MAX			1.36E+02				2.00E-03		
2E 25 2	AVE		8.05E-03*	6.01E+01	3.92E+00*			5.00E-04		
(216-A-1,7)	MIN			2.85E+01				0.00E-01**		
	MAX		2.60E-02							
2E 25 3	AVE		1.72E-02							
(216-A-6)	MIN		0.00E-01**							
	MAX	1.08E-02	3.75E-02	1.34E+02	5.90E+00	8.23E-03	7.57E-03	7.07E-03	3.77E-02	
2E 25 6	AVE	3.40E-03	1.43E-02	3.45E+01	2.90E+00	2.24E-03	2.06E-03	2.11E-03	1.07E-02	
(216-A-8)	MIN	0.00E-01**	2.41E-03	1.35E+01	3.19E-01	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX	2.77E-02	3.77E-02	1.08E+01	9.80E+00	2.18E-02	5.57E-03	4.23E-03	5.64E-02	
2E 25 9	AVE	6.71E-03	1.11E-02	7.88E+00	6.28E+00	4.05E-03	1.79E-03	2.14E-03	1.80E-02	
(216-A-8)	MIN	0.00E-01**	0.00E-01**	5.44E+00	4.65E+00	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX	1.19E-02	4.20E-02				5.79E-03	6.32E-03	3.69E-02	
2E 25 10	AVE	3.85E-03	1.23E-02				2.88E-03	2.19E-03	1.12E-02	7.37E-04*
(216-A-18,19,20)	MIN	0.00E-01**	0.00E-01**				0.00E-01**	0.00E-01**	0.00E-01**	

*— 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984. (sheet 3 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX		5.05E-02	4.51E+01	8.37E+00	5.00E-03	4.27E-03	5.30E-03	8.67E-02	
2E 25 11	AVE		1.93E-02	2.78E+01	5.68E+00	2.13E-03	1.50E-03	1.18E-03	1.45E-02	
(216-A-30)	MIN		0.00E-01**	1.50E+01	4.03E-01	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		1.65E-02							
2E 25 13	AVE		1.11E-02							
(241-AX)	MIN		0.00E-01**							
	MAX		2.89E-02	1.58E+02	2.55E+01	1.01E-02	4.55E-03	1.80E-03	3.23E-02	
2E 25 17	AVE		9.24E-03	6.12E+01	5.61E+00	4.31E-03	2.17E-03	5.90E-04	1.18E-02	
(216-A-37-1)	MIN		0.00E-01**	3.51E+01	2.21E-01	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		3.33E-02	3.21E+02	3.29E+01	7.32E-03	2.24E-03	3.62E-03	6.53E-02	
2E 25 18	AVE		9.11E-03	2.08E+02	2.44E+01	2.02E-03	9.05E-04	1.24E-03	3.61E-02	
(216-A-37-1)	MIN		0.00E-01**	1.05E+02	8.37E+00	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		4.83E-02	1.11E+03	4.05E+02	2.68E-03	3.98E-03	7.33E-03	4.72E-02	
2E 25 19	AVE		2.19E-02	8.54E+02	2.37E+02	1.18E-03	1.86E-03	3.03E-03	1.63E-02	
(216-A-37-1)	MIN		1.93E-03	1.30E+02	1.28E+00	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		6.29E-02	1.31E+03	4.06E+02	8.62E-03	7.67E-03	4.04E-03	6.45E-02	
2E 25 20	AVE		2.40E-02	4.89E+02	1.57E+02	3.46E-03	2.00E-03	2.29E-03	2.86E-02	
(216-A-37-1)	MIN		0.00E-01**	2.53E+02	9.93E+01	0.00E-01**	0.00E-01**	1.12E-03	5.85E-03	
	MAX		5.22E-02	2.82E+01	2.21E+01	8.75E-03	3.44E-03	4.24E-03	0.00E-01**	
2E 25 21	AVE		1.98E-02	1.39E+01	7.95E+00	4.34E-03	1.31E-03	1.93E-03	0.00E-01**	
(216-A-37-2)	MIN		4.20E-03	8.19E+00	2.08E+00	1.16E-03	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		4.65E-02	6.94E+02	1.17E+02	5.72E-03	2.49E-03	4.88E-03	3.22E-02	
2E 25 22	AVE		1.60E-02	1.17E+02	2.71E+01	2.92E-03	1.08E-03	1.34E-03	1.28E-02	
(216-A-37-2)	MIN		0.00E-01**	1.10E+01	7.75E+00	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		3.84E-02	4.55E+00	2.36E+01	2.98E-02	4.80E-03	4.92E-03	2.93E-02	
2E 25 23	AVE		1.26E-02	1.36E+00	3.32E+00	9.69E-03	1.60E-03	1.35E-03	9.15E-03	
(216-A-37-2)	MIN		0.00E-01**	4.24E-01	4.78E-01	3.07E-04	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		1.76E-02	6.92E+00	3.58E+00	1.01E-02	5.70E-03	4.48E-03	8.86E-02	
2E 25 24	AVE		7.01E-03	2.30E+00	1.86E+00	6.04E-03	3.07E-03	1.42E-03	3.67E-02	
(216-A-37-2)	MIN		0.00E-01**	0.00E-01**	4.43E-01	2.67E-03	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		2.68E-02	1.12E+01	2.22E+01					
2E 26 2	AVE		9.39E-03	7.15E+00	8.90E+00					
(216-A-24)	MIN		5.99E-04	3.45E+00	4.00E+00					

*— 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984. (sheet 4 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX		1.62E-02	2.34E+02	8.23E+00					
2E 26 4	AVE		9.79E-03	1.07E+02	4.84E+00					
(216-A-24)	MIN		0.00E-01**	4.08E+01	2.88E+00					
	MAX									
2E 26 6	AVE		5.00E-02*	1.10E+01*	1.81E+02*					
(401-A)	MIN									
	MAX		1.80E-02				2.41E-03	6.14E-03	4.06E-02	
2E 27 5	AVE		1.06E-02				6.89E-04	2.59E-03	2.65E-02	
(216-C-10)	MIN		0.00E-01**				0.00E-01**	0.00E-01**	1.73E-02	
	MAX	8.26E-03	2.45E-02							
2E 27 7	AVE	3.70E-03	1.72E-02							
(241-C)	MIN	0.00E-01**	3.16E-03							
	MAX		5.23E-02	2.53E+02			7.95E-03	9.65E-03	5.98E-02	
2E 28 12	AVE		2.12E-02	1.04E+02		0.00E-01**	2.06E-03	2.29E-03	1.59E-02	
(216-B-55)	MIN		0.00E-01**	7.94E+00			0.00E-01**	0.00E-01**	0.00E-01**	
	MAX									
2E 28 13	AVE		0.00E-01**	8.21E+00*			7.50E-03*	2.24E-03*	1.58E-02*	
(216-B-55)	MIN									
	MAX		2.59E-02							
2E 28 16	AVE	1.56E-02*	1.22E-02							
(216-B-12)	MIN		0.00E-01**							
	MAX	2.50E-02								
2E 28 17	AVE	1.89E-02								
(216-B-6,10B)	MIN	1.31E-02								
	MAX	2.17E-01	1.08E-01	4.83E+01	1.52E+02	1.69E-02	4.07E-03	1.00E-02	5.43E-02	
2E 28 18	AVE	1.68E-01	5.83E-02	3.16E+01	1.25E+02	4.39E-03	1.23E-03	2.81E-03	1.85E-02	
(216-B-62)	MIN	6.15E-04	2.73E-02	1.93E+01	8.76E+01	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX	2.12E-01	7.78E-02	5.42E+01	1.79E+02	8.91E-03	7.83E-03	4.48E-03	5.37E-02	
2E 28 21	AVE	1.33E-01	5.44E-02	3.89E+01	1.28E+02	1.89E-03	2.29E-03	1.67E-03	1.19E-02	
(216-B-62)	MIN	6.00E-03	3.50E-02	1.84E+01	6.02E+01	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX	7.05E-02	2.19E+01	9.24E+00	2.79E+01	1.61E+01	4.75E+00	1.04E-02	0.00E-01**	
2E 28 23	AVE	6.07E-02	1.82E+01	3.67E+00	1.79E+01	1.21E+01	3.86E+00	4.69E-03	0.00E-01**	
(216-B-5)	MIN	5.13E-02	1.44E+01	1.13E+00	7.48E+00	8.38E+00	3.44E+00	0.00E-01**	0.00E-01**	

*— 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984. (sheet 5 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX									
2E 32 1	AVE		2.58E-02*	3.51E+00*	2.71E+01*					
(200 East)	MIN									
	MAX		1.50E+00				3.03E-03	1.24E-01	8.21E-02	
2E 33 1	AVE		6.44E-01				1.24E-03	4.28E-02	2.03E-02	
(216-B-43)	MIN		7.85E-02				0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		5.09E+00	1.08E+01			1.33E-02	8.27E-01	6.43E-02	
2E 33 3	AVE		2.65E+00	6.05E+00		1.05E-02*	5.57E-03	3.85E-01	2.91E-02	
(216-B-44,45, 46)	MIN		8.76E-02	2.12E+00			0.00E-01**	3.75E-02	0.00E-01**	
	MAX		1.37E+00				6.71E-03	1.18E-01	2.92E-02	
2E 33 5	AVE		1.09E+00				4.19E-03	8.35E-02	1.18E-02	
(216-B-47)	MIN		4.44E-01				0.00E-01**	4.03E-02	0.00E-01**	
	MAX									
2E 33 7	AVE		2.94E+00*				1.38E-03*	4.07E-01*	3.87E-03*	
216-B-48,49 50)	MIN									
	MAX		1.80E-01				1.93E-03	1.01E-02	5.16E-02	
2E 33 8	AVE		1.06E-01				7.30E-04	3.12E-03	2.11E-02	
(216-B-41)	MIN		7.00E-02				0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		3.57E-01	5.43E+00	3.75E+02	5.16E-02	3.60E-02	3.69E-02	3.65E-03	
2E 33 9	AVE		1.98E-01	2.46E+00	2.31E+02	1.76E-02	1.91E-02	1.24E-02	9.13E-04	
(241-BY)	MIN		6.64E-02	5.89E-01	3.77E+01	4.49E-03	9.40E-03	0.00E-01**	0.00E-01**	
	MAX									
2E 33 10	AVE		3.49E-02*	2.52E+00*	1.37E+01*		6.54E-03*	0.00E-01**	4.01E-02*	
(216-B-35,41)	MIN									
	MAX		5.01E-02			4.43E-03	6.17E-03	3.35E-03	5.43E-02	
2E 33 18	AVE		3.95E-02			3.40E-03	3.17E-03	1.87E-03	3.70E-02	
(216-B-7A,7B)	MIN		1.68E-02			2.42E-03	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX									
2E 33 20	AVE		2.65E-02*			5.21E-03*				
(216-B-7A,7B, 11A,11B)	MIN									
	MAX		5.16E-02				3.10E-03	1.80E-03	5.10E-02	
2E 33 21	AVE		2.44E-02				1.88E-03	6.74E-04	1.28E-02	
(216-B-36)	MIN		0.00E-01**				3.86E-04	0.00E-01**	0.00E-01**	

*— 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984. (sheet 6 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX		2.58E-01				6.98E-03	9.81E-03	4.34E-02	
2E 33 24	AVE		1.71E-01				2.85E-03	5.72E-03	1.09E-02	
(216-B-57)	MIN		1.03E-01				0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		1.20E+00				7.12E-03	9.54E-02	6.40E-02	
2E 33 26	AVE		5.84E-01				1.81E-03	4.02E-02	4.35E-02	
(216-B-61)	MIN		1.28E-01				0.00E-01**	0.00E-01**	2.69E-02	
	MAX		8.48E-02	2.70E+01			9.09E-03	8.47E-03	2.40E-02	
2E 34 1	AVE		2.20E-02	3.16E+00	1.02E+01*		2.96E-03	2.82E-03	6.23E-03	
(216-B-63)	MIN		0.00E-01**	3.15E-01			0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		4.52E-02							
2W 10 1	AVE		3.67E-02							
(216-T-5)	MIN		2.56E-02							
	MAX	1.66E-02	1.79E-01							
2W 10 3	AVE	1.33E-02	1.23E-01					8.50E-03*		
(216-T-32)	MIN	9.34E-03	8.53E-02							
	MAX		1.34E-01				5.40E-03	1.23E-02	2.39E-02	
2W 10 4	AVE		1.15E-01				1.35E-03	8.75E-03	8.39E-03	
(216-T-36)	MIN		1.05E-01				0.00E-01**	4.19E-03	0.00E-01**	
	MAX	4.37E-03	1.28E-01				1.31E-03	2.01E-02	4.15E-02	
2W 10 8	AVE	2.03E-03	9.36E-02				6.17E-04	1.30E-02	1.04E-02	
(241-T)	MIN	0.00E-01**	5.68E-02				0.00E-01**	6.15E-03	0.00E-01**	
	MAX	2.50E-03	1.36E-01				4.52E-03	2.21E-02	6.65E-02	
2W 10 9	AVE	9.38E-04	1.02E-01				2.41E-03	1.47E-02	3.65E-02	
(241-T)	MIN	0.00E-01**	6.49E-02				1.14E-03	4.75E-03	0.00E-01**	
	MAX	1.18E-02	1.22E-01				3.19E-04	1.23E-02	5.70E-02	
2W 11 11	AVE	4.53E-03	1.00E-01				7.98E-05	5.64E-03	1.71E-02	
(216-T-8)	MIN	0.00E-01**	8.35E-02				0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		3.75E-02							
2W 11 15	AVE		2.90E-02							
(216-T-34)	MIN		2.27E-02							
	MAX		1.49E-01							
2W 11 18	AVE		1.27E-01							
(216-T-35)	MIN		1.12E-01							

*— 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984.
(sheet 7 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX	1.33E-02	1.55E-01				1.38E-03	2.49E-02	2.58E-02	
2W 11 23 (241-T)	AVE	9.26E-03	1.30E-01				6.72E-04	2.06E-02	6.45E-03	
	MIN	6.41E-03	9.08E-02				0.00E-01**	1.63E-02	0.00E-01**	
	MAX	8.26E-03	1.63E-01				1.93E-03	1.79E-02	3.46E-02	
2W 11 24 (241-T)	AVE	3.31E-03	1.35E-01				8.10E-04	1.37E-02	1.43E-02	
	MIN	0.00E-01**	1.10E-01				0.00E-01**	4.30E-03	0.00E-01**	
	MAX	4.66E-03	5.74E-02	3.33E+02						
2W 14 2 (216-T-26,27, 28)	AVE	2.90E-03	4.97E-02	2.91E+02						
	MIN	0.00E-01**	4.44E-02	2.67E+02						
	MAX		5.91E-02	5.93E+01						
2W 14 5 (241-TX)	AVE		1.69E-02	4.78E+01						
	MIN		0.00E-01**	3.13E+01						
	MAX		2.82E-02							
2W 14 6 (241-TX)	AVE		9.70E-03							
	MIN		0.00E-01**							
	MAX	1.46E-02	3.60E-02		2.63E+02	8.95E-03	5.67E-03	4.95E-03	6.41E-02	
2W 14 10 (216-W-LWC)	AVE	6.74E-03	6.75E-03		1.69E+02	3.80E-03	1.43E-03	1.96E-03	1.93E-02	
	MIN	0.00E-01**	0.00E-01**		1.13E+02	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX									
2W 15 3 (241-TY)	AVE		5.24E-02*				2.00E-03*	4.08E-03*	3.12E-02*	
	MIN									
	MAX		4.07E-02	1.13E+03	9.65E+02					
2W 15 4 (216-T-19)	AVE		2.30E-02	9.40E+02	5.38E+02					
	MIN		9.33E-03	8.02E+02	6.55E+01					
	MAX	6.86E-03	1.39E-02		1.66E+01					
2W 15 6 (216-Z-9)	AVE	3.23E-03	5.28E-03		7.90E+00					
	MIN	1.08E-03	0.00E-01**		3.32E+00					
	MAX									
2W 15 7 (216-Z-7)	AVE	3.21E-03*	8.70E-02*		1.26E+02*		1.87E-03*	3.65E-02*	2.92E-03*	
	MIN									
	MAX	5.82E-03	4.56E-02		1.36E+02					
2W 15 10 (216-Z-16)	AVE	3.45E-03	2.67E-02		1.20E+02					
	MIN	1.75E-03	1.32E-02		9.16E+01					

*-- 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**-- NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984. (sheet 8 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX	9.53E-03	8.49E-02		2.41E+02					
2W 15 11	AVE	5.24E-03	5.32E-02		1.93E+02					
(216-Z-16)	MIN	2.54E-03	2.19E-02		1.49E+02					
	MAX	7.50E-03	4.03E-02							
2W 18 5	AVE	3.60E-03	1.73E-02							
(216-Z-12)	MIN	4.89E-04	0.00E-01**							
	MAX	1.29E-02	5.06E-02		2.17E+02					
2W 18 9	AVE	7.26E-03	1.97E-02		1.05E+02					
(216-Z-18)	MIN	3.75E-03	0.00E-01**		3.95E+01					
	MAX	1.86E-02	5.57E-01	3.80E+00	8.19E+00					7.20E-03
2W 18 12	AVE	6.28E-03	5.63E-02	1.24E+00	5.37E+00					4.06E-03
(216-Z-18)	MIN	2.05E-03	0.00E-01**	2.28E-01	2.28E+00					1.62E-03
	MAX	8.91E-02	6.82E-02	2.00E+00	2.14E+00		4.15E-03	8.45E-03	4.61E-02	
2W 18 15	AVE	5.38E-02	3.30E-02	4.55E-01	6.98E-01	1.03E-04*	1.12E-03	2.61E-03	7.06E-03	7.11E-02*
(216-U-10)	MIN	6.99E-03	4.78E-03	4.24E-02	4.00E-02		0.00E-01**	0.00E-01**	0.00E-01**	
	MAX	3.18E-03	3.02E-02	9.44E-01			6.41E-03	7.36E-03	2.53E-02	
2W 18 17	AVE	7.95E-04	1.70E-02	4.65E-01	9.98E-01*		1.60E-03	3.02E-03	6.32E-03	
(216-Z-20)	MIN	0.00E-01**	4.84E-03	1.55E-01			0.00E-01**	0.00E-01**	0.00E-01**	
	MAX	6.15E-03	9.29E-02	3.57E-01			3.44E-03	6.75E-03	1.61E-02	
2W 18 18	AVE	3.38E-03	2.74E-02	2.03E-01	1.06E+00*		1.15E-03	1.94E-03	6.38E-03	
(216-Z-20)	MIN	1.16E-03	0.00E-01**	0.00E-01**			0.00E-01**	0.00E-01**	0.00E-01**	
	MAX	1.18E-02	2.83E-02	8.10E+00	2.58E+01		6.41E-03	7.36E-03	4.38E-02	
2W 18 19	AVE	2.66E-03	1.18E-02	2.36E+00	7.36E+00		2.11E-03	1.20E-03	1.30E-02	
(216-Z-20)	MIN	0.00E-01**	0.00E-01**	0.00E-01**	1.15E-01		0.00E-01**	0.00E-01**	0.00E-01**	
	MAX	1.13E-02	2.94E-02	2.16E+00	5.93E+00		6.82E-03	6.11E-03	4.74E-02	
2W 18 20	AVE	3.59E-03	9.73E-03	3.91E-01	1.45E+00		2.16E-03	1.86E-03	1.73E-02	
(216-Z-20)	MIN	0.00E-01**	0.00E-01**	6.50E-03	6.60E-02		0.00E-01**	0.00E-01**	0.00E-01**	
	MAX									
2W 19 2	AVE		4.30E-02*	5.86E+01*	1.27E+02*		0.00E-01**	8.26E-03*		1.48E-03*
(216-U-8)	MIN									
	MAX	2.11E-01	6.91E-01	7.30E-01	8.06E+01		0.00E-01**	5.63E-03	0.00E-01**	5.85E-01
2W 19 3	AVE	9.66E-02	3.15E-01	5.10E-01	2.69E+01		0.00E-01**	2.44E-03	0.00E-01**	1.98E-01
(216-U-1,2)	MIN	3.92E-02	1.57E-01	2.87E-01	7.44E+00		0.00E-01**	0.00E-01**	0.00E-01**	5.75E-02

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**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984. (sheet 9 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
2W 19 5 (216-S-23)	MAX		1.31E-02	2.77E+00	2.05E+00					
	AVE		4.29E-03	1.66E+00	1.34E+00					
	MIN		0.00E-01**	5.75E-01	8.37E-01					
2W 19 11 (216-U-1)	MAX	1.30E-01		1.99E+01	2.29E+03		3.20E-03	1.41E-02	5.13E-02	
	AVE	3.77E-02		5.45E+00	5.80E+02		1.13E-03	6.29E-03	3.20E-02	
	MIN	0.00E-01**		5.30E-01	6.64E+00		0.00E-01**	1.01E-03	0.00E-01**	
2W 19 12 (241-U)	MAX	1.16E-02	9.00E-02	1.48E+00	1.33E+01		4.24E-03	6.04E-03	2.60E-02	3.28E-03
	AVE	7.01E-03	4.98E-02	8.83E-01	8.13E+00		2.10E-03	4.71E-03	1.09E-02	2.82E-03
	MIN	1.87E-03	2.34E-02	3.26E-01	3.45E+00		0.00E-01**	2.26E-03	0.00E-01**	1.85E-03
2W 19 13 (216-U-16)	MAX									
	AVE	1.22E-02*	2.54E-02*	6.50E-01*	2.92E+01*	0.00E-01**	0.00E-01**	3.04E-03*	0.00E-01**	4.92E-03*
	MIN									
2W 19 14 (216-U-16)	MAX									
	AVE	0.00E-01**	3.33E-02*	3.56E-01*	2.54E+00*	1.14E-03*	2.88E-03*	4.05E-03*	0.00E-01**	1.77E-03*
	MIN									
2W 22 1 (216-S-1)	MAX	1.21E-02	7.77E-01	7.08E+01	1.75E+01	4.20E-01	7.95E-03	7.35E-03	4.30E-02	
	AVE	6.77E-03	5.82E-01	5.17E+01	1.38E+01	2.73E-01	3.90E-03	2.91E-03	2.46E-02	
	MIN	0.00E-01**	2.12E-01	4.50E+00	1.24E+01	7.65E-02	0.00E-01**	0.00E-01**	1.20E-02	
2W 22 2 (216-S-1,2)	MAX	1.25E-02	3.05E-01	3.39E+00	2.17E+01	2.90E-02	4.87E-03	6.69E-03	4.03E-02	
	AVE	8.25E-03	2.66E-01	1.73E+00	1.68E+01	8.34E-03	2.16E-03	4.12E-03	2.70E-02	
	MIN	3.11E-03	2.36E-01	8.18E-01	1.19E+01	4.25E-04	0.00E-01**	0.00E-01**	1.91E-02	
2W 22 12 (216-S-7)	MAX		9.98E-02	9.76E+02	1.43E+01	5.54E-03				
	AVE		4.20E-02	8.81E+02	9.70E+00	2.39E-03				
	MIN		2.09E-02	7.12E+02	5.62E+00	9.54E-04				
2W 22 20 (216-S-20)	MAX									
	AVE		7.78E-02*	5.79E+02*		7.15E-04*				
	MIN									
2W 22 21 (216-S-13)	MAX									
	AVE	4.14E-02*	2.19E-01*		5.58E+00*	0.00E-01**	3.85E-03*	1.76E-03*	2.94E-02*	
	MIN									
2W 22 22 (216-U-12)	MAX	8.11E-03	5.62E-02	4.09E+00	6.51E+00	9.58E-03	6.88E-03	6.06E-03	4.77E-02	3.44E-03
	AVE	3.10E-03	1.30E-02	2.87E+00	2.22E+00	2.61E-03	1.86E-03	1.45E-03	1.44E-02	1.45E-03
	MIN	0.00E-01**	0.00E-01**	2.13E+00	4.43E-01	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	3.08E-04

*— 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984. (sheet 10 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX		5.77E-02	4.35E+02		7.30E-03	3.41E-03	3.54E-03	2.42E-02	
2W 22 26	AVE		4.05E-02	3.45E+02		2.77E-03	8.53E-04	1.79E-03	9.98E-03	
(216-S-9)	MIN		1.79E-02	2.44E+02		0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		3.16E-01							
2W 23 1	AVE		8.94E-02							
(216-S-3,241-S)	MIN		7.14E-03							
	MAX		1.59E+00							
2W 23 2	AVE		4.03E-01							
(241-SX)	MIN		0.00E-01**							
	MAX		1.02E+00							
2W 23 3	AVE		2.58E-01							
(241-SX)	MIN		0.00E-01**							
	MAX									
2W 23 4	AVE	4.25E-02*	3.57E-02*	4.14E-01*	5.34E-01*					4.03E-02*
(216-S-21)	MIN									
	MAX	2.00E-02	4.39E-02	1.18E+02		7.83E-03	1.14E-02	1.12E-02	5.91E-02	
2W 23 9	AVE	8.49E-03	1.32E-02	6.73E+01		2.49E-03	4.02E-03	1.28E-03	1.64E-02	
(216-S-25)	MIN	0.00E-01**	0.00E-01**	1.39E+01		0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX		4.27E-02	4.09E+02		1.73E-02	8.31E-03	7.83E-03	5.18E-02	
2W 23 10	AVE		1.70E-02	2.38E+02		4.95E-03	2.25E-03	3.17E-03	1.21E-02	
(216-S-25)	MIN		0.00E-01**	2.68E+01		4.15E-05	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX	2.12E-02	3.66E-02	1.56E+01			4.82E-03	8.59E-03	1.87E-02	
2W 23 11	AVE	1.20E-02	1.16E-02	9.15E+00			6.85E-04	2.53E-03	4.21E-03	
(216-U-10)	MIN	3.49E-03	0.00E-01**	5.47E+00			0.00E-01**	0.00E-01**	0.00E-01**	
	MAX									
2W 26 3	AVE	5.71E-03*	2.11E-02*	5.68E-01*	2.85E+00*					
(216-S-6)	MIN									
	MAX	9.53E-03	3.69E-01	7.48E-01	2.25E+01					
2W 26 6	AVE	4.71E-03	1.11E-01	4.30E-01	1.59E+01					
(216-S-5)	MIN	1.25E-03	6.09E-04	1.79E-01	2.74E+00					
	MAX			1.96E+02	2.25E+01	4.31E-04				
2W 27 1	AVE	8.61E-03*	2.94E-02*	1.27E+02	1.43E+01	1.69E-04	4.27E-03*	4.77E-03*	1.93E-02*	
(216-S-26)	MIN			1.17E+01	4.10E+00	0.00E-01**				

*— 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984. (sheet 11 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX	1.21E-02	6.77E-02	1.30E+02				1.70E-02		
6 32 72	AVE	2.27E-03	1.64E-02	1.23E+02	2.20E+00*			5.23E-03		
(216-S-19)	MIN	0.00E-01**	0.00E-01**	1.20E+02				0.00E-01**		
	MAX	5.85E-02	5.04E-02	1.54E+01	2.32E+00		5.40E-03	6.73E-03	3.80E-02	5.78E-02
6 35 78A	AVE	3.69E-02	2.37E-02	1.94E+00	1.19E+00	7.12E-04*	2.24E-03	3.20E-03	1.08E-02	4.16E-02
(216-U-10)	MIN	1.06E-02	0.00E-01**	0.00E-01**	4.43E-01		0.00E-01**	0.00E-01**	0.00E-01**	3.42E-02
	MAX		3.73E-02	2.12E+01	6.64E+00	8.77E-03	8.68E-03	7.33E-03	6.34E-02	3.09E-03
6 42 40A	AVE		9.54E-03	7.81E+00	3.73E+00	3.36E-03	2.29E-03	1.61E-03	1.88E-02	2.07E-03
(216-B-3)	MIN		0.00E-01**	3.71E-01	1.88E+00	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	1.52E-03
	MAX		3.65E-02	9.68E+00	1.28E+01	1.51E-02	7.57E-03	6.34E-03	6.54E-02	
6 42 40B	AVE		1.65E-02	5.41E+00	8.14E+00	3.73E-03	1.68E-03	2.81E-03	2.57E-02	5.31E-03*
(216-B-3)	MIN		0.00E-01**	1.84E+00	5.58E+00	0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX			2.90E+00						
6 50 42	AVE			2.23E+00	5.60E-01*	5.01E-04*				
(216-A-25)	MIN			1.80E+00						
	MAX	8.75E-03	1.29E-01			1.09E-01	5.40E-03	7.08E-03	5.91E-02	
6 53 47A	AVE	2.74E-03	8.78E-02			7.27E-02	2.10E-03	1.92E-03	1.49E-02	
(216-A-25)	MIN	0.00E-01**	2.48E-02			3.84E-02	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX									
6 53 47B	AVE	1.25E-03*	9.70E-02*			7.39E-02*	7.66E-03*	5.60E-04*	1.58E-02*	
(216-A-25)	MIN									
	MAX									
6 53 48A	AVE					6.70E-04*				
(216-A-25)	MIN									
	MAX									
6 53 48B	AVE					9.10E-01*				
(216-A-25)	MIN									
	MAX	1.46E-02	4.25E-02			9.46E-03	5.78E-03	6.76E-03	3.17E-02	
6 53 55A	AVE	4.02E-03	1.14E-02			2.40E-03	2.33E-03	2.43E-03	6.67E-03	
(216-A-25)	MIN	0.00E-01**	0.00E-01**			0.00E-01**	0.00E-01**	0.00E-01**	0.00E-01**	
	MAX									
6 54 48	AVE					1.50E-02*				
(216-A-25)	MIN									

*— 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

9 2 1 2 1 5 6 1 9 0 5

Appendix B.1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1984.
(sheet 12 of 12)

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX									
6 54 49	AVE					1.60E-02*				
(216-A-25)	MIN									
	MAX			5.80E-01		1.85E-02				
6 55 50C	AVE			2.53E-01	2.87E+00*	3.15E-03	0.00E-01**	0.00E-01**	5.34E-02*	
(216-A-25)	MIN			0.00E-01**		0.00E-01**				
	MAX									
6 55 50D	AVE			2.71E-01*	9.80E-01*					
(216-A-25)	MIN									
	MAX									
6 56 51	AVE					1.60E-04*				
(216-A-25)	MIN									
	MAX			1.40E+00						
6 59 58	AVE			1.13E+00	8.30E-01*	6.80E-04*				
(216-A-25)	MIN			9.20E-01						
	MAX			8.10E-01						
6 63 58	AVE			5.83E-01		1.47E-04*				
(216-A-25)	MIN			4.20E-01						

*— 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

Appendix B.2. Results of the Confined Aquifer Ground-Water Monitoring Network in CY 1984.

WELL NO. (Waste Site)		TOTAL ALPHA (PCI/ML)	TOTAL BETA (PCI/ML)	TRITIUM (PCI/ML)	NITRATE (MG/L)	^{90}Sr (PCI/ML)	^{137}Cs (PCI/ML)	^{60}Co (PCI/ML)	^{106}Ru (PCI/ML)	URANIUM (PCI/ML)
	MAX									
2E 26 8	AVE			1.87E+00*	2.53E-01*					
	MIN									
	MAX									
2E 33 12	AVE			2.21E+00*	8.22E-01*					
	MIN									
	MAX									
6 42 40C	AVE			0.00E-01**						
	MIN									
	MAX									
6 47 50	AVE			1.62E-01*	2.16E+00*					
	MIN									
	MAX									
6 50 48	AVE			4.62E-01*	1.06E-01*					
	MIN									
	MAX									
6 51 46	AVE			1.78E-01*	4.93E-01*					
	MIN									
	MAX									
6 52 48	AVE			3.25E-01*	3.67E-01*					
	MIN									
	MAX			7.00E-01						
6 54 57	AVE			2.03E-01	2.00E-02*					
	MIN			0.00E-01**						

*— 3 VALUES OR LESS, NO MAX OR MIN CALCULATED

**— NEGATIVE ANALYTICAL VALUES APPEAR AS ZEROES

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APPENDIX C

SEPARATIONS AREA CONFINED AND UNCONFINED AQUIFER GROUND-WATER MONITORING SCHEDULES FOR CY 1985

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Tables:

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C.2 Separations Area Confined Aquifer Monitoring Schedule for CY 1985 .... C-9

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Table C.1. Separations Area Unconfined Aquifer Ground-Water Monitoring Schedule for CY 1985. (sheet 1 of 5)

Well	EMA[a] No.	Site monitored	Sample type	Total alpha	Total beta	^{90}Sr	^{137}Cs	^{106}Ru	^{60}Co	^{3}H	NO_3	U
299-E13-5	2314	216-B-18	P[b]		Q[c]					Q		
299-E13-8	2334	216-B-21	P		Q		Q	Q	Q			
299-E13-14	2340	216-B-29	P		Q							
299-E13-19	2352	216-B-28	P		Q							
299-E16-2	2372	216-A-30	B[d]	M[e]	M	M	M	M	M	M	M	
299-E17-1	2328	216-A-10	P	M	M	M	M	M	M	M	M	
299-E17-2	2367	216-A-27	B	M	M					M	M	
299-E17-5	2511	216-A-36B	P	M	M	M	M	M	M	M	M	M
299-E17-6	2512	200 East	P		M					Q	Q	
299-E17-8	2513	216-A-38	P		M	Q	Q	Q	Q	M	M	
299-E17-9	2514	216-A-36B	P	M	M	M	M	M	M	M	M	
299-E23-2	2376	200 East	B		Q					Q	Q	
299-E24-1	2317	216-A-5	B		M	Q	Q	Q	Q	M	M	
299-E24-2	2326	216-A-10	P	M	M	M	M	M	M	M	M	
299-E24-4	2329	216-A-9	B		M	Q	Q	Q	Q	M	M	
299-E24-8	2355	216-C-3, -4, -5	P		M		M	M	M	M	M	
299-E24-12	2521	216-A-21, -31	P		M					M	M	
299-E24-13	2383	241-A	B		Q						Q	
299-E25-2	2316	216-A-1, -7	B		S[f]					S	S	
299-E25-3	2318	216-A-6	B		Q							
299-E25-6	2343	216-A-8	B	M	M	M	M	M	M	M	Q	
299-E25-9	2344	216-A-8	B	M	M	M	M	M	M	M	Q	
299-E25-10	2363	216-A-18, -19, -20	P	Q	Q		Q	Q	Q			Q
299-E25-11	2370	216-A-30	B	M	M	M	M	M	M	M	M	
299-E25-13	2523	241-AX	B		Q						Q	
299-E25-17	2386	216-A-37-1	B	M	M	Q	Q	Q	Q	M	M	
299-E25-18	2387	216-A-37-1	P	M	M	Q	Q	Q	Q	M	M	
299-E-25-19	2388	216-A-37-1	B	M	M	Q	Q	Q	Q	M	M	

Table C.1. Separations Area Unconfined Aquifer Ground-Water Monitoring Schedule for CY 1985. (sheet 2 of 5)

Well	EMA No.	Site monitored	Sample type	Total alpha	Total beta	^{90}Sr	^{137}Cs	^{106}Ru	^{60}Co	^{3}H	NO_3	U
299-E25-20	2389	216-A-37-1	P	M	M	Q	Q	Q	Q	M	M	
299-E25-21	2391	216-A-37-2	P	M	M	M	M	M	M	M	M	
299-E25-22	2392	216-A-37-2	P	M	M	M	M	M	M	M	M	
299-E25-23	2393	216-A-37-2	P	M	M	M	M	M	M	M	M	
299-E25-24	2394	216-A-37-2	P	M	M	M	M	M	M	M	M	
299-E26-2	2364	216-A-24	B		Q					Q	Q	
299-E26-4	2362	216-A-24	B		Q					Q	Q	
299-E26-6		401-A Cooling	P	Q	Q					Q	Q	
299-E27-5	2551	216-C-10	P		Q		Q	Q	Q			
299-E27-7	2557	241-C	P	Q	Q						Q	
299-E28-9	2357	216-B-12	B	Q	Q							Q
299-E28-12	2380	216-B-55	B		M		M	M	M	M		
299-E28-13	2324	216-B-55	P		M		M	M	M	M		
299-E28-16	2325	216-B-12	P	Q	Q							Q
299-E28-17	2519	216-B-6-10B	B	Q								
299-E28-18	2524	216-B-62	P	M	M	M	M	M	M	M	M	M
299-E28-21	2556	216-B-62	P	M	M	M	M	M	M	M	M	M
299-E28-23	2390	216-B-5	B	Q	Q	Q	Q	Q	Q	Q	Q	
299-E32-1	2358	200 East	P		S					S	S	
299-E33-1	2301	216-B-43	P		Q		Q	Q	Q			
299-E33-3	2303	216-B-44, -45, -46	P		Q	Q	Q	Q	Q	Q		
299-E33-5	2308	216-B-47	P		Q		Q	Q	Q			
299-E33-7	2305	216-B-48, -49, -50	P		Q		Q	Q	Q			
299-E33-8	2300	216-B-41	P		Q		Q	Q	Q			
299-E33-9	2299	241-BY	B		Q	Q	Q	Q	Q	Q	Q	
299-E33-10	2306	216-B-35, -41	P		Q		Q	Q	Q	Q	Q	
299-E33-18	2309	216-B-7A, -7B	P		Q	Q	Q	Q	Q			
299-E33-20	2332	216-B-7A, -7B, -11A, -11B	B		Q	Q					Q	

Table C.1. Separations Area Unconfined Aquifer Ground-Water Monitoring Schedule for CY 1985. (sheet 3 of 5)

Well	EMA No.	Site monitored	Sample type	Total alpha	Total beta	^{90}Sr	^{137}Cs	^{106}Ru	^{60}Co	^{3}H	NO_3	U
299-E33-21	2353	216-B-36	P		Q		Q	Q	Q			
299-E33-24	2520	216-B-57	P		Q		Q	Q	Q			
299-E33-26	2382	216-B-61	P		Q		Q	Q	Q			
299-E33-27	2527	241-BX	B		Q	Q	M	Q	M	Q	Q	
299-E34-1	2374	216-B-63	P	M	M			M		M		
299-W10-1	2892	216-T-5	B		Q		Q		Q			
299-W10-3	2885	216-T-32	B	Q	Q		Q		Q			
299-W10-4	2886	216-T-36	P		Q		Q	Q	Q			
299-W10-8	2996	241-T	P	Q	Q			Q			Q	
299-W10-9	3009	241-T	P	Q	Q			Q			Q	
299-W11-11	2887	216-T-18	P	Q	Q		Q	Q	Q			
299-W11-13	2942	200 West	B		S					S	S	
299-W11-15	2961	216-T-32	P		Q							
299-W11-18	2963	216-T-35	P		Q							
299-W11-23	2616	241-T	P	Q	Q		Q	Q	Q		Q	
299-W11-24	3010	241-T	P	Q	Q			Q			Q	
299-W14-2	2895	216-T-26, -27, -28	P	Q	Q					Q		
299-W14-5	3007	241-TX	P		Q					Q	Q	
299-W14-6	3008	241-TX	P		Q					Q	Q	
299-W14-10	3018	216-W-LWC	P	M	M	M		M		M	M	
299-W15-3	2894	241-TY	B		Q			Q			Q	
299-W15-4	2896	216-T-19	P		Q					Q	Q	
299-W15-6	2934	216-Z-9	B	Q	Q						Q	
299-W15-7	2960	216-Z-7	P	Q	Q			Q			Q	
299-W15-10	2609	216-Z-16	P	Q	Q						Q	
299-W15-11	2610	216-Z-16	P	Q	Q						Q	

Table C.1. Separations Area Unconfined Aquifer Ground-Water Monitoring Schedule for CY 1985. (sheet 4 of 5)

Well	EMA No.	Site monitored	Sample type	Total alpha	Total beta	^{90}Sr	^{137}Cs	^{106}Ru	^{60}Co	^{3}H	NO_3	U
299-W18-5	2933	216-Z-12	P	Q	Q							
299-W18-9	2965	216-Z-18	B	Q	Q						Q	
299-W18-12	2967	216-Z-18	P	M	M					Q	Q	Q
299-W18-15	3015	216-U-10	P	M	M		M	M	M	M	M	M
299-W18-17	3016	216-Z-20	B	Q	Q		Q	Q	Q	Q	Q	
299-W18-18	3017	216-Z-20	P	M	M		M	M	M	M	M	
299-W18-19	3019	216-Z-20	P	M	M		M	M	M	M	M	
299-W18-20	3020	216-Z-20	B	Q	Q		Q	Q	Q	Q	Q	
299-W19-2	2928	216-U-8	P	Q	Q					Q	Q	Q
299-W19-3	2929	216-U-1, -2	P	Q	Q		Q	Q	Q	Q	Q	Q
299-W19-5	2968	216-S-23	P		Q					Q	Q	
299-W19-11	2619	216-U-1	P	Q			Q	Q	Q	Q	Q	
299-W19-12	2618	241-U	P	Q	Q		Q	Q	Q	Q	Q	Q
299-W19-13	2622	216-U-16	P	M	M	M	M	M	M	M	M	M
299-W19-14	2623	216-U-16	P	M	M	M	M	M	M	M	M	M
299-W22-1	2919	216-S-1	P	Q	Q	Q	Q	Q	Q	Q	Q	
299-W22-2	2920	216-S-1, -2	P	Q	Q	Q	Q	Q	Q	Q	Q	
299-W22-12	2912	216-S-7	P		Q	Q				Q	Q	
299-W22-20	2926	216-S-20	P		Q	Q				Q		
299-W22-21	2931	216-S-13	P	Q	Q	Q	Q	Q	Q		Q	
299-W22-22	2939	216-U-12	P	M	M	M	M	M	M	M	M	M
299-W22-26	2954	216-S-9	P		Q	Q	Q	Q	Q	Q		
299-W22-27	2955	216-S-9, -18	B		S					S	S	
299-W23-1	2898	216-S-3; 241-S	B		Q						Q	
299-W23-2	2910	241-SX	B		Q						Q	
299-W23-3	2911	241-SX	B		Q						Q	
299-W23-4	2925	216-S-21	B	Q	Q					Q	Q	Q

Table C.1. Separations Area Unconfined Aquifer Ground-Water Monitoring Schedule for CY 1985. (sheet 5 of 5)

Well	EMA No.	Site monitored	Sample type	Total alpha	Total beta	^{90}Sr	^{137}Cs	^{106}Ru	^{60}Co	^{3}H	NO_3	U
299-W23-9	2993	216-S-25	B	M	M	M	M	M	M	M		
299-W23-10	2994	216-S-25	P		M	M	M	M	M	M		
299-W23-11	2995	216-U-10	P	M	M		M	M	M	M		M
299-W26-3	2917	216-S-6	P	Q	Q					Q	Q	
299-W26-6	2520	216-S-5	P	Q	Q					Q	Q	
299-W27-1	2621	216-S-26	P	M	M	Q	Q	Q	Q	Q	Q	Q
699-32-72	6868	216-S-19	P	M	M							
699-35-78A	4869	216-U-10	P	M	M		M	M	M	M	Q	M
699-42-40A	4874	216-B-3	B	M	M	M	M	M	M	M	Q	Q
699-42-40B	4875	216-B-3	P		M	M	M	M	M	M	Q	
699-50-42	4460	216-A-25	P	S	S	Q						
699-53-47A	4866	216-A-25	P	M	M	M	M	M	M			
699-53-47B	4600	216-A-25	P	M	M	M	M	M	M			
699-53-48A	4893	216-A-25	P	M	M	M	M	M	M			
699-53-48B	4894	216-A-25	P	M	M	M	M	M	M			
699-54-48	4895	216-A-25	P	M	M	M	M	M	M			
699-54-49	4732	216-A-25	P	M	M	M						
699-53-55A	4867	216-A-25	P	M	M	M	M	M	M			
699-55-50C	4483	216-A-25	P	Q	Q	M						
699-55-50D		216-A-25	B	Q	Q	Q						
699-56-50		216-A-25	P	M	M	M						
699-59-58	4827	216-A-25	P	S	S	Q						
699-63-58	4822	216-A-25	P	S	S	Q						

[a]Identification number used in PNL data base.
[b]Pump.
[c]Quarterly.
[d]Bailer.
[e]Monthly.
[f]Semiannually.

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Table C.2. Separations Area Confined Aquifer Monitoring Schedule for CY 1985.

Well	EMA[a] No.	Site monitored	Sample type	^3H	NO_3
299-E26-8	--	Rattlesnake Ridge	Bailer	S[b]	S
299-E33-12	2294	Rattlesnake Ridge	Bailer	S	S
699-42-40C	--	Rattlesnake Ridge	Bailer	S	S
699-47-50	4882	Rattlesnake Ridge	Bailer	S	S
699-49-55B	--	Rattlesnake Ridge	Bailer	S	S
699-50-45	--	Rattlesnake Ridge	Bailer	S	S
699-50-48	4883	Rattlesnake Ridge	Bailer	S	S
699-51-46	4884	Rattlesnake Ridge	Bailer	S	S
699-52-46A	4885	Rattlesnake Ridge	Bailer	S	S
699-52-48	4886	Rattlesnake Ridge	Bailer	S	S
699-53-50	--	Rattlesnake Ridge	Bailer	S	S
699-54-57	4469	Rattlesnake Ridge	Bailer	S	S
699-56-53	--	Rattlesnake Ridge	Bailer	S	S

[a]Identification number used in PNL data base.

[b]Semiannually.

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APPENDIX D

LONG-TERM CONCENTRATION HISTORIES OF SELECTED ACTIVE LIQUID WASTE DISPOSAL SITES AND MONITORING WELLS

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D-17	Crib 216-U-12, Well 299-W22-22	D-19

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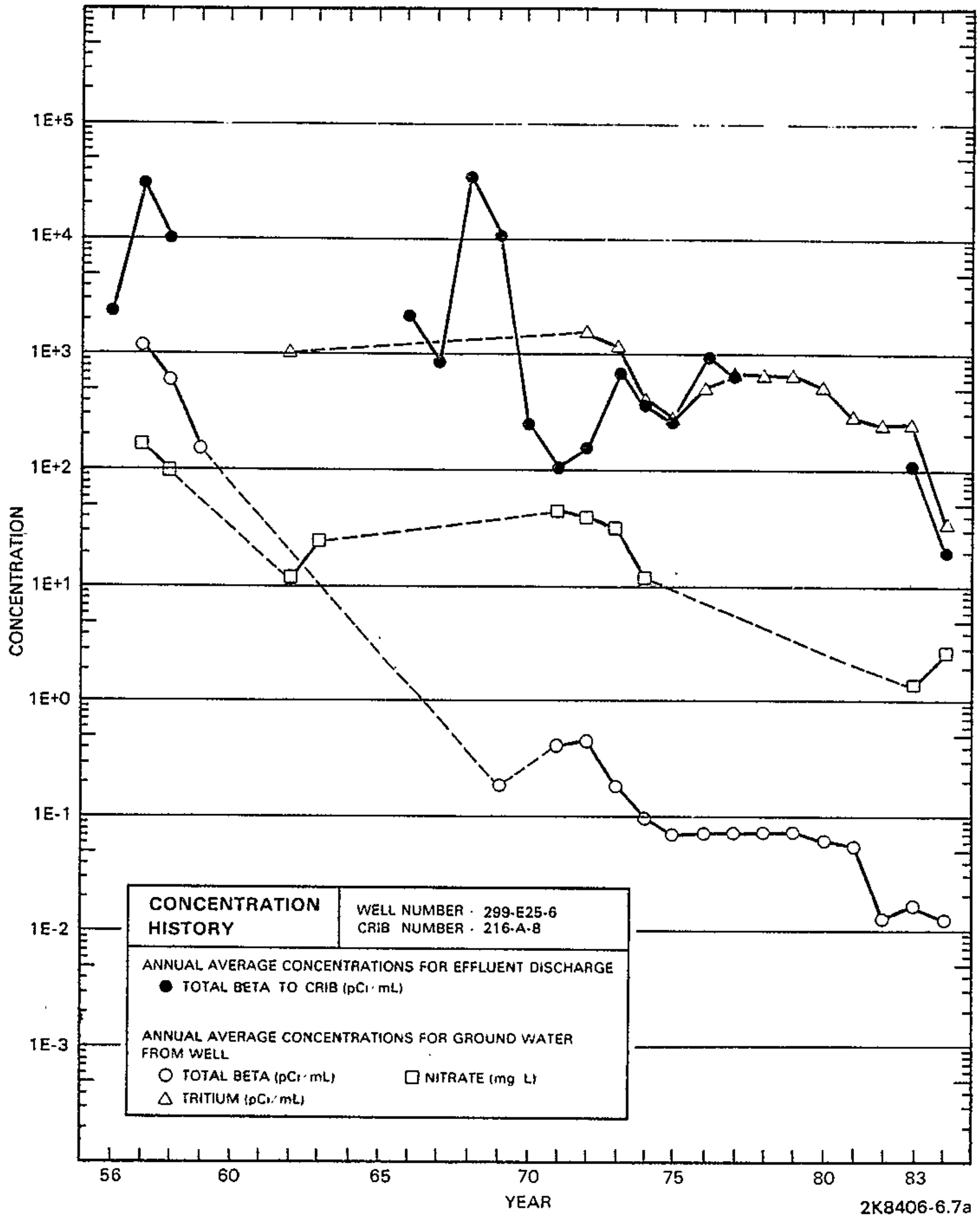


Figure D-1. Crib 216-A-8, Well 299-E25-6.

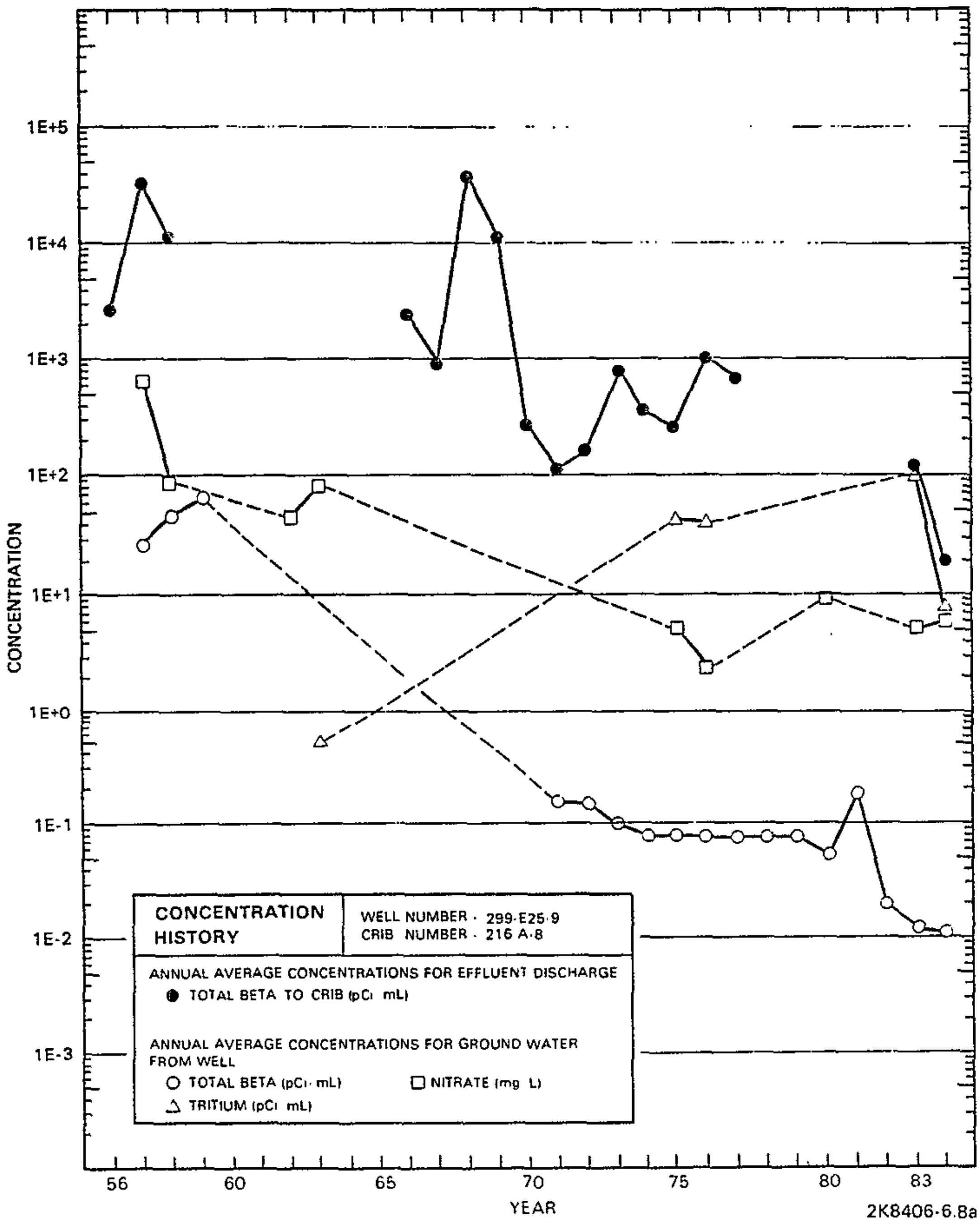


Figure D-2. Crib 216-A-8, Well 299-E25-9.

9 2 1 2 3 5 6 1 9 2 1

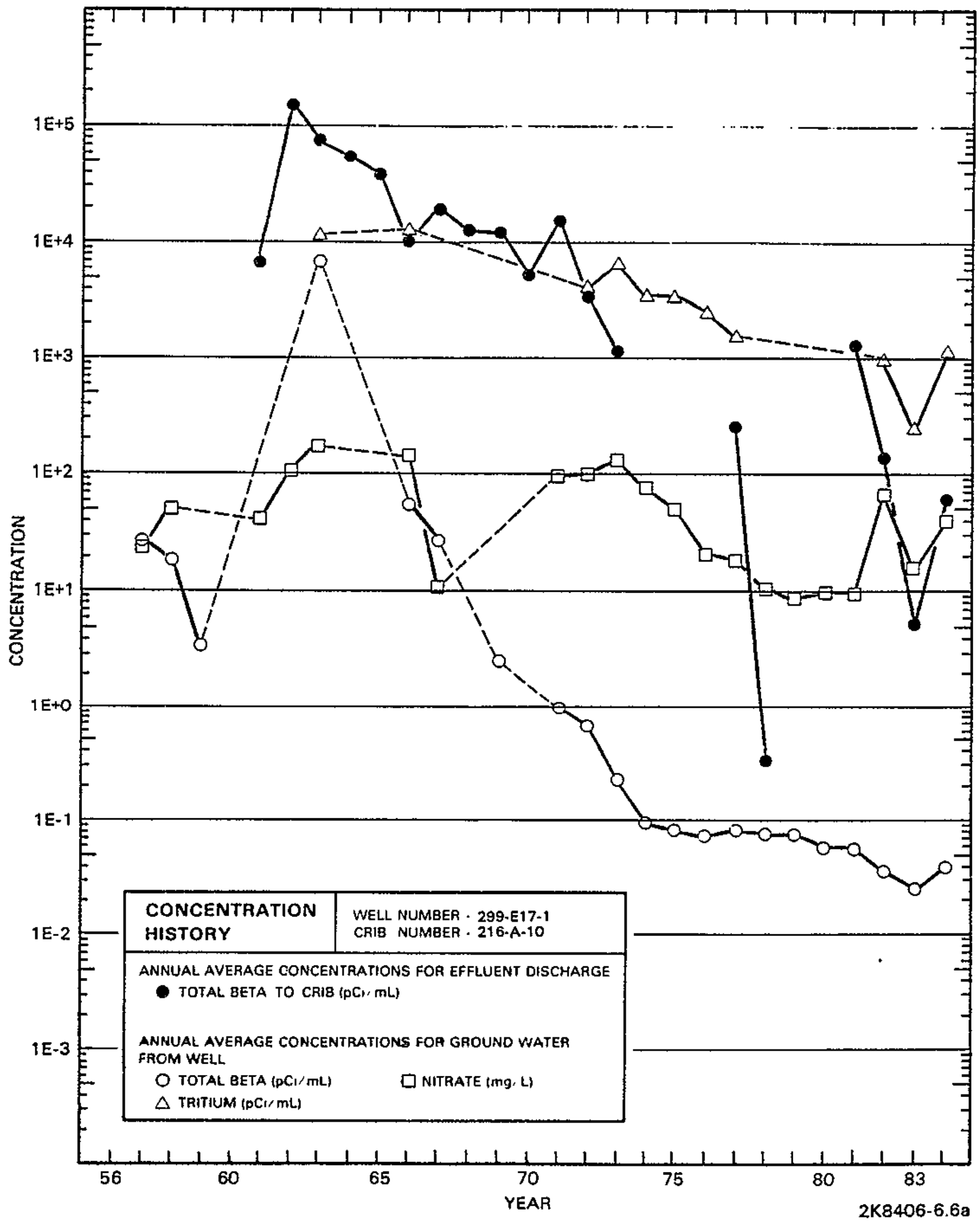


Figure D-3. Crib 216-A-10, Well 299-E17-1.

9 2 1 2 1 5 6 1 9 2 2

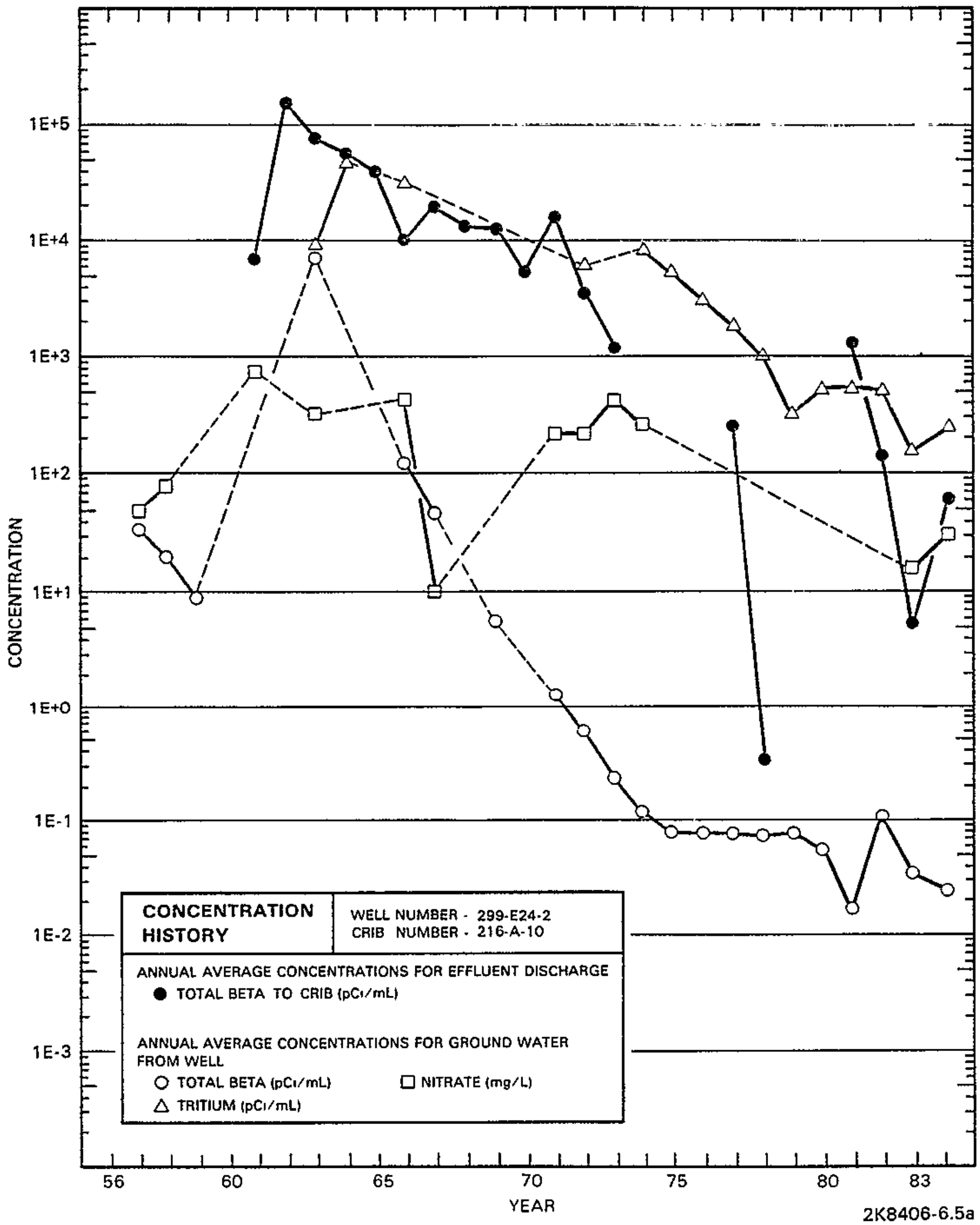


Figure D-4. Crib 216-A-10, Well 299-E24-2.

9 2 1 2 1 5 6 1 9 2 3

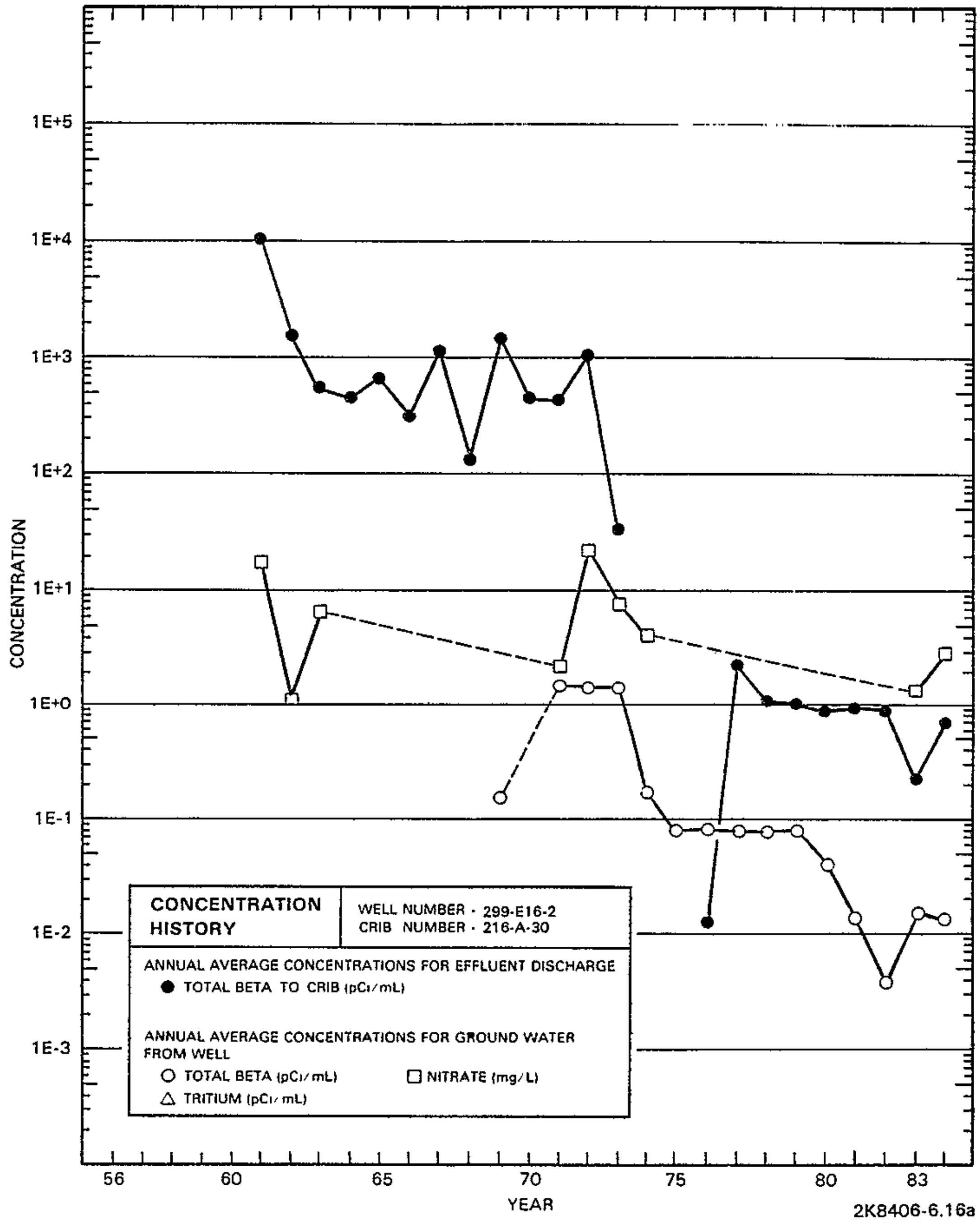


Figure D-5. Crib 216-A-30, Well 299-E16-2.

9 2 1 2 1 5 5 1 9 2 4

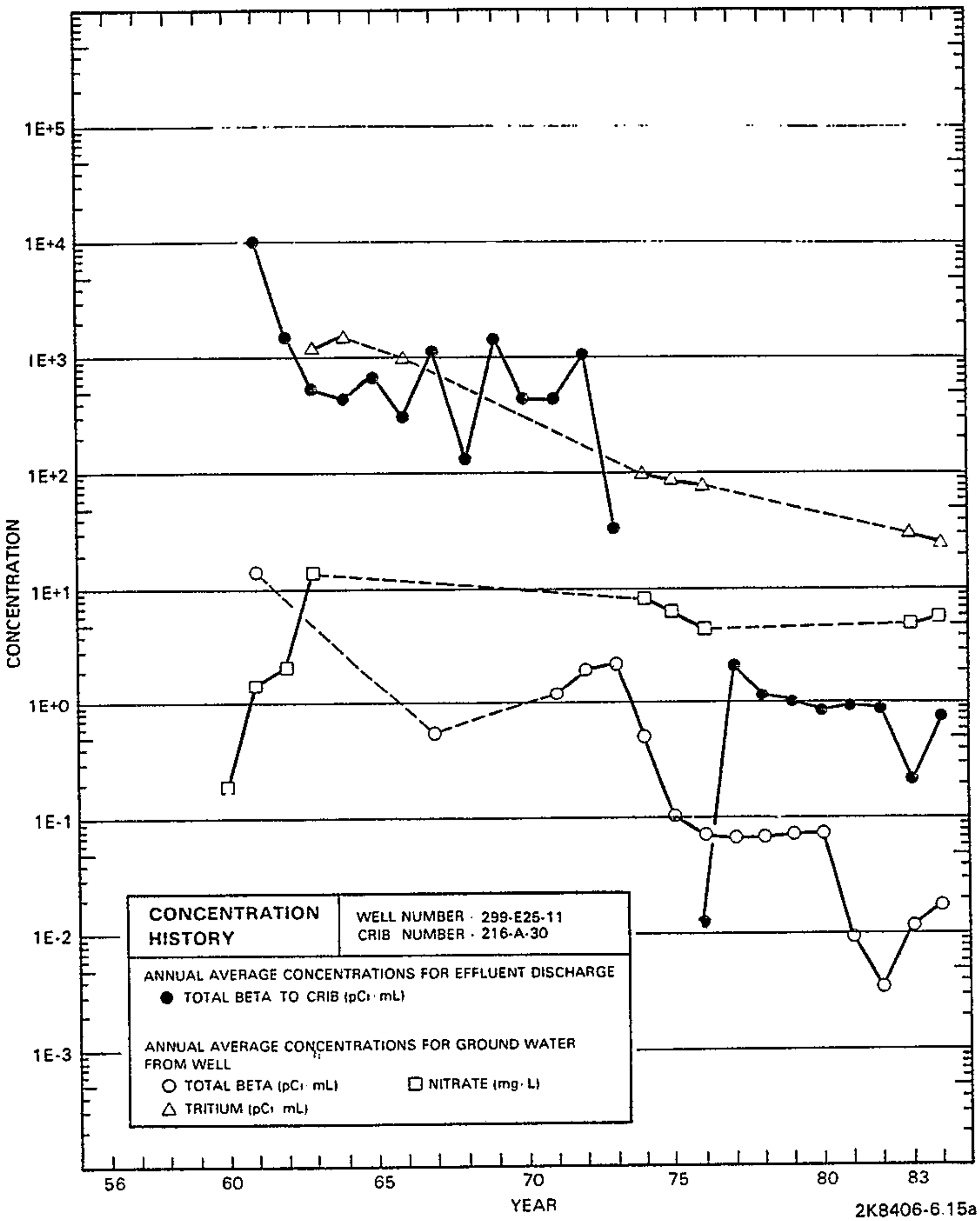
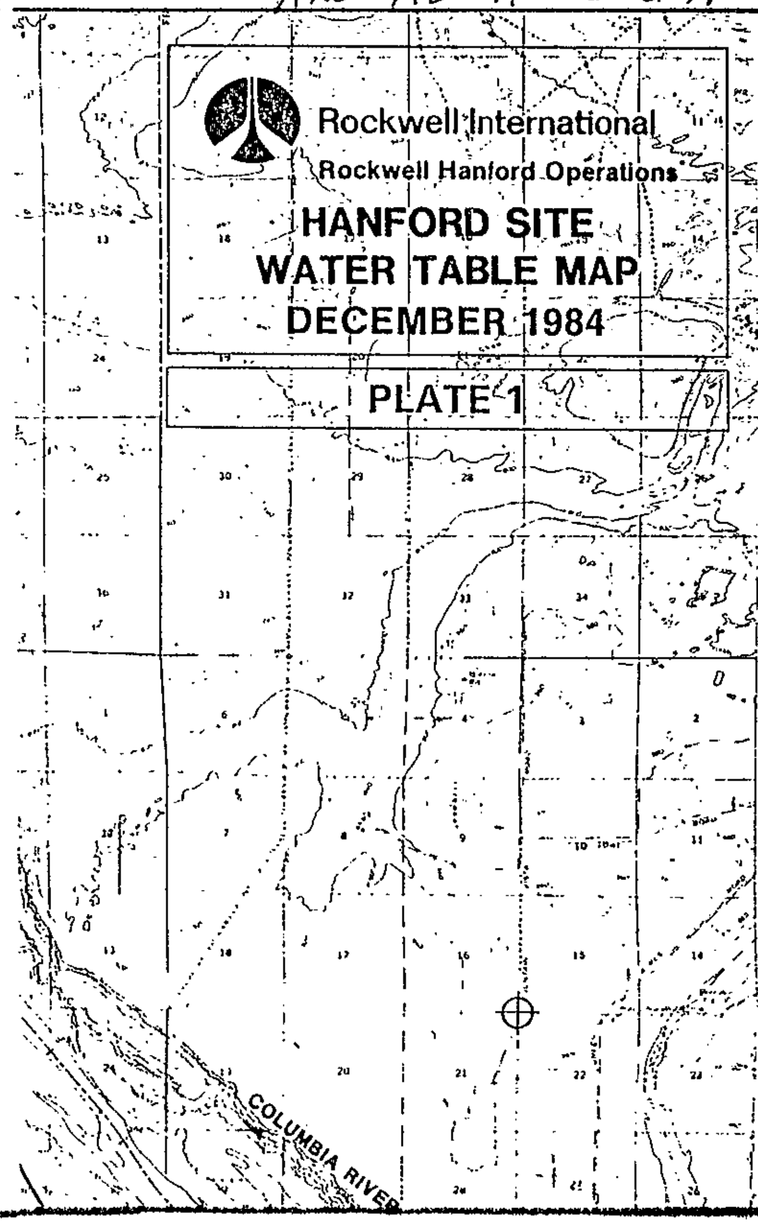


Figure D-6. Crib 216-A-30, Well 299-E25-11.

9 2 1 2 1 5 6 1 9 2 5

9 2 1 2 4 5 5 1 9 2 6

RHO-RESR-85-24P



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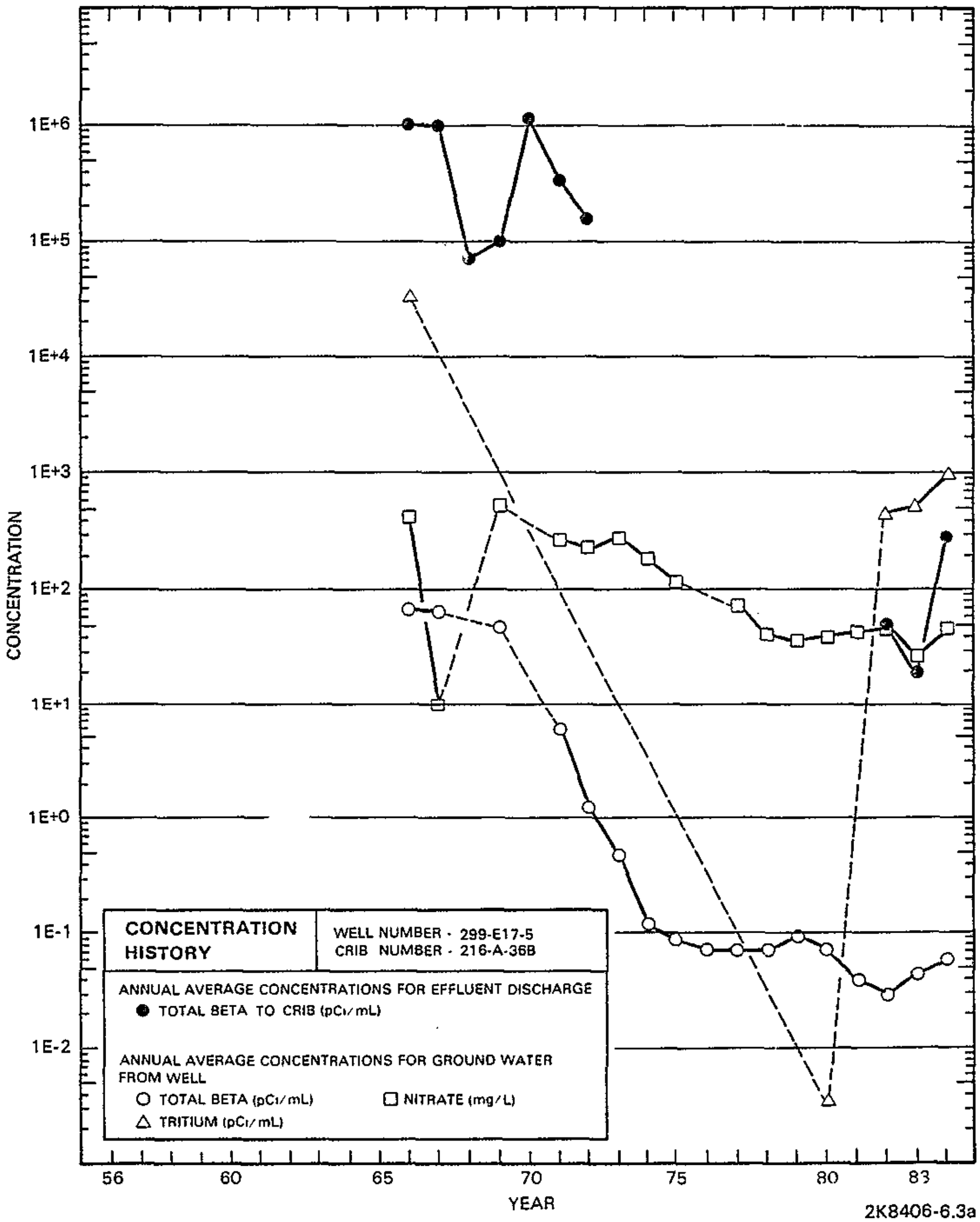

Figure D-7. Crib 216-A-36B, Well 299-E17-5.

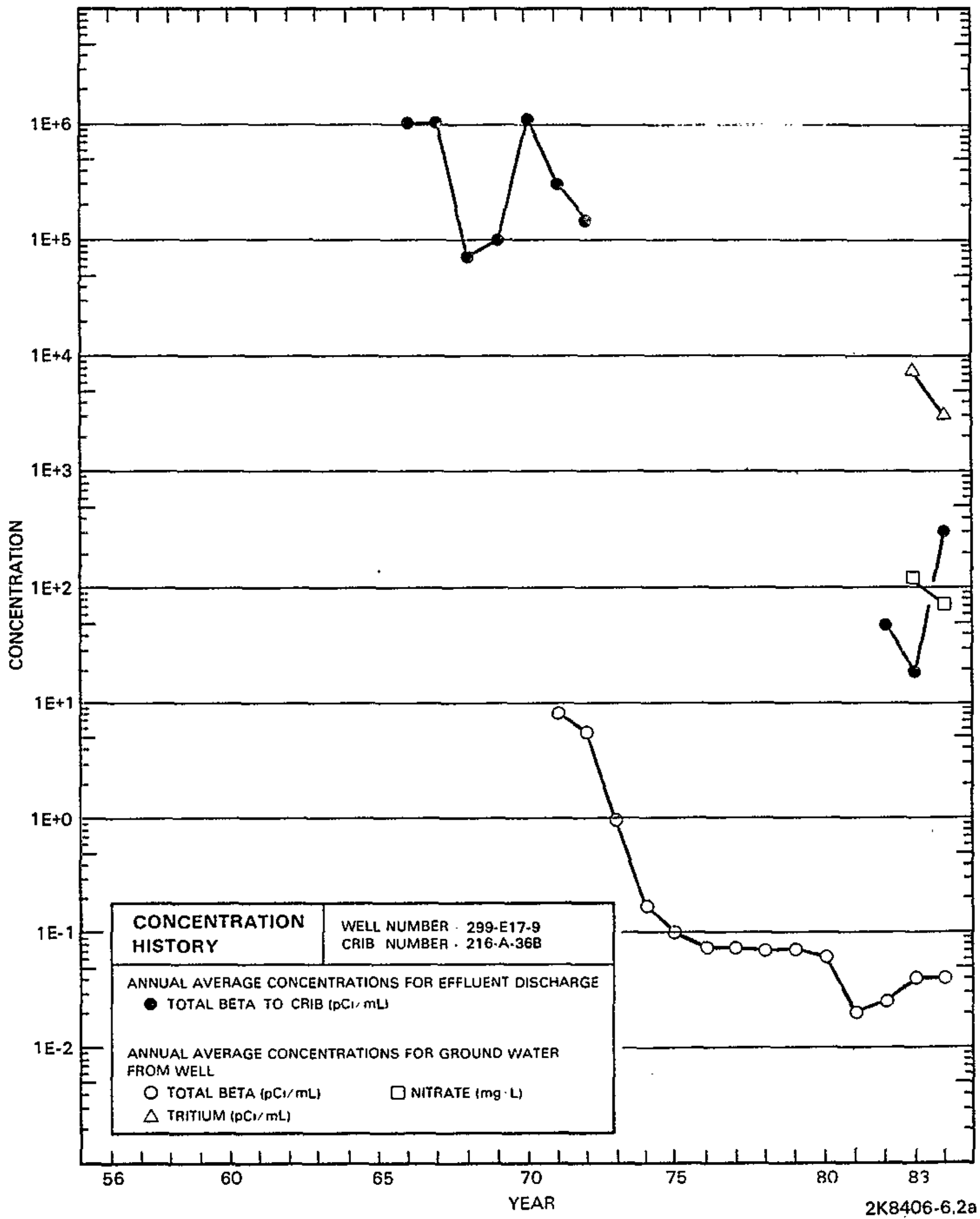

Figure D-8. Crib 216-A-36B, Well 299-E17-9.

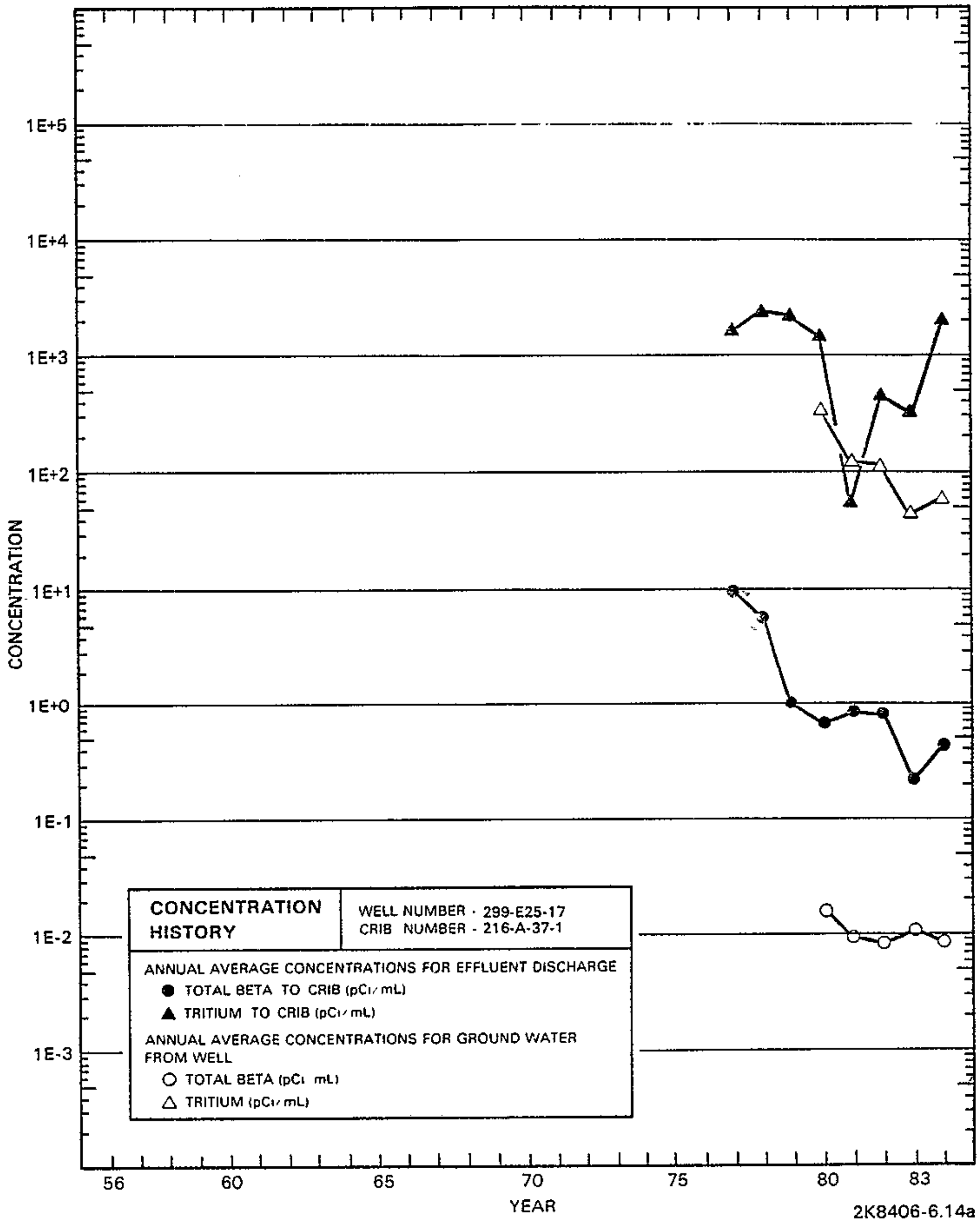

Figure D-9. Crib 216-A-37-1, Well 299-E25-17.

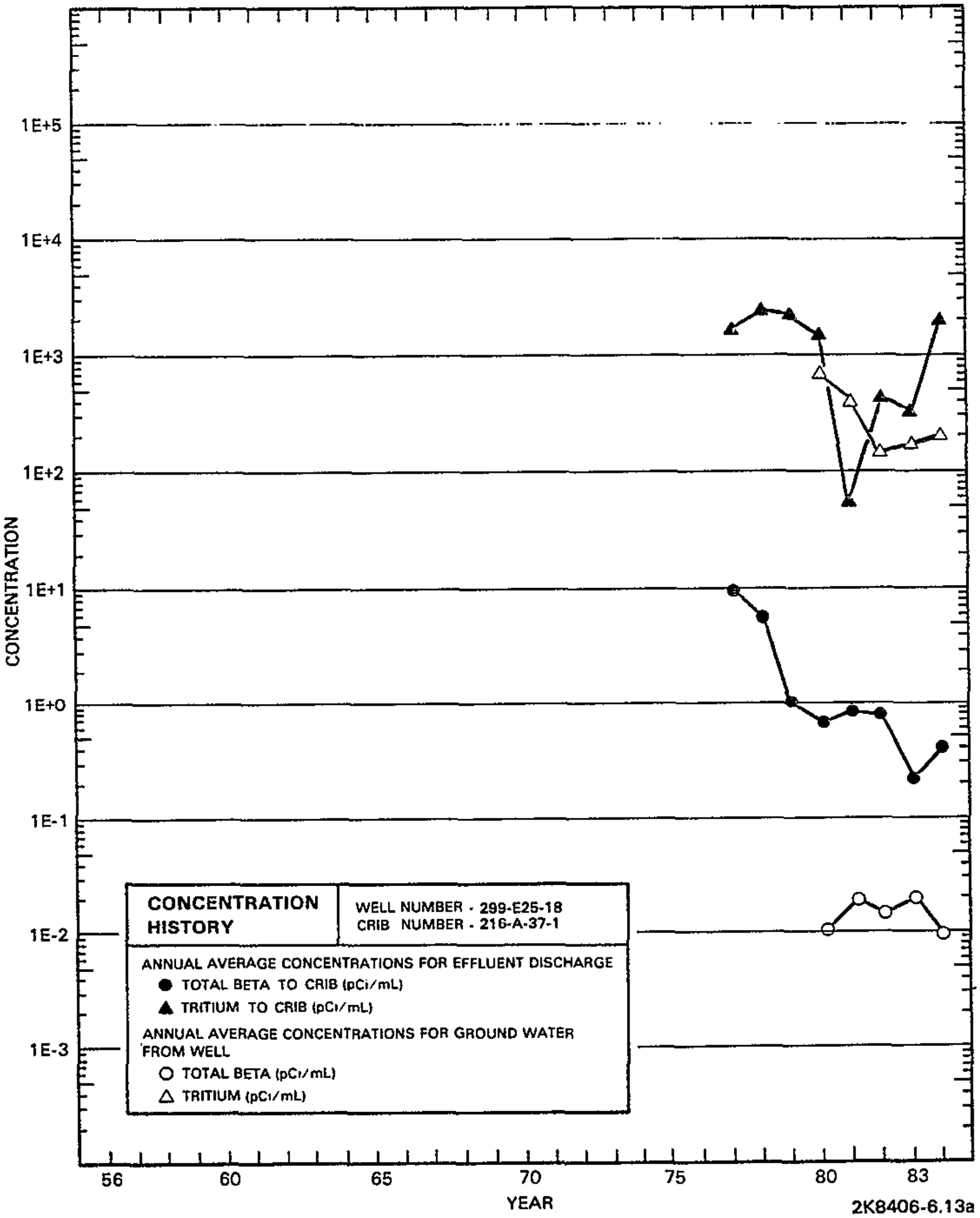

Figure D-10. Crib 216-A-37-1, Well 299-E25-18.

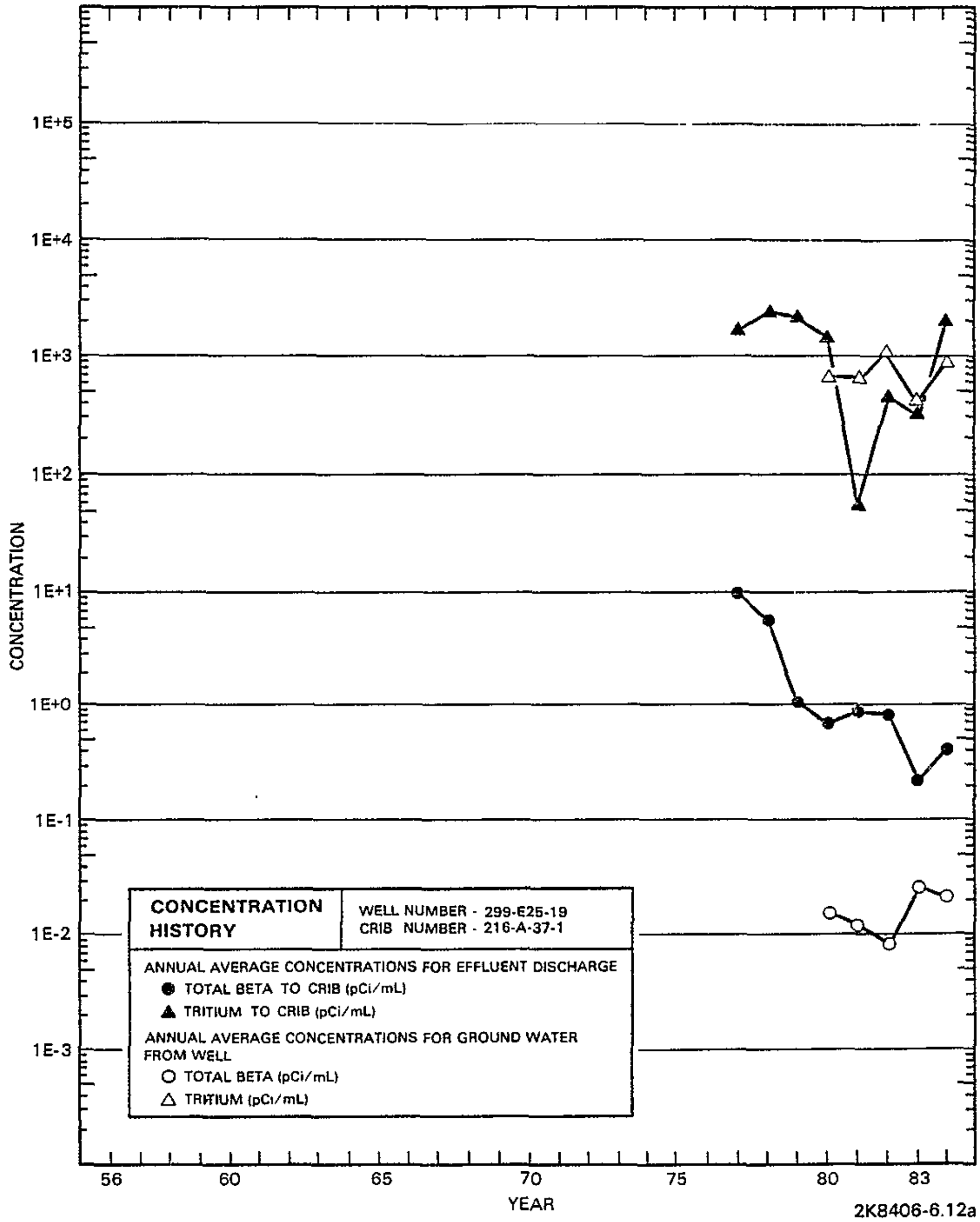

Figure D-11. Crib 216-A-37-1, Well 299-E25-19.

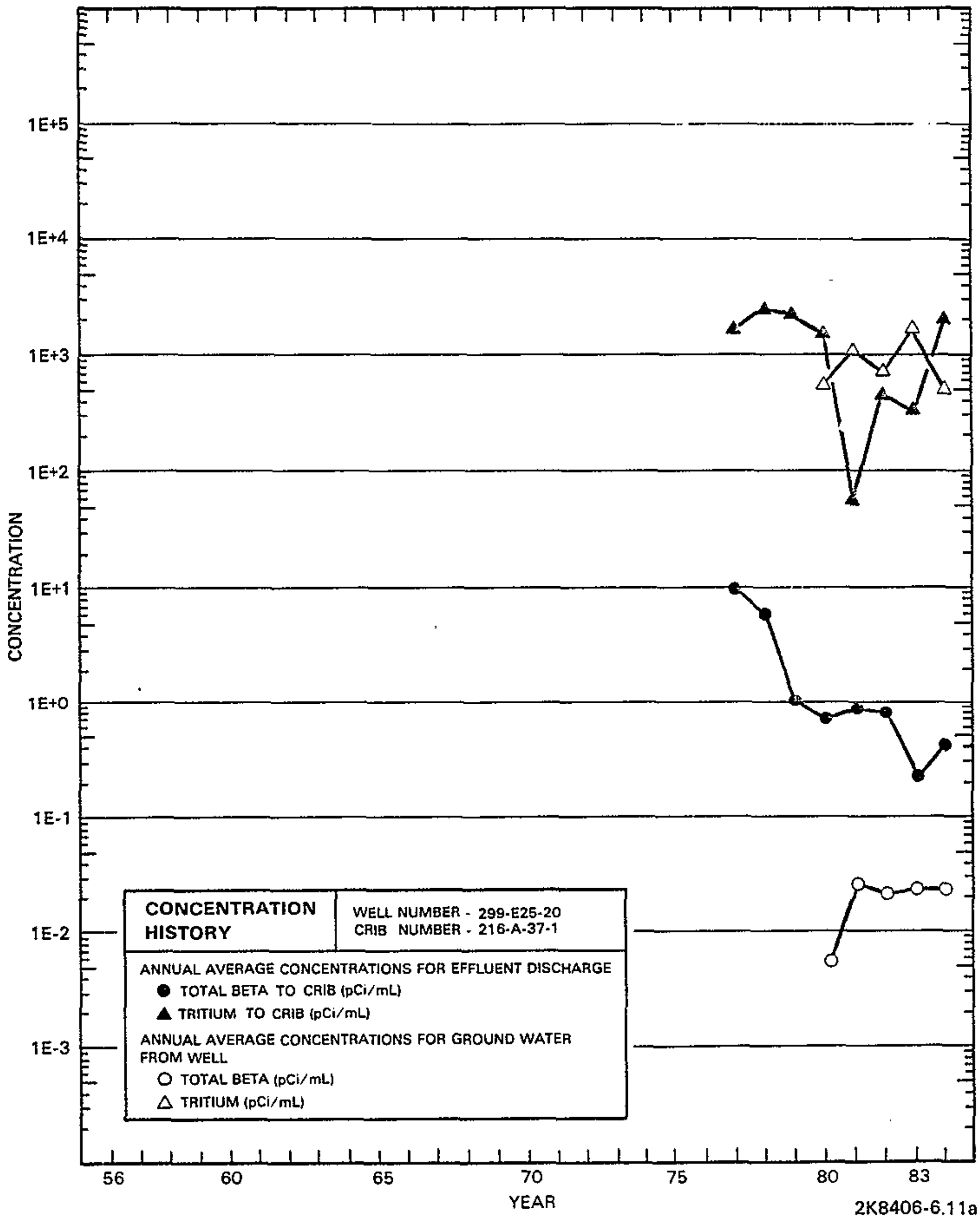

Figure D-12. Crib 216-A-37-1, Well 299-E25-20.

9 2 1 2 4 5 6 1 9 3 2

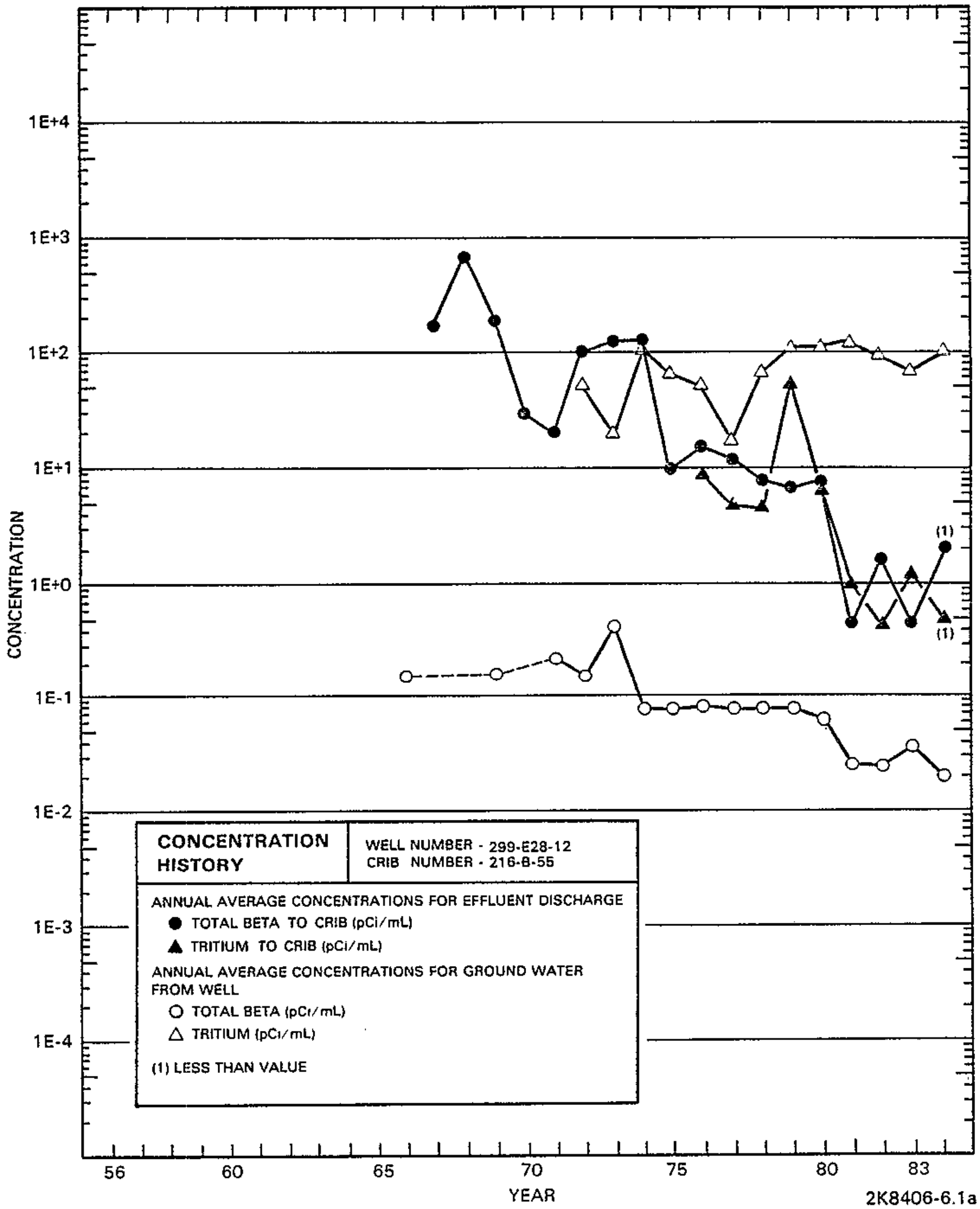

Figure D-13. Crib 216-B-55, Well 299-E28-12.

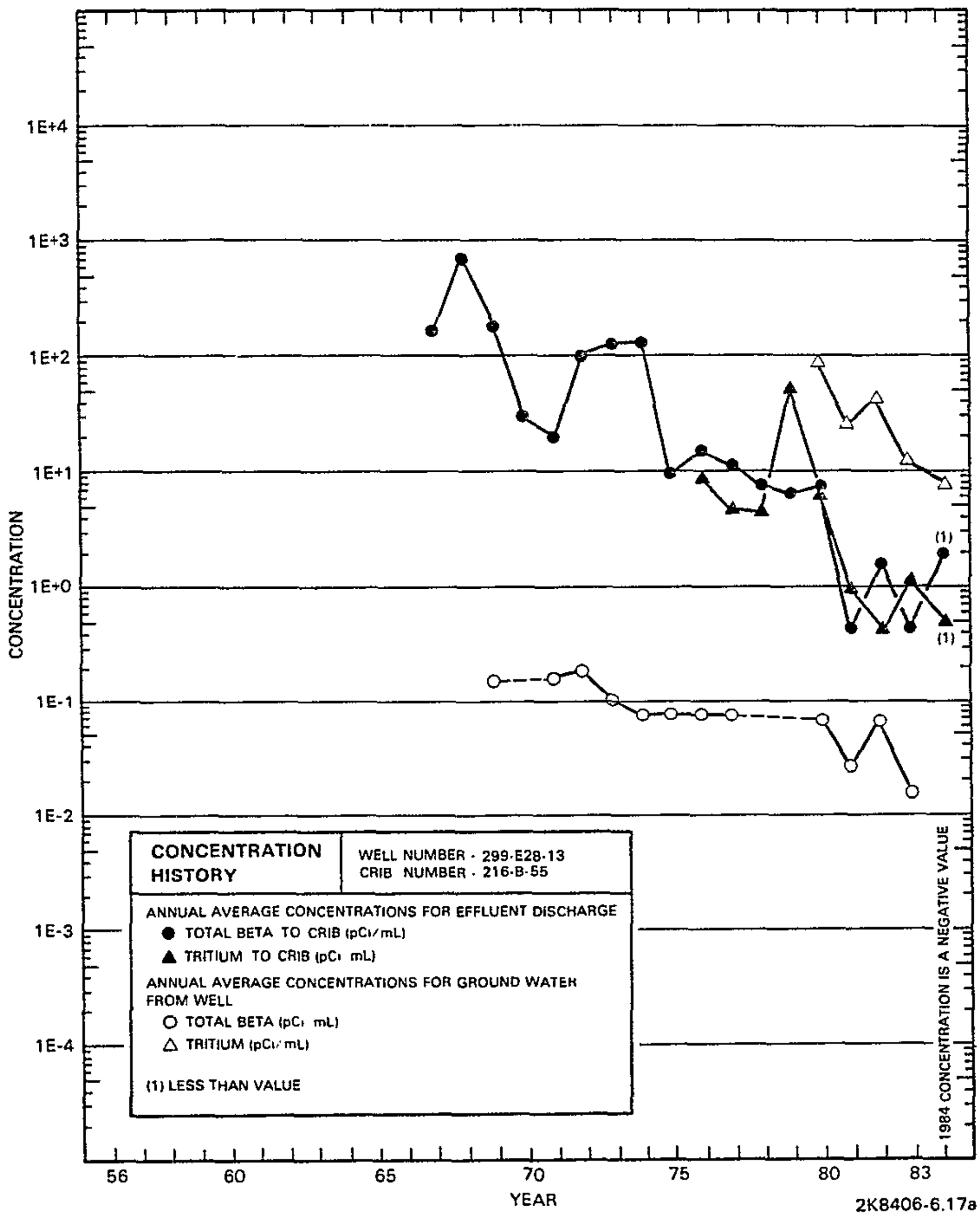

Figure D-14. Crib 216-B-55, Well 299-E28-13.

9 2 1 2 5 6 1 9 3 4

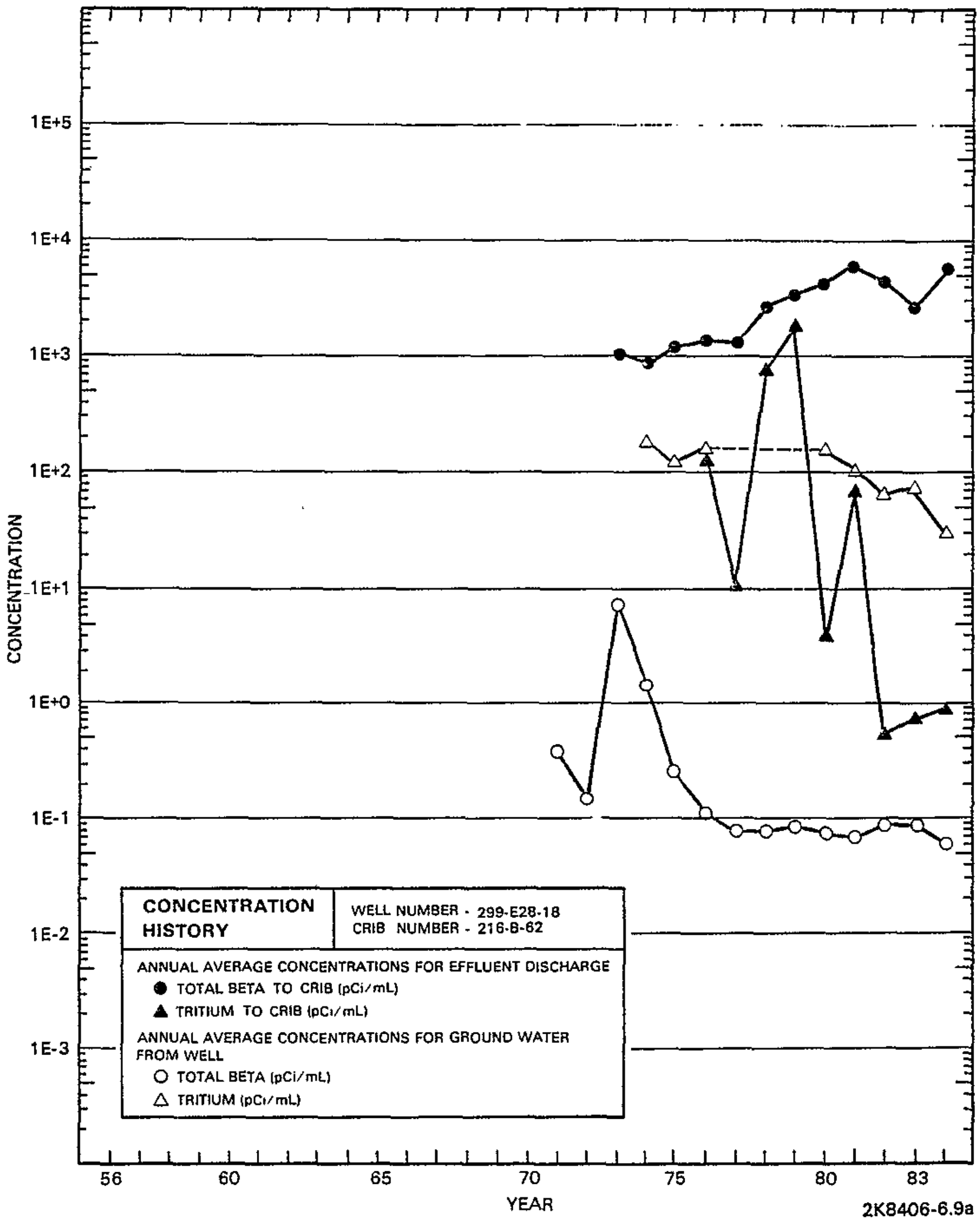

Figure D-15. Crib 216-B-62, Well 299-E28-18.

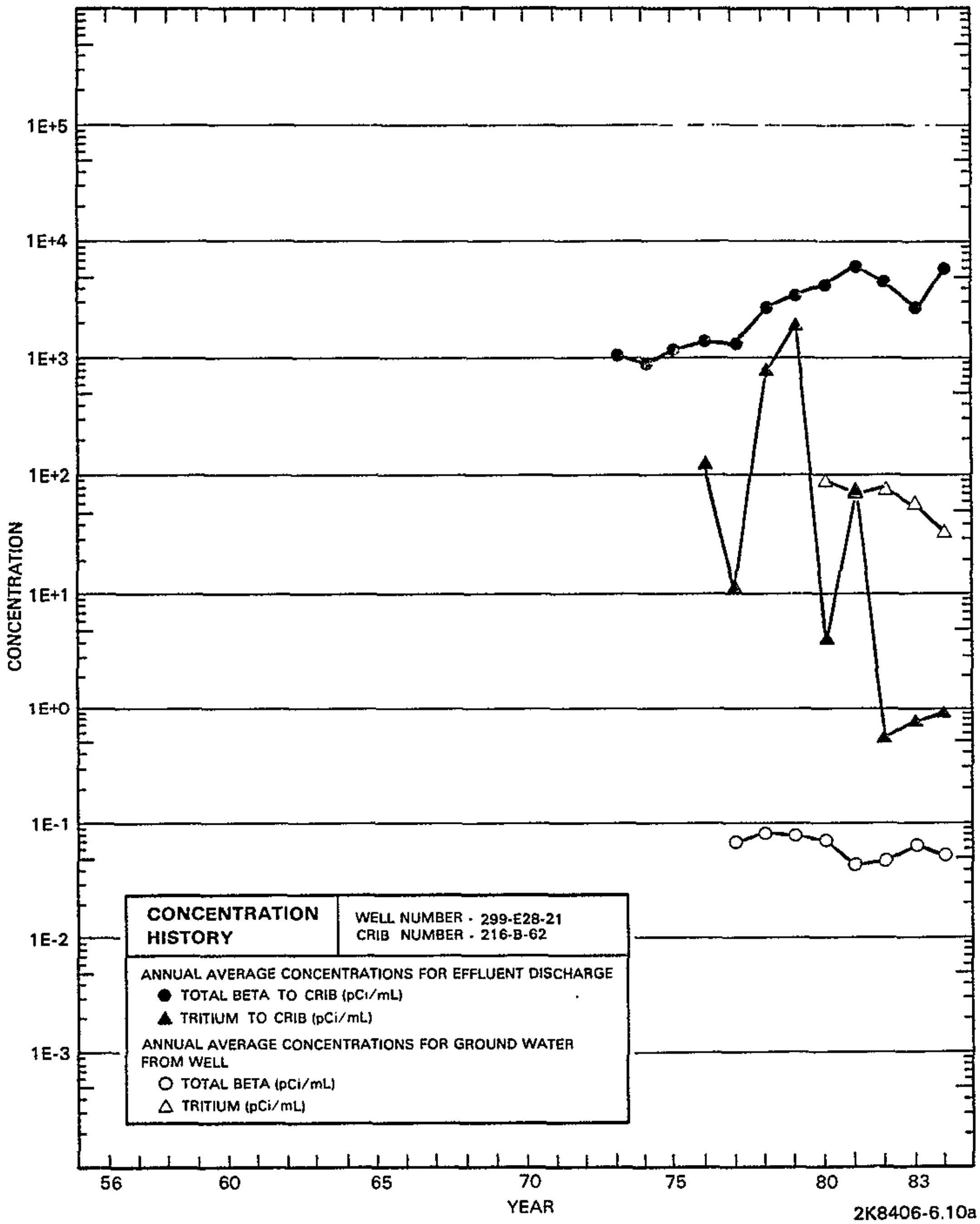

Figure D-16. Crib 216-B-62, Well 299-E28-21.

9 2 1 2 4 5 6 1 9 3 6

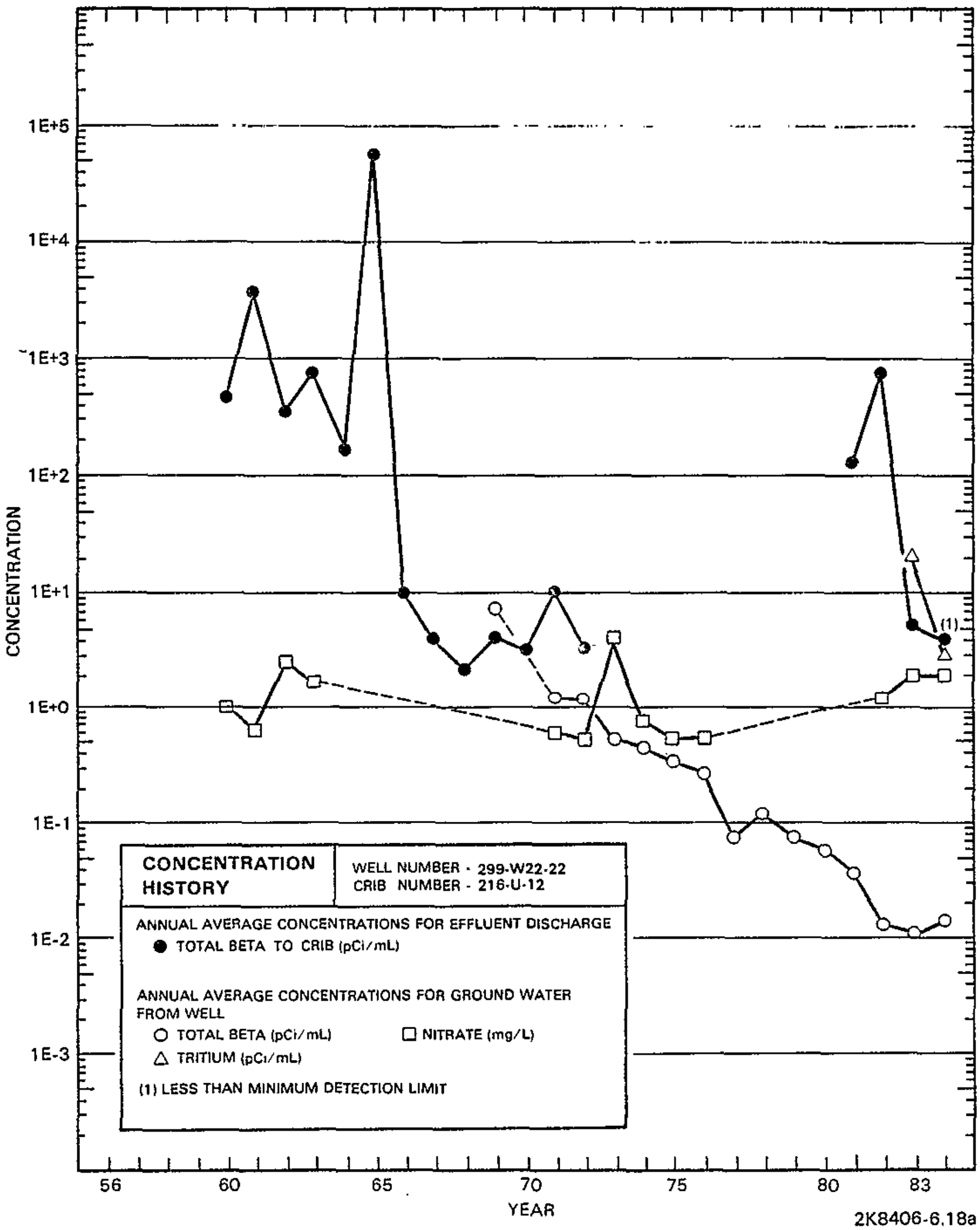

Figure D-17. Crib 216-U-12, Well 299-W22-22.

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