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1988 HANFORD RIVERBANK SPRINGS CHARACTERIZATION REPORT

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SUMMARY

This report presents the results of a special study undertaken to characterize the riverbank springs (i.e., ground-water seepage) entering the Columbia River along the Hanford Site. Radiological and nonradiological analyses were performed. River water samples were also analyzed from upstream and downstream of the Site as well as from the immediate vicinity of the springs. In addition, irrigation return water and spring water entering the river along the shoreline opposite Hanford were analyzed.

Hanford-origin contaminants were detected in spring water entering the Columbia River along the Hanford Site. The type and concentrations of contaminants in the spring water were similar to those known to exist in the ground water near the river. The location and extent of the contaminated discharges compared favorably with recent ground-water reports and predictions. Spring discharge volumes remain very small relative to the flow of the Columbia. Downstream river sampling demonstrates the impact of ground-water discharges to be minimal, and negligible in most cases.

Radionuclide concentrations were below U.S. Department of Energy Derived Concentration Guides (DCGs) with the exception of ^{90}Sr near the 100-N Area. Tritium, while below the DCG, was detected at concentrations above the U.S. Environmental Protection Agency drinking water standards in several springs. All other radionuclide concentrations were below drinking water standards. Nonradiological contaminants were generally undetectable in the spring water. River water contaminant concentrations, outside of the immediate discharge zones, were below drinking water standards in all cases.

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INTRODUCTION

This report presents the results of a special study performed by the Surface Environmental Monitoring Project (SEMP) to investigate the radiological and nonradiological characteristics of the riverbank springs entering the Columbia River along the Hanford Site shoreline. The SEMP is conducted by Pacific Northwest Laboratory (PNL) for the U.S. Department of Energy (DOE).

Routine SEMP monitoring activities provide a historical record of radionuclide concentrations and radiation levels attributable to natural causes, worldwide fallout, and Hanford Operations. Data are also collected to monitor levels of nonradiological contaminants at the Hanford Site and in the Columbia River. In addition to routine monitoring activities, special studies are also conducted periodically to enhance the understanding of specific aspects of the Hanford environment. The special study described herein was performed during 1988 to supplement the routine monitoring program and to follow up on previously conducted studies investigating similar environmental conditions.

BACKGROUND INFORMATION

The Hanford Site is located in southeastern Washington State, occupying an area of approximately 560 square miles. The Site lies approximately 170 miles southeast of Seattle, Washington, 125 miles southwest of Spokane, Washington, and 200 miles northeast of Portland, Oregon (Figure 1). The Columbia River flows through the northern portion of the Hanford Site and forms part of the Site's eastern boundary. The Rattlesnake Hills, with elevations in excess of 3200 feet, form part of the southern boundary of the Site. The Columbia River Basalt Group, the Ringold Formation, and a series of glaciofluvial sands and gravels known informally as the Hanford sediments are the predominant geological units. Both confined and unconfined aquifers exist beneath the Hanford Site.

The Hanford Site was originally established in 1943 for the production of plutonium for use in nuclear weapons. As a result of operations at

Hanford, large volumes of wastewater were generated and discharged to the ground. The disposal of this liquid effluent to the ground has had a considerable impact on the ground water in the unconfined aquifer beneath the Site. Water levels have been influenced and the local flow patterns, generally from the recharge areas in the west to the discharge areas (primarily the Columbia River) in the east, have been altered. Because of the continual variation in both the volumes and make-up of the wastewater, the movement of the ground water and its associated contaminants have changed with time. In addition, the discharge locations of the contaminated ground water into the Columbia River have expanded over time, encompassing a larger segment of the shoreline.

The Ground-Water Protection and Monitoring Project (GWPMP), formerly the Hanford Ground-Water Surveillance Program, is responsible for monitoring the ground water beneath the Hanford Site. Monitoring is performed via a network of sampling wells located throughout the Site. Sample results are reported in a series of semi-annual and annual ground-water monitoring reports. Recently, the ground-water monitoring and surface environmental monitoring data have been combined in a single Hanford Site environmental monitoring report (Price 1986). While this program has been primarily interested historically in radioactive pollutants in the ground water, nonradiological contaminants have also been monitored during the past few years. In addition to the routine sitewide ground-water monitoring project, several hazardous waste ground-water monitoring compliance projects are ongoing at various locations on the Site that provide information relative to contaminant concentrations in the ground water beneath the Site. Two such projects are presently being conducted in areas near the river, one in the 100-H Area and the other in the 300 Area. These projects provide extensive information about the contaminants in the ground water near the river along these areas (Schalla et al. 1988; Liikala et al. 1988).

Monitoring data have shown several contaminants to be present in the ground water beneath waste disposal sites. The data also indicate that several of these contaminants are mobile in the ground-water system and travel at various rates through the unconfined aquifer, eventually to discharge to the Columbia River. Estimates of ground-water contaminant travel times, made since the early 1950s, were recently summarized by Freshley and Graham (1988). Tritium and nitrate are the primary constituents used in determining the extent of the contaminated ground water on the Hanford Site since they are present in easily measurable quantities and they move through the ground water virtually unimpeded. Figures 2 and 3 show tritium and nitrate concentrations in the unconfined aquifer during 1988, illustrating the migration of contaminants away from waste disposal areas. The primary areas where contaminated ground water is discharging into the Columbia River are also evident in these figures.

The SEMP is responsible for the monitoring of the surface water on and around the Hanford Site. Columbia River monitoring has been performed at Hanford since 1945, shortly after the startup of the original plutonium production reactors. Samples have been collected routinely from several locations over the years, with the primary emphasis of the program focused on the evaluation of the potential dose to those persons using and/or consuming the river water. In addition, special studies have investigated the mixing characteristics of the river and the dispersion of contaminants entering the river along the Hanford Reach. The springs, or ground-water seepage, are also sampled periodically as part of the SEMP.

The seepage of ground water into the Columbia River has been known to exist for many years. Spring discharges were documented along the Hanford Reach long before the startup of Hanford operations (Jenkins 1922). These relatively small springs flow intermittently, apparently influenced primarily by the changes in the river level. During periods of high river stage, the flow of ground water may be temporarily reversed with river water infiltrating the riverbank (Raymond and Brown 1963). This phenomena, referred to as bank storage, is a key factor in sample collection and in data interpretation. The interface between the ground water and the Columbia River is highly complex and not well defined. Seepage above the river level is considered to be just a fraction of the total amount of ground water entering the river along the Hanford Reach. The exchange of ground-water contaminants at depth between the ground water and the river through submerged seepage is not well understood.

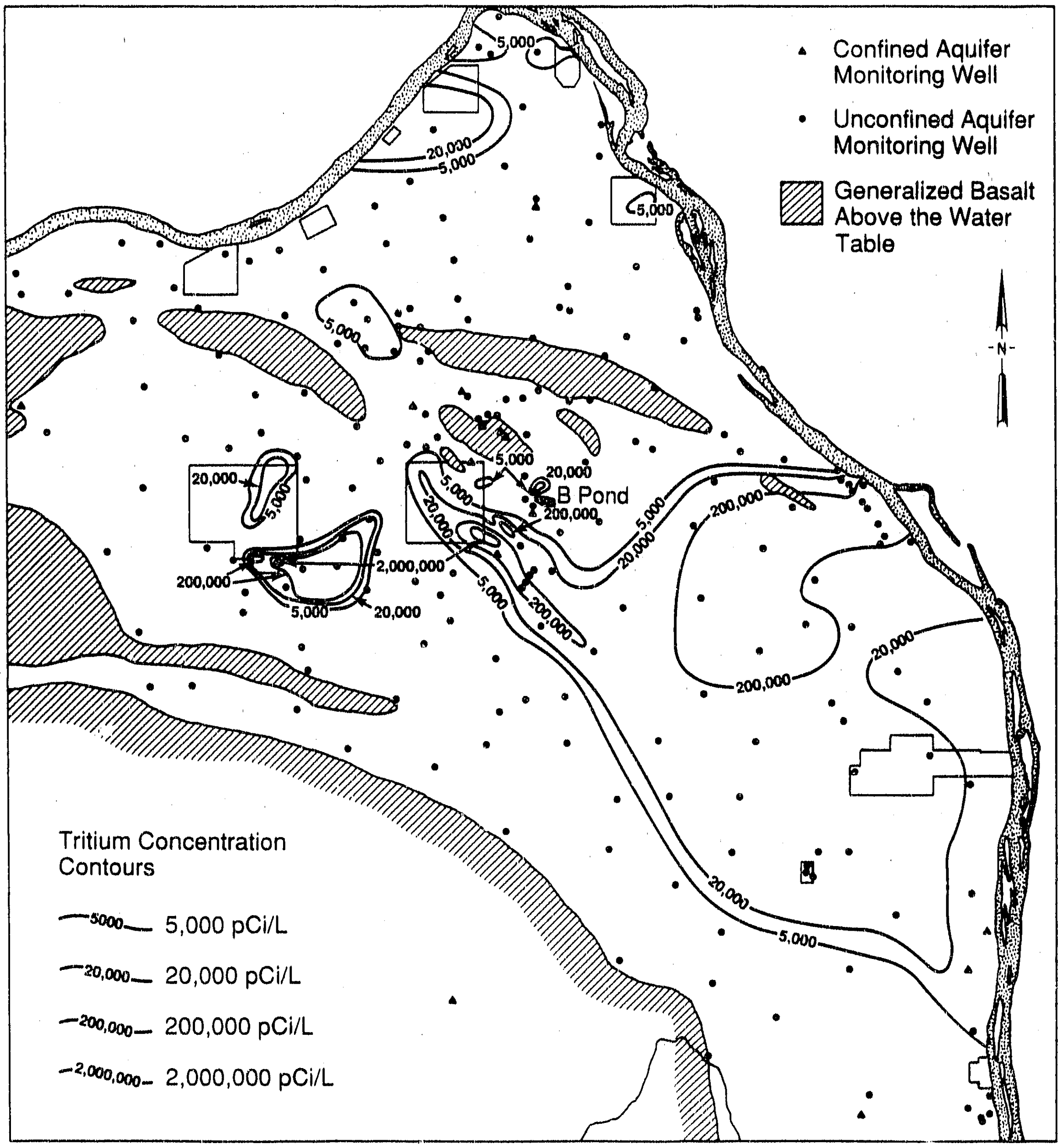

FIGURE 2. Tritium (^{3}H) Concentrations in the Hanford Site Unconfined Aquifer in 1988 (Jaquish and Bryce 1989)

The volume of the ground-water discharge to the river along the entire Hanford Reach has not been quantified. However, estimates of the ground-water discharge in specific areas along the Site have been reported. The N-Springs, adjacent to the 100-N Area, discharged approximately

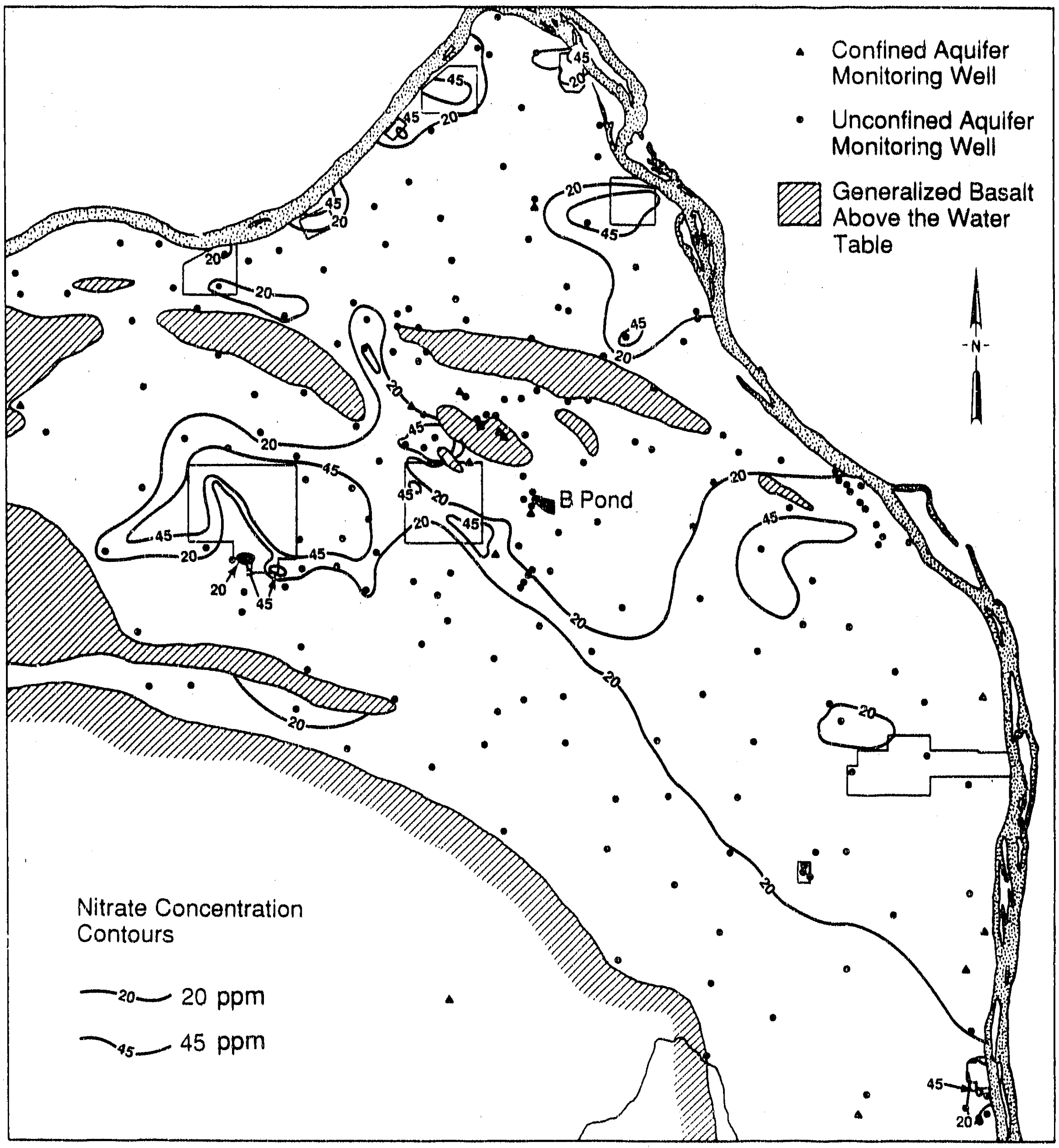

FIGURE 3. Nitrate (NO_3) Concentrations in the Hanford Site Unconfined Aquifer in 1988 (Jaquish and Bryce 1989)

14,700,000 ft^3 during 1987, or an average flowrate over the year of approximately 0.5 ft^3/s (Rokkan 1988). The contaminated ground-water discharge to the river near the Hanford Townsite, as a result of past waste disposal practices in the 200 Areas, has been estimated to be approximately 3.0 ft^3/s

(Cline et al. 1985). These two areas, 100-N Area and the Hanford Townsite, have been identified as major discharge zones for contaminated Hanford ground water. Based on these estimates, it is apparent that the total flow of ground water into the Columbia River is very small when compared to the flow of the Columbia River. Recent annual average river flow rates have ranged from 100,000 to 120,000 ft^3/s. The long-term average annual flow at Priest Rapids Dam, based on 68 years of record, is 120,000 ft^3/s (McGavock et al. 1987).

Ground-water discharges along the Hanford Reach of the Columbia River have been monitored since the mid-1960s. Springs in the vicinity of the 300-Area retention basin and sewage leaching trenches were routinely sampled and analyzed for various biological, chemical, and radiological parameters. Springs along the 100-N Area, resulting from liquid waste disposal practices, have been, and are today, monitored routinely (Rokkan 1988).

In addition, special studies of ground-water discharges have been conducted periodically. The latest of these special studies was conducted in 1982 and 1983 (McCormack and Carlile 1984). This study covered approximately 41 miles of Hanford Site shoreline, identifying 115 springs or seepage areas. During this study, the constituents used as indicators of contaminated ground water were tritium and nitrate because of their predominance in much of the Hanford ground water. Uranium analyses were substituted in place of tritium on samples collected near the 300 Area where uranium is a primary constituent in the ground water. In addition to these analyses, a few samples were selected for the analysis of ^{90}Sr, ^{99}Tc, and gross beta. The McCormack and Carlile (1984) study confirmed areas of contaminated ground-water entry into the Columbia River and documented contaminant concentrations similar to the local ground water in the riverbank spring water.

Numerous attempts to sample the riverbank springs have been made since the McCormack and Carlile (1984) study. A cooperative sampling program was initiated in 1984 that concentrated its effort on the Columbia River and the ground-water seepage entering the river along the Hanford Reach. A few springs have been sampled consistently over the years as a result of this program. This program is an ongoing effort presently involving the state of

Washington, the state of Oregon, the U.S. Environmental Protection Agency (EPA), the Washington Public Power Supply System, SEARCH, Inc., and the DOE, represented by PNL. When and where sample collection was successful, sample results obtained as a result of this program have generally been in good agreement with previous observations and provide additional background information concerning the concentrations of various radionuclides in the ground-water discharges (Jaquish et al. 1987).

SPRING CHARACTERIZATION STUDY DESCRIPTION

The FY 1988 Project Management Plan (PMP) for the SEMP included a special study to characterize the riverbank springs along the Hanford Site shoreline. The objectives of the Spring Characterization Study were to monitor the discharges along the Hanford Reach shoreline for radiological and nonradiological constituents and define points suitable for the establishment of permanent, routine spring sampling locations.

Identification of previously documented spring locations was not included in the scope of this study. Also excluded from the scope of the Spring Characterization Study, as was the case in the McCormack and Carlile (1984) study, were investigations of ground-water discharges as a function of time or as related to the flow rate of the Columbia River. No attempt was made to quantify the amount of ground water entering the river via the springs during this effort. The primary elements of the Spring Characterization Study were

- follow-up and expansion of the McCormack and Carlile (1984) study
- screening of radiologically contaminated ground-water plumes for nonradiological parameters
- identification of permanent sampling locations
- identification of future needs relating to the ground-water/river system.

Past studies have provided significant background information concerning the concentrations of certain contaminants entering the river through the discharge of contaminated ground water. The current effort was intended to follow-up and expand on the information previously obtained. As such, sample location and analysis combinations were selected to allow for comparisons of present radionuclide concentrations with those observed in the past. Similar locations and analysis were included to determine if significant increases or decreases in contaminant concentrations were apparent. Other location/analysis combinations were requested to determine what other, if any, contaminants were entering the river through ground water and to define the extent and location of the ground-water plumes entering the river.

Also included in this study were the sampling and analysis of irrigation returns and springs along the Franklin County shoreline to identify potentially significant sources of contaminants not associated with Hanford operations entering the river along the Hanford Reach.

A notable change in this study versus the previous spring study is the expansion of analysis to include an extensive number of nonradiological parameters. This provides much-needed background information regarding the discharge of nonradiological contaminants into the river that can be used by others in future ground- and surface-water monitoring activities as well as in the development and implementation of Resource Conservation and Recovery Act (RCRA) feasibility investigation/corrective measures studies (RFI/CMS) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigations and feasibility studies (RI/FS). The inclusion of nonradiological analysis also provides some verification of observations and predictions of the ground-water monitoring projects relative to contaminants in ground water near the Columbia River shoreline.

Specific sample locations will be identified as part of this task and incorporated into the routine SEMP sampling schedule. In the future, information on specific ground-water plumes will be obtained from a specific spring or springs over time to provide time-series information relative to both the flow of the spring and the contaminant concentrations in the spring water when the discharge is active. Routine monitoring of the ground-water discharges into the Columbia River will also provide a degree of public assurance in the surveillance activities in that a visible, albeit small, transport pathway is not being ignored.

The final element of this task is intended to identify future needs or activities that would further enhance our understanding of the ground-water discharges, the interaction between these and the river, and the transport and fate of the contaminants entering the river via this pathway. In addition, better understanding of the ground-water/spring/river interactions may lead to improved river monitoring system design and allow for more complete and accurate data evaluation and interpretation of current river monitoring results.

SAMPLING PLAN

Figure 4 illustrates the extent of the study area. Hanford River Miles (HRMs) shown on this figure are approximate, starting from the Vernita Bridge and progressing 44 miles downstream at approximately 1-mile intervals to a point about 1 mile downstream of the 300 Area. HRM markers have been placed along the river, providing a field reference point for river-related activities and future relocation of specific springs.

Table A.1, Appendix A, provides the spring sample locations identified for the FY 1988 Spring Characterization Study. The locations are defined by HRM, the operational area being monitored, and the spring number, as defined in the McCormack and Carlile (1984) study. Locations were selected to be consistent, to the extent possible, with the McCormack and Carlile (1984) study to allow for meaningful comparisons and to maximize the opportunity to relocate springs with a flow adequate for the collection of a sample. The selected sample locations included springs identified as having "moderate" or "good" flows in the McCormack and Carlile (1984) study at locations just upstream, within, or just downstream of areas with elevated contaminant concentrations. Experience has shown that sampling attempts are not always successful. Therefore, multiple sites (backup sampling locations) along each operating area or point of contaminated ground-water entry were identified in an effort to obtain at least one meaningful sample from each area. Sampling activities were scheduled to coincide with low river flows, to the extent possible, to maximize the chances of finding the springs flowing and obtaining a sample.

In addition, those sites at which near-shore river water samples were scheduled are identified in Table A.1. Near-shore river water samples were collected within 5 feet of the shoreline and immediately downstream of the actively flowing springs. As such, results of near-shore river water samples provide information concerning the localized influence of the seepage and are not representative of average river concentrations. River water samples were also collected from the SEMP Columbia River monitoring stations located at Priest Rapids Dam and the Richland Pumphouse. These samples were obtained from the routine sampling systems.

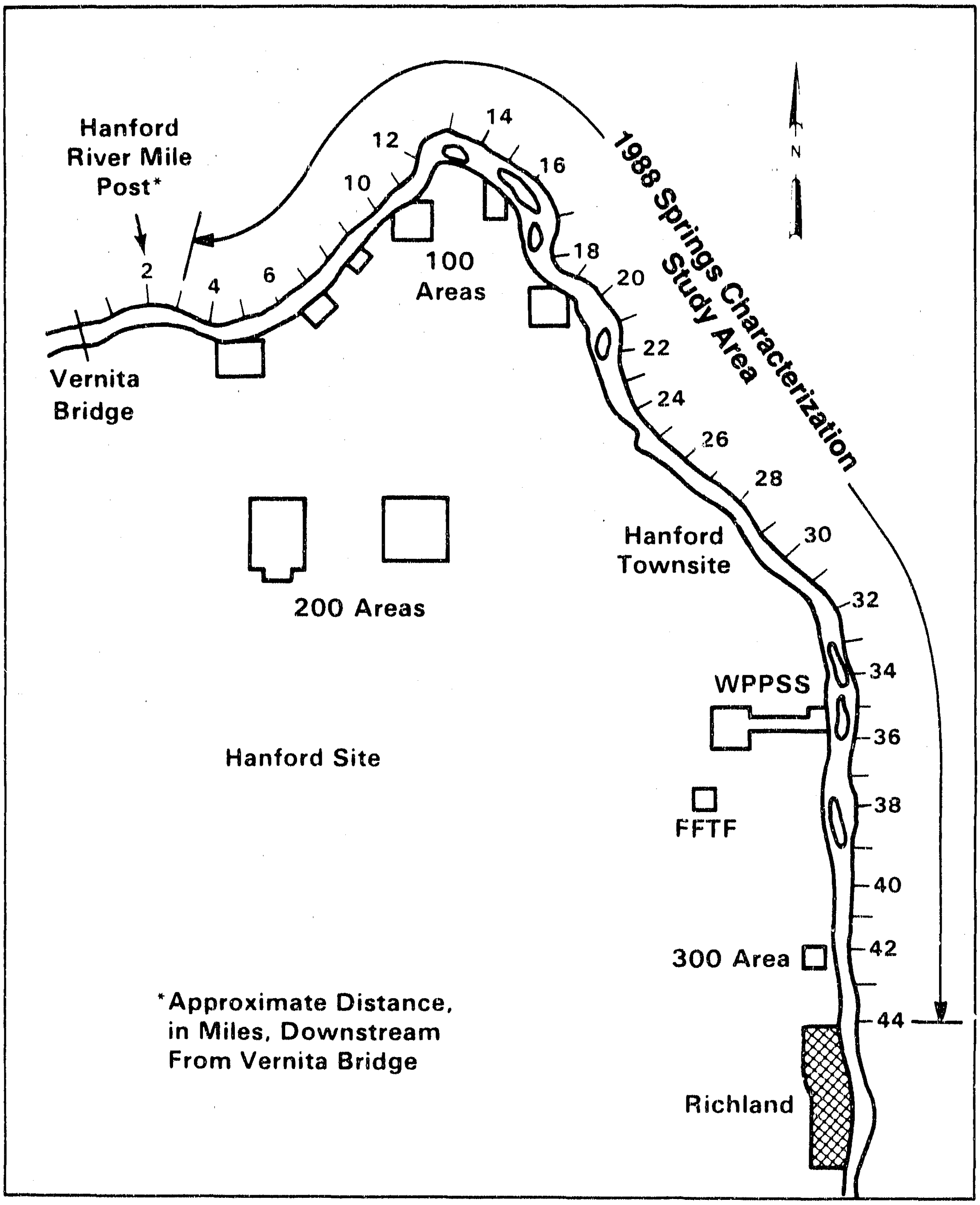

FIGURE 4. 1988 Springs Characterization Study Area

Water sample locations were also identified on the Franklin County side of the Columbia River (opposite Hanford). These samples were collected from two irrigation canal returns and from a spring entering the river as a result of extensive irrigation practices east of the river. Results of these samples provide insight on potential sources of contaminants entering the river not associated with Hanford operations, and allow for better interpretation of results obtained from river samples collected downstream.

SAMPLE COLLECTION AND ANALYSIS

Sample collection methods were consistent at all locations except for the need to "improve" those sites where the spring flow was very low and/or extremely shallow. These sites were deepened to allow for the collection of the spring water without disturbing the sediments. All suspended material was allowed to clear from the modified springs before collection of the sample. Care was taken to ensure the spring flow was not interrupted, reversed, or otherwise modified in such a manner that could influence the sample results.

A small hand suction pump was used to transfer the water from the springs to the sample containers. The pump was thoroughly rinsed before and following sample collection at each site. In addition, the pump was flushed with spring water at each site before sample collection to avoid cross contamination between samples. Flushing the pump also served to purge the spring sampling area, providing fresh spring water for sample collection. Use of the hand pump eliminated the disturbance and inadvertent collection of sediment material and minimized or eliminated aeration of the sample during the collection process, which is critical in the sampling and analysis of numerous nonradiological parameters.

Samples of river water, where specified, were collected immediately downstream of the spring entry point using methods similar to those described for the collection of spring samples. Water was collected within 2 to 5 feet of the shoreline at approximately mid-depth. Care was taken to avoid stagnant areas along the shoreline to the extent possible and collect the near-shore river samples in flowing water.

The analyses performed on each sample are identified in Table A.1, Appendix A. As with the selection of sample locations, analyses were chosen to allow for comparison with previous results on spring samples and local ground-water monitoring results. In addition, analyses were expanded at several locations to determine what additional contaminants are present in the spring water entering the river and provide background information concerning the concentrations of these contaminants. Radiological analyses are listed as a specific analysis except in the case of the gamma scan, which provides concentrations of a number of gamma-emitting radionuclides including ^{60}Co, ^{106}Ru, ^{125}Sb, ^{134}Cs, and ^{137}Cs, as well as several others. At a minimum, all spring water samples received analysis for gross alpha, gross beta, gamma scan, tritium, and nitrate (included in the 735 and 9905 codes).

Nonradiological analyses are listed as laboratory codes (735 and 9905) in Table A.1, Appendix A. The 735 code provides for the determination of common anions such as chloride, fluoride, nitrate, phosphate, and sulphate using ion chromatography (IC). The 9905 code is made up of an extensive set of lists for various types of analyses. The 9905 code includes the dangerous waste constituents as identified by the state of Washington in WAC 173-303-9905 (Washington State Department of Ecology 1986). Analysis of the entire 9905 list provides a screening mechanism on the spring discharges, ensuring that potential contaminants are not being overlooked. The 9905 code includes analysis for the ICP metals, enhanced thiourea, enhanced pesticides, volatile organic compounds, phosphorous pesticides, direct aqueous injection analysis, enhanced herbicides, IC Report, PCB analysis, arsenic, mercury, selenium, thallium, lead, total organic carbon (TOC), cyanide, perchlorate, sulfide, ammonium ion, ethylene glycol, citrus red, total carbon (TC), and total organic halogen (TOX). Table A.2, Appendix A, lists the specific nonradiological parameters included in the 9905 (including 735) analytical code. As is evident in Table A.2, Appendix A, those samples for which the 9905 list was requested received an extensive screening for nonradiological contaminants. Because of the relatively high cost of analysis for the entire 9905 list, the number of samples analyzed for the entire list was minimal, and locations were selected in areas of known contamination to maximize the amount of useful information obtained.

All sample analyses, radiological and nonradiological, were performed by United States Testing Company (UST). All analytical procedures were the same as those used for the routine SEMP and GWPMP samples. An extensive Quality Assurance (QA) program is required for the SEMP and GWPMP that documents typical lab performance for the analysis performed (Jaquish and Bryce 1989). Detection levels for the various nonradiological constituents are included in Table A.2, Appendix A.

The type of sample container varied widely, depending on the analyses to be performed. Multiple sample containers were required at all sample locations. The bottle size, bottle type, method of sample preservation, and special handling requirements were dependent on the specific analysis performed. Table A.3, Appendix A, provides the type of sample container and sample preservation requirements for each group of analysis.

Nonradiological samples were stored in ice-filled coolers, as appropriate, and transported to the laboratory as soon as possible following sample collection. Samples to be analyzed for radiological constituents, while not having special preservation or handling requirements, were also transported to the laboratory as soon as practical following sample collection. In all cases, samples were delivered to the lab the same day they were collected.

RESULTS AND DISCUSSION

Samples were collected from 18 springs between HRM 2 and HRM 44 during 1988 as part of the Spring Characterization Study. Samples were obtained from the river along the 100-B, 100-N, 100-D, 100-H, and 300 Areas. In addition, springs were sampled that are associated with the contaminated ground-water plume originating beneath the 200 Areas, which enters the river between approximately HRM 27 (Hanford Townsite) and HRM 40. Samples were also collected upstream of all past operating areas near HRM 2.5 and downstream of all facilities at approximately HRM 43.8.

Samples were not obtained at all sites identified in the sampling plan. Locations successfully sampled during 1988 are identified in Table B.1, Appendix B. Attempts to collect samples along the 100-K and 100-F Areas were unsuccessful. In addition, several back-up sites were not sampled. A minimum of three sampling attempts were made at each specific site. River flow rates during these attempts were at levels conducive to active spring flow. This is supported by the fact that nearby springs were actively flowing and successfully sampled during the same day, sometimes minutes apart. This may be a result of changing flow patterns in the local ground water or perhaps reflect seasonal variances in flow patterns similar to those identified in the 300 Area (Schalla et al. 1988). Table B.2, Appendix B, provides the river flow rates at Priest Rapids Dam during the periods of sample collection. Daily average flow rates are provided for 2 days before sampling, the day of sample collection, and the day following sampling.

In addition to sampling the springs themselves, near-shore river water samples were collected at actively flowing spring locations along the 100-N, 100-H, and 300 Areas as well as along the Hanford Townsite. As previously discussed, these samples were intended to maximize the localized influence of the seepage and are not intended to be representative of the average river conditions. River water samples were also collected as planned from the routine SEMP Columbia River monitoring stations located at Priest Rapids Dam and the Richland Pumphouse. These samples were obtained from the routine water sampling system intakes to provide some indication of the concentrations present in the river at these locations during the spring sampling. As scheduled, water samples were also collected from two irrigation water return canals and a seepage area on the Franklin County shoreline along the Hanford Site.

As indicated in the initial sampling plan (Table A.1, Appendix A), all the spring samples collected were analyzed for gross alpha, gross beta, gamma scan, tritium, and nitrate. Selected samples received additional radiochemical analyses depending on their locations. Individual samples from the 100-N, 100-H, and 300 Areas as well as from the Hanford Townsite area (200-Areas ground-water plume) received the extensive 9905 screening list of nonradiological analyses in addition to the radiological analysis. In addition, Columbia River water samples collected at Priest Rapids Dam and the Richland Pumphouse were analyzed for the entire list of nonradiological constituents. Similarly, the spring and irrigation return water samples collected from the Franklin County side of the river also received these analyses.

Background river concentrations are of interest in evaluating the effect of the discharge of ground water into the river along the Hanford Site. Background river concentrations are defined as those levels observed upstream of Hanford at Priest Rapids Dam or Vernita Bridge. Tables B.3 and B.4, Appendix B, provide background river concentrations for several radiological and nonradiological parameters. For those constituents where data were not available, values observed in the Priest Rapids Dam river water sample collected as part of this study are used.

Background concentrations for several contaminants in ground water have been estimated and are presented in Table B.5, Appendix B (Evans et al. 1989a and 1989b). The estimates of background contaminant concentrations were based on samples collected from areas not affected by Hanford operations. Since the spring water is ground water emanating from the riverbank and flowing into the river, ground-water background concentrations are appropriate for comparison. In some cases, background concentrations have apparently not been estimated, making comparisons with the spring sampling data difficult.

Radiological and nonradiological analytical results are presented in Tables B.6 and B.7, Appendix B, respectively. In general, the concentrations of those constituents for which previous data exist were similar during 1988 to those previously documented. In addition, contaminant concentrations found in the spring water were generally at or below those known to exist in the local ground water. Contaminant concentrations in near-shore river water samples were indicative of the localized effect of the discharge of contaminated ground water into the river. Specific results are discussed in more detail in the following subsections.

100-B AREA

The 100-B Area has not been identified as an area of extensive ground-water discharge to the Columbia River, although several springs have been documented along the shoreline that contained elevated levels of tritium and nitrate. Only one active spring was found in the vicinity of the 100-B Area during the 1988 sampling activities. This spring was located just upstream of the 181-B Water Intake at about HRM 3.75. Spring locations downstream of the water intake, identified in previous studies, were visited on several occasions; however, no flow was present. Tritium and nitrate concentrations observed during 1988 in the spring water (1100 pCi/L and 6700 ppb, respectively) were similar to those observed in 1982 and slightly lower than those present in the local ground water during 1988 (McCormack and Carlile 1984; Evans et al. 1989a and 1989b).

100-K AREA

As in the case of the 100-B Area, the 100-K Area is not considered a major source of ground-water discharge to the Columbia River. Several spring locations were identified during 1982 shoreline inspections (McCormack and Carlile 1984). No spring flow was observed during any of the three attempts to collect samples from the 100-K Area.

100-N AREA

The 100-N Area shoreline has been identified as a major ground-water discharge area containing elevated levels of several radionuclides and nitrate. The N8T Monitoring Well, operated by Westinghouse Hanford Company, provides a reliable method for the collection of ground water that is representative of the spring water under most conditions. This well is located very near the river and is sampled routinely by Westinghouse Hanford Company as a record of the discharge via the springs from the 100-N Area (Rokkan 1988). Active springs were not observed in the immediate vicinity of the monitoring well during the sampling efforts, although they are known to flow periodically in this region. Large boulders placed along the shoreline hinder the location and sampling of springs that may be present in the area. An additional spring was located and sampled downstream of the riprap. This spring has shown increased flows since the closure of the 1301-N Liquid Waste Disposal Facility (LWDF) and startup of the 1325-N LWDF.

Radionuclide concentrations in the 100-N Area springs were similar to those observed in the past and were indicative of the local ground water. Table 1 presents the radionuclide concentrations observed in the springs and the 100-N Area ground water during 1988. Gross beta, tritium, ^{60}Co, ^{90}Sr, and ^{125}Sb are present at elevated levels in the spring water, well above background river water concentrations (Table B.3); however, the concentrations are within the range of values observed in the local ground water. Of these, gross beta, tritium, and ^{90}Sr are above the applicable drinking water standard (DWS). The ^{90}Sr concentration is above the DOE Derived Concentration Guide. Gross beta and ^{90}Sr discharges to the river via the 1301-N LWDF and associated springs have decreased during recent years, primarily as a result of the smaller volumes of water being discharged into the LWDF (Rokkan 1988). However, as shown in Table 2, the concentrations of these constituents in the N8T Monitoring Well water have not shown a decrease. This is probably due to the inventory of ^{90}Sr remaining in the soil column as a result of past effluent disposal practices.

Extensive nonradiological analyses were performed on the sample collected from the N8T Monitoring Well. In most instances, nonradiological

TABLE 1. Contaminant Concentrations in Spring and Ground Water Along the 100-N Area Shoreline During 1988

	Concentration, pCi/L			
		Spring Water		
Radionuclide	Ground Water(a)	Date	HRM 8.9	HRM 9.5
Gross Alpha	3.07 ± 2.38	9/06/88	0.55 ± 0.61	0.37 ± 0.46
		9/13/88	0.0004 ± 0.28	NS(b)
Gross Beta	40,800 ± 1,110	9/06/88	13,800 ± 100	74 ± 8
		9/15/88	10,800 ± 296	NS
Tritium	459,000 ± 2,210	9/06/88	74,000 ± 700	111,000 ± 870
		9/15/88	75,800 ± 908	NS
^{90}Sr	13,800 ± 262	9/06/88	6,680 ± 260	0.31 ± 0.09
		9/15/88	7,270 ± 192	NS
^{60}Co	128 ± 24	9/06/88	45.0 ± 4.5	30.0 ± 4.0
		9/15/88	53.4 ± 19.4	NS
^{106}Ru	116 ± 67.3	9/06/88	8.9 ± 11.4	13.5 ± 14.6
		9/15/88	12.6 ± 71.2	NS
^{125}Sb	108.00 ± 47.50	9/06/88	43.1 ± 6.4	ND(c)
		9/15/88	ND	NS
^{137}Cs	6.01 ± 4.79	9/06/88	-0.2 ± 1.0	0.4 ± 1.1
		9/15/88	-0.4 ± 4.4	NS
NO$_3$	67,100 ppb	9/06/88	NA(d)	NA
		9/15/88	28,630 ppb	NS

(a) Maximum reported value from any one well in the general area during 1988.
(b) NS = Not sampled.
(c) ND = Not detected.
(d) NA = Not analyzed.

TABLE 2. Selected Contaminants in 100-N Area Spring Water 1986 through 1988

	Concentration, pCi/L(a)				
Year	Beta	^{3}H	^{60}Co	^{90}Sr	NO$_3$
1986	9,120 ± 610	65,100 ± 800	68 ± 10	6,060 ± 370	9.5 mg/L
1987	10,500 ± 350	84,300 ± 1,120	98 ± 30	5,830 ± 380	-
1988	13,800 ± 110	74,000 ± 730	45 ± 5	6,680 ± 260	-

(a) The maximum concentration is reported for those years having more than one sample collected.

contaminant concentrations were below detection levels. When detectable, contaminant concentrations were generally at or below the estimated background levels for Hanford ground water. Nitrates were observed at elevated levels, consistent with past ground-water monitoring and spring sampling results. The concentration of nitrate in the spring samples was well above those typical of the river water, but below the DWS in all cases.

100-D AREA

The 100-D Area has not been identified as a major ground-water discharge source directly to the river. Predominant ground-water flow in this region is to the east-northeast, across the northernmost tip of the Hanford Site. One spring was identified along the 100-D Area at HRM 11 during the McCormack and Carlile (1984) study. This spring was located and successfully sampled during 1988. Concentrations of tritium and NO_3 found in 1988 were similar to those observed in 1982 (McCormack and Carlile 1984). The concentration of tritium was below the analytical detection level, well below the DWS of 20,000 pCi/L. Nitrate levels were also well below the DWS and lower than those observed in the nearby ground water. The concentration of ^{90}Sr was elevated with respect to river levels. However, it remained below the 8 pCi/L DWS and was lower than the maximum observation made in the local ground water during the first half of 1988 (Evans et al. 1989b).

100-H AREA

Springs identified along the 100-H Area during the 1982 shoreline seepage investigation were generally not flowing during the 1988 sampling attempts. Samples were successfully obtained on two occasions from a small spring at HRM 15. The first sample was collected during July and the second in September. Results from the two samples varied considerably, particularly in the case of tritium. This is believed to be a result of the influence of river water on the spring water composition during the second sampling. It was apparent that the river level had been rather high a short time before sampling. Therefore, it is probable that the water sampled was a mixture of river water and ground water.

Results of spring and ground-water samples collected along the 100-H Area during 1988 are included in Table 3. Tritium concentrations in the springs during the first sampling (2520 ± 220 pCi/L) were considerably higher than those found later in the year (550 ± 180 pCi/L). Nitrate levels were also lower in the September sample than they were in July (less than 500 ppb and 2700 ppb, respectively), similar to those observed in the river, further supporting the idea that the sample in September was composed primarily of river water. These concentrations were, however, similar to those observed in nearby springs during earlier studies and below those typically observed in the local ground water (McCormack and Carlile 1984; Evans et al. 1989a and 1989b).

Results of the extensive nonradiological analysis performed on the sample collected during September revealed concentrations similar to background levels in those few cases where the constituents were above the analytical detection level. The 100-H Area is known to have elevated levels

TABLE 3. Selected Radionuclide Concentrations in Spring and Ground Water Along the 100-H Shoreline During 1988

	Concentration, pCi/L		
		Spring Water HRM 15.0	
Radionuclide	Ground Water(a)	9-12-88	7-11-88
Gross Alpha	1230	0.30 ± 0.35	NA(b)
Gross Beta	1920	1.63 ± 1.27	NA
^{3}H	5550	545 ± 178	2520 ± 220
^{60}Co	6.08	-0.55 ± 1.92	0.9 ± 1.8
^{90}Sr	10.30	NA	0.2 ± 0.1
^{99}Tc	3835	NA	NA
^{106}Ru	NR(c)	-1.69 ± 20.1	17 ± 15
^{125}Sb	NR	NR	NR
^{137}Cs	NR	-0.94 ± 1.62	-1.1 ± 1.7
U Total	166	0.12 ± 0.06	NA

(a) Maximum reported value from any one well in the general area during 1988. Uncertainty terms associated with results not reported.
(b) NA = Not analyzed.
(c) NR = Not reported.

(above DWS) of chromium in the ground water (Liikalla 1988); however, no evidence of chromium was detected in the spring sample. The apparent presence of river water in the spring water at the time of sampling may have diluted the chromium to less than the detectable level. In addition, examination of the chromium plume in the 100-H Area ground water indicates that the chromium may be entering the river downstream of the spring that was sampled during 1988. Inspection of the shoreline downstream of HRM 15 in areas of previously identified seepage failed to locate any active springs during the 1988 sampling attempts.

100-F AREA

No active seepage areas were located during several shoreline inspections along the 100-F Area. Two springs were documented along the 100-F Area (HRM 18.5 to HRM 20) during earlier investigations (McCormack and Carlile 1984). Three attempts to locate these springs in these areas during 1988 were unsuccessful.

300 AREA

Seepage of the contaminated 300-Area ground water is of particular interest because of its proximity to drinking water supply intakes. The 300-Area water system intake is located directly downstream of active seepage areas and within the contaminated ground-water plume as identified in recent ground-water monitoring reports (Schalla et al. 1988; Jaquish and Bryce 1989). In addition, the city of Richland withdraws river water for its water supply approximately 5 miles downstream of the 300 Area. Richland is the nearest community downstream of Hanford using the Columbia River as its drinking water source.

The 300 Area is also the focus of ongoing Hazardous Waste Ground-Water Monitoring Compliance Program characterization studies. Initiated in 1985 and expanded in 1986, this effort has provided an extensive amount of information relative to the hydrogeology and contaminant history of the 300 Area. Most recently, PNL-6716, Interim Characterization Report for the 300 Area Process Trenches (Schalla et al. 1988), was issued, providing the basis for comparisons of the concentrations observed in the riverbank spring water with the local ground water.

Table 4 presents the radionuclide concentrations in spring and ground water along the 300 Area shoreline during 1988. The concentrations were similar to those found during earlier years. As expected, the gross alpha, gross beta, ^{234}U, ^{235}U, and ^{238}U concentrations were elevated with respect to river concentrations and similar to those reported in the ground water beneath the 300 Area (Schalla et al. 1988). Concentrations of other radioisotopes were below the analytical detection levels.

One of the springs along the 300 Area (Spring 42-2, HRM 42.1) has been sampled routinely over the years as part of the cooperative radiochemical laboratory intercomparison effort previously discussed. Results of samples collected from Spring 42-2 during recent years have shown relatively good agreement and are comparable with those observed in the local ground water.

TABLE 4. Selected Radionuclide Concentrations in Spring and Ground Water Along the 300 Area Shoreline During 1988

	Concentration, pCi/L		
		Spring Water	
Radionuclide	Ground Water[a]	HRM 42.1	HRM 42.3
Gross Alpha	115 ± 7.6	8.0 ± 1.5	6.5 ± 1.4
Gross Beta	67.6 ± 7.69	11.6 ± 3.3	9.8 ± 2.2
Tritium	5940 ± 291	346 ± 172	283 ± 170
^{60}Co	7.68 ± 7.05	0.25 ± 0.80	1.6 ± 2.2
^{90}Sr	7.29 ± 1.54	0.16 ± 0.07	NA[b]
^{99}Tc	214 ± 2.9	NA	NA
^{137}Cs	8.25 ± 6.37	0.40 ± 0.60	-0.36 ± 2.08
^{234}U	21.2 ± 0.4	4.5 ± 0.2	3.48 ± 0.18
^{235}U	0.84 ± 0.08	0.36 ± 0.06	0.24 ± 0.05
^{238}U	20.8 ± 0.4	4.6 ± 0.2	3.00 ± 0.17
U Total	101 ± 5	9.5 ± 0.4	6.7 ± 0.4

(a) Maximum reported value from any one well in the general area during 1988.

(b) NA = Not analyzed.

Spring 42-2 samples were analyzed for nonradiological pollutants during the 1988 study. Results of this sampling revealed elevated concentrations (with respect to background ground-water concentrations) of chloroform, copper, nitrate, and zinc in the spring water. All of these contaminants have been identified as being present in the local ground water (Schalla et al. 1988). Table 5 provides the concentrations of these constituents in the spring water and in the local ground water during 1988. Nitrates were at concentrations similar to those previously experienced in the springs and known to exist in the ground water. The concentrations of copper and zinc were well within the range reported in the local ground water. Fluoride, present in the ground water at elevated levels in some locations, was not detected in the spring water samples.

Chloroform has been documented to be present in the ground water beneath the 300 Area (Schalla et al. 1988). The concentrations of chloroform observed in the spring water during 1988 were similar to those found in the local ground water (Schalla et al. 1988; Evans et al. 1989a and 1989b). Concentrations of other organic contaminants identified in the ground water, such as methylene chloride, PCE, TCE, 1,1,1-trichloroethane, and trans-1,2-dichloroethylene were not detected in the 1988 spring samples. Of these, methylene chloride, PCE, TCE, and 1,1,1-trichloroethane have been only sporadically detected in a few locations and would not be expected at detectable levels in the spring water. Trans-1,2-dichloroethylene,

TABLE 5. Selected Nonradiological Contaminants in Spring and Ground Water Along the 300 Area Shoreline

	Concentration, ppb		
		Spring Water	
Contaminant	Ground Water	HRM 42.1	HRM 42.3
NO_3	66,800	1,699	9,183
Chloroform	42	24	19
Zinc	232	23	10
Copper	70	34	<10

(a) Maximum reported value from any one well in the general area during 1988.

consistently found at relatively high levels, has been detected primarily in the intermediate and deep wells (Schalla et al. 1988). Consequently, this contaminant may be entering the river through submerged seepage, consistent with typical ground-water flow patterns (Raymond and Brown 1963).

HANFORD TOWNSITE (200-AREAS GROUND-WATER PLUME)

The 200-Areas contaminated ground-water plume has long been identified as generally flowing from the 200 Areas in a easterly/southeasterly direction, discharging into the Columbia River in the vicinity and downstream of the old Hanford Townsite (Figures 2 and 3). Primary contaminants present in the ground water near the river are tritium, ^{129}I, and nitrate (Jaquish and Bryce 1989). Technetium-99 was also identified in springs sampled along this stretch of the river (McCormack and Carlile 1984). Other studies have implicated the possible presence of ^{60}Co and ^{90}Sr in the ground water along the Hanford Townsite (Buske and Josephson 1989). Analytical methods used in the routine ground-water monitoring program and for special SEMP samples typically are not sensitive enough to detect these radionuclides at their extremely low concentrations.

Table 6 contains the concentrations of selected radionuclides in the spring and ground water along the old Hanford Townsite during 1988. Radionuclide concentrations observed during the year were generally similar to those previously reported (McCormack and Carlile 1984). Radionuclide concentrations in the springs were also comparable with those in the nearby ground water (Evans et al. 1989a and 1989b). It appears that the highest concentrations in the plume discharge zone remain at approximately HRM 28.

A notable difference between earlier investigations and the present study was the southern extent of the contaminated springs associated with the contaminated 200-Areas ground-water plume. Consistent with the findings of the GWPMP, the southern extent of the plume reaches nearly to the northern border of the 300 Area. Table 7 lists the tritium concentrations in spring water from the northern edge of the 200-Areas ground-water plume to the southern boundary of the Hanford Site (also see Figure 5).

TABLE 6. Selected Radionuclide Concentrations in Spring and Ground Water Along the Hanford Townsite During 1988

	Concentration, pCi/L					
		Spring Water				
Radionuclide	Ground Water[a]	HRM 25.75	HRM 27.25	HRM 27.5	HRM 28.1	HRM 28.5
Gross Alpha	4.1 ± 0.9	NA[b]	2.5 ± 2.1	2.1 ± 1.0	2.3 ± 1.1	1.5 ± 0.9
Gross Beta	69.9 ± 5.78	NA	4.3 ± 4.1	14.2 ± 2.7	48 ± 5	45 ± 5
^{3}H	246,000 ± 1,610	264 ± 169	7,420 ± 296	72,000 ± 890	155,000 ± 1,290	145,000 ± 1,250
^{60}Co	14.7 ± 8.15	-0.08 ± 1.2	NA	1.1 ± 3.7	4.7 ± 4.8	2.8 ± 3.2
^{90}Sr	NR[c]	NA	NA	-0.07 ± 0.33	0.07 ± 0.3	0.0014 ± 0.3
^{99}Tc	350 ± 4	NA	NA	48 ± 2	223 ± 3	215 ± 3
^{137}Cs	NR	0.4 ± 1.4	NA	0.6 ± 2.8	-3.7 ± 3.3	-1.3 ± 2.6

(a) Maximum reported value from any one well in the general area during 1988.
(b) NA = Not analyzed.
(c) NR = Not reported.

TABLE 7. Tritium Concentration in Spring Water Along the Hanford Shoreline from HRM 25.75 to HRM 44 During 1988

HRM	Tritium Concentration, pCi/L
25.75	260 ± 170
27.25	7,420 ± 300
27.5	72,000 ± 890
28.1	155,000 ± 1,290
28.5	145,000 ± 1,250
38.25	2,630 ± 230
38.8	682 ± 180
41.75	6,580 ± 310
42.0	1,070 ± 190
42.1	346 ± 170
42.3	283 ± 170
43.6	65 ± 160

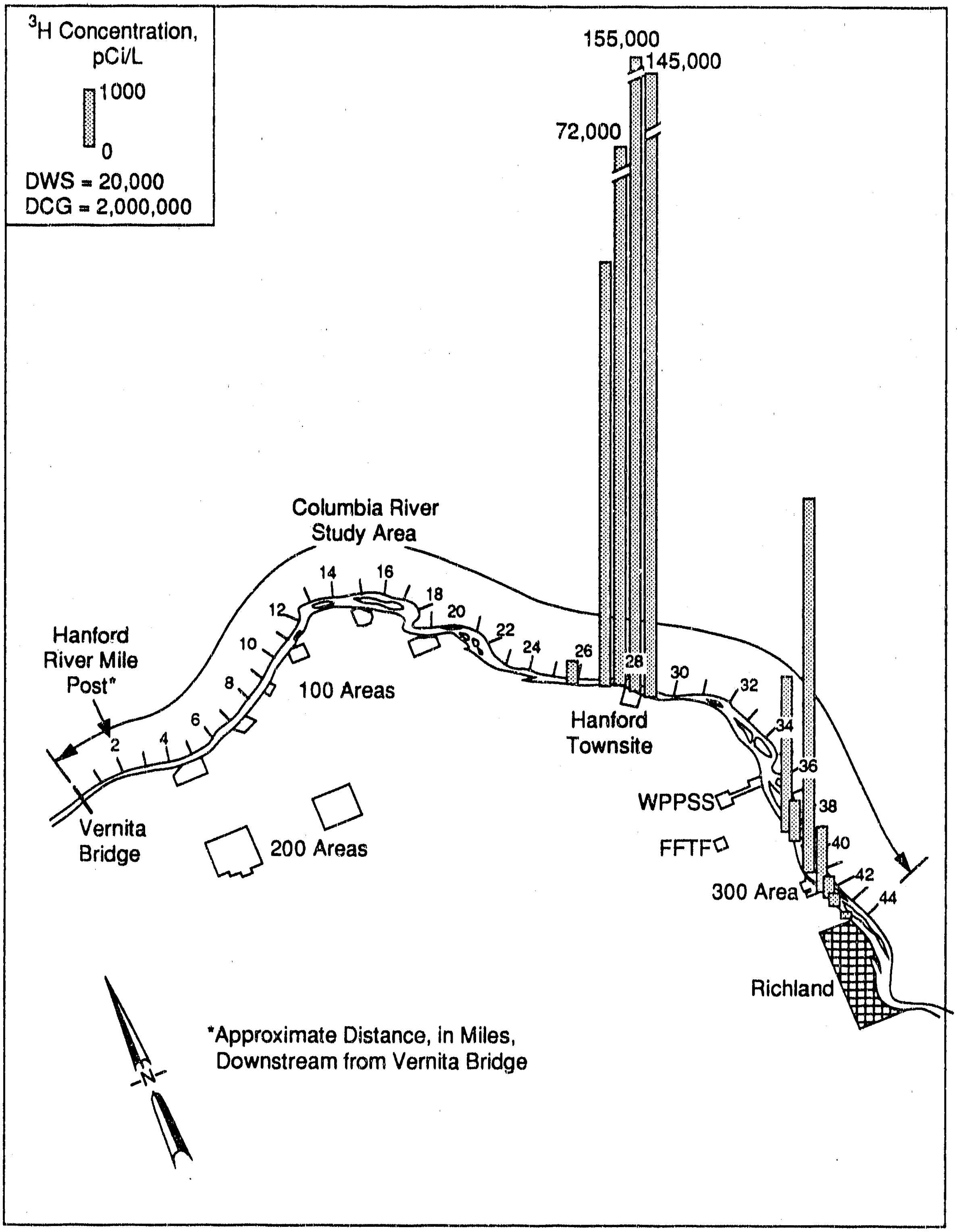

FIGURE 5. Tritium Concentrations in Spring Water Along the Hanford Shoreline from HRM 25.75 to HRM 44 During 1988

COLUMBIA RIVER

Samples of the Columbia River were collected as part of the Spring Characterization Study for comparison and to provide information relative to the impact of the ground-water discharge. Grab samples were collected from the routine sample locations using the routine sampling system intakes. In addition, river water samples were collected immediately downstream of selected riverbank springs in order to identify the localized influence of the seepage on the river. The concentrations observed in these near-shore river samples are not representative of average river water concentrations and are indicative of the elevated concentrations attributable to the discharge of contaminated ground water into the river.

Radiological and nonradiological sample results from Priest Rapids Dam and the Richland Pumphouse, observed above the detection level, are included in Tables 8 and 9, respectively. As was the case for selected springs, samples from these two locations received the extensive 9905 list of nonradiological analysis. As expected, most contaminants were not detectable in the river water samples. Radiologically, only the concentrations of tritium, ^{99}Tc, ^{234}U, and ^{238}U were above the analytical detection levels. The tritium and ^{99}Tc concentrations were higher at the Richland Pumphouse than at Priest Rapids Dam, although the uncertainties associated with the ^{99}Tc results overlapped on the two locations. The tritium concentration was considerably higher at the Richland Pumphouse location, well above the 1988 average concentration of 130 pCi/L (Jaquish and Bryce 1989). This is expected since the annual average is determined using composite samples that flatten out the extremes during the year and because the grab sample in this study was obtained during a low flow condition that would maximize the influence of the ground-water discharges to the river. Nonradiological sample results (Table 9) were similar at the two locations and similar to concentrations previously reported (McGavock 1987).

Table 10 lists the tritium and nitrate results of the near-shore river water samples collected immediately downstream of specific riverbank springs. Also included in this table are the corresponding concentrations observed in

TABLE 8. Radiological Results of Water Samples Collected at Priest Rapids Dam and the Richland Pumphouse on September 13, 1988

Constituent	Concentration, pCi/L Priest Rapids Dam	Concentration, pCi/L Richland Pumphouse
Tritium	180 ± 170	580 ± 180
^{99}Tc	0.6 ± 1.2	1.8 ± 1.2
^{234}U	0.16 ± 0.04	0.18 ± 0.04
^{238}U	0.13 ± 0.04	0.16 ± 0.04

TABLE 9. Nonradiological Sample Results of Water Samples Collected at Priest Rapids Dam and the Richland Pumphouse on September 13, 1988

Constituent	Concentration, ppb Priest Rapids Dam	Concentration, ppb Richland Pumphouse
Strontium	125	120
Zinc	12	9
Calcium	21,657	21,362
Barium	33	32
Sodium	2,452	2,563
Manganese	14	8
Potassium	811	862
Iron	160	37
Magnesium	4,777	4,567
Nitrate	<500	554
Sulphate	10,336	10,802
Chloride	895	1,019

the spring water itself. Concentrations of radiological constituents in the near-shore river water samples were generally similar to those observed in average river water samples, typically below the analytical detection level. Exceptions to this included tritium in samples collected at various locations along the Hanford Reach, ^{90}Sr concentrations in the near-shore river sample near the N-spring, and uranium concentrations in the near-shore river samples collected at the 300 Area, which were found at levels similar to the local ground water.

TABLE 10. Tritium and Nitrate in Near-Shore River and Spring Samples Along the Hanford Site During 1988

		Concentration	
Location	Sample Type	Tritium, pCi/L	Nitrate, ppb
HRM 9.0	Spring	75,800 ± 910	28,630
	River	76,400 ± 910	NA(a)
HRM 15.0	Spring	545 ± 180	<500
	River	70 ± 130	<500
HRM 27.5	Spring	72,000 ± 890	12,713
	River	26,400 ± 525	NA
HRM 28.1	Spring	155,000 ± 1,290	31,040
	River	158,000 ± 1,250	31,290
HRM 42.1	Spring	346 ± 170	2,149
	River	485 ± 180	1,697

(a) NA = Not analyzed.

Contaminant concentrations in the near-shore river samples reflect the localized effects of the ground-water discharge to the river. Specific sample locations were chosen to maximize the potential to detect the influence of the springs on the river concentrations. As expected, the radionuclide concentrations found in the near-shore river samples were generally elevated with respect to the average concentrations in the river as defined by the samples collected at Priest Rapids Dam and the Richland Pumphouse. Most near-shore river water samples displayed concentrations between those observed in the spring and the average river water concentrations. In some instances, the concentrations observed in the near-shore samples were at or above the corresponding spring water concentrations, indicating a significant contribution from the ground water on local river water concentrations. This phenomena has been reported in previous studies (McCormack and Carlile 1984).

FRANKLIN COUNTY

An understanding of all sources of pollutants entering the river along the Hanford Site, whether or not they are associated with Hanford operations, is needed to fully understand the results of Columbia River monitoring downstream of Hanford and evaluate the subsequent impacts attributable to Hanford. Samples were collected from an area of extensive ground-water seepage across from and just above the 300 Area (HRM 41) and from two irrigation return canals that enter the river upstream of the Richland Pumphouse Columbia River monitoring station. The first canal enters the river at approximately HRM 32 at Ringold, and the second canal enters near the southern Site boundary at Byers Landing, HRM 44.

Samples collected from the Franklin County shoreline contained detectable concentrations of several constituents at levels above those known to exist in Columbia River water. Tables 11 and 12 provide the concentrations of those constituents. Interestingly, gross alpha, gross beta, ^{234}U, ^{235}U, and ^{238}U concentrations were found at levels considerably higher than those

TABLE 11. Selected Radiological Contaminant Concentrations in Franklin County Seepage and Irrigation Return Canal Water During 1988

	Concentration, pCi/L			
Constituent	Ringold Irrigation	Sagemoor Seep	Byers Landing Irrigation	River Background(a)
Gross Alpha	17 ± 0.7	2.0 ± 1.0	0.7 ± 0.5	0.3 ± 0.2
Gross Beta	9.9 ± 2.5	2.6 ± 1.7	6.4 ± 2.1	1.0 ± 0.4
Tritium	NA(b)	380 ± 170	NA	70 ± 6
^{60}Co	1.6 ± 3.5	3.0 ± 3.0	1.3 ± 2.5	<0.0002
^{90}Sr	0.39 ± 0.36	0.09 ± 0.35	0.42 ± 0.36	0.10 ± 0.02
^{137}Cs	0.9 ± 3.0	2.5 ± 3.0	0.8 ± 2.0	<0.003
^{234}U	3.0 ± 0.2	4.6 ± 0.2	2.6 ± 0.2	0.20 ± 0.03
^{235}U	0.17 ± 0.04	0.14 ± 0.03	0.15 ± 0.05	0.006 ± 0.003
^{238}U	2.3 ± 0.1	3.9 ± 0.2	2.3 ± 0.2	0.17 ± 0.02

(a) 1988 average at Priest Rapids Dam.
(b) NA = Not analyzed.

TABLE 12. Selected Nonradiological Contaminant Concentrations in Franklin County Seepage and Irrigation Return Canal Water During 1988

Constituent	Ringold Irrigation	Sagemoor Seep	Byers Landing Irrigation	River Background[a]
	Concentration, ppb			
Calcium	52,916	93,019	45,680	21,657
Barium	53	64	63	33
Sodium	47,725	72,148	42,975	2,452
Vanadium	15	8	13	<5
Aluminum	<150	692	<150	<150
Manganese	11	93	10	14
Potassium	7,316	2,605	5,067	811
Iron	200	696	155	160
Magnesium	25,446	48,426	21,418	4,777
Arsenic	6	<5	5	<5
Selenium	5	10	<5	<5
TOC (Total Organic Carbon)	2,500	2,000	2,600	1,281
TC (Total Carbon)	47,290	39,928	40,770	13,320
TOX (Total Organic Halogen)	14	12	28	8.0
Nitrate	10,795	52,320	15,631	<500
Sulphate	63,760	238,000	50,670	10,336
Chloride	15,810	42,370	13,560	895

(a) Sample from Priest Rapids Dam Location.

observed in the river. In addition, ^{90}Sr concentrations in the two irrigation return canals were slightly higher than those typically found in the river, although the uncertainties associated with these results were very large with respect to the results themselves.

The elevated gross alpha and beta concentrations are attributed to the corresponding elevated levels of uranium present in these water samples. Uranium is known to be present in the ground water in Franklin County (WDSHS 1988); therefore, it is not surprising for it to be present in the springs entering the river along this stretch of the river. Uranium is also known to be present in the Spokane River drainage system, which feeds into the

Columbia River upstream of Grand Coulee Dam. The irrigation water in the two canals sampled originated from behind Grand Coulee Dam, near the mouth of the Spokane River, perhaps contributing to the elevated concentrations. Another possible contributor to the uranium concentrations in the irrigation return water is phosphate fertilizer, used extensively in agricultural applications in this region. The phosphate rock ores used in fertilizer production typically contain above-average concentrations of uranium (NCRP 1984).

CONCLUSIONS

The 1988 Spring Characterization Study has confirmed that the type and concentrations of contaminants in the riverbank springs along the Hanford shoreline are within the range known to exist in the ground water near the river. In addition, the location and extent of ground-water discharge zones compare favorably with those plotted or predicted by the GWPMP in recent reports. The major contaminated ground-water discharge areas continue to be the 100-N Area, the old Hanford Townsite (200-Areas ground-water plume), and the 300 Area. The 200-Areas ground-water plume has expanded as expected and is now discharging into the river farther south than previously observed, nearly to the northern edge of the 300 Area. The ground-water flow patterns beneath the 100-N LWDFs also appear to be changing as a result of different effluent disposal practices.

Discharges of a few contaminants above the DWS into the Columbia River were observed in some areas. Discharge volumes remained very small relative to the flow of the Columbia River. However, as in the past, localized areas of impact were observed within the river near the discharge zone with radionuclide concentrations above the DWS. Past experience has shown these zones of influence to be rapidly dissipated within the mainstream of the river (Haney 1957). Downstream river sampling also demonstrated the impact of ground-water discharges to be very small, negligible in most cases. In all cases, river water concentrations observed outside of the immediate discharge zones were well below DWS.

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APPENDIX A

SAMPLING LOCATIONS ANALYSES INFORMATION

TABLE A.1. Scheduled Spring Sample Locations and Analyses - 1988

Area	HRM(a)	Spring No.	River	Analysis
Above 100-B	3.3	3-2		Alpha, Beta, ^{3}H, 735(b)
100-B	4.2	4-1	X	Alpha, Beta, ^{3}H, 9905(b)
100-B	5.0	5-1		Alpha, Beta, ^{3}H, 735
Above 100-K	6.0	6-1		Alpha, Beta, ^{3}H, 735
100-K	6.8	7-0		Ahpha, Beta, ^{3}H, 735
Above 100-N	7.5-8.2	7-4/8-1		Alpha, Beta, ^{3}H, 735
100-N	8.6-8.8	8-10/8-11		Alpha, Beta, ^{3}H, ^{90}Sr, Gamma, 735
100-N (N8T)	8.9	N8T	X	Alpha, Beta, ^{3}H, ^{90}Sr, Gamma, 9905
100-N	9.25	9-2/9-4		Alpha, Beta, ^{3}H, ^{90}Sr, Gamma, 735
Below 100-N	9.5-10.0	NA(c)		Alpha, Beta, ^{3}H, ^{90}Sr, Gamma, 735
100-D	11.0	11-1		Alpha, Beta, ^{3}H, ^{90}Sr, 735
100-H	14.5	14-4/14-5		Alpha, Beta, ^{3}H, U-iso, 735
100-H	15.0	15-0	X	Alpha, Beta, ^{3}H, U-iso, 9905
100-H	15.5	15-5		Alpha, Beta, ^{3}H, 735
100-F	18.0	18-0		Alpha, Beta, ^{3}H, 735
100-F	18.6	18-2		Alpha, Beta, ^{3}H, 9905
Hanford Ferry Landing	25.75	25-4		Alpha, Beta, ^{3}H, 735
Hanford Townsite	27.0	27-1		Alpha, Beta, ^{3}H, 735
Hanford Townsite	27.25	27-2		Alpha, Beta, ^{3}H, 735
Hanford Townsite	27.5	27-3	X	Alpha, Beta, ^{3}H, ^{90}Sr, ^{99}Tc, 735
Hanford Townsite	28.1	28-2	X	Alpha, Beta, ^{3}H, ^{90}Sr, ^{99}Tc, 9905
Hanford Townsite	28.5	28-4		Alpha, Beta, ^{3}H, ^{90}Sr, ^{99}Tc, 735
Ringold Island	31.6	31-5		Alpha, Beta, ^{3}H, 735
WPPSS Intake	35.6	35-1		Alpha, Beta, ^{3}H, 735
Above Wooded Island	37.5	37-2		Alpha, Beta, ^{3}H, 735
Wooded Island	38.25	38-1		Alpha, Beta, ^{3}H, 735
Wooded Island	38.8	38-10/39-0		Alpha, Beta, ^{3}H, 735
Above 300	41.5-41.8	41-1/41-2		Alpha, beta, ^{3}H, 735
300	42.0	42-1		Alpha, Beta, ^{3}H, U-iso, 735
300	42.1	42-2	X	Alpha, Beta, ^{3}H, U-iso, ^{236}U, 9905
300	42.3	42-4		Alpha, Beta, ^{3}H, U-iso, ^{236}U, 9905

TABLE A.1. (contd)

Area	HRM	Sample No.	River	Analysis
Port of Benton	43.6	43-1		Alpha, Beta, ^{3}H, 735
Byers Lndg:Irr. Return	--(d)	NA		Alpha, Beta, ^{90}Sr, U-iso, 9905
Slide Seep	--	NA		Alpha, Beta, ^{3}H, ^{90}Sr, U-iso, 9905
Ringold Irr. Return	--	NA		Alpha, Beta, ^{90}Sr, U-iso, 9905
Priest Rapids Dam	--	NA	X	Alpha, Beta, ^{3}H, ^{90}Sr, ^{99}Tc, U-iso, 9905
Richland Pumphouse	--	NA	X	Alpha, Beta, ^{3}H, ^{90}Sr, ^{99}Tc, U-iso, 9905

(a) HRM = Hanford River Mile.
(b) Analytical Laboratory Codes.
(c) NA = Not applicable.
(d) -- = No data.

TABLE A.2. Nonradiological Analysis

Analytical Code	Compound	MDL (ppb)
726	ICP Metals	
A01	Beryllium	5
A03	Strontium	20
A04	Zinc	5
A05	Calcium	50
A06	Barium	6
A07	Cadmium	2
A08	Chromium	10
A10	Silver	10
A11	Sodium	200
A12	Nickel	10
A13	Copper	10
A14	Vanadium	5
A15	Antimony	100
A16	Aluminum	150
A17	Manganese	5
A18	Potassium	100
A19	Iron	30
A50	Magnesium	50
727	Enhanced Thiourea	
A24	Thiourea	200
A25	1-Acetyl-2-Thiourea	200
A26	1-(O-Chlorophenyl)-Thiourea	200
A27	Diethylstilbestrol	200
A28	Ethylenethiourea	200
A29	1-Naphthyl-2-Thiourea	200
A32	N-Phenylthiourea	500
729	Enhanced Pesticides	
A33	Endrin	0.1
A34	Methoxychlor	3
A35	Toxaphene	1
A36	Alpha BHC	0.1
A37	Beta BHC	0.1
A38	Gamma BHC	0.1
A39	Delta BHC	0.1
A40	DDD	0.1
A41	DDE	0.1
A42	DDT	0.1
A43	Heptachlor	0.1
A44	Heptachlor Epoxide	0.1
A46	Dieldrin	0.1
A47	Aldrin	0.1
A48	Chlordane	1
A49	Endosulfan I	0.1

TABLE A.2. (contd)

Analytical Code	Compound	MDL (ppb)
729	Enhanced Pesticides (contd)	
A52	Endosulfan II	0.1
C62	Chlorobenzilate	30
X10	DBC	1.0 (Expected)
731	Volatile Organic Compounds	
A61	Tetrachloromethane	5
A62	Benzene	5
A63	Dioxane	500
A64	Methylethyl Ketone	10
A65	Pyridine	500
A66	Toluene	5
A67	1,1,1-Trichloroethane	5
A68	1,1,2-Trichloroethane	5
A69	1,1,2-Trichloroethene	5
A70	Perchloroethylene	5
A71	Xylene (O, P)	5
B14	Xylene (M)	5
A76	Methyl Bromide	10
A77	Carbon Disulfide	10
A78	Chlorobenzene	10
A79	2-Chloroethyl vinyl ether	10
A80	Chloroform	5
A81	Chloromethane	10
A89	1,1-Dichloroethane	10
A90	1,2-Dichloroethane	10
A91	Trans-1,2-Dichloroethene	10
A92	1,1-Dichloroethene	10
A93	Methylene Chloride	10
A94	1,2-Dichloropropane	10
A95	1,3-Dichloropropenes	10
B06	1,1,2,2-Tetrachloroethane	10
B08	Bromoform	10
B13	Vinyl Chloride	10
H68	Hexone	10
	The following have been forward searched:	
A72	Acrolein	10
A73	Acrylonitrile	10
A74	Bis (Chloromethyl) Ether	10
A75	Bromo Acetone	10
A82	Chloromethylmethylether	10
A83	Crotonaldehyde	10
A84	1,2-Dibromo-3-Chloropropane	10

TABLE A.2. (contd)

Analytical Code	Compound	MDL (ppb)
731	Volatile Organic Compounds (contd)	
A85	1,2-Dibromoethane	10
A86	Dibromomethane	10
A87	1,4-Dichloro-2-Butene	10
A88	Dichlorodifluoromethane	10
A96	N,N-Diethylhydrazine	10
A99	Hydrogen Sulfide	10
B01	Iodo Methane	10
B02	Methacrylonitrile	10
B03	Methanethiol	10
B04	Pentachloroethane	10
B05	1,1,1,2-Tetrachloroethane	10
B09	Trichloromethanethiol	10
B10	Trichlorofluoromethane	10
B11	Trichloropropane	10
B12	1,2,3-Trichloropropane	10
B15	Diethylarsine	10
C71	Formaldehyde	500
C04	Methyl Methacrylate	10
H06	Ethyl Methacrylate	10
B19	Acetonitrile	3 ppm
H05	Ethylene Oxide	3 ppm
733	Semivolatile Organic Analysis	
B26	Aniline	10
B30	Benz(A)Anthracene	10
B33	Benzidine	10
B34	Benzo(B)Fluoranthene	10
B38	Bis(2-Chloroethoxy)Methane	10
B39	Bis(2-Chloroethyl)Ether	10
B40	Bis(2-Ethylhexyl)Phthalate	10
B41	4-Bromophenyl Phenyl Ether	10
B42	Butyl Benzyl Phthalate	10
B45	P-Chloroaniline	10
B46	P-Chloro M-Cresol	10
B48	2-Chloronaphthalene	10
B49	2-Chlorophenol	10
B50	Chrysene	10
B55	Dibenz(A,H)Anthracene	10
B60	Di-N-Butyl Phthalate	10
B61	1,2-Dichlorobenzene	10
B62	1,3-Dichlorobenzene	10
B63	1,4-Dichlorobenzene	10
B64	3,3′-Dichlorobenzidine	20
B65	2,4-Dichlorophenol	10
B67	Diethyl Phthalate	10
B75	2,4-Dimethylphenol	10

TABLE A.2. (contd)

Analytical Code	Compound	MDL (ppb)
733	Semivolatile Organic Analysis (contd)	
B76	Dimethyl Phthalate	10
B78	4,6-Dinitro-O-Cresol	10
B80	2,4-Dinitrotoluene	10
B81	2,6-Dinitrotoluene	10
B82	Di-N-Octyl Phthalate	10
B84	1,2-Diphenylhydrazine	10
B88	Fluoranthene	10
B89	Hexachlorobenzene	10
B90	Hexachlorobutadiene	10
B91	Hexachlorocyclopentadiene	10
B92	Hexachloroethane	10
B93	Indeno(1,2,3-CD)Pyrene	10
C54	Hexachlorophene	10
C55	Naphthalene	10
C12	Nitrobenzene	10
C17	N-Nitrosodimethylamine	10
C57	Phenol	10
C43	1,2,4-Trichlorobenzene	10
B79	2,4-Dinitrophenol	50
C13	4-Nitrophenol	50
C11	Para-Nitroaniline	50
C28	Pentachlorophenol	50
C44	2,4,5-Trichlorophenol	50
C45	2,4,6-Trichlorophenol	10
C56	1,2,3-Trichlorobenzene	10
C58	1,3,5-Trichlorobenzene	10
C37	1,2,4,5-Tetrachlorobenzene	10
C59	1,2,3,4-Tetrachlorobenzene	10
C60	1,2,3,5-Tetrachlorobenzene	10
C26	Pentachlorobenzene	10
B51	Cresols	10
B85	N-Nitrosodinpropylamine	10
C49	Benzo(A)Pyrene	10
C51	Bis(2-Chloroisopropyl) Ether	10
I21	Tibutylphosphate	10
B20	Acetophenone	10
B21	Warfarin	10
B22	2-Acetylaminofluorene	10
B23	4-Aminobyphenyl	10
B24	5-(Aminomethyl)-3-Isoxazo1ol	10
B25	Amitrole	10
B27	Aramite	10
B28	Auramine	10
B29	Benz(C)Acridine	10
B31	Benzene, Dichloromethyl	10
B32	Benzemethoil	10

TABLE A.2. (contd)

Analytical Code	Compound	MDL (ppb)
733	Semivolatile Organic Analysis (contd)	
B36	P-Benzoquinone	10
B37	Benzyl Chloride	10
B43	2-Sec-Butyl-4,6-Dinitrophenol	10
B44	Chloroalkyl Ethers	10
B47	1-Chloro-2,3-Epoxypropane	10
B52	2-Cyclohexyl-4,6-Dinitrophenol	10
B53	Dibenz(A,H)Acridine	10
B54	Dibenz(A,J)Acridine	10
B56	7H-Dibenzo(C,G)Carbazole	10
B57	Dibenzo(A,E)Pyrene	10
B58	Dibenzo(A,H)Pyrene	10
B59	Dibenzo(A,I)Pyrene	10
B66	2,6-Dichlorophenol	10
B68	Dihydrosafrole	10
B69	3,3'-Dimethoxybenzidine	10
B70	P-Dimethylaminoazobenzene	10
B71	7,12-Dimethylbenz(A)Anthracene	10
B72	3,3'-Dimethylbenzidine	10
B73	Thiofanox	10
B74	Alpha, Alpha-Dimethylphenethyl-Amine	10
B77	Dinitrobenzene	10
B83	Diphenylamine	10
B86	Ethyleneimine	10
B87	Ethyl Methanesulfonate	10
B94	Isosafrole	10
B95	Malononitrile	10
B96	Malphalan	10
B97	Methapyrilene	10
B98	Matholonyl	10
B99	2-Methylaziridine	10
C01	3-Methylcholanthrene	10
C02	4,4'-Methylenebis(2-Chloro-Aniline)	10
C03	2-Methyllactonitrile	10
C05	Methyl Methanesulfonate	10
C06	2-Methyl-2-(Methylthio)Propion-Aldehyde-O-(Methylcarbonyl) Oxime	10
C07	Methylthiouracil	10
C08	1,4-Naphthoquinone	10
C09	1-Naphthylamine	10
C10	2-Naphthylamine	10
C14	N-Nitrosodi-N-Butylamine	10
C15	N-Nitrosodiethanolamine	10
C16	N-Nitrosodiethylamine	10

TABLE A.2. (contd)

Analytical Code	Compound	MDL (ppb)
733	Semivolatile Organic Analysis (contd)	
C18	N-Nitrosomethylethylamine	10
C19	N-Nitroso-N-Methylurethane	10
C20	N-Nitrosomethylvinylamine	10
C21	N-Nitrosomorpholine	10
C22	N-Nitrosonornicotine	10
C23	N-Nitrosonopiperidine	10
C24	Nitrosopyrrolidine	10
C25	5-Nitro-O-Toluidine	10
C27	Pentachloronitrobenzene	10
C29	Phenacetin	10
C30	Phenylenediamine	10
C31	Phthalic Acid Esters	10
C32	2-Picoline	10
C33	Pronamide	10
C34	Reserpine	10
C35	Rescorzinol	10
C36	Safrol	10
C39	2,3,4,6-Tetrachlorophenol	10
C40	Thiuram	10
C41	Toluenediamine	10
C42	O-Toluidine Hydrochloride	10
C46	O,O,O-Triethyl Phosphorothioate	10
C47	Sym-Trinitrobenzene	10
C48	Tris(2,3-Dibromopropyl)-Phosphate	10
C50	Chloronaphazine	10
C52	Hexachloropropene	10
C79	Kerosene	10
C92	Maleic Hydrazide	500
C93	Nicotinic Acid	100
C91	Strychnine	50
B35	Benzo(J)Fluoranthene	10
734	Phosphorous Pesticides	
C61	Tetraethylpyrophosphate	2
C63	Carbophenothion	2
C64	Disulfoton	2
C65	Dimethoate	2
C66	Methylparathion	2
C67	Ethyl Parathion	2
735	IC Report	
C72	Nitrate	500
C73	Sulphate	5000
C74	Fluoride	500
C75	Chloride	5000
C76	Phosphate	1000

TABLE A.2. (contd)

Analytical Code	Compound	MDL (ppb)
736	Direct Aqueous Injection Analysis	
C53	Hydrazine	3000
C90	Paraldehyde	2000
C94	Acrylamide	10,000
C95	Allyl Alcohol	2500
C97	Chloroacetaldehyde	16,000
C98	3-Chloropropionitrile	4000
H03	Ethyl Carbamate	5000
H04	Ethyl Cyanide	2000)
H09	Isobutyl Alcohol	1000
H11	N-Propylamine	10,000
H12	2-Propyn-1-OL	8000
737	Enhanced Herbicides	
H13	2,4-D	2
H14	2(2,4,5-T)P	2
H15	(2,4,5-T)	2
739	PCB Analysis	
A54	Arochlor 1016	4.0
A55	Arochlor 1221	1.0
A56	Arochlor 1232	1.0
A57	Arochlor 1242	1.0
A58	Arochlor 1248	1.0
A59	Arochlor 1254	1.0
A60	Arochlor 1260	1.0
A20	Arsenic	5.0
A21	Mercury	0.1
A22	Selenium	5.0
A23	Thallium	5.0
A51	Lead	5.0
C69	TOC (Total Organic Carbon)	
C70	Cyanide	10.0
C77	Perchlorate	1000
C78	Sulfide	1000
C80	Ammonium Ion	50
C81	Ethylene Glycol	10 ppm
C87	Citrus Red	1000
H16	TC (Total Carbon)	2000
H42	TOX (Total Organic Halogen)	10

TABLE A.3. Sample Container and Preservation Requirements

Constituent[a]	Code	Container Type	Volume (mLs)	Preservative
ICP Metals, Enh[b]	726	Plastic, White Cap	1000	HNO_3
Arsenic	A20	Plastic, White Cap	1000	HNO_3
Selenium	A22	Plastic, White Cap	1000	HNO_3
Thallium	A23	Plastic, White Cap	1000	HNO_3
Lead, by GFAA	A51	Plastic, White Cap	1000	HNO_3
Mercury	A21	Glass, Clear	500	HNO_3
Cyanide	C70	Plastic, White Cap	1000	NaOH
Sulfide	C78	Plastic, White Cap	500	ZnAcet/NaOH
Ammonium Ion	C80	Glass, Clear	500	H_2SO_4
TOC	C69	Glass, Amber	250	H_3PO_4
TOX	H42	Glass, Amber Septum	250	H_2SO_4
Pesticides, Enh	729	Glass, Amber	4000	--
Herbicides	737	Glass, Amber	4000	--
Phosphorous Pesticides	734	Glass, Amber	4000	--
4/B/N, Enh	733	Glass, Amber	4000	--
Thiourea, Enh	727	Glass, Amber	250	--
Direct Aqueous Inj.	736	Glass, Amber	250	--
Ethylene Glycol	C81	Glass, Amber	250	--
Citrus Red	C87	Glass, Amber	250	--
TC	H16	Glass, Amber	250	--
IC	735	Plastic, White Cap	125	--
Perchlorate	C77	Plastic, White Cap	125	--
VOA, Enh	731	Glass, Amber Septum	40	--

(a) Several specific constituents reported for some codes.

(b) Enh = enhanced analysis.

APPENDIX B

SAMPLE RESULTS

TABLE B.1. Actual Spring Sample Locations and Analyses Performed - 1988

Area	HRM(a)	Spring No.	River	Analysis
Above 100-B	3.3	3-2		Alpha, Beta, ^{3}H, 735(b)
100-N (N8T)	8.9	N8T	X	Alpha, Beta, ^{3}H, ^{90}Sr, Gamma, 9905(b)
Below 100-N	9.5-10.0	--		Alpha, Beta, ^{3}H, ^{90}Sr, Gamma, 735
100-D	11.0	11-1		Alpha, Beta, ^{3}H, ^{90}Sr, 735
100-H	15.0	15-0	X	Alpha, Beta, ^{3}H, U-iso, 9905
Hanford Ferry Landing	25.75	25-4		Alpha, Beta, ^{3}H, 735
Hanford Townsite	27.25	27-2		Alpha, Beta, ^{3}H, 735
Hanford Townsite	27.5	27-3	X	Alpha, Beta, ^{3}H, ^{90}Sr, ^{99}Tc, 735
Hanford Townsite	28.1	28-2	X	Alpha, Beta, ^{3}H, ^{90}Sr, ^{99}Tc, 9905
Hanford Townsite	28.5	28-4		Alpha, Beta, ^{3}H, ^{90}Sr, ^{99}Tc, 735
Wooded Island	38.25	38-1		Alpha, Beta, ^{3}H, 735
Wooded Island	38.8	38-10/39-0		Alpha, Beta, ^{3}H, 735
Above 300	41.5-41.8	41-1/41-2		Alpha, beta, ^{3}H, 735
300	42.0	42-1		Alpha, Beta, ^{3}H, U-iso, 735
300	42.1	42-2	X	Alpha, Beta, ^{3}H, U-iso, ^{238}U,, 9905
300	42.3	42-4		Alpha, Beta, ^{3}H, U-iso, ^{238}U, 9905
Port of Benton	43.6	43-1		Alpha, Beta, ^{3}H, 735
Byers Lndg:Irr. Return	--(c)	NA(d)		Alpha, Beta, ^{90}Sr, U-iso, 9905
Slide Seep	--	NA		Alpha, Beta, ^{3}H, ^{90}Sr, U-iso, 9905
Ringold Irr. Return	--	NA		Alpha, Beta, ^{90}Sr, U-iso, 9905
Priest Rapids Dam	--	NA	X	Alpha, Beta, ^{3}H, ^{90}Sr, ^{99}Tc, U-iso, 9905
Richland Pumphouse	--	NA	X	Alpha, Beta, ^{3}H, ^{90}Sr, ^{99}Tc, U-iso, 9905

(a) HRM = Hanford River Mile.
(b) Analytical laboratory code.
(c) No data.
(d) NA = Not applicable.

TABLE B.2. Columbia River Flow Rates During 1988 Spring Sampling Activities

Date	Flow Rate, cfs
09-04-89	76,000
09-05-89	89,700
09-06-89	96,200
09-07-89	121,000
09-10-89	103,000
09-11-89	46,300
09-12-89	70,800
09-13-89	108,000
09-14-89	99,800
09-15-89	84,700
09-16-89	96,400
09-24-89	102,000
09-25-89	65,200
09-26-89	82,400
09-27-89	92,800
11-12-89	96,800
11-13-89	95,900
11-14-89	100,000
11-15-89	105,000

TABLE B.3 Background Radionuclide Concentrations Measured in Columbia River at Priest Rapids Dam in 1988

Radionuclide(b)	No. of Samples	Concentration (pCi/L)(a) Maximum	Minimum	Average	Drinking Water Standard(c)
Composite System					
Gross Alpha	12	0.85 ± 0.81	-0.07 ± 0.20	0.31 ± 0.17	15
Gross Beta	12	2.31 ± 1.00	0.06 ± 1.00	0.96 ± 0.40	50
Tritium	12	89 ± 6	56 ± 4	70 ± 6	20,000
^{89}Sr	12	0.184 ± 0.084	-0.044 ± 0.072	0.019 ± 0.038	20
^{90}Sr	12	0.15 ± 0.03	0.05 ± 0.03	0.10 ± 0.02	8
^{234}U	12	0.27 ± 0.06	0.11 ± 0.03	0.20 ± 0.03	---(d)
^{235}U	12	0.014 ± 0.013	-0.003 ± 0.008	0.006 ± 0.003	---
^{238}U	12	0.21 ± 0.04	0.11 ± 0.03	0.17 ± 0.02	---
U-Total	12	0.48 ± 0.07	0.23 ± 0.05	0.37 ± 0.04	---
Continuous System					
^{60}Co P	20	0.0018 ± 0.0019	-0.0012 ± 0.0024	0.0006 ± 0.0003	100
D	20	0.0042 ± 0.0041	-0.0027 ± 0.0042	0.0009 ± 0.0011	
^{129}I D	4	0.000045 ± 0.000005	0.000006 ± 0.000001	0.000017 ± 0.000019	1
^{131}I P	11	0.0026 ± 0.0037	-0.0011 ± 0.0043	0.0008 ± 0.0008	3
D	11	0.0038 ± 0.0073	-0.0068 ± 0.0114	0.0007 ± 0.0023	---
^{137}Cs P	20	0.004 ± 0.0024	0.0002 ± 0.0014	0.0018 ± 0.0005	200
D	20	0.0067 ± 0.0040	-0.0019 ± 0.0044	0.0028 ± 0.0011	---
^{239,240}Pu P	4	0.00010 ± 0.00008	0.000002 ± 0.000007	0.00006 ± 0.00004	---
D	4	0.00010 ± 0.00016	0.00002 ± 0.00005	0.00006 ± 0.00004	

(a) Maximum and minimum values ±2 sigma counting error. Average ±2 standard error of the calculated mean.

(b) Radionuclides measured using the continuous system show the particulate (P) and dissolved (D) fractions separately. Other radionuclides are based on samples collected by the composite system.

(c) From State of Washington and EPA.

(d) Dashes indicate no concentration guides provided in DWS.

TABLE B.4 Columbia River Background Water Quality Data for 1988 (from Jaquish and Bryce 1989)

Analysis	Units	Vernita Bridge (Upstream) No. of Samples	Maximum	Minimum	Annual Average[(a)]
PNL Environmental Monitoring					
pH	pH units	12	8.5	7.4	NA[(b)]
Fecal coliform	#/100 mL	12	130	2	2[(c)]
Total coliform	#/100 mL	12	1600	2	48[(c)]
Biological oxygen demand	mg/L	12	5.2	0.7	2.1 ± 0.8
Nitrate	mg/L	12	0.23	0.05	0.14 ± 0.03
USGS Sampling Program[(d)]					
Temperature[(e)]	°C	365	19.6	1.8	11.3
Dissolved oxygen	mg/L	6	13.4	8.8	11.5 ± 1.4
Turbidity	NTU	6	1.8	0.4	1.0 ± 0.4
pH	pH units	6	8.8	8.0	NA
Fecal coliform	#/100mL	6	3	<1	2[(c)]
Suspended solids, 105°C	mg/L	NR			
Dissolved solids, 180°C	mg/L	6	88	71	81 ± 6
Specific conductance	µmhos	6	162	123	140 ± 15
Hardness, as $CaCO_3$	mg/L	6	77	58	68 ± 7
Phosphorus, total	mg/L	6	0.03	0.02	0.023 ± 0.004
Chromium, dissolved	µg/L	3	<1	<1	<1
Nitrogen, Kjeldahl	mg/L	6	0.5	<0.2	<0.28 ± 0.11
Total organic carbon	mg/L	4	2.8	1.4	2.1 ± 0.7
Iron, dissolved	µg/L	3	65	9	28 ± 37
Ammonia, dissolved (as N)	mg/L	5	0.05	<0.01	<0.02 ± 0.02

(a) Average values ±2 standard error of the calculated mean.
(b) NA = Not applicable.
(c) Annual median.
(d) Provisional data subject to revision.
(e) Maximum and minimum represent daily averages.

TABLE B.5. Estimated Background Levels for Selected Constituents in Hanford Ground Water (from Evans et al. 1989)

Constituent	Detection Limit(a)	Background Concentration(a)
Aluminum	2(b)	<2(b)
Ammonia	50	<50
Arsenic	0.2(b)	3.9 ± 2.4(b)
Barium	6	42 ± 20
Beryllium	0.3(b)	<0.3(b)
Bismuth	0.02(b)	<0.02(b)
Boron	50(b)	<50(b)
Cadmium	0.2(b)	<0.2(b)
Calcium	50	40,000 ± 10,300
Chloride	500	10,300 ± 6,500
Chromium	2(b)	4.0 ± 2.0(b)
Copper	1(b)	<1(b)
Cyanide	10	<10
Fluoride	500	370 ± 100
Lead	0.5(b)	<0.5(b)
Magnesium	10	11,800 ± 3,400
Manganese	5	7 ± 5
Mercury	0.1	<0.1
Nickel	4(b)	<4(b)
Phosphate	1,000	<1,000
Potassium	100	4,950 ± 1,240
Selenium	2(b)	<2(b)
Silver	10	<10
Sodium	10	18,260 ± 10,150
Strontium	20	236 ± 102
Sulfate	500	34,300 ± 16,900
Uranium	0.5(c)	1.7 ± 0.8(c)
Vanadium	5	17 ± 9
Zinc	5	6 ± 2

TABLE B.5. (contd)

Constituent	Detection Limit[a]	Background Concentration[a]
Alkalinity	--	123,000 ± 21,000
pH	--	7.64 ± 0.16
Total Organic Carbon	200	586 ± 347
Conductivity	1[d]	380 ± 82[d]
Gross Alpha	0.5[c]	2.5 ± 1.4[c]
Gross Beta	4[c]	19 ± 12[c]
Radium	0.2[c]	<0.2[c]

(a) Units in ppb unless otherwise noted.
(b) Based on ICP/MS data.
(c) Units in pCi/L data.
(d) Units in μmho/cm.

TABLE B.6. Radiological Analyses of Water Samples Collected from the Columbia River, Columbia River Shoreline Springs (onsite) and Irrigation Wastewater Discharges (offsite)

(All Concentrations in pCi/l. Blank spaces indicate not analyzed.)

Sample Date	Sample Location	Sample Source	Gross Alpha	Gross Beta	Tritium
11/14/88	HRM 2.5	Spring	0.49 +/- 0.38	1.37 +/- 1.07	-320 +/- 128
11/14/88	HRM 3.3	Spring	1.87 +/- 0.90	7.87 +/- 1.93	1100 +/- 162
09/15/88	HRM 8.9	River			76400 +/- 910
09/15/88	HRM 8.9	Spring	0.00036 +/- 0.28	10800 +/- 296	75800 +/- 908
09/06/88	HRM 8.9	Spring	0.55 +/- 0.61	13800 +/- 100	74000 +/- 700
09/06/88	HRM 9.5	Spring	0.37 +/- 0.46	73.8 +/- 7.8	111000 +/- 868
11/14/88	HRM 11.0	Spring	0.36 +/- 0.33	1.65 +/- 1.12	21.5 +/- 137
09/12/88	HRM 15.0	River			65.7 +/- 127
09/12/88	HRM 15.0	Spring	0.30 +/- 0.35	1.63 +/- 1.27	545 +/- 178
09/12/88	HRM 25.75	Spring	0.42 +/- 0.42	0.69 +/- 1.14	264 +/- 169
09/12/88	HRM 27.25	Spring	2.50 +/- 2.07	4.33 +/- 4.1	7420 +/- 296
09/12/88	HRM 27.5	River			26400 +/- 525
09/12/88	HRM 27.5	Spring	2.11 +/- 1.02	14.2 +/- 2.71	72000 +/- 888
09/12/88	HRM 28.1	River			158000 +/- 1250
09/12/88	HRM 28.1	Spring	2.32 +/- 1.07	48 +/- 4.86	155000 +/- 1290
09/06/88	HRM 28.1	Spring	2.62 +/- 1.12	168 +/- 11	143000 +/- 980
09/12/88	HRM 28.5	Spring	1.49 +/- 0.91	45 +/- 4.65	145000 +/- 1250
09/26/88	HRM 38.25	Spring	2.91 +/- 1.14	1.85 +/- 1.4	2630 +/- 231
09/28/88	HRM 38.8	Spring	2.28 +/- 1.11	6.84 +/- 1.98	682 +/- 182
09/26/88	HRM 41.5-.8	Spring	3.25 +/- 1.49	10.1 +/- 2.41	6580 +/- 308
09/26/88	HRM 42.0	Spring	4.42 +/- 1.18	5.25 +/- 1.69	1070 +/- 192
09/12/88	HRM 42.1	River			485 +/- 176
09/16/88	HRM 42.1	Spring	7.95 +/- 1.48	11.6 +/- 3.3	168 +/- 115
09/12/88	HRM 42.1	Spring	6.40 +/- 1.29	7.31 +/- 1.94	346 +/- 172
09/12/88	HRM 42.3	Spring	6.51 +/- 1.36	9.81 +/- 2.22	283 +/- 170
09/26/88	HRM 43.6	Spring	0.52 +/- 0.60	4.69 +/- 1.76	64.8 +/- 163
09/15/88	Byers Lndg	Irr. Rtn	0.75 +/- 0.46	6.39 +/- 2.12	
09/15/88	Slide	Seep	2.02 +/- 0.99	2.60 +/- 1.66	377 +/- 174
09/15/88	Ringold	Irr. Rtn	1.70 +/- 0.73	9.94 +/- 2.51	
09/13/88	Priest Rapids	River			180 +/- 167
09/13/88	Richland	Pumphouse			581 +/- 179

TABLE B.6. (contd)

Sample Date	Sample Location	Sample Source	Sr90	Co60	Zn65
11/14/88	HRM 2.5	Spring		-0.69 +/- 3.39	2.03 +/- 9.41
11/14/88	HRM 3.3	Spring		0.42 +/- 1.71	-1.25 +/- 5.14
09/15/88	HRM 8.9	River	6740 +/- 186	30.9 +/- 4.53	3.25 +/- 6.72
09/15/88	HRM 8.9	Spring	7270 +/- 192	53.4 +/- 19.4	5.30 +/-15.60
09/06/88	HRM 8.9	Spring	6680 +/- 260	45 +/- 4.5	0.70 +/- 2.90
09/06/88	HRM 9.5	Spring	0.31 +/- 0.09	30.3 +/- 4	-2.10 +/- 3.30
11/14/88	HRM 11.0	Spring	1.41 +/- 0.43	-2.06 +/- 3.46	-1.53 +/- 9.94
09/12/88	HRM 15.0	River			
09/12/88	HRM 15.0	Spring		-0.55 +/- 1.92	-0.38 +/- 6.25
09/12/88	HRM 25.75	Spring		-0.082 +/- 1.16	-1.38 +/- 6.41
09/12/88	HRM 27.25	Spring			
09/12/88	HRM 27.5	River			
09/12/88	HRM 27.5	Spring	-0.0693 +/- 0.33	1.07 +/- 3.68	-4.41 +/- 10.1
09/12/88	HRM 28.1	River			
09/12/88	HRM 28.1	Spring	0.074 +/- 0.35	4.72 +/- 4.76	1.52 +/- 14.4
09/06/88	HRM 28.1	Spring	0.79 +/- 0.11	4 +/- 1.8	-0.20 +/- 2.60
09/12/88	HRM 28.5	Spring	0.0014 +/- 0.33	2.82 +/- 3.16	4.39 +/- 8.77
09/26/88	HRM 38.25	Spring		-1.06 +/- 2.03	-4.32 +/- 5.49
09/26/88	HRM 38.8	Spring		-0.71 +/- 1.8	-1.77 +/- 6.13
09/26/88	HRM 41.5-.8	Spring		0.38 +/- 1.45	-2.14 +/- 5.79
09/26/88	HRM 42.0	Spring		0.34 +/- 1.53	4.63 +/- 5.12
09/12/88	HRM 42.1	River		0.61 +/- 1.42	1.68 +/- 5.60
09/16/88	HRM 42.1	Spring	0.16 +/- 0.07	0.25 +/- 0.3	-0.90 +/- 1.60
09/12/88	HRM 42.1	Spring		-3.36 +/- 2.74	5.44 +/- 7.98
09/12/88	HRM 42.3	Spring		1.61 +/- 2.16	2.96 +/- 7.25
09/26/88	HRM 43.6	Spring		0.41 +/- 1.29	-2.21 +/- 6.05
09/15/88	Byers Lndg	Irr. Rtn	0.422 +/- 0.36	1.26 +/- 2.46	0.69 +/- 7.84
09/15/88	Slide	Seep	0.0897 +/- 0.35	2.95 +/- 3.01	3.30 +/- 11.4
09/15/88	Ringold	Irr. Rtn	0.385 +/- 0.36	1.57 +/- 3.51	-4.48 +/- 8.71
09/13/88	Priest Rapids	River	-0.172 +/- 0.29	-2.35 +/- 2.86	-4.44 +/- 7.73
09/13/88	Richland	Pumphouse	0.28 +/- 0.35	-0.49 +/- 4.67	-2.54 +/- 14.3

TABLE B.6. (contd)

Sample Date	Sample Location	Sample Source	Tc99	Ru106	Sb125
11/14/88	HRM 2.5	Spring		12.4 +/- 31.8	
11/14/88	HRM 3.3	Spring		9.07 +/- 15.6	
09/15/88	HRM 8.9	River		11.8 +/- 24.2	28.6 +/- 7.51
09/15/88	HRM 8.9	Spring		12.6 +/- 71.2	
09/06/88	HRM 8.9	Spring		8.9 +/- 11.4	43.1 +/- 6.4
09/06/88	HRM 9.5	Spring		13.5 +/- 14.6	
11/14/88	HRM 11.0	Spring		-4.02 +/- 33.7	
09/12/88	HRM 15.0	River			
09/12/88	HRM 15.0	Spring		-1.69 +/- 20.1	
09/12/88	HRM 25.75	Spring		6.86 +/- 15.8	
09/12/88	HRM 27.25	Spring			
09/12/88	HRM 27.5	River			
09/12/88	HRM 27.5	Spring	48.4 +/- 1.76	3.22 +/- 39	
09/12/88	HRM 28.1	River			
09/12/88	HRM 28.1	Spring	223 +/- 2.95	-2.65 +/- 41.4	
09/06/88	HRM 28.1	Spring	228 +/- 3	3.0 +/- 7.6	
09/12/88	HRM 28.5	Spring	215 +/- 2.89	24.1 +/- 28.7	
09/26/88	HRM 38.25	Spring		-2.62 +/- 17.1	
09/26/88	HRM 38.8	Spring		0.93 +/- 20.6	
09/26/88	HRM 41.5-.8	Spring		-3.9 +/- 21.8	
09/26/88	HRM 42.0	Spring		13.2 +/- 17.0	
09/12/88	HRM 42.1	River		9.6 +/- 17.4	
09/16/88	HRM 42.1	Spring		-0.3 +/- 6.1	
09/12/88	HRM 42.1	Spring		9.29 +/- 21.7	
09/12/88	HRM 42.3	Spring		-16.8 +/- 27.1	
09/26/88	HRM 43.6	Spring		11.3 +/- 19.9	
09/15/88	Byers Lndg	Irr. Rtn		2.37 +/- 24.6	
09/15/88	Slide	Seep		12.0 +/- 38.7	
09/15/88	Ringold	Irr. Rtn		-4.72 +/- 33.8	
09/13/88	Priest Rapids	River	0.63 +/- 1.16	-14.8 +/- 26.8	
09/13/88	Richland	Pumphouse	1.77 +/- 1.24	41.8 +/- 48.4	

TABLE B.6. (contd)

Sample Date	Sample Location	Sample Source	Cs137	U234	U235
11/14/88	HRM 2.5	Spring	1.16 +/- 2.7		
11/14/88	HRM 3.3	Spring	-0.62 +/- 1.37		
09/15/88	HRM 8.9	River	-0.60 +/- 1.63		
09/15/88	HRM 8.9	Spring	-0.37 +/- 4.35		
09/06/88	HRM 8.9	Spring	-0.2 +/- 1		
09/06/88	HRM 9.5	Spring	0.41 +/- 1.07		
11/14/88	HRM 11.0	Spring	-0.19 +/- 3.5		
09/12/88	HRM 15.0	River			
09/12/88	HRM 15.0	Spring	-0.94 +/- 1.62	0.083 +/- 0.03	-0.0031 +/- 0.0041
09/12/88	HRM 25.75	Spring	0.41 +/- 1.43		
09/12/88	HRM 27.25	Spring			
09/12/88	HRM 27.5	River			
09/12/88	HRM 27.5	Spring	0.63 +/- 2.78		
09/12/88	HRM 28.1	River			
09/12/88	HRM 28.1	Spring	-3.74 +/- 3.31		
09/06/88	HRM 28.1	Spring	-0.5 +/- 1.1		
09/12/88	HRM 28.5	Spring	-1.3 +/- 2.58		
09/26/88	HRM 38.25	Spring	-0.58 +/- 1.41		
09/26/88	HRM 38.8	Spring	1.37 +/- 1.79		
09/26/88	HRM 41.5-.8	Spring	0.45 +/- 1.76		
09/26/88	HRM 42.0	Spring	-1.64 +/- 1.53	2.03 +/- 0.13	0.18 +/- 0.041
09/12/88	HRM 42.1	River	-0.94 +/- 1.25	4.28 +/- 0.21	0.31 +/- 0.056
09/16/88	HRM 42.1	Spring	0.4 +/- 0.6	4.96 +/- 0.20	0.20 +/- 0.04
09/12/88	HRM 42.1	Spring	-0.44 +/- 1.99	4.48 +/- 0.20	0.38 +/- 0.058
09/12/88	HRM 42.3	Spring	-0.36 +/- 2.08	3.48 +/- 0.18	0.24 +/- 0.048
09/26/88	HRM 43.6	Spring	0.49 +/- 1.65		
09/15/88	Byers Lndg	Irr. Rtn	0.76 +/- 2.03	2.6 +/- 0.20	0.15 +/- 0.049
09/15/88	Slide	Seep	2.51 +/- 3.02	4.6 +/- 0.20	0.14 +/- 0.034
09/15/88	Ringold	Irr. Rtn	0.80 +/- 2.99	3.02 +/- 0.16	0.17 +/- 0.040
09/13/88	Priest Rapids	River	-1.81 +/- 2.5	0.16 +/- 0.04	0.0082 +/- 0.013
09/13/88	Richland	Pumphouse	-0.27 +/- 3.91	0.18 +/- 0.04	-0.0007 +/- 0.009

TABLE B.6. (contd)

Sample Date	Sample Location	Sample Source	U238
11/14/88	HRM 2.5	Spring	
11/14/88	HRM 3.3	Spring	
09/15/88	HRM 8.9	River	
09/15/88	HRM 8.9	Spring	
09/06/88	HRM 8.9	Spring	
09/06/88	HRM 9.5	Spring	
11/14/88	HRM 11.0	Spring	
09/12/88	HRM 15.0	River	
09/12/88	HRM 15.0	Spring	0.097 +/- 0.030
09/12/88	HRM 25.75	Spring	
09/12/88	HRM 27.25	Spring	
09/12/88	HRM 27.5	River	
09/12/88	HRM 27.5	Spring	
09/12/88	HRM 28.1	River	
09/12/88	HRM 28.1	Spring	
09/06/88	HRM 28.1	Spring	
09/12/88	HRM 28.5	Spring	
09/26/88	HRM 38.25	Spring	
09/26/88	HRM 38.8	Spring	
09/26/88	HRM 41.5-.8	Spring	
09/26/88	HRM 42.0	Spring	1.94 +/- 0.13
09/12/88	HRM 42.1	River	3.95 +/- 0.20
09/16/88	HRM 42.1	Spring	4.48 +/- 0.20
09/12/88	HRM 42.1	Spring	4.6 +/- 0.20
09/12/88	HRM 42.3	Spring	3 +/- 0.17
09/26/88	HRM 43.6	Spring	
09/15/88	Byers Lndg	Irr. Rtn	2.27 +/- 0.19
09/15/88	Slide	Seep	3.91 +/- 0.18
09/15/88	Ringold	Irr. Rtn	2.32 +/- 0.14
09/13/88	Priest Rapids	River	0.13 +/- 0.036
09/13/88	Richland	Pumphouse	0.16 +/- 0.04

TABLE B.7. Nonradiological Analysis of Water Sample Collected from the Columbia River, Columbia River Shoreline Springs (onsite) and Irrigation Water Discharges (offsite)

(All Concentrations in ppb. Blank spaces indicate not analyzed.)

Analytical Code	Compound	Detection Limit (ppb)	88316 RM 8.9 Spring	88322 RM 14.5 Spring	88335 RM 28.1 Spring	88346 RM 42.1 Spring	88348 RM 42.3 Spring
726	ICP Metals						
A01	Beryllium	5	<5	<5	<5	<5	<5
A03	Strontium	20	150	132	333	109	119
A04	Zinc	5	47	11	17	23	10
A05	Calcium	50	41797	23980	45520	24289	26492
A06	Barium	6	52	43	60	48	54
A07	Cadmium	2	<2	<2	<2	<2	<2
A08	Chromium	10	<10	<10	<10	<10	<10
A10	Silver	10	<10	<10	<10	<10	<10
A11	Sodium	200	4337	3165	21435	10269	12320
A12	Nickel	10	<10	<10	<10	<10	<10
A13	Copper	10	<10	<10	<10	34	<10
A14	Vanadium	5	<5	<5	16	<5	<5
A15	Antimony	100	<100	<100	<100	<100	<100
A16	Aluminum	150	<150	<150	306	<150	<150
A17	Manganese	5	6	7	24	<5	5
A18	Potassium	100	1663	923	2784	2493	2461
A19	Iron	30	103	<30	461	87	121
A50	Magnesium	50	6014	5407	13127	4584	4821
727	Enhanced Thiourea						
A24	Thiourea	200	<200	<200	<200	<200	<200
A25	1-Acetyl-2-Thiourea	200	<200	<200	<200	<200	<200
A26	1-(0-Chlorophenyl)-Thioure	200	<200	<200	<200	<200	<200
A27	Diethylstilbestrol	200	<200	<200	<200	<200	<200
A28	Ethylenethiourea	200	<200	<200	<200	<200	<200
A29	1-Naphthyl-2-Thiourea	200	<200	<200	<200	<200	<200
A32	N-Phenylthiourea	500	<500	<500	<500	<500	<500
729	Enhanced Pesticides						
A33	Endrin	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A34	Methoxychlor	3	<3	<3	<3	<3	<3
A35	Toxaphene	1	<1	<1	<1	<1	<1
A36	Alpha BHC	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A37	Beta BHC	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A38	Gamma BHC	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A39	Delta BHC	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A40	DDD	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A41	DDE	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A42	DDT	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A43	Heptachlor	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A44	Heptachlor Epoxide	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88361 Byers Lndg Irr Rtn	88363 Slide Seep	88365 Ringold Irr Rtn	88367 Priest Rapid River	88369 Richland Pumphouse
726	ICP Metals						
A01	Beryllium	5	<5	<5	<5	<5	<5
A03	Strontium	20	323	1045	379	125	120
A04	Zinc	5	8	10	6	12	9
A05	Calcium	50	45680	93019	52916	21657	21362
A06	Barium	6	63	64	53	33	32
A07	Cadmium	2	<2	<2	<2	<2	<2
A08	Chromium	10	<10	<10	<10	<10	<10
A10	Silver	10	<10	<10	<10	<10	<10
A11	Sodium	200	42975	72148	47725	2452	2563
A12	Nickel	10	<10	<10	<10	<10	<10
A13	Copper	10	<10	<10	<10	<10	<10
A14	Vanadium	5	13	8	15	<5	<5
A15	Antimony	100	<100	<100	<100	<100	<100
A16	Aluminum	150	<150	892	<150	<150	<150
A17	Manganese	5	10	93	11	14	8
A18	Potassium	100	5067	2605	7316	811	862
A19	Iron	30	155	696	200	160	37
A50	Magnesium	50	21418	48426	25446	4777	4567
727	Enhanced Thiourea						
A24	Thiourea	200	<200	<200	<200	<200	<200
A25	1-Acetyl-2-Thiourea	200	<200	<200	<200	<200	<200
A26	1-(0-Chlorophenyl)-Thiourea	200	<200	<200	<200	<200	<200
A27	Diethylstilbestrol	200	<200	<200	<200	<200	<200
A28	Ethylenethiourea	200	<200	<200	<200	<200	<200
A29	1-Naphthyl-2-Thiourea	200	<200	<200	<200	<200	<200
A32	N-Phenylthiourea	500	<500	<500	<500	<500	<500
729	Enhanced Pesticides						
A33	Endrin	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A34	Methoxychlor	3	<3	<3	<3	<3	<3
A35	Toxaphene	1	<1	<1	<1	<1	<1
A36	Alpha BHC	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A37	Beta BHC	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A38	Gamma BHC	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A39	Delta BHC	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A40	DDD	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A41	DDE	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A42	DDT	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A43	Heptachlor	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A44	Heptachlor Epoxide	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88316 RM 8.9 Spring	88322 RM 14.5 Spring	88335 RM 28.1 Spring	88346 RM 42.1 Spring	88348 RM 42.3 Spring
A46	Dieldrin	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A47	Aldrin	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A48	Chlordane	1	<1	<1	<1	<1	<1
A49	Endosulfan I	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A52	Endosulfan II	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C62	Chlorobenzilate	30	<30	<30	<30	<30	<30
X10	DBC	1	<1	<1	<1	<1	<1
731	Volatile Organic Compounds						
A61	Tetrachloromethane	5	<5	<5	<5	<5	<5
A62	Benzene	5	<5	<5	<5	<5	<5
A63	Dioxane	500	<500	<500	<500	<500	<500
A64	Methylethyl Ketone	10	<10	<10	<10	<10	<10
A65	Pyridine	500	<500	<500	<500	<500	<500
A66	Toluene	5	<5	<5	<5	<5	<5
A67	1,1,1-Trichloroethane	5	<5	<5	<5	<5	<5
A68	1,1,2-Trichloroethane	5	<5	<5	<5	<5	<5
A69	1,1,2-Trichloroethene	5	<5	<5	<5	<5	<5
A70	Perchloroethylene	5	<5	<5	<5	<5	<5
A71	Xylene (O, P)	5	<5	<5	<5	<5	<5
B14	Xylene (M)	5	<5	<5	<5	<5	<5
A76	Methyl Bromide	10	<10	<10	<10	<10	<10
A77	Carbon Disulfide	10	<10	<10	<10	<10	<10
A78	Chlorobenzene	10	<10	<10	<10	<10	<10
A79	2-Chloroethylvinylether	10	<10	<10	<10	<10	<10
A80	Chloroform	5	<5	<5	<5	24	19
A81	Chloromethane	10	<10	<10	<10	<10	<10
A89	1,1-Dichloroethane	10	<10	<10	<10	<10	<10
A90	1,2-Dichloroethane	10	<10	<10	<10	<10	<10
A91	Trans-1,2-Dichloroethene	10	<10	<10	<10	<10	<10
A92	1,1-Dichlorethene	10	<10	<10	<10	<10	<10
A93	Methylene Chloride	10	<10	<10	<10	<10	<10
A94	1,2-Dichloropropane	10	<10	<10	<10	<10	<10
A95	1,3-Dichloropropenes	10	<10	<10	<10	<10	<10
B06	1,1,2,2-Tetrachloroethane	10	<10	<10	<10	<10	<10
B08	Bromoform	10	<10	<10	<10	<10	<10
B13	Vinyl Chloride	10	<10	<10	<10	<10	<10
H68	Hexone	10	<10	<10	<10	<10	<10
A72	Acrolein	10	<10	<10	<10	<10	<10
A73	Acrylonitrile	10	<10	<10	<10	<10	<10
A74	Bis (Chloromethyl) Ether	10	<10	<10	<10	<10	<10

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88351 Byers Lndg Irr Rtn	88353 Slide Seep	88355 Ringold Irr Rtn	88357 Priest Rapid River	88359 Richland Pumphouse
729	Enhanced Pesticides						
A46	Dieldrin	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A47	Aldrin	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A48	Chlordane	1	<1	<1	<1	<1	<1
A49	Endosulfan I	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A52	Endosulfan II	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C82	Chlorobenzilate	30	<30	<30	<30	<30	<30
X10	DBC	1	<1	<1	<1	<1	<1
731	Volatile Organic Compounds						
A61	Tetrachloromethane	5	<5	<5	<5	<5	<5
A62	Benzene	5	<5	<5	<5	<5	<5
A63	Dioxane	500	<500	<500	<500	<500	<500
A64	Methylethyl Ketone	10	<10	<10	<10	<10	<10
A65	Pyridine	500	<500	<500	<500	<500	<500
A66	Toluene	5	<5	<5	<5	<5	<5
A67	1,1,1-Trichloroethane	5	<5	<5	<5	<5	<5
A68	1,1,2-Trichloroethane	5	<5	<5	<5	<5	<5
A69	1,1,2-Trichloroethene	5	<5	<5	<5	<5	<5
A70	Perchloroethylene	5	<5	<5	<5	<5	<5
A71	Xylene (O, P)	5	<5	<5	<5	<5	<5
B14	Xylene (M)	5	<5	<5	<5	<5	<5
A76	Methyl Bromide	10	<10	<10	<10	<10	<10
A77	Carbon Disulfide	10	<10	<10	<10	<10	<10
A78	Chlorobenzene	10	<10	<10	<10	<10	<10
A79	2-Chloroethylvinylether	10	<10	<10	<10	<10	<10
A80	Chloroform	5	<5	<5	<5	<5	<5
A81	Chloromethane	10	<10	<10	<10	<10	<10
A89	1,1-Dichloroethane	10	<10	<10	<10	<10	<10
A90	1,2-Dichloroethane	10	<10	<10	<10	<10	<10
A91	Trans-1,2-Dichloroethene	10	<10	<10	<10	<10	<10
A92	1,1-Dichlorethene	10	<10	<10	<10	<10	<10
A93	Methylene Chloride	10	<10	<10	<10	<10	<10
A94	1,2-Dichloropropane	10	<10	<10	<10	<10	<10
A95	1,3-Dichloropropenes	10	<10	<10	<10	<10	<10
B06	1,1,2,2-Tetrachloroethane	10	<10	<10	<10	<10	<10
B08	Bromoform	10	<10	<10	<10	<10	<10
B13	Vinyl Chloride	10	<10	<10	<10	<10	<10
H68	Hexone	10	<10	<10	<10	<10	<10
A72	Acrolein	10	<10	<10	<10	<10	<10
A73	Acrylonitrile	10	<10	<10	<10	<10	<10
A74	Bis (Chloromethyl) Ether	10	<10	<10	<10	<10	<10

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88316 RM 8.9 Spring	88322 RM 14.5 Spring	88335 RM 28.1 Spring	88346 RM 42.1 Spring	88348 RM 42.3 Spring
731	Volatile Organic Compounds						
A75	Bromo Acetone	10	<10	<10	<10	<10	<10
A82	Chloromethylmethylether	10	<10	<10	<10	<10	<10
A83	Crotonaldehyde	10	<10	<10	<10	<10	<10
A84	1,2-Dibromo-3-Chloropropane	10	<10	<10	<10	<10	<10
A85	1,2-Dibromoethane	10	<10	<10	<10	<10	<10
A86	Dibromomethane	10	<10	<10	<10	<10	<10
A87	1,4-Dichloro-2-Butene	10	<10	<10	<10	<10	<10
A88	Dichlorodifluoromethane	10	<10	<10	<10	<10	<10
A96	N,N-Diethylhydrazine	10	<10	<10	<10	<10	<10
A99	Hydrogen Sulfide	10	<10	<10	<10	<10	<10
B01	Iodo methane	10	<10	<10	<10	<10	<10
B02	Methacrylonitrile	10	<10	<10	<10	<10	<10
B03	Methanethiol	10	<10	<10	<10	<10	<10
B04	Pentachloroethane	10	<10	<10	<10	<10	<10
B05	1,1,1,2-Tetrachloroethane	10	<10	<10	<10	<10	<10
B09	Trichloromethanethiol	10	<10	<10	<10	<10	<10
B10	Trichlorofluoromethane	10	<10	<10	<10	<10	<10
B11	Trichloropropane	10	<10	<10	<10	<10	<10
B12	1,2,3-Trichloropropane	10	<10	<10	<10	<10	<10
B15	Diethylarsine	10	<10	<10	<10	<10	<10
C71	Formaldehyde	500	<500	<500	<500	<500	<500
C04	Methyl Methacrylate	10	<10	<10	<10	<10	<10
H06	Ethyl Methacrylate	10	<10	<10	<10	<10	<10
B19	Acetonitrile	3 ppm	<3 ppm	<3 ppm	<3 ppm	<3 ppm	<3 ppm
H05	Ethylene Oxide	3 ppm	<3 ppm	<3 ppm	<3 ppm	<3 ppm	<3 ppm
733	Semi-Volatile Organic Compounds						
B26	Aniline	< 10	< 10	< 10	< 10	< 10	< 10
B30	Benz(A)Anthracene	< 10	< 10	< 10	< 10	< 10	< 10
B33	Benzidine	< 10	< 10	< 10	< 10	< 10	< 10
B34	Benzo(B)Fluoranthene	< 10	< 10	< 10	< 10	< 10	< 10
B38	Bis(2-Chloroethoxy)Methane	< 10	< 10	< 10	< 10	< 10	< 10
B39	Bis(2-Chloroethyl)Ether	< 10	< 10	< 10	< 10	< 10	< 10
B40	Bis(2-Ethylhexyl)Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B41	4-Bromophenyl Phenyl Ether	< 10	< 10	< 10	< 10	< 10	< 10
B42	Butyl Benzyl Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B45	P-Chloroaniline	< 10	< 10	< 10	< 10	< 10	< 10
B46	P-Chloro M-Cresol	< 10	< 10	< 10	< 10	< 10	< 10
B48	2-Chloronaphthalene	< 10	< 10	< 10	< 10	< 10	< 10
B49	2-Chlorophenol	< 10	< 10	< 10	< 10	< 10	< 10
B50	Chrysene	< 10	< 10	< 10	< 10	< 10	< 10

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88351 Byers Lndg Irr Rtn	88353 Slide Seep	88355 Ringold Irr Rtn	88357 Priest Rapid River	88359 Richland Pumphouse
731	Volatile Organic Compounds						
A75	Bromo Acetone	10	<10	<10	<10	<10	<10
A82	Chloromethylmethylether	10	<10	<10	<10	<10	<10
A83	Crotonaldehyde	10	<10	<10	<10	<10	<10
A84	1,2-Dibromo-3-Chloropropane	10	<10	<10	<10	<10	<10
A85	1,2-Dibromoethane	10	<10	<10	<10	<10	<10
A86	Dibromomethane	10	<10	<10	<10	<10	<10
A87	1,4-Dichloro-2-Butene	10	<10	<10	<10	<10	<10
A88	Dichlorodifluoromethane	10	<10	<10	<10	<10	<10
A93	N,N-Diethylhydrazine	10	<10	<10	<10	<10	<10
A99	Hydrogen Sulfide	10	<10	<10	<10	<10	<10
B01	Iodo methane	10	<10	<10	<10	<10	<10
B02	Methacrylonitrile	10	<10	<10	<10	<10	<10
B03	Methanethiol	10	<10	<10	<10	<10	<10
B04	Pentachloroethane	10	<10	<10	<10	<10	<10
B05	1,1,1,2-Tetrachloroethane	10	<10	<10	<10	<10	<10
B09	Trichloromethanethiol	10	<10	<10	<10	<10	<10
B10	Trichlorofluoromethane	10	<10	<10	<10	<10	<10
B11	Trichloropropane	10	<10	<10	<10	<10	<10
B12	1,2,3-Trichloropropane	10	<10	<10	<10	<10	<10
B15	Diethylarsine	10	<10	<10	<10	<10	<10
C71	Formaldehyde	500	<500	<500	<500	<500	<500
C04	Methyl Methacrylate	10	<10	<10	<10	<10	<10
H06	Ethyl Methacrylate	10	<10	<10	<10	<10	<10
B19	Acetonitrile	3 ppm	<3 ppm	<3 ppm	<3 ppm	<3 ppm	<3 ppm
H05	Ethylene Oxide	3 ppm	<3 ppm	<3 ppm	<3 ppm	<3 ppm	<3 ppm
733	Semi-Volatile Organic Compounds						
B26	Aniline	< 10	< 10	< 10	< 10	< 10	< 10
B30	Benz(A)Anthracene	< 10	< 10	< 10	< 10	< 10	< 10
B33	Benzidine	< 10	< 10	< 10	< 10	< 10	< 10
B34	Benzo(B)Fluoranthene	< 10	< 10	< 10	< 10	< 10	< 10
B38	Bis(2-Chloroethoxy)Methane	< 10	< 10	< 10	< 10	< 10	< 10
B39	Bis(2-Chloroethyl)Ether	< 10	< 10	< 10	< 10	< 10	< 10
B40	Bis(2-Ethylhexyl)Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B41	4-Bromophenyl Phenyl Ether	< 10	< 10	< 10	< 10	< 10	< 10
B42	Butyl Benzyl Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B45	P-Chloroaniline	< 10	< 10	< 10	< 10	< 10	< 10
B46	P-Chloro M-Cresol	< 10	< 10	< 10	< 10	< 10	< 10
B48	2-Chloronaphthalene	< 10	< 10	< 10	< 10	< 10	< 10
B49	2-Chlorophenol	< 10	< 10	< 10	< 10	< 10	< 10
B50	Chrysene	< 10	< 10	< 10	< 10	< 10	< 10

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88316 RM 8.9 Spring	88322 RM 14.5 Spring	88335 RM 28.1 Spring	88346 RM 42.1 Spring	88348 RM 42.3 Spring
733	Semi-Volatile Organic Compounds						
B55	Dibenz(A,H)Anthracene	< 10	< 10	< 10	< 10	< 10	< 10
B60	Di-N-Butyl Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B61	1,2-Dichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B62	1,3-Dichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B63	1,4-Dichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B64	3,3'-Dichlorobenzidine	< 20	< 20	< 20	< 20	< 20	< 20
B65	2,4-Dichlorophenol	< 10	< 10	< 10	< 10	< 10	< 10
B67	Diethyl Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B75	2,4-Dimethylphenol	< 10	< 10	< 10	< 10	< 10	< 10
B76	Dimethyl Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B78	4,6-Dinitro-O-Cresol	< 10	< 10	< 10	< 10	< 10	< 10
B80	2,4-Dinitrotoluene	< 10	< 10	< 10	< 10	< 10	< 10
B81	2,6-Dinitrotoluene	< 10	< 10	< 10	< 10	< 10	< 10
B82	Di-N-Octyl Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B84	1,2-Diphenylhydrazine	< 10	< 10	< 10	< 10	< 10	< 10
B88	Fluoranthene	< 10	< 10	< 10	< 10	< 10	< 10
B89	Hexachlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B90	Hexachlorobutadiene	< 10	< 10	< 10	< 10	< 10	< 10
B91	Hexachlorocyclopentadiene	< 10	< 10	< 10	< 10	< 10	< 10
B92	Hexachloroethane	< 10	< 10	< 10	< 10	< 10	< 10
B93	Indeno(1,2,3-CD)Pyrene	< 10	< 10	< 10	< 10	< 10	< 10
C54	Hexachlorophene	< 10	< 10	< 10	< 10	< 10	< 10
C55	Naphthalene	< 10	< 10	< 10	< 10	< 10	< 10
C12	Nitrobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C17	N-Nitrosodimethylamin	< 10	< 10	< 10	< 10	< 10	< 10
C57	Phenol	< 10	< 10	< 10	< 10	< 10	< 10
C43	1,2,4-Trichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B79	2,4-Dinitrophenol	< 50	< 50	< 50	< 50	< 50	< 50
C13	4-Nitrophenol	< 50	< 50	< 50	< 50	< 50	< 50
C11	Para-Nitroaniline	< 50	< 50	< 50	< 50	< 50	< 50
C28	Pentachlorophenol	< 50	< 50	< 50	< 50	< 50	< 50
C44	2,4,5-Trichlorophenol	< 50	< 50	< 50	< 50	< 50	< 50
C45	2,4,6-Trichlorophenol	< 10	< 10	< 10	< 10	< 10	< 10
C56	1,2,3-Trichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C58	1,3,5-Trichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C37	1,2,4,5-Tetrachlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C59	1,2,3,4-Tetrachlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C60	1,2,3,5-Tetrachlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C26	Pentachlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B51	Cresols	< 10	< 10	< 10	< 10	< 10	< 10
B85	N-Nitrosodinpropylamine	< 10	< 10	< 10	< 10	< 10	< 10

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88351 Byers Lndg Irr Rtn	88353 Slide Seep	88355 Ringold Irr Rtn	88357 Priest Rapid River	88359 Richland Pumphouse
733	Semi-Volatile Organic Compounds						
B55	Dibenz(A,H)Anthracene	< 10	< 10	< 10	< 10	< 10	< 10
B60	Di-N-Butyl Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B61	1,2-Dichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B62	1,3-Dichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B63	1,4-Dichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B64	3,3'-Dichlorobenzidine	< 20	< 20	< 20	< 20	< 20	< 20
B65	2,4-Dichlorophenol	< 10	< 10	< 10	< 10	< 10	< 10
B67	Diethyl Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B75	2,4-Dimethylphenol	< 10	< 10	< 10	< 10	< 10	< 10
B76	Dimethyl Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B78	4,6-Dinitro-O-Cresol	< 10	< 10	< 10	< 10	< 10	< 10
B80	2,4-Dinitrotoluene	< 10	< 10	< 10	< 10	< 10	< 10
B81	2,6-Dinitrotoluene	< 10	< 10	< 10	< 10	< 10	< 10
B82	Di-N-Octyl Phthalate	< 10	< 10	< 10	< 10	< 10	< 10
B84	1,2-Diphenylhydrazine	< 10	< 10	< 10	< 10	< 10	< 10
B88	Fluoranthene	< 10	< 10	< 10	< 10	< 10	< 10
B89	Hexachlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B90	Hexachlorobutadiene	< 10	< 10	< 10	< 10	< 10	< 10
B91	Hexachlorocyclopentadiene	< 10	< 10	< 10	< 10	< 10	< 10
B92	Hexachloroethane	< 10	< 10	< 10	< 10	< 10	< 10
B93	Indeno(1,2,3-CD)Pyrene	< 10	< 10	< 10	< 10	< 10	< 10
C54	Hexachlorophene	< 10	< 10	< 10	< 10	< 10	< 10
C55	Naphthalene	< 10	< 10	< 10	< 10	< 10	< 10
C12	Nitrobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C17	N-Nitrosodimethylamin	< 10	< 10	< 10	< 10	< 10	< 10
C57	Phenol	< 10	< 10	< 10	< 10	< 10	< 10
C43	1,2,4-Trichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B79	2,4-Dinitrophenol	< 50	< 50	< 50	< 50	< 50	< 50
C13	4-Nitrophenol	< 50	< 50	< 50	< 50	< 50	< 50
C11	Para-Nitroaniline	< 50	< 50	< 50	< 50	< 50	< 50
C28	Pentachlorophenol	< 50	< 50	< 50	< 50	< 50	< 50
C44	2,4,5-Trichlorophenol	< 50	< 50	< 50	< 50	< 50	< 50
C45	2,4,6-Trichlorophenol	< 10	< 10	< 10	< 10	< 10	< 10
C56	1,2,3-Trichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C58	1,3,5-Trichlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C37	1,2,4,5-Tetrachlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C59	1,2,3,4-Tetrachlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C60	1,2,3,5-Tetrachlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C26	Pentachlorobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B51	Cresols	< 10	< 10	< 10	< 10	< 10	< 10
B85	N-Nitrosodinpropylamine	< 10	< 10	< 10	< 10	< 10	< 10

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88316 RM 8.9 Spring	88322 RM 14.5 Spring	88335 RM 28.1 Spring	88346 RM 42.1 Spring	88348 RM 42.3 Spring
733	Semi-Volatile Organic Compounds						
C49	Benzo(A)Pyrene	< 10	< 10	< 10	< 10	< 10	< 10
C51	Bis(2-Chloroisopropyl) Ether	< 10	< 10	< 10	< 10	< 10	< 10
I21	Tributylphosphate	< 10	< 10	< 10	< 10	< 10	< 10
B20	Acetophenone	< 10	< 10	< 10	< 10	< 10	< 10
B21	Warfarin	< 10	< 10	< 10	< 10	< 10	< 10
B22	2-Acetylaminofluorene	< 10	< 10	< 10	< 10	< 10	< 10
B23	4-Aminobiphenyl	< 10	< 10	< 10	< 10	< 10	< 10
B24	5-(Aminomethyl)-3-Isoxazolol	< 10	< 10	< 10	< 10	< 10	< 10
B25	Amitrole	< 10	< 10	< 10	< 10	< 10	< 10
B27	Aramite	< 10	< 10	< 10	< 10	< 10	< 10
B28	Auramine	< 10	< 10	< 10	< 10	< 10	< 10
B29	Benz(C)Acridine	< 10	< 10	< 10	< 10	< 10	< 10
B31	Benzene, Dichloromethyl	< 10	< 10	< 10	< 10	< 10	< 10
B32	Benzemethoil	< 10	< 10	< 10	< 10	< 10	< 10
B36	P-Benzoquinone	< 10	< 10	< 10	< 10	< 10	< 10
B37	Benzyl Chloride	< 10	< 10	< 10	< 10	< 10	< 10
B43	2-Sec-Butyl-4,6-Dinitrophenol	< 10	< 10	< 10	< 10	< 10	< 10
B44	Chloroalkyl Ethers	< 10	< 10	< 10	< 10	< 10	< 10
B47	1-Chloro-2,3-Epoxypropane	< 10	< 10	< 10	< 10	< 10	< 10
B52	2-Cyclohexyl-4,6-Dinitrophenol	< 10	< 10	< 10	< 10	< 10	< 10
B53	Dibenz(A,H)Acridine	< 10	< 10	< 10	< 10	< 10	< 10
B54	Dibenz(A,J)Acridine	< 10	< 10	< 10	< 10	< 10	< 10
B56	7H-Dibenzo(C,G)Carbazole	< 10	< 10	< 10	< 10	< 10	< 10
B57	Dibenzo(A,E)Pyrene	< 10	< 10	< 10	< 10	< 10	< 10
B58	Dibenzo(A,H)Pyrene	< 10	< 10	< 10	< 10	< 10	< 10
B59	Dibenzo(A,I)Pyrene	< 10	< 10	< 10	< 10	< 10	< 10
B66	2,6-Dichlorophenol	< 10	< 10	< 10	< 10	< 10	< 10
B68	Dihydrosafrole	< 10	< 10	< 10	< 10	< 10	< 10
B69	3,3'-Dimethoxybenzidine	< 10	< 10	< 10	< 10	< 10	< 10
B70	P-Dimethylaminoazobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B71	7,12-Dimethylbenz(A) Anthracene	< 10	< 10	< 10	< 10	< 10	< 10
B72	3,3'-Dimethylbenzidine	< 10	< 10	< 10	< 10	< 10	< 10
B73	Thiofanox	< 10	< 10	< 10	< 10	< 10	< 10
B74	Alpha, Alpha-Dimethylphenethylamine	< 10	< 10	< 10	< 10	< 10	< 10
B77	Dinitrobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B83	Diphenylamine	< 10	< 10	< 10	< 10	< 10	< 10
B86	Ethyleneimine	< 10	< 10	< 10	< 10	< 10	< 10
B87	Ethyl Methanesulfonate	< 10	< 10	< 10	< 10	< 10	< 10
B94	Isosafrole	< 10	< 10	< 10	< 10	< 10	< 10

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88351 Byers Lndg Irr Rtn	88353 Slide Seep	88355 Ringold Irr Rtn	88357 Priest Rapid River	88359 Richland Pumphouse
733	Semi-Volatile Organic Compounds						
C49	Benzo(A)Pyrene	< 10	< 10	< 10	< 10	< 10	< 10
C51	Bis(2-Chloroisopropyl) Ether	< 10	< 10	< 10	< 10	< 10	< 10
I21	Tributylphosphate	< 10	< 10	< 10	< 10	< 10	< 10
B20	Acetophenone	< 10	< 10	< 10	< 10	< 10	< 10
B21	Warfarin	< 10	< 10	< 10	< 10	< 10	< 10
B22	2-Acetylaminofluorene	< 10	< 10	< 10	< 10	< 10	< 10
B23	4-Aminobiphenyl	< 10	< 10	< 10	< 10	< 10	< 10
B24	5-(Aminomethyl)-3-Isoxazolol	< 10	< 10	< 10	< 10	< 10	< 10
B25	Amitrole	< 10	< 10	< 10	< 10	< 10	< 10
B27	Aramite	< 10	< 10	< 10	< 10	< 10	< 10
B28	Auramine	< 10	< 10	< 10	< 10	< 10	< 10
B29	Benz(C)Acridine	< 10	< 10	< 10	< 10	< 10	< 10
B31	Benzene, Dichloromethyl	< 10	< 10	< 10	< 10	< 10	< 10
B32	Benzemethoil	< 10	< 10	< 10	< 10	< 10	< 10
B36	P-Benzoquinone	< 10	< 10	< 10	< 10	< 10	< 10
B37	Benzyl Chloride	< 10	< 10	< 10	< 10	< 10	< 10
B43	2-Sec-Butyl-4,6-Dinitrophenol	< 10	< 10	< 10	< 10	< 10	< 10
B44	Chloroalkyl Ethers	< 10	< 10	< 10	< 10	< 10	< 10
B47	1-Chloro-2,3-Epoxypropane	< 10	< 10	< 10	< 10	< 10	< 10
B52	2-Cyclohexyl-4,6-Dinitrophenol	< 10	< 10	< 10	< 10	< 10	< 10
B53	Dibenz(A,H)Acridine	< 10	< 10	< 10	< 10	< 10	< 10
B54	Dibenz(A,J)Acridine	< 10	< 10	< 10	< 10	< 10	< 10
B56	7H-Dibenzo(C,G)Carbazole	< 10	< 10	< 10	< 10	< 10	< 10
B57	Dibenzo(A,E)Pyrene	< 10	< 10	< 10	< 10	< 10	< 10
B58	Dibenzo(A,H)Pyrene	< 10	< 10	< 10	< 10	< 10	< 10
B59	Dibenzo(A,I)Pyrene	< 10	< 10	< 10	< 10	< 10	< 10
B66	2,6-Dichlorophenol	< 10	< 10	< 10	< 10	< 10	< 10
B68	Dihydrosafrole	< 10	< 10	< 10	< 10	< 10	< 10
B69	3,3'-Dimethoxybenzidine	< 10	< 10	< 10	< 10	< 10	< 10
B70	P-Dimethylaminoazobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B71	7,12-Dimethylbenz(A) Anthracene	< 10	< 10	< 10	< 10	< 10	< 10
B72	3,3'-Dimethylbenzidine	< 10	< 10	< 10	< 10	< 10	< 10
B73	Thiofanox	< 10	< 10	< 10	< 10	< 10	< 10
B74	Alpha, Alpha-Dimethylphenethylamine	< 10	< 10	< 10	< 10	< 10	< 10
B77	Dinitrobenzene	< 10	< 10	< 10	< 10	< 10	< 10
B83	Diphenylamine	< 10	< 10	< 10	< 10	< 10	< 10
B86	Ethyleneimine	< 10	< 10	< 10	< 10	< 10	< 10
B87	Ethyl Methanesulfonate	< 10	< 10	< 10	< 10	< 10	< 10
B94	Isosafrole	< 10	< 10	< 10	< 10	< 10	< 10

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88316 RM 8.9 Spring	88322 RM 14.5 Spring	88335 RM 28.1 Spring	88346 RM 42.1 Spring	88348 RM 42.3 Spring
733	Semi-Volatile Organic Compounds						
B95	Malononitrile	< 10	< 10	< 10	< 10	< 10	< 10
B96	Melphalan	< 10	< 10	< 10	< 10	< 10	< 10
B97	Methapyrilene	< 10	< 10	< 10	< 10	< 10	< 10
B98	Metholonyl	< 10	< 10	< 10	< 10	< 10	< 10
B99	2-Methylaziridine	< 10	< 10	< 10	< 10	< 10	< 10
C01	3-Methylcholanthrene	< 10	< 10	< 10	< 10	< 10	< 10
C02	4,4'-Methylenebis(2-Chloroaniline)	< 10	< 10	< 10	< 10	< 10	< 10
C03	2-Methyllactonitrile	< 10	< 10	< 10	< 10	< 10	< 10
C05	Methyl Methanesulfonate	< 10	< 10	< 10	< 10	< 10	< 10
C06	2-Methyl-2-(Methylthio)Propionaldehyde-O-(Methylcarbonyl)Oxime	< 10	< 10	< 10	< 10	< 10	< 10
C07	Methylthiouracil	< 10	< 10	< 10	< 10	< 10	< 10
C08	1,4-Naphthoquinone	< 10	< 10	< 10	< 10	< 10	< 10
C09	1-Napthylamine	< 10	< 10	< 10	< 10	< 10	< 10
C10	2-Napthylamine	< 10	< 10	< 10	< 10	< 10	< 10
C14	N-Nitrosodi-N-Butylamine	< 10	< 10	< 10	< 10	< 10	< 10
C15	N-Nitrosodiethanolamine	< 10	< 10	< 10	< 10	< 10	< 10
C16	N-Nitrosodiethylamine	< 10	< 10	< 10	< 10	< 10	< 10
C18	N-Nitrosomethylethylamine	< 10	< 10	< 10	< 10	< 10	< 10
C19	N-Nitroso-N-Methylurethane	< 10	< 10	< 10	< 10	< 10	< 10
C20	N-Nitrosomethylvinylamine	< 10	< 10	< 10	< 10	< 10	< 10
C21	N-Nitrosomorpholine	< 10	< 10	< 10	< 10	< 10	< 10
C22	N-Nitrosonornicotine	< 10	< 10	< 10	< 10	< 10	< 10
C23	N-Nitrosonopiperidine	< 10	< 10	< 10	< 10	< 10	< 10
C24	Nitrosopyrrolidine	< 10	< 10	< 10	< 10	< 10	< 10
C25	5-Nitro-O-Toluidine	< 10	< 10	< 10	< 10	< 10	< 10
C27	Pentachloronitrobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C29	Phenacetin	< 10	< 10	< 10	< 10	< 10	< 10
C30	Phenylenediamine	< 10	< 10	< 10	< 10	< 10	< 10
C31	Phthalic Acid Esters	< 10	< 10	< 10	< 10	< 10	< 10
C32	2-Picoline	< 10	< 10	< 10	< 10	< 10	< 10
C33	Pronamide	< 10	< 10	< 10	< 10	< 10	< 10
C34	Reserpine	< 10	< 10	< 10	< 10	< 10	< 10
C35	Rescorzinol	< 10	< 10	< 10	< 10	< 10	< 10
C36	Safrol	< 10	< 10	< 10	< 10	< 10	< 10
C39	2,3,4,6-Tetrachlorophenol	< 10	< 10	< 10	< 10	< 10	< 10
C40	Thiuram	< 10	< 10	< 10	< 10	< 10	< 10
C41	Toluenediamine	< 10	< 10	< 10	< 10	< 10	< 10
C42	O-Toluidine Hydrochloride	< 10	< 10	< 10	< 10	< 10	< 10

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88351 Byers Lndg Irr Rtn	88353 Slide Seep	88355 Ringold Irr Rtn	88357 Priest Rapid River	88359 Richland Pumphouse
733	Semi-Volatile Organic Compounds						
B95	Malononitrile	< 10	< 10	< 10	< 10	< 10	< 10
B96	Malphalan	< 10	< 10	< 10	< 10	< 10	< 10
B97	Mathapyrilene	< 10	< 10	< 10	< 10	< 10	< 10
B98	Matholonyl	< 10	< 10	< 10	< 10	< 10	< 10
B99	2-Methylaziridine	< 10	< 10	< 10	< 10	< 10	< 10
C01	3-Methylcholanthrene	< 10	< 10	< 10	< 10	< 10	< 10
C02	4,4'-Methylenebis(2-Chloroaniline)	< 10	< 10	< 10	< 10	< 10	< 10
C03	2-Methyllactonitrile	< 10	< 10	< 10	< 10	< 10	< 10
C05	Methyl Methanesulfonate	< 10	< 10	< 10	< 10	< 10	< 10
C06	2-Methyl-2-(Methylthio)Propionaldehyde-0-(Methylcarbonyl)Oxime	< 10	< 10	< 10	< 10	< 10	< 10
C07	Methylthiouracil	< 10	< 10	< 10	< 10	< 10	< 10
C08	1,4-Naphthoquinone	< 10	< 10	< 10	< 10	< 10	< 10
C09	1-Napthylamine	< 10	< 10	< 10	< 10	< 10	< 10
C10	2-Napthylamine	< 10	< 10	< 10	< 10	< 10	< 10
C14	N-Nitrosodi-N-Butylamine	< 10	< 10	< 10	< 10	< 10	< 10
C15	N-Nitrosodiethanolamine	< 10	< 10	< 10	< 10	< 10	< 10
C16	N-Nitrosodiethylamine	< 10	< 10	< 10	< 10	< 10	< 10
C18	N-Nitrosomethylethylamine	< 10	< 10	< 10	< 10	< 10	< 10
C19	N-Nitroso-N-Methylurethane	< 10	< 10	< 10	< 10	< 10	< 10
C20	N-Nitrosomethylvinylamine	< 10	< 10	< 10	< 10	< 10	< 10
C21	N-Nitrosomorpholine	< 10	< 10	< 10	< 10	< 10	< 10
C22	N-Nitrosonornicotine	< 10	< 10	< 10	< 10	< 10	< 10
C23	N-Nitrosonopiperidine	< 10	< 10	< 10	< 10	< 10	< 10
C24	Nitrosopyrrolidine	< 10	< 10	< 10	< 10	< 10	< 10
C25	5-Nitro-O-Toluidine	< 10	< 10	< 10	< 10	< 10	< 10
C27	Pentachloronitrobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C29	Phenacetin	< 10	< 10	< 10	< 10	< 10	< 10
C30	Phenylenediamine	< 10	< 10	< 10	< 10	< 10	< 10
C31	Phthalic Acid Esters	< 10	< 10	< 10	< 10	< 10	< 10
C32	2-Picoline	< 10	< 10	< 10	< 10	< 10	< 10
C33	Pronamide	< 10	< 10	< 10	< 10	< 10	< 10
C34	Reserpine	< 10	< 10	< 10	< 10	< 10	< 10
C35	Rescorzinol	< 10	< 10	< 10	< 10	< 10	< 10
C36	Safrol	< 10	< 10	< 10	< 10	< 10	< 10
C39	2,3,4,6-Tetrachlorophenol	< 10	< 10	< 10	< 10	< 10	< 10
C40	Thiuram	< 10	< 10	< 10	< 10	< 10	< 10
C41	Toluenediamine	< 10	< 10	< 10	< 10	< 10	< 10
C42	O-Toluidine Hydrochloride	< 10	< 10	< 10	< 10	< 10	< 10

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88316 RM 8.9 Spring	88322 RM 14.5 Spring	88335 RM 28.1 Spring	88346 RM 42.1 Spring	88348 RM 42.3 Spring
733	Semi-Volatile Organic Compounds						
C46	O,O,O-Triethyl Phosphorothioate	< 10	< 10	< 10	< 10	< 10	< 10
C47	Sym-Trinitrobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C48	Tris(2,3-Dibromopropyl)-Phosphate	< 10	< 10	< 10	< 10	< 10	< 10
C50	Chloronaphazine	< 10	< 10	< 10	< 10	< 10	< 10
C52	Hexachloropropene	< 10	< 10	< 10	< 10	< 10	< 10
C79	Kerosene	< 10	< 10	< 10	< 10	< 10	< 10
C92	Maleic Hydrazide	<500	<500	<500	<500	<500	<500
C93	Nicotinic Acid	<100	<100	<100	<100	<100	<100
C91	Strychnine	< 50	< 50	< 50	< 50	< 50	< 50
B35	Benzo(J)Fluoranthene	< 10	< 10	< 10	< 10	< 10	< 10
734	Phosphorous Pesticides						
C61	Tetraethylpyrophosphate	2	<2	<2	<2	<2	<2
C63	Carbophenothion	2	<2	<2	<2	<2	<2
C64	Disulfoton	2	<2	<2	<2	<2	<2
C65	Dimethoate	2	<2	<2	<2	<2	<2
C66	Methylparathion	2	<2	<2	<2	<2	<2
C67	Ethyl Parathion	2	<2	<2	<2	<2	<2
736	Direct Aqueous Injection Analysis						
C53	Hydrazine	3000	<3000	<3000	<3000	<3000	<3000
C90	Paraldehyde	2000	<2000	<2000	<2000	<2000	<2000
C94	Acrylamide	10000	<10000	<10000	<10000	<10000	<10000
C95	Allyl Alcohol	2500	<2500	<2500	<2500	<2500	<2500
C97	Chloroacetaldehyde	16000	<16000	<16000	<16000	<16000	<16000
C98	3-Chloropropionitrile	4000	<4000	<4000	<4000	<4000	<4000
H03	Ethyl Carbamate	5000	<5000	<5000	<5000	<5000	<5000
H04	Ethyl Cyanide	2000	<2000	<2000	<2000	<2000	<2000
H09	Isobutyl Alcohol	1000	<1000	<1000	<1000	<1000	<1000
H11	N-Propylamine	10000	<10000	<10000	<10000	<10000	<10000
H12	2-Propyn-1-OL	8000	<8000	<8000	<8000	<8000	<8000
737	Enhanced Herbicides						
H13	2,4-D	2	<2	<2	<2	<2	<2
H14	2(2,4,5-T)P	2	<2	<2	<2	<2	<2
H15	(2,4,5-T)	2	<2	<2	<2	<2	<2

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88351 Byers Lndg Irr Rtn	88353 Slide Seep	88355 Ringold Irr Rtn	88357 Priest Rapid River	88359 Richland Pumphouse
733	Semi-Volatile Organic Compounds						
C46	O,O,O-Triethyl Phosphorothioate	< 10	< 10	< 10	< 10	< 10	< 10
C47	Sym-Trinitrobenzene	< 10	< 10	< 10	< 10	< 10	< 10
C48	Tris(2,3-Dibromopropyl)-Phosphate	< 10	< 10	< 10	< 10	< 10	< 10
C50	Chloronaphazine	< 10	< 10	< 10	< 10	< 10	< 10
C52	Hexachloropropene	< 10	< 10	< 10	< 10	< 10	< 10
C79	Kerosene	< 10	< 10	< 10	< 10	< 10	< 10
C92	Maleic Hydrazide	<500	<500	<500	<500	<500	<500
C93	Nicotinic Acid	<100	<100	<100	<100	<100	<100
C91	Strychnine	< 50	< 50	< 50	< 50	< 50	< 50
B35	Benzo(J)Fluoranthene	< 10	< 10	< 10	< 10	< 10	< 10
734	Phosphorous Pesticides						
C61	Tetraethylpyrophosphate	2	<2	<2	<2	<2	<2
C63	Carbophenothion	2	<2	<2	<2	<2	<2
C64	Disulfoton	2	<2	<2	<2	<2	<2
C65	Dimethoate	2	<2	<2	<2	<2	<2
C66	Methylparathion	2	<2	<2	<2	<2	<2
C67	Ethyl Parathion	2	<2	<2	<2	<2	<2
736	Direct Aqueous Injection Analysis						
C53	Hydrazine	3000	<3000	<3000	<3000	<3000	<3000
C90	Paraldehyde	2000	<2000	<2000	<2000	<2000	<2000
C94	Acrylamide	10000	<10000	<10000	<10000	<10000	<10000
C95	Allyl Alcohol	2500	<2500	<2500	<2500	<2500	<2500
C97	Chloroacetaldehyde	16000	<16000	<16000	<16000	<16000	<16000
C98	3-Chloropropionitrile	4000	<4000	<4000	<4000	<4000	<4000
H03	Ethyl Carbamate	5000	<5000	<5000	<5000	<5000	<5000
H04	Ethyl Cyanide	2000	<2000	<2000	<2000	<2000	<2000
H09	Isobutyl Alcohol	1000	<1000	<1000	<1000	<1000	<1000
H11	N-Propylamine	10000	<10000	<10000	<10000	<10000	<10000
H12	2-Propyn-1-OL	8000	<8000	<8000	<8000	<8000	<8000
737	Enhanced Herbicides						
H13	2,4-D	2	<2	<2	<2	<2	<2
H14	2(2,4,5-T)P	2	<2	<2	<2	<2	<2
H15	(2,4,5-T)	2	<2	<2	<2	<2	<2

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88316 RM 8.9 Spring	88322 RM 14.5 Spring	88335 RM 28.1 Spring	88346 RM 42.1 Spring	88348 RM 42.3 Spring
739	PCB Analysis						
A54	Arochlor 1016	4	<1	<1	<1		<1
A55	Arochlor 1221	1	<1	<1	<1		<1
A56	Arochlor 1232	1	<1	<1	<1		<1
A57	Arochlor 1242	1	<1	<1	<1		<1
A58	Arochlor 1248	1	<1	<1	<1		<1
A59	Arochlor 1254	1	<1	<1	<1		<1
A60	Arochlor 1260	1	<1	<1	<1		<1
A20	Arsenic	5	<5	<5	<5	<5	<5
A21	Mercury	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
A22	Selenium	5	<5	<5	<5	<5	<5
A23	Thallium	5	<5	<5	<5	<5	<5
A51	Lead	5	<5	<5	<5	<5	<5
C69	TOC (Total Organic Carbon)		400	1110	433	656	782
C70	Cyanide	10	<10	<10	10.5	<10	<10
C77	Perchlorate	1000	<1000	<1000	<1000	<1000	<1000
C78	Sulfide	1000	<1000	<1000	<1000	<1000	<1000
C80	Ammonium Ion	50		<50	<50	<50	<50
C81	Ethylene Glycol	10 ppm	<10 ppm	<10 ppm	<10 ppm	<10 ppm	<10 ppm
C87	Citrus Red	1000	<1000	<1000	<1000	<1000	<1000
H16	TC (Total Carbon)	2000	14058	18213	25460	14298	15718
H42	TOX (Total Organic Halogen)	10	<10		<10	30.2	24.9

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88351 Byers Lndg Irr Rtn	88353 Slide Seep	88355 Ringold Irr Rtn	88357 Priest Rapid River	88359 Richland Pumphouse
739	PCB Analysis						
A54	Arochlor 1016	4				<1	<1
A55	Arochlor 1221	1				<1	<1
A56	Arochlor 1232	1				<1	<1
A57	Arochlor 1242	1				<1	<1
A58	Arochlor 1248	1				<1	<1
A59	Arochlor 1254	1				<1	<1
A60	Arochlor 1260	1				<1	<1
A20	Arsenic	5	5	<5	8	<5	<5
A21	Mercury	0.1	<0.1	<0.1		<0.1	<0.1
A22	Selenium	5	<5	10	5	<5	<5
A23	Thallium	5	<5	<5	<5	<5	<5
A51	Lead	5	<5	<5	<5	<5	<5
C69	TOC (Total Organic Carbon)		2600	2000	2500	1281	1272
C70	Cyanide	10	<10	<10	<10	<10	<10
C77	Perchlorate	1000	<1000	<1000	<1000	<1000	<1000
C78	Sulfide	1000	<1000	<1000	<1000	<1000	<1000
C80	Ammonium Ion	50	<50	<50	<50	<50	<50
C81	Ethylene Glycol	10 ppm	<10 ppm	<10 ppm	<10 ppm	<10 ppm	<10 ppm
C87	Citrus Red	1000	<1000	<1000	<1000	<1000	<1000
H16	TC (Total Carbon)	2000	40770	39928	47290	13320	14103
H42	TOX (Total Organic Halogen)	10	28	12	14	<10	<10

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88305 RM 3.3 Spring	88316 RM 8.9 Spring	88319 RM 11.0 Spring	88320 RM 14.5 River	88322 RM 14.5 Spring
735	IC Report						
C72	Nitrate	500	6700	28630	2200	<500	<500
C73	Sulphate	5000	36900	36670	13800	10147	13107
C74	Fluoride	500	<500	<500	<500	<500	<500
C75	Chloride	5000	6700	1879	1900	850	1113
C76	Phosphate	1000	<1000	<1000	<1000	<1000	<1000

Analytical Code	Compound	Detection Limit (ppb)	88328 RM 27.75 Spring	88330 RM 27.25 Spring	88332 RM 27.5 Spring	88333 RM 28.1 River	88335 RM 28.1 Spring
735	IC Report						
C72	Nitrate	500	2297	6363	12713	31290	31040
C73	Sulphate	5000	14872	24767	33410	36540	38360
C74	Fluoride	500	<500	<500	<500	<500	<500
C75	Chloride	5000	1942	4999	6390	9240	9110
C76	Phosphate	1000	<1000	<1000	<1000	<1000	<1000

Analytical Code	Compound	Detection Limit (ppb)	88336 RM 28.5 Spring	88338 RM 2.5 Spring	88340 RM 38.25 Spring	88341 RM 38.8 Spring	88342 RM 41.5-.8 Spring
735	IC Report						
C72	Nitrate	500	28288	800	25437	13091	4064
C73	Sulphate	5000	30480	10900	28349	30830	20804
C74	Fluoride	500	<500	<500	<500	<500	<500
C75	Chloride	5000	7050	800	10980	9500	7700
C76	Phosphate	1000	<1000	<1000	<1000	<1000	<1000

TABLE B.7. (contd)

Analytical Code	Compound	Detection Limit (ppb)	88343 RM 42.0 Spring	88344 RM 42.1 River	88346 RM 42.1 Spring	88348 RM 42.3 Spring	88349 RM 43.6 Spring
735	IC Report						
C72	Nitrate	500	20458	2149	1697	9183	9166
C73	Sulphate	5000	47340	17270	17423	16320	14651
C74	Fluoride	500	<500	<500	<500	<500	<500
C75	Chloride	5000	15420	6920	7506	13470	2573
C76	Phosphate	1000	<1000	<1000	<1000	<1000	<1000

Analytical Code	Compound	Detection Limit (ppb)	88351 Byers Lndg Irr Rtn	88353 Slide Seep	88355 Ringold Irr Rtn	88357 Priest Rapid River	88359 Richland Pumphouse
735	IC Report						
C72	Nitrate	500	15631	52320	10795	<500	554
C73	Sulphate	5000	50870	238000	83760	10336	10802
C74	Fluoride	500	<500	<500	<500	<500	<500
C75	Chloride	5000	13560	42370	15810	895	1019
C76	Phosphate	1000	<1000	<1000	<1000	<1000	<1000

END

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