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Hanford Site Groundwater Background

United States
Department of Energy
Richland, Washington

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EXECUTIVE SUMMARY

This report represents a compilation and a preliminary evaluation of available data and information pertaining to the natural composition of groundwater in the unconfined aquifer system beneath the Hanford Site. These efforts serve as a baseline for the characterization of natural groundwater compositions and controls that can be used to support the environmental restoration on the Hanford Site. The natural background compositions serve as a basis for distinguishing the presence and significance of contamination in groundwater. The model of the physical and compositional controls on groundwater composition presented here serves as a basis for establishing the upper bounds of naturally occurring constituents that might be regarded as dangerous waste if the constituents exceed background levels, and also in guiding the collection and interpretation of new data. For the purpose of this report, the relevant parts of the aquifer extend from the surface waters that potentially recharge the aquifer to the uppermost portion of the underlying confined aquifer.

The determination of natural background concentrations for constituents in Hanford Site groundwater requires the use of representative groundwater data unaffected by onsite operations. The primary criteria used in the selection of data suitable for consideration in the evaluation of natural background included site geohydrology, well characteristics, data quality objectives, and the distribution of indicator contaminants in the groundwater (i.e., tritium). These screening processes yielded a subset of the available data that can be considered without reservation as pristine groundwater. These data are representative of groundwater from the upper part of the unconfined aquifer within recharge zones upgradient to Hanford Site operations.

The natural range of compositions for these data extends from those of surface waters to those in the upper confined aquifer in basalt. The average concentrations of most constituents occur systematically in the following sequence:

surface waters < springs < unconfined < confined groundwater

The range of compositions of the unconfined groundwater in the background study area overlaps with the compositions of spring water and groundwater from the upper confined aquifer.

A conceptual model for the controls and processes affecting the natural composition of groundwater in this region was developed based on the site-specific characteristics of the natural groundwater and aquifer system, the results of experimental testing, and theoretical considerations. The main feature of this model is that the composition of groundwater within the unconfined aquifer is determined primarily by the extent to which water either flows through the aquifer or is stagnant within the aquifer, e.g., open versus closed system behavior. It is indicated that groundwater in the dynamic parts of the aquifer flushed by recharge have compositions largely inherited from the composition of the recharge sources. The most important recharge source

appears to be surface run-off and spring waters containing significant amounts of dissolved solids from previous reaction within the basalt aquifer.

Groundwater with the largest concentrations of major and minor constituents also appears to be the oldest and most reduced. The compositions of these groundwaters are distinctive, and comparable to those obtained by closed-system reactions of water with aquifer sediment. The compositions of these waters appear to be rapidly established and dominated by surface reactions involving basaltic components and dissolution of the most readily soluble components in the aquifer.

The open-system groundwater generally would be expected to have lower constituent concentrations and to be more oxidized that the closed-system groundwaters. Both types probably change little over time in the study area. However, flowing groundwater further downgradient and/or deeper in the aquifer could have more evolved compositions.

Factors such as subsequent rock-water interaction within the aquifer appear to have subordinate effects on the composition of groundwater in the study area, with the possible exception of reduction-oxidation reaction, and denitrification processes, which might be associated with inorganic and/or microbial processes. The effects of reaction path and/or microbial processes on groundwater composition elsewhere in the aquifer presently are not well characterized.

Provisional background threshold levels were estimated from the data presented in this report. These threshold levels are likely to be conservatively low because aquifer systems generally have the lowest concentrations of dissolved solids in the upper parts of the aquifer system closest to recharge zones. It is expected that the natural range of compositions from other parts of the aquifer also will extend between the range of compositions among recharge sources and the upper confined aquifer, except in areas of river recharge where the main effect is to dilute the groundwater. The concentration of trace constituents important for environmental restoration considerations is expected to vary with the major and minor constituents. The possible exception is more evolved groundwaters, such as those in the upper confined aquifer, which have relatively high concentrations of trace elements but lower concentrations of certain major elements as a characteristic of the normal reaction path.

The similarity in the average compositions of unconfined groundwater in the study area to that based on groundwater data from across the Hanford Site indicates the results of this study could be representative of larger areas of the Hanford Site.

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ACRONYMS AND ABBREVIATIONS

BSS	background study subset
BWIP	Basalt Waste Isolation Project
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
DQO	data quality objectives
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
HEIS	Hanford Environmental Information System
HGDB	Hanford Groundwater Database
MTCA	Model Toxics Control Act (WAC 173-340)
NWIS	National Water Information System
ORP	oxidation-reduction potential
PNL	Pacific Northwest Laboratory
ppm	parts per million
RCRA	*Resource Conservation and Recovery Act of 1976*
USGS	United States Geologic Survey
WAC	Washington Administrative Code
WMU	waste management unit

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DEFINITION OF TERMS

Definitions with unidentified sources are based on common usage. Several of the longer definitions have been abridged, as noted at the end of the definition.

Analyte. The element, ion, or compound of interest.

Anthropogenic. Involving the impact of man on nature: induced or altered by the presence and activities of man.

Aquifer. A lithologic unit or combination of units that has appreciably greater water transmissibility than adjacent units. An aquifer stores and transmits water commonly recoverable in economic useable quantities.

Area background. The concentrations of hazardous substances that are consistently present in the environment in the vicinity of a site that are the result of human activities unrelated to the releases from that site.[1]

Background threshold. Based on a tolerance interval approach, background threshold is the concentration level defining the upper limit of what will be considered as part of the background population. Calculating a threshold requires specifying the cumulative frequency distribution, the percentile level, and the coverage. The WAC 173-340-708(11)(d) specifies the 95 percentile and coverage of 95 percent. Departure from the tolerance interval approach requires approval by Ecology for those waste management units under Ecology jurisdiction.

Basalt. A dark- to medium-dark-colored mafic (iron-magnesium rich) extrusive igneous rock with small grains composed primarily of feldspar (calcic plagioclase), pyroxene, with or without olivine, and varying proportions of glass.[2]

Bulk composition. A complete chemical composition of a sample as performed by a method such as x-ray fluorescence or a spectroscopic analysis on a sample completely dissolved by acid digestion preparation techniques.

Cleanup level. The concentration of a hazardous substance in soil, water, air, or sediment that is determined to be protective of human health and the environment under specified exposure conditions.[1]

Cleanup standards. The standards promulgated under the Revised Code of Washington 70.105D.030(2)(d). Establishing cleanup standards requires specification of the following:

- Hazardous substance concentrations that protect human health and the environment ('cleanup levels')

- The location and site where those cleanup levels must be attained ('point of compliance')

- Additional regulatory requirements that apply to a cleanup action because of the type of action and/or the location of the site.

These requirements are specified in applicable federal and state laws and generally are established following selection of a specific cleanup action.[1]

Conceptual model. A symbolic representation of the essential characteristics of a physical system. The representation can be in language, image, or mathematical form.

Contaminant. Any hazardous substance that does not occur naturally or occurs at greater than natural background levels.[1]

Data quality objectives. These are qualitative and quantitative statements that specify the quality of the data required to support agency (EPA) decisions during remedial response activities. For example, depending on the project phase, sufficient data may have to be collected to characterize the site, evaluate remedial alternatives, determine design criteria, or monitor site conditions and/or remedial action effectiveness (EPA/540/g-7/003).[3]

End member. (a) One of the two or more simple compounds of which an isomorphous (solid solution) series is composed. For example, the end members of the plagioclase feldspar series are albite ($NaAlSi_3O_8$) and anorthite ($CaAl_2Si_2O_8$). (b) One of the two extremes of a series, e.g., types of sedimentary rock or fossils.[4]

Eolian. (a) Pertaining to the wind; especially said of such deposits as loess and dune sand, of sedimentary structures such as wind formed ripple marks, or of erosion and deposition accomplished by the wind. (b) Said of the active phase of a dune cycle, marked by diminished vegetal control and increased dune growth.[4]

Feldspar. A group of silicate minerals that make up about 60 percent of the outer 15 km of the Earth's crust; the minerals are silicates of aluminum with the metals potassium, sodium, and calcium, and rarely, barium.[2]

Fluvial. (a) Of or pertaining to a river or rivers. (b) Existing, growing, or living in or about a stream or river. (c) Produced by the action of a stream or river.[4]

Groundwater. Water in a saturated zone or stratum beneath the surface of land or below a surface water[1].

Leachate. The liquid resulting from the partial acid digestion and dissolution of a sample. The material resulting from the acid digestion sample preparation method identified by regulatory protocol (e.g., Method 3050 in EPA's SW-846 guidance).

Local background. Same as area background.

Loess. A widespread, homogenous, fine-grained blanket deposit (generally less than 98.4 feet (30 meters) thick), consisting predominately of silt with subordinate grain sizes ranging from clay to fine sand. Loess is generally buff to light yellow or yellowish brown. Loess now is generally believed to be windblown dust of Pleistocene age, carried from desert surfaces, alluvial valleys, and outwash plains, or from unconsolidated glacial or glaciofluvial deposits. The mineral grains, composed mostly of silica and associated heavy minerals, are fresh and angular and generally are held together by calcareous cement. (abridged)[4]

Natural background. The concentration of a hazardous substance consistently present in the environment that has not been influenced by local human activities. For example, several metals naturally occur in the bedrock and soils of Washington State due to the geologic processes that formed these materials, and the concentration of these metals would be considered natural background. Also, low concentrations of some particularly persistent organic compounds such as polychlorinated biphenols (PCBs) can be found in the surficial soils and sediment throughout much of Washington State because of the global use of these hazardous substances. These low concentrations would be considered natural background. Similarly, concentrations of various radionuclides that are present at low concentrations throughout Washington State because of distribution of global radioactive fallout would be considered natural background.[1]

Nugget effect. The variation in sample concentration levels caused by the presence of a nugget of a mineral or phase that is modally subordinate in the parent material.

Operable unit. A group of contiguous past-practice waste sites related by site characteristics or operations so as to be considered collectively for purposes of environmental restoration under the CERCLA process.

Quartz. (a) Crystalline silica, an important rock-forming mineral: SiO_2. (b) A general term for a variety of noncrystalline or cryptocrystalline minerals having the same chemical composition as that of quartz, such as chalcedony, agate, and opal. (abridged)[4]

Sediment. (a) Solid fragmental material that originates from weathering of rocks and is transported by air, water, or ice, or that accumulates by other natural agents, such as chemical precipitation from solution or secretion by organisms; and that forms in layers on the Earth's surfaces at ordinary temperatures in a loose unconsolidated form; e.g., sand, gravel, silt, mud, till, loess, alluvium. (b) Strictly solid material that has settled from a state of suspension in a liquid. In the singular, the term is usually applied to material held in suspension in water or recently deposited from suspension. In the plural, the term is applied to all kinds of deposits, and refers to essentially unconsolidated materials.[4]

Site-wide background or Site background. The natural background of the Hanford site. Includes all contributions from anthropogenic sources unrelated to the Hanford Site operations, e.g., regional agricultural chemicals, nuclear weapons testing fallout, etc.

Soil. A mixture of organic and inorganic solids and biota that exists on the Earth's surface above bedrock.

TSD facility. Treatment, storage, and/or disposal facility. A RCRA designation for a facility that handles hazardous waste.

Unconfined aquifer. An aquifer having a water table; an aquifer containing unconfined groundwater.[4]

Unit background. Same as area background, applied to a waste management unit.

Vadose zone. Zone of aeration. A subsurface zone containing water under pressure less than that of the atmosphere, including water held by capillarity; and containing air or gases generally under atmospheric pressure. This zone is limited above by the land surface and below by the surface of the 'zone of saturation', i.e., the water table. (abridged)[4]

Waste management unit. A location on the Hanford Site where waste has or may have been placed, either planned or unplanned, as identified in the Tri-Party Agreement.

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[1] *Model Toxics Control Act Cleanup Regulations*, as amended, WAC Chapter 173-340.

[2] *Basalt Waste Isolation Project Glossary*, SD-BWI-PMP-005, Rockwell Hanford Operations, Richland, Washington.

[3] EPA documentation as referenced in each definition.

[4] Bates, R.L., 1990, "Glossary of Geology", J.A. Jackson, ed., American Geological Institute, Falls Church, Virginia.

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1.0 INTRODUCTION

This report is a compilation and an evaluation of available data and information that can be used in characterizing the levels of naturally occurring inorganic chemicals, i.e., background, in groundwater within the unconfined aquifer at the Hanford Site. Groundwater background composition is important in both *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) *of 1980* and *Resource Conservation and Recovery Act* (RCRA) *of 1976* environmental restoration and closure activities at the Hanford Site because it serves as a site-specific basis for defining contamination, as a baseline for assessing protection to human health and the environment, and in establishing remediation goals [e.g., EPA 1986; Washington Administrative Code (WAC) 173-303 and 173-340].

The term 'background' generally refers to the composition of a medium unimpacted by activities at a waste management unit (WMU) at either a RCRA or a CERCLA site (WHC 1991a). Natural background is defined by the U.S. Environmental Protection Agency (EPA) as the ambient concentration of chemicals in the environment unimpacted by human activities. The concentration of chemicals consistently present in the environment due to human activities that is not site-specific is defined by the EPA (EPA 1989b) as anthropogenic background, and as natural background by the Washington State Department of Ecology (WAC 173-303). Background as used in this document is intended to be consistent with the EPA definition of natural background. Where it can be distinguished, anthropogenic background is identified as the background levels attributable to non-Hanford human activities (i.e., contaminants resulting from offsite agricultural activities).

When the background composition is known, it can be used to define contaminated media as those having concentrations of chemicals resulting from activities that exceed those of background. The natural range of chemical concentrations also is used in risk assessment activities as (1) the primary screening parameter and (2) to constrain the levels of human and ecosystem exposure to chemicals that are normal for the site or region. Thus, background compositions provide a lower bound for the levels of chemicals that are harmful to humans and the environment because the concentrations of chemicals that occur naturally in the environment generally are not regarded as harmful to human health or to the environment (EPA 1989b). Characterization of background has the added benefit of providing a scientific basis to justify the unnecessary expenditure of resources on remediation efforts of the natural environment.

Essentially all of the inorganic constituents measured in groundwater in accordance with analytical protocols [e.g., SW-846 (EPA 1986) and contractor laboratory program (EPA 1989c)] occur naturally at some level, mainly in ionic form. The constituents calcium, magnesium, silicon, sodium, chlorine, sulfate, and bicarbonate are the major inorganic constituents in groundwater (>5 milligrams per liter) and comprise over 90 percent of the total dissolved solids in most water; iron, fluorine, potassium, and strontium, nitrate, and carbonate are common minor constituents (0.01 to 10 milligrams per liter). Most other components occur as trace constituents (<0.1 milligram per liter).

The constituents of greatest concern for groundwater background are those that also are regarded as dangerous waste constituents, and that occur naturally at levels high enough to be mistaken for contaminants. Characterization of the background levels are particularly important at sites where the natural constituent concentrations are high (i.e., compared to drinking water levels). For example, the natural concentration of constituents such as chlorine, fluorine, lead, and certain other metals and anionic species in groundwater from the confined aquifer at the Hanford Site approach or exceed drinking water levels (Chapter 5.0). However, the chemical composition of groundwater in the unconfined aquifer has not been as well characterized as groundwater in the confined aquifer. Thus, the extent to which elevated constituent concentrations in groundwater exist and can be verified is the subject of much interest, and is one of the main topics of this report.

This report is intended to provide a foundation for the characterization of natural groundwater background for use in environmental restoration activities at the Hanford Site. The extent to which the existing data can be used to characterize natural background composition, and to understand the geochemical variability of groundwater in the aquifer, also is addressed in this report.

The following is the approach used in this initial data and information compilation and evaluation effort:

- Identify the sources of existing and/or available data
- Identify data quality objectives (DQO) (EPA 1987) for data to be used in establishing natural groundwater background
- Develop screening criteria to determine the extent to which the available data can be used for this purpose
- Screen the available data using these criteria to produce a data set that unequivocally represent natural background
- Document compositional characteristics
- Evaluate these data in the context of the process and/or geochemical conceptual model
- Revise the process and/or geochemical conceptual model as necessary
- Summarize the findings and results regarding the status of groundwater background at the Hanford Site
- Provide recommendations regarding additional and/or new information or data required to adequately characterize groundwater background for the purposes of environmental restoration activities at the Hanford Site including new wells, locations, depths, etc.

The DQOs that pertain to the characterization of groundwater background are identified in Chapter 2.0 together with an overview of the Site-wide

approach to the characterization of groundwater background. The DQOs are important because the objectives help ensure that the data used are appropriate for their intended purposes. A summary of the conceptual model for the controls on groundwater composition at the Hanford Site, and an overview of the hydrologic framework are presented in Chapter 3.0. The sources of information and data that are presently available are identified in Chapter 4.0. The usability and limitations of the data, and the criteria used to screen these data are summarized in Chapter 4.0. The compositional characteristics of groundwater background based on the screened data set, and an evaluation of these data in terms of the conceptual model, are presented in Chapter 5.0. A summary of findings resulting from this status report, conclusions, and recommendations regarding the necessity and/or utility of further activities and/or data collection efforts are presented in Chapter 6.0. References used throughout the document are listed in Chapter 7.0.

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2.0 DATA QUALITY OBJECTIVES AND THE HANFORD SITE-WIDE APPROACH TO CHARACTERIZATION OF GROUNDWATER BACKGROUND

The following sections address DQOs and the Hanford Site-wide approach to characterization of groundwater background.

2.1 DATA QUALITY OBJECTIVES

The DQOs are qualitative and quantitative parameters that specify the data quality that is required for a given purpose during remedial response activities. The purpose of DQOs is to ensure that the data that are collected and/or used are appropriate, and have an appropriate level of quality, for the intended use. The development of DQOs is mandated for use by the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1990) for essentially all data collection efforts on the Hanford Site. The DQOs are an integral part of this report because the evaluation of available data is an integral component of the initial stage of the DQO process, together with identification of objectives and decisions, and development of a conceptual model. The basic elements of the DQOs used in this data compilation, screening, and evaluation effort are summarized in the following sections.

2.1.1 Objectives and Use of Data

The primary objective of this study is to characterize the range of groundwater compositions that exist naturally in the unconfined aquifer beneath the Hanford Site. Data considered in this report include major, minor, and selected trace nonradioactive chemical components. This characterization effort includes the following recognition and documentation of compositional trends as a function of:

- Lateral distance from surface recharge areas
- Spatial distribution across the Hanford Site
- Depth within the aquifer
- Various water-rock reaction indices
- Other compositional parameters.

The objectives also include the identification of the natural processes that are known or suspected to affect the composition of groundwater in the unconfined aquifer beneath the Hanford Site, and to evaluate the compositional data on the natural groundwater in the context of these processes.

These data are to be used primarily as a baseline for defining groundwater contamination. These data also are to be used as a baseline for evaluating the significance of contamination, including the assessment of risk to human health, as a baseline for guiding the decisions and activities for environmental restoration on the Hanford Site. These data also will be used in the evaluation and revision of the geochemical conceptual model for groundwater beneath the Hanford Site. The information in this study also is

intended to be used as a technical basis for recommending new well sites and data collection efforts, and for the purpose of establishing Hanford Site-wide groundwater background for environmental restoration efforts.

2.1.2 Data Users

The primary users of these data are the U.S. Department of Energy (DOE) and its contractors, the environmental regulatory agencies and other government agencies [EPA, Ecology, United States Geologic Survey (USGS)], and other organizations involved in the use of groundwater background compositional data at the Hanford Site.

2.1.3 Data and Information Types

There are three primary categories of information compiled and evaluated in this report: (1) quantitative compositional data on groundwater, (2) leachate compositions from rock-water interaction tests, and (3) quantitative and qualitative information on the processes that potentially impact groundwater chemistry beneath the Hanford Site. The second category includes characterization of the processes controlling the evolution of groundwater under the Hanford Site, including the manner in which these processes are expected to occur and to be manifested in the aquifer.

2.1.4 Data and Information Sources

Quantitative compositional data on Hanford Site groundwater considered in this report are from four sources: (1) the Hanford groundwater database, (2) the Basalt Waste Isolation Project (BWIP) database, (3) the USGS data, and (4) selected data on groundwater from test wells available through Pacific Northwest Laboratory (PNL).

Supporting information includes compositional data on the aquifer materials, the results of testing and modeling, data and information from the scientific literature, and DOE-sponsored reports.

2.1.5 Conceptual Models

Two types of conceptual models are used in conjunction with this effort. The general physical descriptive model for the hydrologic system and its characteristics (DOE 1988) are used as a framework for the flow dynamics of the aquifers beneath the Hanford Site. A qualitative descriptive model in which the chemical composition of groundwater beneath the Hanford Site is expected to change and vary within the aquifer also was developed for this effort (WHC 1991a) and is summarized in Chapter 4.0. This geochemical conceptual model addresses the roles of the many natural processes that influence the composition of the groundwater. An evaluation of this conceptual model in the context of the available data and a revision of the model are presented in Chapter 5.0

2.1.6 Data Quality Needs

Stringent acceptance criteria were applied to the screening of Hanford Site groundwater data to ensure that only background data were used in this evaluation. Although this level of data screening severely reduced the amount of data used, the screening yielded a valuable data set to ensure that: (1) the geochemical conceptual models were evaluated against uncontaminated groundwater compositions and (2) provisional groundwater background threshold levels were based on uncontaminated groundwater data. The primary criteria used in this screening process were based on the necessity to ensure representative, complete, and comparable data. Because these data were all collected for other purposes, some DQOs were necessarily emphasized at the expense of others. The DQOs used to ensure that the data were representative of uncontaminated groundwater, for example, impacted representativeness and completeness in terms of spatial distribution and coverage. The former aspect of representativeness, however, was regarded as inviolate for the purpose of this study. In addition, certain quantitative indicators of data quality, such as tritium content and charge balance, were weighted more heavily than general default DQOs, such as the use of data exclusively from RCRA-compliant wells. This approach is consistent with the DQO process that provides for the use of data to the maximum extent possible.

The general DQO criteria considered in this study include the following:

- Lateral and vertical coverage
- The distinction between data representing natural groundwater and anthropogenically influenced groundwater (e.g., artificial recharge)
- The numbers and types of samples appropriate for evaluating the various natural process impacts
- Well selection and sampling criteria
- Data quality control.

Data from the sources identified in Chapter 4.0 across the Hanford Site were evaluated and screened against the following specific criteria:

- Groundwater monitoring database samples analyzed since December 31, 1984
- Samples from intact wells open to the aquifer
- Wells located away from contaminated plumes or zones of artificial groundwater recharge
- Groundwater free of anthropogenic contaminants
- Tritium levels $\leq$ 500 picocuries per liter

- Absence of any anomalously large concentration levels, particularly those of known Hanford Site groundwater contaminants (e.g., nitrate)

- Samples obtained from wells using a submersible pump with prior purging, and using existing sampling procedures

- Groundwater analyses with good charge balance, where sufficient information exists.

These criteria are discussed in more detail in Chapter 3.0

2.2 SITE-WIDE APPROACH TO THE CHARACTERIZATION OF GROUNDWATER BACKGROUND

One of the most important DQOs for data on groundwater background is that the data represent the range of compositions that exist naturally in the aquifer. The information in this report is intended to serve as a baseline for the characterization of natural background on the scale of the aquifer at the Hanford Site (i.e., Site-wide scale), because natural variations in groundwater composition exist on the scale of the aquifer laterally and vertically.

The most common method of defining groundwater contamination at WMUs is to evaluate the compositions of potentially contaminated groundwater by comparing groundwater compositions from downgradient wells to the composition of groundwater from wells upgradient of the WMU, i.e., local background composition. In general, this WMU-based (unit-based) approach is well suited to monitoring waste releases. At the Hanford Site, this approach results in the establishment of a local reference background for each WMU.

However, there are several problems with this approach for purposes of environmental restoration. These problems include the following:

- Establishment of different background levels results in multiple definitions of groundwater within the same aquifer. Because groundwater beneath the Hanford Site is one system, this approach is scientifically unjustified. This problem is exacerbated where background is defined differently for WMUs that are adjacent or superimposed, such as when a RCRA treatment, storage, and/or disposal unit is located within or next to a CERCLA operable unit.

- Inconsistencies in identifying contamination and in decisions regarding monitoring or the extent of remediation that is necessary or feasible, owing to establishment of multiple background levels.

- Inefficient and costly use of resources resulting from the inconsistencies in identifying contamination and attendant remedial response decisions.

- Misidentification of contamination. Groundwater in upgradient wells, defined as uncontaminated from the local WMU perspective, might be contaminated from other operations at the Hanford Site. This might be

acceptable for monitoring in some cases, but it is inappropriate for use as natural background.

- Sampling from only the upper portion of the aquifer. Much of the groundwater data collected from monitoring wells across the Hanford Site is from the uppermost part of the unconfined aquifer, which has been impacted by large amounts of water pumped from the Columbia River and discharged into the aquifer over the past 40 years (artificial recharge). Although this water might not be contaminated, it does not represent natural groundwater background.

- The unit-based approach has no provisions for the characterization or consideration of the range of compositions that exist naturally within the aquifer, or for the scale required for representative characterization data.

- Groundwater contamination typically impacts the aquifer beyond the lateral dimensions of a WMU and the WMU monitoring wells

- Environmental restoration activities for groundwater generally are evaluated and performed on the scale of the aquifer rather than on the scale of individual WMUs, which would require characterization on the scale of the remedial action.

In light of these concerns, a Site-wide approach to the characterization of groundwater background has been proposed as an alternative to a unit-based background for purposes of environmental restoration (WHC 1991a). The main difference between the Site-wide and the unit-based approach to the characterization of groundwater background is that the data used to establish groundwater background are not restricted to groundwater compositions from upgradient wells at individual WMUs. Instead, data from groundwater laterally and vertically within the aquifer (at the Hanford Site) and on the scale of the aquifer would be used to evaluate the range of compositions that exist naturally within the aquifer, for the purpose of establishing groundwater background maxima or thresholds. This approach is more appropriate for the characterization of natural background because natural variations in groundwater composition exist on the scale of the aquifer as a result of many natural processes. In general, only groundwater contaminated above the levels of Site-wide background would require consideration for risk assessment or remedial action.

The rationale for this approach is that it provides for and requires the use of data that more accurately represent natural background, and that are more appropriate for their intended use, characterization of natural background. These and other DQOs are incorporated into the development and use of a geochemical conceptual model that includes data and information on the hydrologic framework of the aquifer, and on the natural and anthropogenic processes that influence groundwater composition laterally and vertically within the aquifer. The Site-wide approach also is more appropriate from a regulatory perspective, because it is the only approach to the characterization of natural groundwater background that can be justified in

the context of the DQO methodology, which is mandated for use by the Tri-Party Agreement (pp. 6-8).

The primary benefits of a Site-wide groundwater background are that the background can provide: (1) compositional data that more accurately represent natural background than any subset of the background array or data set from an upgradient well and (2) a consistent basis for defining groundwater contamination throughout the aquifer, particularly in parts of the aquifer impacted beyond the boundaries of individual WMUs and/or by unknown sources. Thus, the Site-wide approach can provide greater efficiency in the environmental restoration activities by minimizing the misidentification of uncontaminated samples as contaminated, and also by minimizing the allocation of resources for remediation of contamination within the range of natural background that poses no increased risk to human health and the environment. Additional discussion on the unit-based and Site-wide approaches to the characterization of groundwater background are presented in other publications (WHC 1991a).

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3.0 HYDROCHEMICAL PRINCIPLES AND HYDROGEOLOGY OF THE HANFORD SITE

This chapter provides a general introduction to some well-established hydrochemical and hydrologic principles, followed by a brief description of the geology and geochemistry of the Hanford Site. The goal is to provide a fundamental understanding of the factors influencing groundwater composition, and apply this knowledge toward understanding the hydrology of the Hanford Site.

3.1 GENERAL PROCESSES AND CONTROLS ON GROUNDWATER COMPOSITION

The general nature of groundwater is controlled by fundamental geochemical properties and principles that are operative in all aquifer systems. Only a few processes commonly control the composition of groundwater, and these are specific to the particular characteristics of the hydrologic regime and the aquifer system. Discussions of natural groundwater compositions usually only address inorganic elements, because the great majority of dissolved substances are inorganic in nature.

Most inorganic substances that occur in groundwater are dissolved ions, whose behavior is controlled by general geochemical properties. These principles are based on equilibrium concepts that establish boundary conditions for the chemical processes, and provide a quantitative framework for evaluation of the system (Freeze and Cherry 1979, pp. 81-82). These principles include solubility controls, dissolution, disassociation, ion exchange, and oxidation-reduction processes.

Major factors influencing groundwater chemistry involve a sequence of processes and reactions that occur as water interacts with the natural environment (Figure 3-1). These interactions range from controls on source water composition to the reactions that occur between water and the environment before and after entering an aquifer system. There are commonly many components within these events, but most aspects of groundwater composition are controlled by the following:

- Initial composition of the water
- Composition and characteristics of the geologic reactant material
- Type of reactions (e.g., dissolution, oxidation-reduction)
- Degree of reaction (i.e., length of time reaction occurs)
- Conditions of the system (e.g., temperature, available oxygen and carbon dioxide, pH, microbial activity).

Most groundwater originates as either meteoric water (i.e., rain or snowmelt) or surface water (i.e., rivers, streams, springs, or other aquifers). Meteoric waters typically contain few dissolved solids and have compositions that generally vary with the distance that the water has migrated

from its source. Surface waters, however, usually contain higher levels of dissolved solids, as a result of reacting with rocks before entering the aquifer system. The amount of dissolved solids in these surface waters can vary greatly because of the effects of the controlling factors identified previously.

Before entering and recharging an aquifer, most waters react with the rock and/or sediment as the waters pass through the unsaturated zone. Because geologic materials are the primary source of dissolved solids, reactions between water and these materials before and after entering the aquifer are the primary controls on groundwater composition. Each of these geologic solids have a specific chemical composition or range of compositions, as well as specific physical properties that control the nature and extent of their reactions with water. These reactions result in a wide range of concentrations of dissolved inorganic constituents.

Most reactions between water and geologic materials involve dissolution and/or transfer of chemicals from the solid materials into the water. These reactions result in partial or total dissolution of the solid material and/or transformation of the solid into a new secondary solid, with the attendant release of certain chemicals into the water. The type and extent of reaction depends on the composition of the reactants (both water and solid) and the specific conditions under which the reaction occurs, as presented previously. The primary physical controls governing these reactions relate mostly to the conditions of the solid phase, which include the effective surface area and the nature and extent of flow through the media.

The surface area available for reaction and the initial rate of reaction for a porous medium are determined by grain size and their degree of cementation, and for a solid medium as determined by the size and number of fractures. The extent of reaction, which is dependent on the time available for reaction, is determined by the physical characteristics of the system. These include the properties of porosity, permeability, and hydraulic gradient, which together determine flow rate (hydraulic conductivity). The flow conditions of the system are important for two reasons: (1) the reactions that control groundwater chemistry can vary in extent, type, and sequence depending on the residence time (i.e., the time available for reactions to occur), and (2) water composition resulting from reactions in closed systems differs from those in systems where the aquifer system is flushed of early reaction products. All of these factors contribute to a series of reactions that occur over time within the aquifer system. Rock-water interaction can, therefore, result in a wide range of groundwater compositions that reflect differences in the physical and/or compositional characteristics between aquifer systems, heterogeneities within aquifer systems, and normal evolution of groundwater with residence time in the aquifer.

Normal evolution of groundwater in an aquifer system is attributable to the sequence of reactions that occur over time (reaction path). The reaction sequence typically involves processes, such as the dissolution of solids, solubility controls, phase changes, and cation exchange, that largely control changes in groundwater composition with time and spatial position within the

aquifer. For example, minerals dissolve or precipitate in the system depending on their relative stability under specific conditions (e.g., temperature, pressure, and water composition). Changes in phase relationships, (e.g., the stability of a new mineral or changes in the relative solubilities of reactants) are part of the normal evolution of aquifer systems. These reaction paths largely represent a series of reaction steps that occur as the system attempts to attain stable equilibrium conditions.

Although the chemical characteristics of groundwater in an aquifer system reflect site-specific reaction paths and aquifer characteristics, there are general compositional patterns seen in most aquifer systems that can serve as a basis for understanding the type of rock-water interaction and its role in the evolution of groundwater compositions.

3.2 COMPOSITIONAL CHARACTERISTICS OF AQUIFER SYSTEMS

The general characteristics in groundwater chemistry, reaction path, oxidation-reduction conditions, microbial processes, and carbonate stability are discussed in the following sections.

3.2.1 General Characteristics

Systematic variations in groundwater chemistry generally exist in large sedimentary basins due to differences in residence time of water in the aquifer and to the extent to which groundwater flushing occurs (open-system behavior). The concentrations of dissolved solids of most major ions normally increase with time, as groundwater moves along its flow path in the saturated zone. As noted previously, this process is the result of the effects of rock-water interaction and increased residence time. Shallow groundwater in recharge areas generally has lower concentrations of dissolved solids than older, more evolved water in shallow zones farther from recharge areas, or groundwater deeper in the system (Freeze and Cherry 1979).

Vertical zonation of aquifers in large sedimentary basins commonly results from the influence of two different groundwater systems, open and closed. Open system behavior occurs in the upper portion of the aquifer, and usually results in groundwater with lower concentrations of dissolved solids and bicarbonate (HCO_3^-) as the dominant anion. This behavior is the result of flushing the upper portions of the aquifer, which both decreases the reaction time and leaches the rocks of easily-dissolved solids. Systematic compositional variations related to this process commonly are manifested as vertical zonation within the upper portion of the aquifer system. Conversely, total dissolved solids contents are greater where groundwater circulation is less active (i.e., in deeper, older parts of an aquifer system). The highest concentrations of total dissolved solids, and the anions chlorine (Cl^-) and sulfate (SO_4^{2-}), generally occur in the parts of an aquifer that behave more like closed systems, where the contributions of highly soluble minerals such as salts are not flushed from the system (i.e., deeper zones). These

open-closed system relationships can occur anywhere in the system under appropriate conditions.

3.2.2 Reaction Path

Geologic materials in aqueous systems dissolve or precipitate depending on their relative stability under given conditions of temperature, pressure, and water composition. Changes in phase relationships (stability of minerals in an assemblage) and changes in the relative solubilities of reactants normally occur with reaction progress in natural systems. These reaction paths largely represent a series of reaction steps, taken by the system as it attempts to attain stable equilibrium conditions. Equilibrium conditions might be reached or closely approximated for some constituents, but are seldom attained for others, owing to sluggish phase changes or other kinetic effects. A common feature of the evolutionary sequence of groundwater composition with residence time is the alteration or reversal of apparent compositional patterns with reaction progress due to the effects of cation exchange, changes in phase relationships, or local redox conditions (Freeze and Cherry 1979). These relationships are illustrated in Figure 3-2.

3.2.3 Reduction-Oxidation

The conditions of the aquifer system can be affected by the amount of dissolved gases (e.g., oxygen) that are present in, or are readily available to, the groundwater, and/or the nature and type of redox buffers that are present in the system (e.g., Fe^{2+}/Fe^{3+} mineral species). The solubility of most cations is smaller under oxidizing conditions than under reducing conditions which accounts in part for the relatively low concentrations of dissolved solids in well aerated surface waters. Reducing conditions influence the phase relationships and increase the relative solubilities of other cations in groundwater; however, the solubility of some constituents such as uranium decrease under reducing conditions. Reducing environments, commonly characterized by depleted oxygen content or negative electrode potential (Pt/Hg calomel) of <-100 millivolts, can result in either solubilization of metals or precipitation. Manganese and iron, for example, are released to solution under reducing conditions as Fe^{2+} and Mn^{2+}, while uranium generally is insoluble. This accounts for the extremely low concentrations of uranium observed in the deeper (anoxic, <100 millivolts) confined aquifer system beneath the Hanford Site (Smith et al. 1989).

3.2.4 Microbial Processes

The effects of microbial processes also can have important influences on groundwater composition by catalyzing inorganic processes such as mineral dissolution and precipitation through the metabolization of organic carbon. Typical and abundant bacteria, metabolizing and oxidizing organic carbon as a source of energy, require a complimentary compound to accept the free electrons resulting from this process. Where dissolved oxygen is present, bacteria use it as an electron acceptor, and excrete carbon dioxide; bacteria

thus deplete the aqueous system in dissolved oxygen and enrich it in carbon dioxide, creating anaerobic zones. Where oxygen is absent, other compounds are used as electron acceptors: Fe3+ might be reduced to more soluble Fe2+, or sulfate might be reduced to sulfide. Carbon dioxide is manufactured also from organic matter oxidized in these ways. Where no electron acceptor is available, fermentation (the incomplete oxidation of organic matter) might occur, resulting in the release of such compounds as methane. These microbial metabolic processes might have a pronounced effect on solid and liquid phases in an aquifer. Depletion of oxygen will create anaerobic conditions. Reduction of aqueous species might speed dissolution, as in the case of ferric oxides; alternatively, the reduction of uranium will severely limit its solubility. Production of carbon dioxide lowers pH and enhances dissolution of many minerals, while reduction of sulfate might lead to the precipitation of pyrite. The importance of microbes in determining aqueous chemistry might be determined or inferred from investigating the affected aqueous species, including key stable isotope ratios, and concentrations of dissolved oxygen, pH, and redox-sensitive ions such as sulfate/sulfide, nitrate/nitrite, and ferrous/ferric iron.

3.2.5 Carbonate Stability

The extent of equilibrium with respect to calcite is important because of the influence of calcite dissolution or precipitation on groundwater composition. The concentration of bicarbonate affects pH, which is a major determinant of solubility and reaction rate controlling precipitation of secondary minerals and dissolution of solid phases. In addition, bicarbonate strongly complexes some metal ions including uranyl (UO_2^{2+}), enhancing their mobility. Dissolution and or precipitation of minerals, including calcite, also might affect permeability within the aquifer. The effects of carbonate stability can be influenced locally by reaction with gases such as carbon dioxide in air, which can cause the composition of groundwater at an interface with air or in recharge zones to differ from that elsewhere in the aquifer.

Most of these processes and considerations were incorporated into a conceptual model to provide a framework and working model for understanding the processes and parameters that affect the composition of groundwater in the unconfined aquifer in the Pasco Basin, and to also guide the compilation of data and information for this purpose. The original conceptual model developed for evaluation of groundwater background for the Hanford Site (WHC 1991a) is summarized briefly in the following section. A revised conceptual model based on the data, information, and evaluations presented here is presented in Chapter 5.0, Section 5.3.

3.3 PRELIMINARY CONCEPTUAL MODEL FOR GROUNDWATER BACKGROUND

The conceptual model for evaluation of groundwater background for the Hanford Site (WHC 1991a) proposed that the groundwater underlying the Hanford Site could be treated as one system, because the aquifer constitutes one natural system. The primary justifications for this approach are as follows.

- Natural variations exist in the composition of groundwater within the unconfined aquifer beneath the Hanford Site.

- The compositional variability is due to systematic natural processes that control the distribution and range of compositions.

- The natural variability in groundwater composition occurs on the scale of the aquifer both laterally and vertically.

As discussed in Section 3.1, groundwater chemistry is influenced by recharge, mixing with other aquifers, and water-rock-air interactions. Because the unconfined aquifer consists predominately of similar materials throughout the Hanford Site, the rock-water reactions that control the hydrochemistry also should be similar. Thus, groundwater background is a range of compositions resulting from natural processes involving rock-water interaction and aquifer mixing.

For the purposes of environmental restoration, the upper concentration of the range of natural background is of great importance. The conceptual model considered the processes of water-rock reaction to be the predominant influence on groundwater composition. These processes progress over time, but are limited at the maximum range of concentrations by equilibrium conditions. These conditions should cause the concentrations to converge toward largely constant levels (Section 3.1).

Lateral and vertical variations in groundwater compositions also were taken into account in the conceptual model for groundwater. For lateral variation, the effects of time on groundwater compositions might be significant, especially in dynamic aquifers such as the unconfined aquifer underlying the Hanford Site. The lowest concentrations of dissolved solids normally would be expected to occur near recharge areas, and the highest would be expected to occur in waters with the longest residence time in the aquifer, i.e., water farthest downgradient from the recharge zone. Vertical variation might be influenced by stratigraphic or structural controls on flow conditions, effects of gasses on the composition of the top portion of the aquifer, and mixing with other aquifers and surface waters. A more detailed description of this provisional model is described elsewhere (WHC 1991a).

This provisional model guided early development of the groundwater background study and the compilation of the data and information presented here. Examination of existing data for this study has led to refinement of these assumptions and the development of an expanded conceptual model for the evolution of natural groundwater background compositions, which is presented in Chapter 5.0, Section 5.3.

3.4 REGIONAL GEOLOGY AND HYDROCHEMISTRY

The most basic elements of the conceptual model for understanding the groundwater chemistry in an aquifer are the physical characteristics of the hydrologic regime. The regional geology and hydrologic characteristics of the aquifers beneath the Hanford Site are summarized in this section to provide

the framework for understanding the structural and geological controls on the aquifers and their influences on groundwater composition. An overview of the regional geology and a description of the primary geologic units that comprise the uppermost aquifers are provided in this section.

3.4.1 Regional Geology

The Hanford Site lies in the Pasco Basin, which is a structural depression bounded by anticlinal ridges on the north, west, and south and a monocline on the east. The Pasco Basin is divided by the Gable Mountain anticline into the Wahluke syncline to the north and the Cold Creek syncline to the south. The Hanford Site is underlain by Miocene-aged basalt of the Columbia River Basalt Group and late Miocene to Pleistocene suprabasalt sediments. The basalts and sediments thicken into the Pasco Basin and generally reach maximum thicknesses in the Cold Creek syncline, along the west-central part of the Hanford Site. Older Cenozoic sedimentary and volcaniclastic rocks underlying the basalts are not exposed at the surface near the Hanford Site.

Late Miocene to Quaternary sediments unconformably overly the basalts. Most of this sedimentary sequence can be divided into two main groups: rocks belonging to the Ringold Formation and those of the Hanford formation. The uppermost aquifer at the Hanford Site is primarily in the Ringold Formation, which has a fluvial-lacustrine (river-lake) origin, and was deposited during the late Miocene and Pliocene. The majority of the vadose (unsaturated) zone occurs in the Hanford formation, which was deposited in a glaciofluvial (glacier and river activity) environment mainly during the Pleistocene age. Plio-Pleistocene sediments occur between the Ringold and Hanford formation sediments. Quaternary alluvium and wind-blown deposits form a discontinuous veneer over the region.

3.4.2 Stratigraphy

Because most of the unconfined aquifer occurs within the Ringold Formation, the following more detailed discussion deals mostly with those rocks. A short discussion of the basalt (confined aquifer) and Hanford formation (vadose zone) is provided.

3.4.2.1 Columbia River Basalt Group. The Columbia River Basalt Group consists of an assemblage of tholeiitic, continental flood basalts of Miocene age. These flows cover an area of more than 63,000 square miles (163,700 square kilometers) in Washington, Oregon, and Idaho and have an estimated volume of about 40,800 cubic miles (174,356 cubic kilometers) (Tolan et al. 1989). Isotopic age determinations indicate that basalt flows were erupted approximately 17 to 6 million years ago, with more than 98 percent by volume being erupted in a 2.5 million-year period (17 to 14.5 million years ago) (Reidel et al. 1989). The most recent information on the Columbia River Basalt Group is presented by Reidel and Hooper (1989).

3.4.2.2 Ringold Formation. The fluvial-lacustrine Ringold Formation was deposited in generally east-west trending valleys by the ancestral Columbia River and its tributaries in response to development of the Yakima Folds. The Ringold Formation at the Hanford Site is up to 600 feet (185 meters) thick in the deepest part of the Cold Creek syncline, and 560 feet (170 meters) thick in the western Wahluke syncline. This formation pinches out against Gable Mountain, Yakima Ridge, Saddle Mountains, and Rattlesnake Mountain anticlines.

The Ringold Formation consists of semi-indurated clay, silt, pedified mud, fine- to coarse-grained sand, and granule to cobble gravel that usually are divided into the following units: (1) gravel, sand, and paleosols of the basal unit; (2) clay and silt of the lower unit; (3) gravel of the middle unit; (4) mud and lesser sand of the upper unit; and (5) basaltic detritus of the fanglomerate unit (Newcomb 1958; Newcomb et al. 1972; Myers and Price 1979; Bjornstad 1984; DOE 1988). Ringold strata also have been divided on the basis of facies types (Tallman et al. 1981) and fining upwards sequences (PSPL 1982). All of these stratigraphic divisions are of limited use because the divisions are too generalized to account for marked local stratigraphic variation or were defined in detail for relatively small areas (Lindsey and Gaylord 1989). The Ringold Formation is late Miocene to Pliocene age (Fecht et al. 1987; DOE 1988).

Recent studies of the Ringold Formation (Lindsey and Gaylord 1989; Lindsey 1991) indicate that it is best described and divided on the basis of sediment facies associations and their distribution. Facies associations in the Ringold Formation (defined on the basis of lithology, petrology, stratification, and pedogenic alteration) include fluvial gravel, fluvial sand, overbank deposits, lacustrine deposits, and basaltic gravel. The lower half of the Ringold Formation contains five separate stratigraphic intervals dominated by fluvial gravels. These gravels, designated units FSA, FSB, FSC, FSD1, and FSE (Figure 3-3), are separated by intervals containing deposits typical of the overbank and lacustrine facies associations. The uppermost gravel grades upwards into interbedded fluvial sand and overbank deposits, which are in turn overlain by a second lacustrine interval.

3.4.2.3 Hanford formation. The Hanford formation consists of deposits of gravel, sand, and silt. The gravel deposits range from well sorted to poorly sorted. The Hanford formation is commonly divided into two informal members: the Pasco gravels and the Touchet beds (Myers and Price 1979; Tallman et al. 1981; Fecht et al. 1987; DOE 1988). The Pasco gravels generally correspond to the gravelly facies, and the Touchet beds to the sandy to silty facies. The Hanford formation is thickest in Cold Creek in the central portion of the Hanford Site, where it is up to 210 feet (65 meters) thick. Hanford formation deposits are absent on ridges above approximately 1,180 feet (360 meters) above sea level.

3.4.2.4 Other Sedimentary Units. Overlying the Ringold Formation in the western Cold Creek syncline is a Plio-Pleistocene unit, which is up to 82 feet (25 meters) thick and separated into two facies: (1) basaltic detritus and (2) pedogenic calcrete. Depending on the location one or both facies might be present. The calcrete facies generally consists of interfingering carbonate-rich silt and sand and carbonate-poor silt and sand. The basaltic

detritus facies consist of weathered and unweathered basaltic gravels deposited as locally derived slope wash, colluvium, and sidestream alluvium.

Overlying this Plio-Pleistocene unit in the western Cold Creek syncline is an early 'Palouse' soil, which consists of up to 65 feet (20 meters) of silt and fine-grained sand (Tallman et al. 1981; Bjornstad 1984; DOE 1988, vol. 1, pp. 1.2-129). These strata are very similar to loess deposits in character and are interpreted to be of eolian origin. The unit is distinguished from overlying slackwater flood deposits by greater calcium carbonate content and high natural gamma response in geophysical logs (Bjornstad 1984). The upper contact of the unit is poorly defined and it might grade upward into the lower part of the Hanford formation.

Underlying the Hanford formation in the east-central Cold Creek syncline and at the east end of Gable Mountain anticline is a sequence of sediments called the pre-Missoula gravels (PSPL 1982). These sediments consist of quartzose to gneissic clast-supported pebble to cobble gravels with a quartzo-feldspathic sand matrix. The sediments are up to 82 feet (25 meters) thick, and contain less basalt than the underlying Ringold gravels and overlying Hanford deposits. The nature of the contact between the pre-Missoula gravels and the overlying Hanford formation is not clear. In addition, it also is unclear whether the pre-Missoula gravels overlie or interfinger with the early 'Palouse' soil and Plio-Pleistocene unit.

Holocene surficial deposits consist of silt, sand, and gravel that form a thin [<16 foot (4.9 meter)] veneer across much of the Hanford Site. These sediments were deposited by a mix of eolian and alluvial processes.

A more detailed discussion of Hanford Site stratigraphy is presented in Delaney et al. (1991, pp. 2-1 to 2-16).

3.4.3 Hydrology of the Hanford Site

The hydrology of the Pasco Basin is characterized by a number of surface sources and aquifers, associated with both the basalts and the suprabasalt sediments. The basalt aquifers consist of the tholeiitic flood basalts of the Columbia River Basalt Group and relatively minor amounts of intercalated fluvial and volcaniclastic sediments. The upper most aquifer system occurs within the fluvial, lacustrine, and glaciofluvial suprabasalt sediments. This aquifer is regionally unconfined and is contained largely within the Ringold Formation and the Hanford formation.

3.4.3.1 Surface Hydrology. Surface drainage enters the Pasco Basin from several other basins, including the Yakima River Basin, Horse Heaven Basin, Walla Walla River Basin, Palouse/Snake Basin and Big Bend Basin. Within the Pasco Basin, the Columbia River is joined by major tributaries including the Yakima, Snake, and Walla Walla Rivers. Two intermittent streams, Cold Creek and Dry Creek, cut through the Hanford Site. Water drains through these pathways during the wetter winter and spring months. No perennial streams originate within the Pasco Basin.

The total estimated precipitation over the Pasco Basin averages less than 6.3 inches (16 centimeters) per year. Mean annual run-off is estimated to be less than 2.5 x 10^4 acre-feet per year, or approximately 3 percent of the total precipitation. The remaining precipitation is assumed to be lost through evapotranspiration, with a small component (perhaps less than 1 percent) contributing to recharging of the groundwater system (DOE 1988, vol. 2, p. 3.1-6).

Primary surface-water features associated with the Hanford Site are the Columbia and Yakima Rivers and their major tributaries, the Snake and Walla Walla Rivers. West Lake, about 10 acres (4.0 hectares) in size and less than 3 feet (0.9 meter) deep, is the only natural lake within the Hanford Site. Waste water ponds, cribs, and ditches associated with nuclear fuel reprocessing and waste disposal activities also are present on the Hanford Site.

3.4.3.2 Subsurface Hydrology. Groundwater occurs both within the upper unconfined aquifer system and within a system of deeper confined to semiconfined aquifers in the basalt flow tops, flow bottom zones, and sedimentary interbeds (DOE 1988, vol. 2, pp. 3.6-1). These deeper aquifers are intercalated with aquitards, consisting of basalt flow interiors. Vertical flow across the aquitards within the basalt aquifer system is inferred from water level or potentiometric surface data, but the leakage is not quantified and direct measurements are not available (DOE 1988, vol. 2, p. 3.6-17). The multiaquifer system within the Pasco Basin has been conceptualized as consisting of four primary geohydrologic units: (1) suprabasalt Hanford and Ringold Formation sediments, (2) Saddle Mountain Basalt, (3) Wanapum Basalt, and (4) Grande Ronde Basalt. The discussion in the following sections focuses on the suprabasalt aquifer and the uppermost aquifer within the Saddle Mountains Basalt, the Rattlesnake Ridge aquifer.

3.4.3.2.1 Uppermost Aquifer. The suprabasalt aquifer is the uppermost unconfined to semiconfined aquifer associated with the sedimentary units, and underlies all of the Hanford Site. The water table ranges in depth from surface level at West Lake and the Columbia and Yakima Rivers, to >350 feet (106.7 meters) near the center of the Hanford Site. Groundwater within this suprabasalt aquifer system is contained within the glaciofluvial sands and gravels of the Hanford formation and the fluvial-lacustrine sediments of the Ringold Formation. The position of the water table beneath the western portion of the Hanford Site is generally within the middle Ringold unit. In the northern and eastern portions of the Hanford Site, the water table is generally within the Hanford formation. Hydraulic conductivities for the Hanford formation [2,000 to 10,000 feet (609.6 to 3,048 meters) per day] are much greater than those of the middle unit of the Ringold Formation [610 to 3,050 feet (185.9 to 929.6 meters) per day] (Law et al. 1987). The effective porosity for the sediments in the unconfined aquifer ranges between 10 and 30 percent (Graham 1981). Stratigraphic divisions of these units and their hydrologic properties are discussed in detail in Delaney et al. (1991, pp. 2-5 to 2-16, pp. 3-4 to 3-26).

This suprabasalt aquifer system is approximately 500 feet (152.4 meters) thick near the center of the basin. Laterally, the aquifer system is bounded

by anticlinal basalt ridges, which extend above the water table. A generalized east-west geologic cross section showing the position of the water table and major stratigraphic units beneath the Hanford Site is presented in Figure 3-4.

The base of the uppermost aquifer generally is regarded to be the top of the basalt. On a local scale where the Ringold Formation is present, the silts and clays of the lower Ringold and the fine-grained facies of the basal Ringold form a confining layer. Thus, in the strict sense, the groundwater is unconfined above this layer and semiconfined below it.

3.4.3.2.2 Uppermost Confined Aquifer. The uppermost confined aquifer system that occurs regionally beneath the Hanford Site is contained in the uppermost basalt flows and interbeds of the Saddle Mountains Formation. The Rattlesnake Ridge interbed, which is a sedimentary unit and the principal transmissive zone within the aquifer, is generally the primary aquifer component. This aquifer is bounded above and below by the basalt flows (Elephant Mountain Member and Pomona Member, respectively). The thickness of the Rattlesnake Ridge interbed ranges from 50 to 82 feet (15.2 to 25 meters) beneath the 200 Areas and generally thickens toward the west (Graham et al. 1981, 1984). Erosional windows in the Elephant Mountain basalt confining layer exist locally, which might allow hydraulic communication between the Rattlesnake Ridge aquifer and the overlying unconfined aquifer (Graham et al. 1984).

3.4.3.3 Groundwater Recharge and Flowpaths. The general direction of groundwater flow is from the natural recharge areas west of the Hanford Site to discharge areas, primarily toward the Columbia River. Recharge of the confined basalt aquifers occurs through infiltration on the anticlinal ridges bounding the Pasco Basin and from westward flow in basalt aquifers beneath the Columbia Plateau. Sources of natural recharge to the uppermost (unconfined) aquifer system are infiltration and run-off of precipitation and run-off on the ridges bounding the Pasco Basin, infiltration from ephemeral streams, and from rivers along influent reaches of the Yakima and Columbia Rivers. The movement of precipitation through the unsaturated (vadose) zone has been studied at several locations on the Hanford Site (Gee 1987; Routson and Johnson 1990; Rockhold et al. 1990; Fayer et al. 1991), with the general conclusions being that very little, if any, infiltration occurs where the soils are relatively fine grained and normal vegetation is present.

An added complication within the Pasco Basin is the possibility of upwelling of deep groundwater within the basalt aquifer system, as indicated by vertical profiles of chloride concentrations in the confined aquifer (DOE 1988). Figure 3-8, a cross-section through the Pasco Basin, shows vertical contours of chloride concentrations. The convex chloride concentration contours are indicative of upwelling. Whether or not this upwelling reaches the unconfined aquifer on the Hanford Site is unclear, obscured by the relatively small quantities of water that might be available from the low permeability basalts and by the wide chemical variation on the Hanford Site resulting from both natural processes and onsite operations.

Artificial recharge of the uppermost aquifer system occurs from the disposal of large volumes of waste water on the Hanford Site (principally in the 200 Areas), and from large irrigation projects surrounding the Hanford Site. Figure 3-9 is a generalized water table map for the Pasco Basin and adjacent portions of the Columbia Plateau. The water table east of the Columbia River is greatly elevated above the water table west of the river, a result of extensive irrigation in the area east of the Hanford Site. The potential for migration of agricultural contaminants under the Hanford Site as a result of this head difference in the unconfined aquifer is uncertain. The effect of artificial recharge on the Hanford Site is illustrated in Figures 3-5 and 3-6. Figure 3-5 is an approximation of the configuration of the Hanford Site water table in January 1944. Figure 3-6 is a map of the top of the water table beneath the Hanford Site in June 1989. It can be seen from these maps that effluent disposal has altered water table elevations, hydraulic gradients, and groundwater flow directions. Both water table maps show that the steeper groundwater gradients occur where the water table is located in the low permeability sediments of the Ringold Formation.

The major contaminant sources on the Hanford Site are from onsite operations in the 200 Areas and the 100 Areas. The major contaminant plumes from these areas are delineated by the distributions of tritium and nitrate, the two most mobile contaminants in Hanford Site groundwater. The aerial distribution of the tritium and nitrate plumes on the Hanford Site is shown in Figures 3-7 and 3-8. It is interesting to note that both the tritium and nitrate plumes show that the movement of contaminants originating in the 200 West Area is much less extensive than the movement of material originating in the 200 East Area. The slow movement out of the 200 West Area is a result of the location of the water table in the relatively impermeable sediments of the Ringold Formation. This slow migration occurs despite the fact that effluent discharge has raised the water table under parts of the 200 West Area as much as 80 feet (24.4 meters) (Graham et al. 1981). The contaminants from the 200 East Area, on the other hand, have moved rapidly through the highly permeable sediments of the Hanford formation. There is a correlation between the hydraulic conductivity contours in Chapter 5.0 and the tritium concentration contours on Figure 3-7. It appears likely that the migration of the southwestern edges of the tritium and nitrate plumes are controlled by the transition of the water table from the Hanford formation into the Ringold Formation.

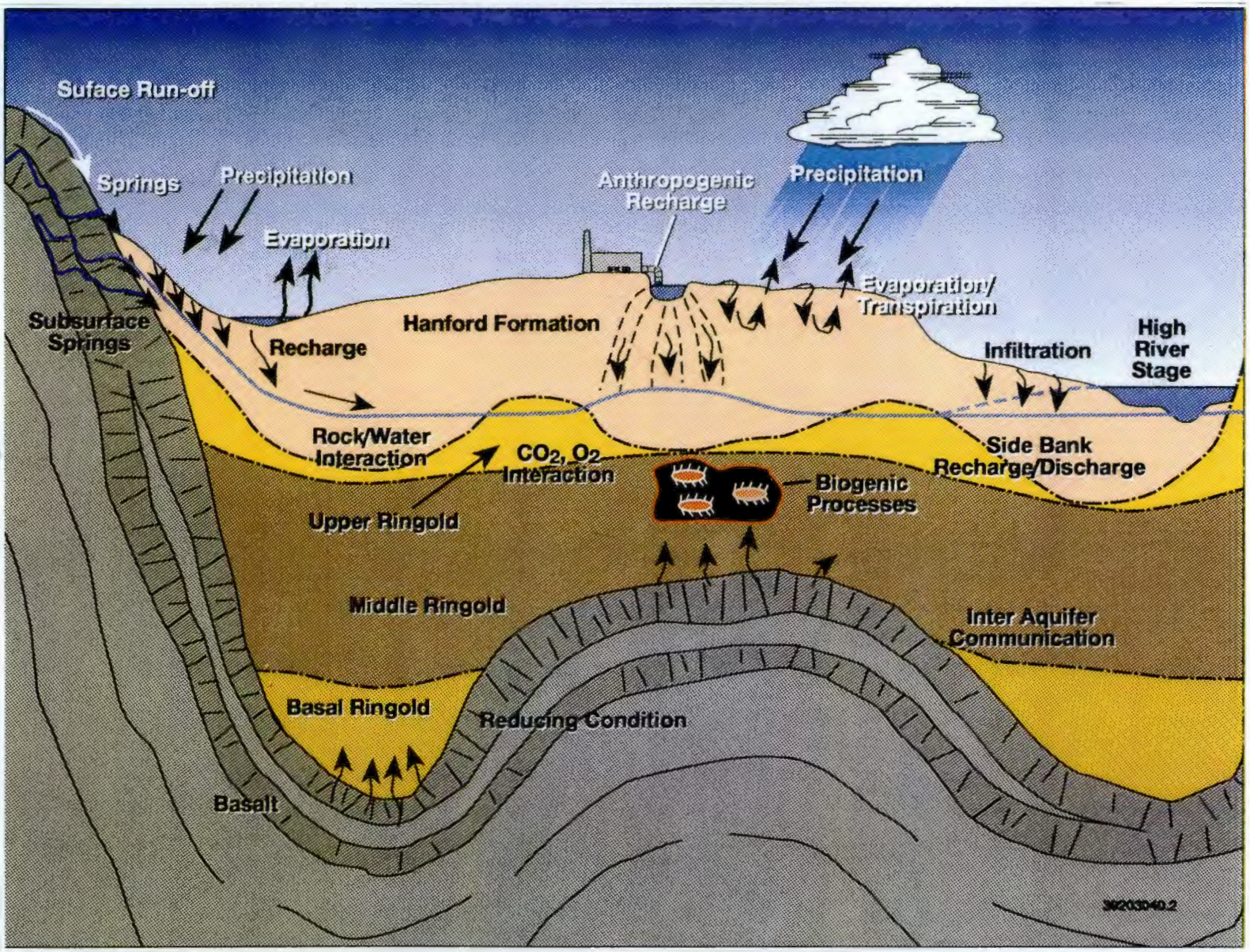

Figure 3-1. Major Processes Affecting Groundwater Composition.

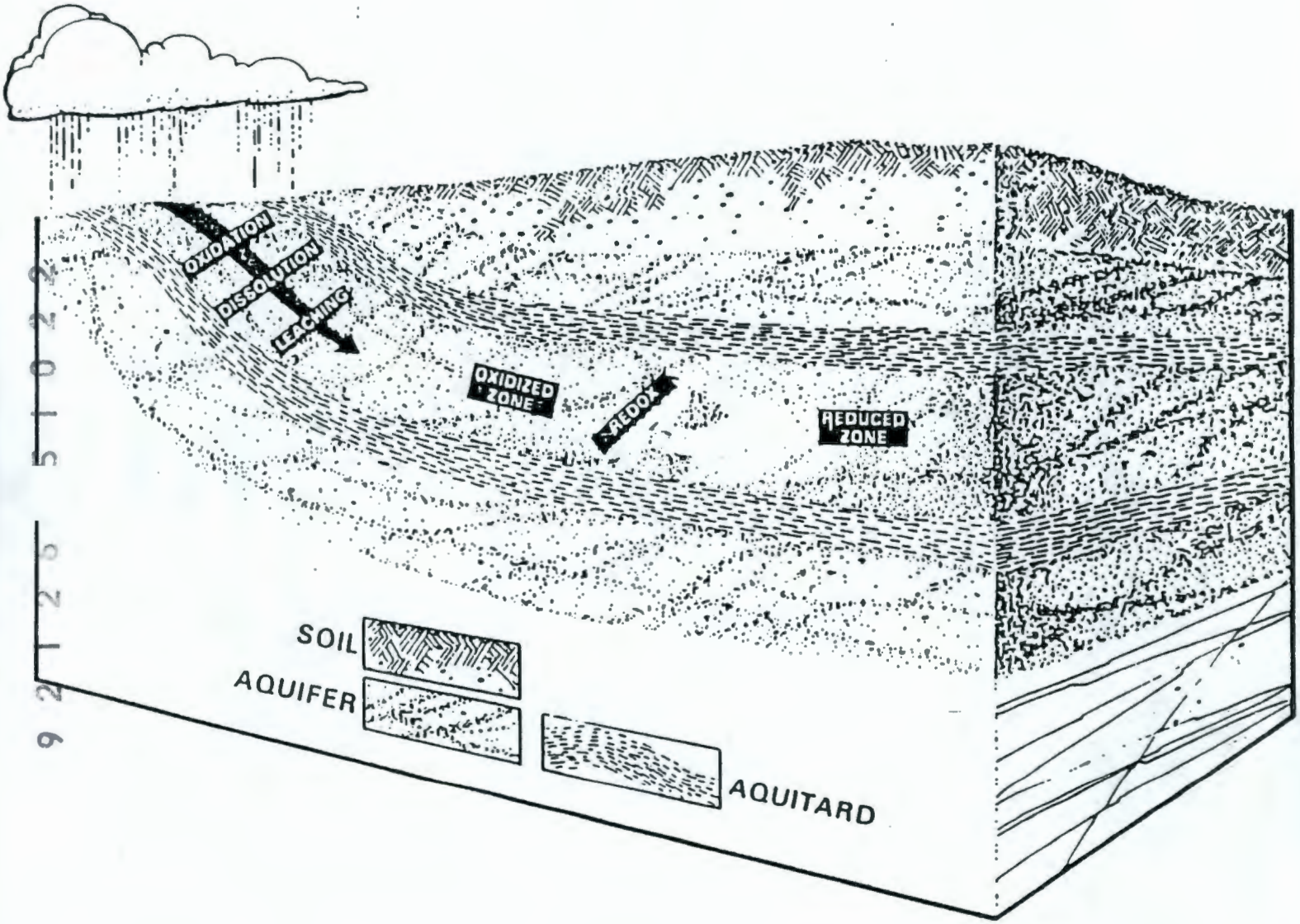

Figure 3-2. Schematic Illustration of the Typical Evolutionary Process of 'Soft' Rainwater to 'Hard' Groundwater Along its Flowpath in an Aquifer.

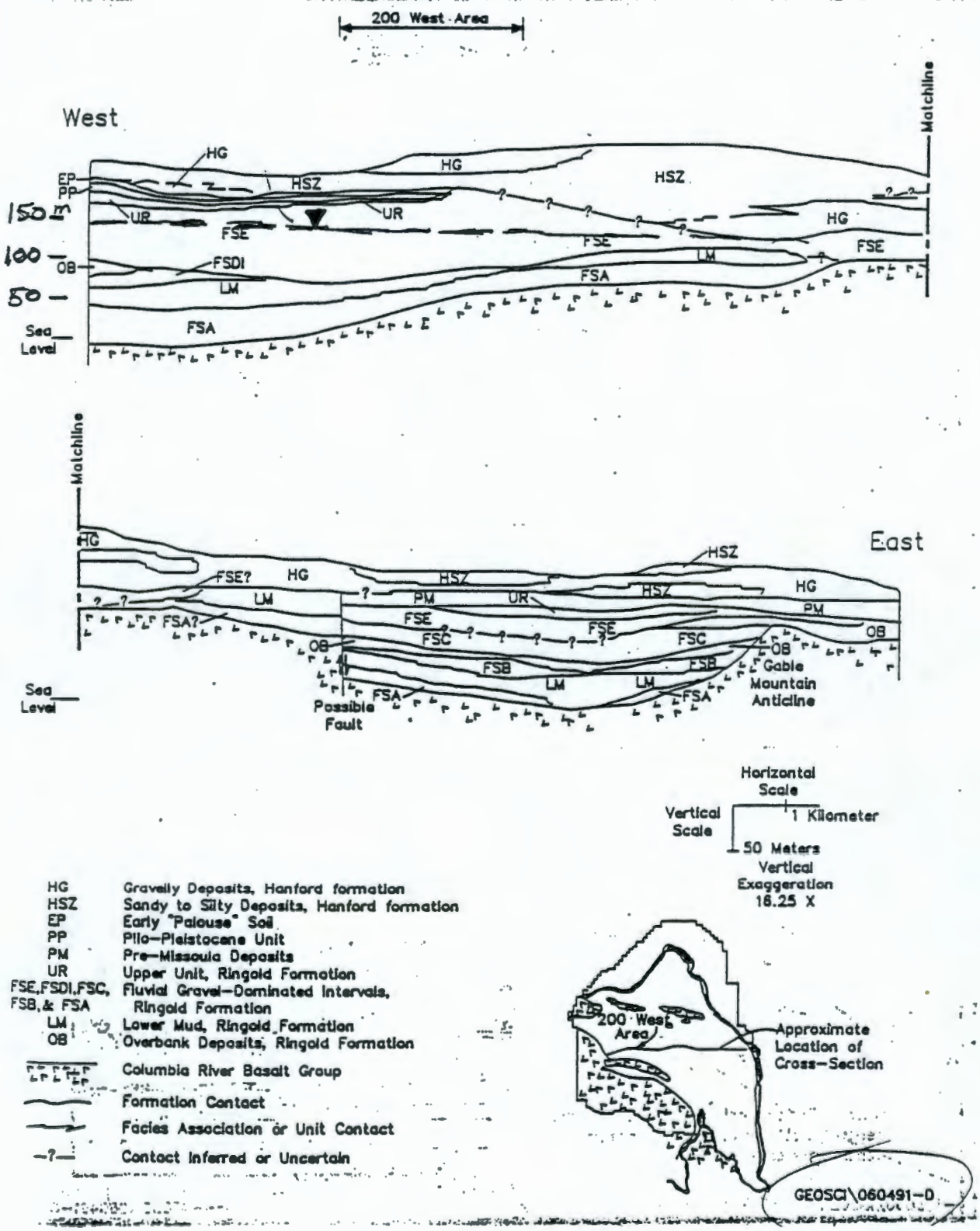

Figure 3-3. Cross Section Across the Hanford Site Through the 200 West Area.

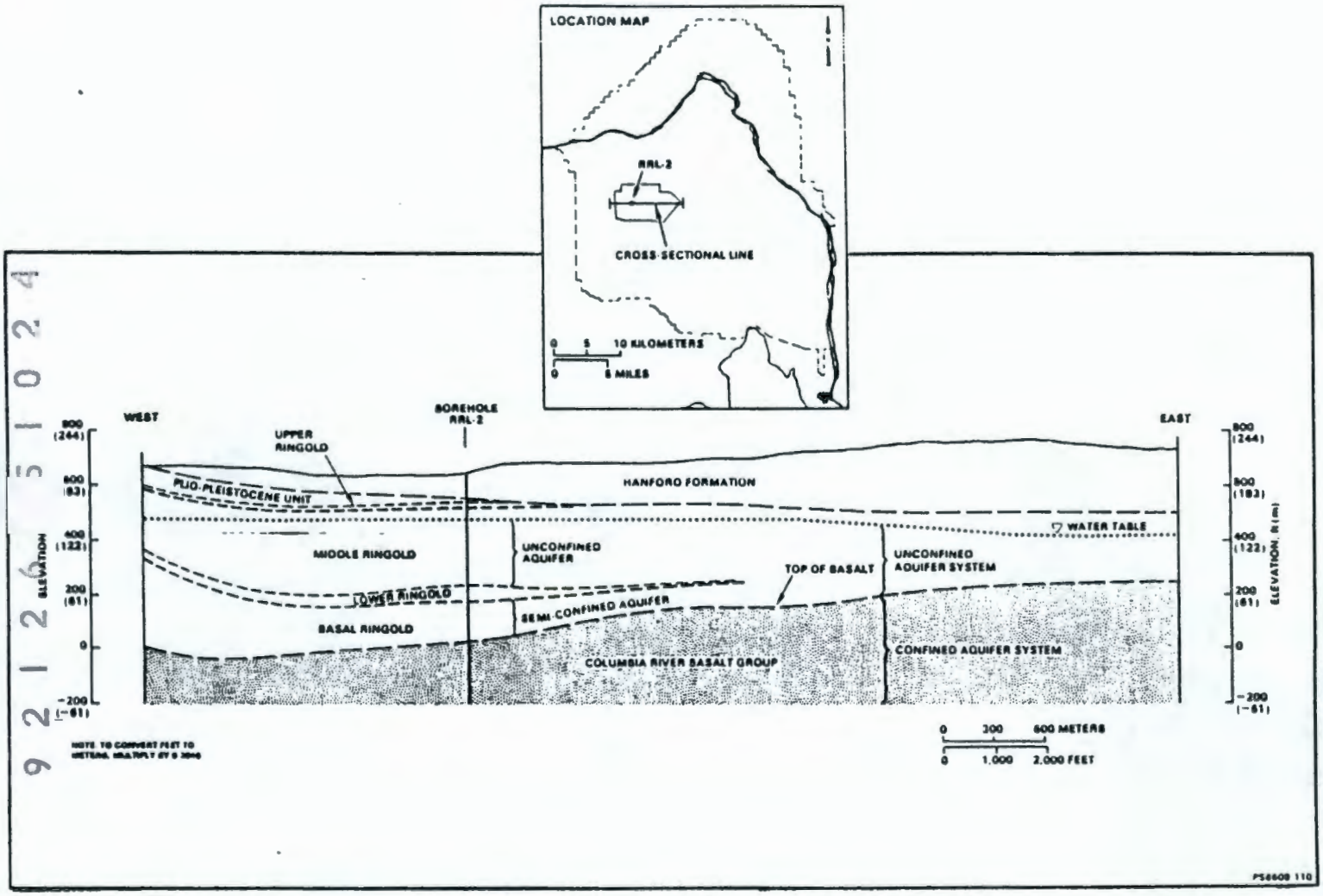

Figure 3-4. Geohydrologic Cross Section Across Part of the Hanford Site (shows the relationships between the unconfined and confined aquifers) (vertical exaggerations = 10X) (After Jensen et al. 1986; Landon and Bjornstad 1986.

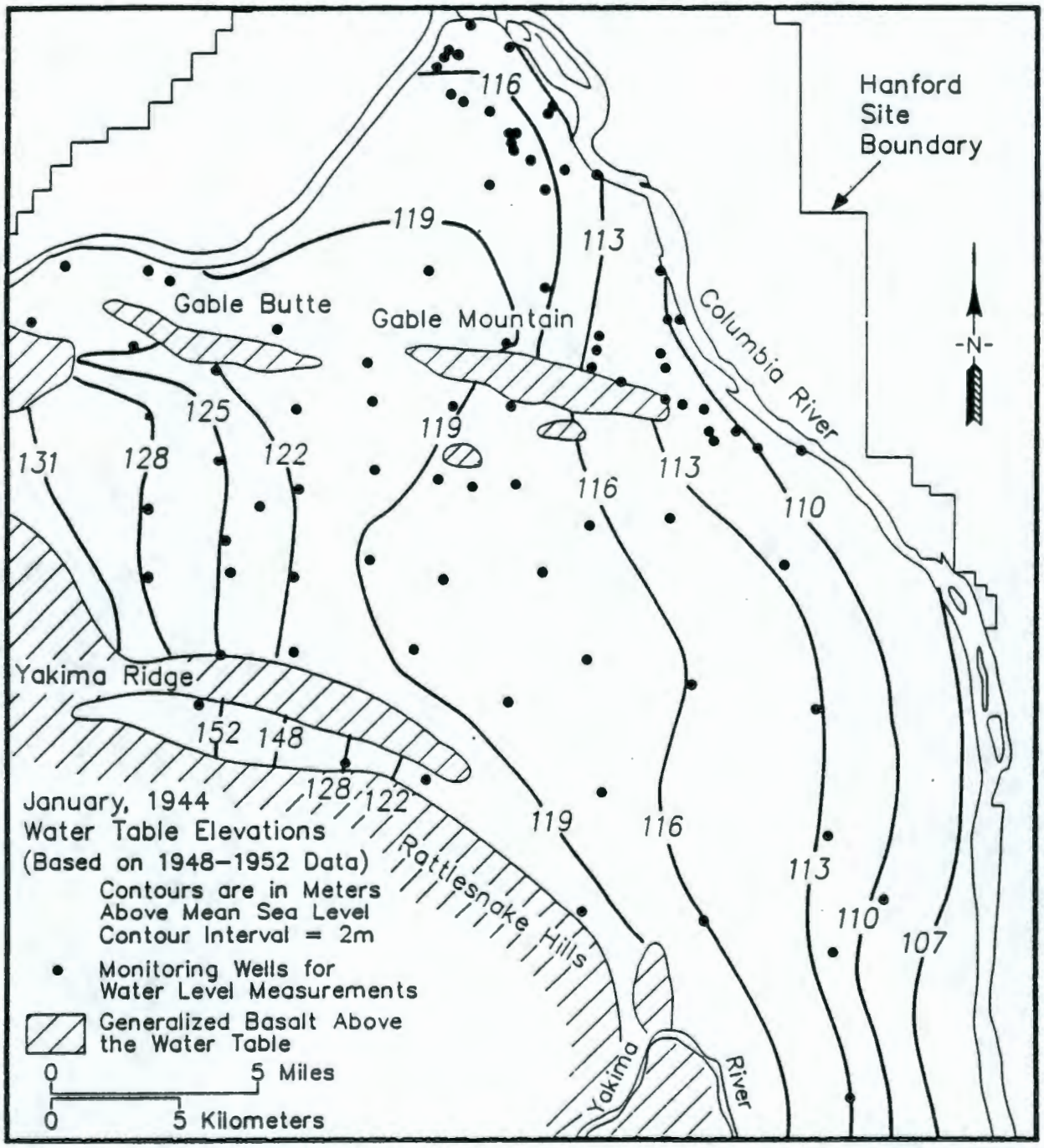

Figure 3-5. Hindcast Water Table Map of the Hanford Site, January 1944.

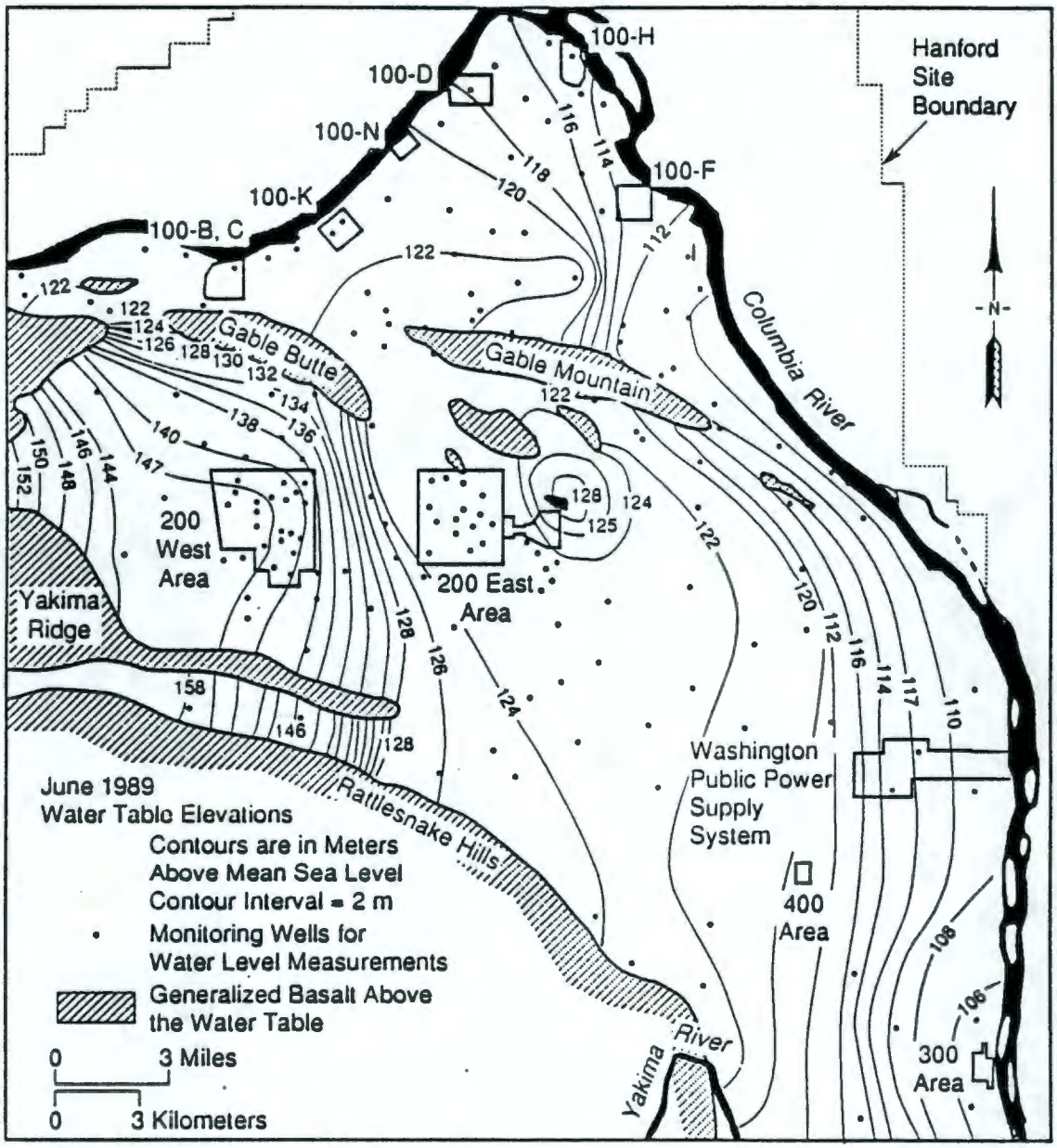

Figure 3-6. Hanford Site Water Table Map, June 1989.

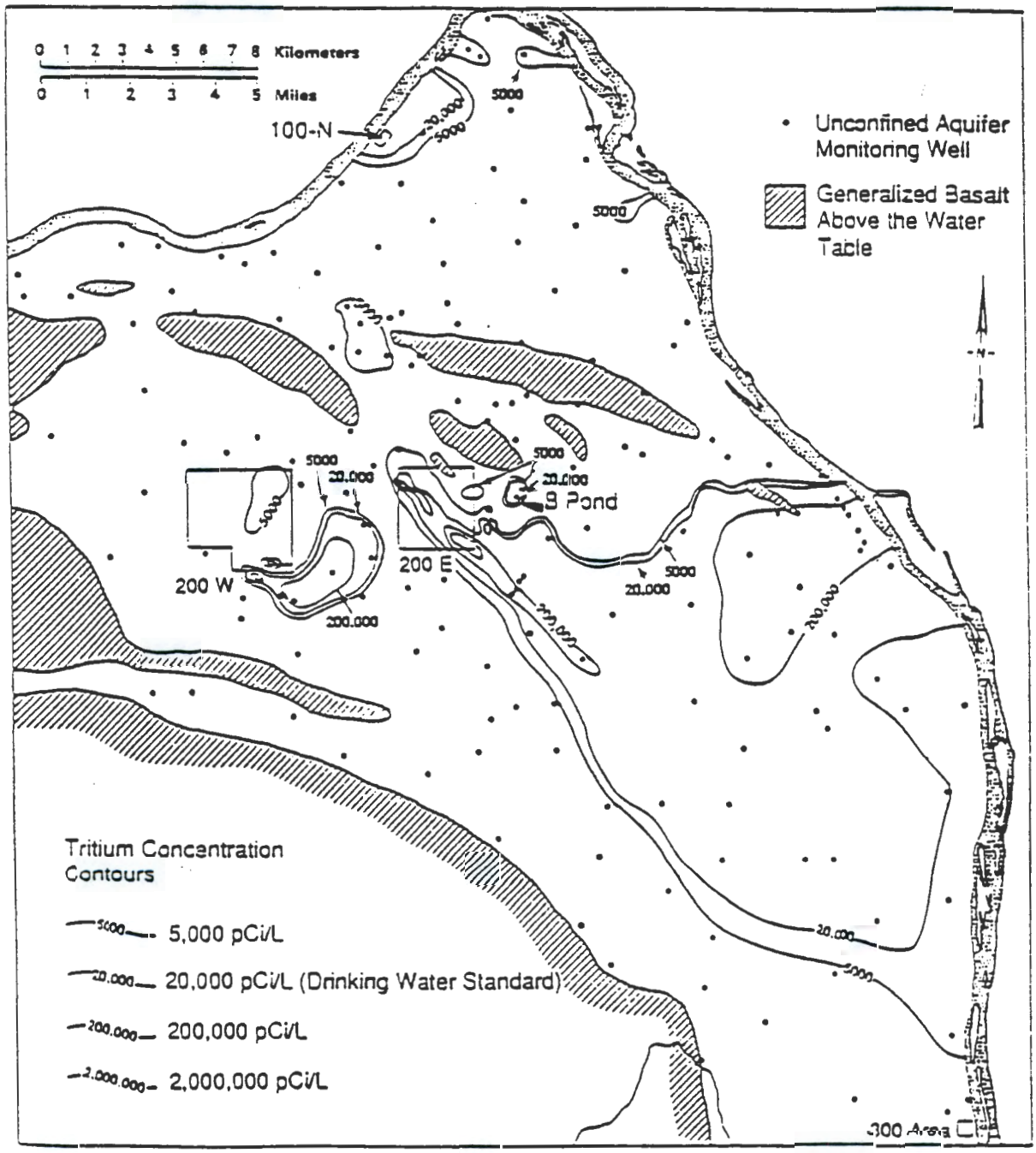

Figure 3-7. Tritium Concentrations in the Hanford Site Unconfined Aquifer, 1989.

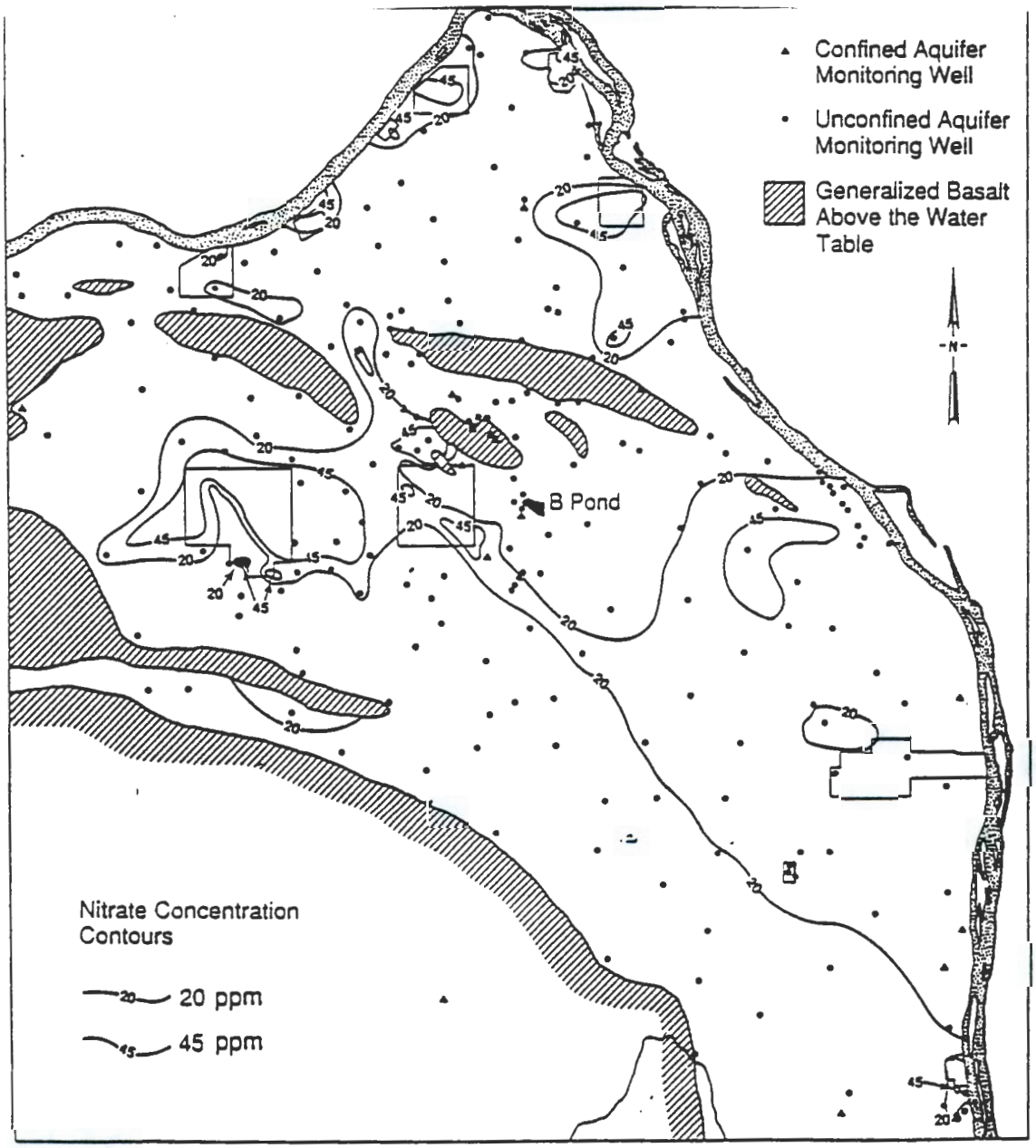

Figure 3-8. Nitrate Concentrations in the Unconfined Aquifer, 1988.

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4.0 INFORMATION SOURCES AND DATA SCREENING

Existing data with potential for use in this study are available from a number of sources. These include: (1) RCRA site-wide and operational monitoring programs, (2) state and federal agency oversight sampling, and (3) nuclear waste repository project files and related reports. Much of the data available for potential use cannot meet currently accepted validation protocols. Some data are from project-related sources for which administrative controls no longer exist (e.g., BWIP). Data from such sources can no longer be traced to original log books, chain-of-custody documentation, analytical record sheets, etc. Such historical data must be evaluated on the basis of internal consistency, trends, comparison with contemporary analytical results at common sample sites, personal knowledge concerning the sampling and analysis, and professional judgment.

A common requirement applicable to all data sources was the need to ensure that sample locations were not influenced by either past or present Hanford Site sources of groundwater contamination. In some cases, it was possible to select the location on the basis of indicator parameters such as low-level tritium. However, this screening tool was not available for all data sources. In these cases, location, knowledge concerning existing contaminant plume distribution, and judgment was applied.

Because of the varied nature of the sources and types of screening that can be applied, source descriptions and screening criteria are discussed on a source-by-source basis in Section 4.1. Existing experimental and modeling data sources related to groundwater evolution are discussed in Section 4.2, followed by a discussion of data availability, access, and limitations in Sections 4.3 and 4.4, respectively.

4.1 FIELD DATA SOURCES AND SELECTION CRITERIA

Three primary existing data sources were evaluated for use: (1) hydrochemical database for the BWIP, (2) HGDB, and (3) USGS database. Well locations and physical description, data storage and retrieval, and screening or data selection criteria for each of these three sources are discussed as in the following sections.

4.1.1 Basalt Waste Isolation Project Hydrochemistry Database

A large hydrochemical database was developed for the BWIP between 1978 and 1987. Surface water, springs, unconfined or suprabasalt aquifers, and confined aquifers to depths of about 4,000 feet (1,219 meters) were sampled and analyzed for a wide range of constituents (DOE 1988; Early et al. 1986; Graham and Johnson 1991). Results were stored in a computerized data storage and retrieval system. However, this electronic database is no longer functional at the Hanford Site.

Analytes and water quality measurements for the BWIP hydrochemistry sampling program included the following:

- Major cations and anions
- pH and alkalinity
- Total and organic carbon
- Redox potential
- Minor and trace elements
- Stable isotopes
- Carbon-14 and tritium.

One objective of the BWIP hydrochemistry program was to characterize the chemical and isotopic history of the recharge portion of the confined aquifer flow system. Accordingly, the conceptual framework for specification of sampling and analytical requirements involved the assumption that infiltration of carbon dioxide-charged precipitation reacted with soil carbonate and basalt-related minerals to yield major cations and anions by the following generalized chemical reactions:

$$CO_2 + H_2O + CaCO_3 = Ca^{+2} + 2HCO_3^{-1}$$

and:

hydrolysis of plagioclase feldspars = clay minerals +

$$K^{+1} + Ca^{+2} + H_4SiO_4 + HCO_3^{-1}$$

Hydrolysis or breakdown of other phases such as basalt glassy mesostatis results in similar reaction products and releases of other major and minor constituents (DOE 1988; WHC 1991a). To assess these types of reaction paths, it was necessary to account for the major anions and cations, especially bicarbonate alkalinity. Thus, the sampling and analysis protocols emphasized obtaining reliable major cation and anion data (i.e., a charge balance between cations and anions that agreed within at least 5 percent). The reaction sequences noted previously also implied that pH should increase with hydrolysis or production of free silica.

Thus, careful measurement of pH involving both field and laboratory determinations was required. Stable isotopes, tritium and carbon-14, were analyzed to obtain information concerning residence time of the recharge water (springs) and groundwater. These DQOs also resulted in validation checks on the analytical results (charge balance), and improved the overall analytical performance of the laboratories involved. Analytical interlaboratory comparisons, reference standards, and duplicate analyses also were used as internal validation checks (Early et al. 1986).

A physical listing of the data collected through 1985 and entered in the database and a summary description of sampling and analysis procedures are provided in publicly available documentation (Early et al. 1986). Additional data acquired from 1985 until early 1987 were available from hardcopy printouts of the database generated on February 8, 1987, before termination of the BWIP. Physical files supporting this information and data entry

validation sheets were retained by interested individuals and this information currently is maintained by the operations and engineering contractor's Geosciences Group.

Data relevant to the scope of the background study were selected from the previously referenced sources and hand entered into a computer file for statistical testing and preparation of interpretive graphics. The transfer of data from the hardcopy printouts to the computer file was verified manually. Check sheets for this effort are on file for the original database hardcopy records.

4.1.1.1 Selection Criteria. Selection of data from the BWIP database involved consideration of relevant hydrostratigraphic regimes and units, screening of results based on contamination indicators, charge balance among major constituents, and consideration of well construction.

4.1.1.2 Hydrostratigraphic Regimes. As noted previously, the primary hydrochemical data of regulatory interest for this study are for the unconfined and uppermost confined aquifers. Surface water and spring data, however, are also of interest because the data are compositional end members for the target aquifers. Except for reference or comparison purposes, hydrostratigraphic zones deeper than the uppermost confined aquifer are excluded from this review.

4.1.1.3 Sample/Aquifer Contamination Indicators. Data for groundwater monitoring wells were screened for indications of Hanford Site contamination on the basis of tritium content. The basic criterion was set at 1 international tritium unit (TU) defined as 3.23 picocuries per liter or 0.12 Bequerel per liter or approximately 10 times the detection limit for low-level tritium measurements. In some cases, however, such as for springs and groundwater near the river sources, fallout tritium is an expected component. In these cases, tritium is used in resolving or setting boundary conditions on spring water and groundwater age (Mazor 1986).

Tritium also might be an indicator for wells that were completed with inadequate development before sample acquisition. For example, drilling fluid makeup water most often consisted of surface water sources with tritium concentrations of about 100 TU. Thus, analytical results for samples from wells that had been inadequately purged contain tritium concentrations well above the 1 TU criterion. This is especially significant for most of the confined aquifer wells drilled for the BWIP, in which drilling mud was used. Inadequate purging under these conditions has been shown to significantly impact major and trace chemical composition (Graham and Johnson 1991).

4.1.1.4 Charge Balance. Another data quality screening tool available for the BWIP data set involved the anion and cation charge balance. If all chemical analyses had been reliably conducted and recorded, the ratio of anionic/cationic charge (ratio of milliequivalents) should equal 1. The charge balance was calculated from the reported concentrations (milligrams per liter) as indicated in Table 4-1.

The selection criterion for the background data subset was set at 0.05 or 5 percent. In most cases, the charge balance was much better than 5 percent, except for the uppermost confined wells. In the latter case, if the data set met the tritium criteria, it was included in the subset. All other data (springs, surface water, and unconfined) had to meet both tests to be included. The poor charge balance for the Rattlesnake Ridge data was attributed to incomplete analysis of the major anions and cations. It should be noted, however, that the lack of a charge balance does not necessarily invalidate the data but might signal the need for closer inspection. Likewise, a good charge balance by itself does not validate historical data. When charge balance data are combined with other criteria, a 'reliability profile' could be developed.

4.1.1.5 Description of Wells. Sample site locations that met the screening criteria are shown in Chapter 5.0, Figure 5-18. Sample identification/location names are listed in Table 4-2 exactly as the names appear in the database (Appendix A). Data for the first three sets consisted of time series sampling over a period of 1.5 years on a quarterly schedule. Samples were all collected in duplicate. Thus, within and between statistical analysis is possible for these locations, which also provides another check on sampling and/or analytical variability as well as a check for any seasonal effects. Monitoring well physical descriptions are summarized in Table 4-3 and 4-4.

All of the wells listed were constructed with carbon steel well casings. The samples were all drawn after a minimum of three bore volumes were removed. The impact of the well casing materials of construction is judged to be minimal for most constituents reported. Even for iron, which would be expected to show high variability, good reproducibility from quarter to quarter was demonstrated. Effects of corrosion or related casing effects would be expected to yield a more erratic pattern during time series sampling. This position is supported by comparison studies between stainless steel wells and carbon steel wells in which good agreement for a wide range of constituents was found (WHC 1990). However, ultra-trace metal analyses could be compromised by this type of well construction. Further comparison testing using ultra-low-level trace metal analytical procedures would be needed to evaluate this possibility.

4.1.1.6 Perforated Test Intervals. The perforated intervals generally are deeper in the (unconfined) older carbon steel wells. Major changes in chemical composition with depth are not expected but this must be recognized as a possible influence on the chemical composition, especially if age (>100 years) and/or lithology has a significant effect. For example, deeper screened intervals might blend older water with the younger, shallower water or water from different lithologic units. There is no practical way in which to evaluate this possibility; rather, it is a qualitative factor that might be important in evaluating the results of model predictions. (This is a generic issue with regard to the usability of a large number of existing monitoring wells on the Hanford Site).

4.1.1.7 Hydrostratigraphy. Lithology and mineralogy of the saturated zone within the test intervals are shown in Chapter 3.0, Figure 3-2. In general, the wells appear to be completed in the middle Ringold Formation with the

exception of well 56-103 (located near the Columbia River), which is completed in the Hanford formation. The wells completed in the Ringold Formation are all in zones of relatively uniform stratigraphy (middle Ringold; i.e., absence of semiconfining mud layers or lenses, etc.). However, for the reasons discussed, the data derived from the older type wells must be considered provisional until larger issues of representativeness are resolved.

4.1.2 Hanford Groundwater Database

Data selected from the HGDB was restricted to groundwater sampling events after 1984 in the belief that later analyses are more reliable; to analyses of filtered samples; and to wells sampling the upper portion of the unconfined aquifer. The data in the HGDB were further screened for relation to known or suspected contaminant plumes or water discharge sites, tritium concentrations, screened or perforated interval, and sampling technique. Hanford Site wells constructed since 1987 are RCRA compliant. However, all of these wells are associated with specific WMUs and are suspect because of the proximity of the wells to Hanford Site operations. Thus, compliance to the requirements of RCRA or WAC 173-162 was not used as a screening criterion.

4.1.2.1 Tritium. Tritium is a major component of Hanford Site groundwater contamination and, because of its high mobility in water, is an excellent indicator of the extent of groundwater contamination on the Hanford Site. The contractual detection limit for tritium analyses in the HGDB is 500 picocuries per liter and this value was used as a screening criterion.

Tritium values less than the contractual detection limit are reported in the HGDB, and because the values are reported relative to a statistically determined background counting value, a number of negative values are reported. Reported tritium concentrations for the 10 wells chosen for this study range from -480 to 787 picocuries per liter. The average for the 120 available analyses is 26 picocuries per liter and the standard deviation is 222 picocuries per liter. Two wells (699-S31-1 and 699-S19-11) have reported values greater than 500 picocuries per liter. However, the average tritium concentration for both of these wells is near zero and the high value is believed to be an analytical outlier.

4.1.2.2 Plumes and Artificial Recharge Sites. Operational effects on groundwater fall into two major categories. Disposal activities have resulted in the addition of various radiochemical and chemical species to Hanford Site groundwater. In addition, the disposal of large quantities of Columbia River water in various ponds on the site (B Pond and U Pond) has resulted in a significant dilution of existing Hanford Site groundwater. Both of these effects on groundwater must be avoided in gathering samples to be used for background determinations, because the first sampling of contaminated groundwater will result in unrealistically high background values and because the dilution effects will result in unrealistically low background values. Screening to avoid samples that are affected by known or potential effects restricted the search to a narrow zone parallel to Rattlesnake and Yakima Ridges along the southern margin of the Hanford Site. The locations of the

selected wells and the boundaries of tritium plumes are presented in Chapter 3.0, Figure 3-7.

4.1.2.3 Well Construction. As discussed previously, there are no RCRA- or WAC 173-160-compliant wells in areas that are outside the effects of Hanford Site operations. However, comparisons between RCRA and non-RCRA wells (WHC 1990) indicates comparable hydrochemical analytical data in cases where the non-RCRA well is purged before sampling. Thus, the wells under consideration were screened for the presence of a pump that would allow purging before sampling. McGhan (1989) indicates that all 10 wells chosen for this study are equipped with submersible sampling pumps.

Very few wells on the Hanford Site provide for sampling of the deeper portions of the Ringold Formation and none of these wells are in the area of interest for background determination. To have comparable data for interpretation, well selection was restricted to wells that sample the upper portion of the unconfined aquifer. The length of the screened interval also was used as a selection criterion. However, past practice has been to construct wells with long perforated (screened) intervals and a strict criterion used here would have resulted in a large reduction in the quantity of data available. The 10 wells selected for this study have perforated or screened intervals ranging from 10 to 57 feet (3.05 to 17.4 meters) (Table 4-4).

4.1.3 U.S. Geological Survey Data

The USGS compiled groundwater chemical, physical, radiologic, well construction, and well location data in the National Water Information System (NWIS) database. Hanford Site area sources for this database include, but are not limited to, the following: Hearn et al. 1985; Steinkampf et al. 1985; Turney 1986a and 1986b; and Steinkampf 1989. The NWIS data for the Hanford Site area was obtained as a computer file from the USGS for evaluation of its potential application to the determination of a Hanford Site-wide groundwater background.

Sampling and analysis were carried out under USGS protocols and data quality is high; however, the data distribution is very irregular. The number and identity of analytes per well and analysis vary widely. Most of the USGS groundwater samples on the Hanford Site were obtained from DOE groundwater monitoring wells and therefore represent a duplication or weighing of information when combined with the DOE data set. In addition, the USGS analyses do not include tritium, a major indicator of contamination on the Hanford Site, making it difficult to determine which samples are unaffected by Hanford Site operations.

The correlation of groundwater analyses listed in the NWIS database to known Hanford Site wells, as indicated in McGhan (1989), also proved to be problematical. Well locations listed in the NWIS (longitude and latitude) were plotted on Hanford Site maps in an attempt to determine which wells were sampled. Unfortunately, even when the USGS coordinates were reasonably close to the location of an existing Hanford Site well, there often were serious

discrepancies in the indicated well construction details (e.g., well depth, screened interval, etc.). A few of the NWIS analyses could be unambiguously correlated with known Hanford Site wells; however, this was the exception rather than the rule.

Very few of the analyses listed in the NWIS database, for wells with sampling intervals above the basalt-sediment interface, appear to be located in areas of interest for a Hanford Site-wide groundwater background determination. Thus, because of the limited number and scope of analyses in the areas of interest, and because of the well identification problems and lack of tritium analyses discussed previously, the Hanford Site groundwater data included in the NWIS were not used in this preliminary background determination.

4.1.4 Pacific Northwest Laboratories Summary

A summary of background data for selected constituents from various locations across the Hanford Site has been compiled by Evans et al. (1989). A mix of both older (non-RCRA) and RCRA-compliant wells were used in preparation of this summary. Approximately 45 to 60 wells from the central, eastern, and southeastern areas of the Hanford Site, as well as from locations upgradient of the Hanford Site operational areas (200 West and 200 East Areas), were used. In all cases, locations near known contaminant plumes were avoided. The focus of this earlier background summary effort was on population means for selected naturally occurring constituents rather than threshold or maximum values. The primary drawback to the Evans et al. (1989) evaluation is that the criteria for acceptable data, specific well locations, documentation of the evaluation process, and other data quality objectives were not reported. This study is valuable because it serves as a basis for comparison with the data summary and evaluation efforts presented here, and as a basis for applying the findings of this study to groundwater across the Hanford Site.

4.2 MODELING AND EXPERIMENTAL DATA

The results and data from experimental studies pertinent to the objectives of this study have been included in this data and information compilation effort. The experimental studies summarized in Chapter 5.0 are from the work of McKinley (1990) and the results of new laboratory tests initiated specifically for this project. The main results and findings of these studies are presented in Chapter 5.0, and are further discussed in Appendix D.

The results of geochemical modeling efforts relevant to this effort also are included in this report. Geochemical modeling of Hanford Site and related aquifers provides an important framework for understanding the controls on and evolution of natural groundwater compositions and for constraining conceptual models and data interpretation. Geochemical modeling of Hanford Site groundwater has been done largely in conjunction with the BWIP (e.g., Deutsch et al. 1982; Krupka and Jenne 1982; Early et al. 1984). The primary focus for the BWIP studies was the deep basalt aquifers. However, these studies provide

important information relating to groundwater in the unconfined aquifer because shallow groundwater and springs also were included in these studies, and also because these models include evaluations of confined aquifer groundwater having chemical compositions similar to those of groundwater in the unconfined aquifer. The major finding of these geochemical modeling efforts are summarized in Chapter 5.0, and are discussed further in Appendix D.

4.3 ACCESS AND RECORDS AVAILABILITY

This section discusses access and records availability from known databases.

4.3.1 Basalt Waste Isolation Project Hydrochemistry Data

At present no plans have been made to enter the BWIP data in the Hanford Environmental Information System (HEIS) database. Accordingly, a complete listing of the subset from the BWIP database used in this study is included as Appendix A.

4.3.2 Hanford Groundwater Database

The HGDB, maintained by PNL, is a computerized listing of available groundwater monitoring hydrochemical data for the Hanford Site. This database system is being replaced by the HEIS database; however, HEIS is in development and not available for this study. After screening, data from the HGDB was downloaded and manually entered into computer data files for statistical testing and manipulation.

4.4 DATA LIMITATIONS

This section summarizes limitations of the existing data acquired for this study.

4.4.1 Basalt Waste Isolation Project Hydrochemical Database

One of the principal limitations of the BWIP data set is the lack of traceability, as noted previously. Thus, it might not be useable for regulatory purposes. Other limitations involve the monitoring well physical conditions (Table 4-3); e.g., the generally deeper perforated intervals and older (carbon steel) well casings. Additional subject-related discussion is included in Section 4.1.1.

4.4.2 Hanford Groundwater Database Subset

Limitations on the data from the HGDB was derived from several sources: well construction, laboratory documentation, and completeness of analyses.

The existing wells in the area of interest for background determination are all relatively old; the newest well for which useful data are available was completed in 1971 and the oldest was completed in 1948. The average completion date for the 10 wells included in this study is 1956. All of the wells were completed with carbon steel casing that was perforated in the zone of interest; however, screens subsequently were added to three of the wells. Comparison of data from RCRA and non-RCRA wells indicates that with proper purging before sampling, the analytical results from the two types of wells are quite comparable (WHC 1990). However, in a strictly regulatory sense, it must be kept in mind that none of these wells are RCRA compliant or meet the standards of WAC 173-162.

Most or all of the data reported here was collected as part of the PNL Hanford Site-wide monitoring program (e.g., Evans et al. 1989) and the analytical work was carried out by U.S. Testing Company, Incorporated, under contract to PNL. The PNL contract with U.S. Testing Company, Incorporated was canceled in June 1990. The quality of these Level III data has been verified by other laboratories, evaluations, and comparisons with other contractor laboratory program data (Omenn et al. 1991). Although some of the laboratory documentation required for Level IV data is not available for much of the data produced by U.S. Testing Company, Incorporated, the quality of these Level III data appears to be appropriate for their intended use in accordance with the EPA guidance on DQOs (EPA 1987).

The analyses reported were collected as part of a contaminant monitoring program, and as a result, were concentrated on perceived contaminants of interest, particularly radionuclides. Therefore, many of the analyses are incomplete in terms of the constituents of interest for background determination, and none of the analyses are complete enough to allow a determination of the cation-anion charge balance.

The results reported are believed to be representative of groundwater compositions in the background area of interest; however, there are several regulatory problems involved in the use of these data. If these problems cannot be resolved, the principal use of the available data will be to allow an approximation of natural background as a framework for the collection of data necessary for the final background determination.

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Table 4-1. Anion and Cation Charge Balance.

Charge balance - The calculated percent deviation between the observed total cations and anions (each measured in milliequivalents/L) determined according to the following equation:

$$\text{Charge balance} = \frac{\text{Total cations} - \text{total anions}}{\text{Total cations} + \text{total anions}} \times 100\%$$

where:

$$\text{Total cations (meq L)} = \frac{[Na^+]}{22.9898} + \frac{[K^+]}{39.102} + \frac{[Ca^{2+}]}{20.04} + \frac{[Mg^{2+}]}{12.156}$$

$$\text{Total anions (meq/L)} = \frac{\text{Alkalinity}}{50.} + \frac{[Cl^-]}{35.453} + \frac{[F^-]}{18.9984} + \frac{[NO_{-3}]}{62.0049} + \frac{[SO_{-4}]}{48.0308}$$

The concentrations are in units of milligrams per liter and divisors in these equations are the equivalent weights of the respective species. A charge balance is computed as long as data for all of the key species are present. Key species include sodium, potassium, calcium, magnesium, alkalinity, chloride, fluoride and sulfate. If available, nitrate is included in the charge calculation, but does not appear to be quantitatively important. Therefore, a charge balance will be determined whether or not nitrate analyses are provided.

Table 4-2. Sample Site Location Codes and General Area Description, Basalt Waste Isolation Project Hydrochemistry Database Subset, 1985-86. (sheet 1 of 2)

Grouping or regime	Sample site code	General location or description
I. Surface water	YR-HR	Yakima River, Horn Rapids
	CR-V-BR	Columbia River, Vernita Bridge
II. Springs	SP-OBSERVTRY	Observatory Springs, Rattlesnake Mountain
	SP-BENNETT	Snively Basin, north
	SP-UP-SNIVEL	Upper Snively Basin, Rattlesnake Mountain
	SP-UR2-07	Umtanum Ridge, Cold Creek
	SP-UR6-20	Umtanum Ridge, Cold Creek
	SP-UR7-22	Umtanum Ridge, Cold Creek
	SP-YR3-04	Yakima Ridge, Cold Creek
	SP-YR5-08	Yakima Ridge, Cold Creek
	SP-YR7-14	Yakima Ridge, Cold Creek
III. Suprabasalt aquifer		
	6-S03-25	South
	6-S24-19	South, near Yakima River
	6-11-45A	Mid-south region
	6-19-58	Mid-region
	6-19-88	Mid-region
	6-24-95	Mid-region
	6-66-103	North, near Columbia River
IV. Confined aquifer		Rattlesnake Ridge interbed
	DB-14	Mid-western area
	DB-15	Mid-eastern area
	2-E26-08	200 East Area fenceline
	6-49-55B	East of 200 East Area
	6-50-45	East of 200 East Area
	6-52-46	East of 200 East Area

Table 4-2. Sample Site Location Codes and General Area Description, Basalt Waste Isolation Project Hydrochemistry Database Subset, 1985-86. (sheet 2 of 2)

Grouping or regime	Sample site code	General location or description
	6-52-48	East of 200 East Area
	6-53-50	East of 200 East Area
	6-54-57	East of 200 East Area
	6-56-53	East of 200 East Area

Note: Sample site location codes are exactly as entered in the database and in the complete data listing included in Appendix A.

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Table 4-3. Physical Description of Suprabasalt Aquifer Monitoring Wells. (Sampled for Basalt Waste Isolation Project Hydrochemical Characterization Program, 1985-1986).

Well no. (699-)	Casing elev. (ft.)	Depth to water (ft.)	Perforated Interval (ft.)	Casing diameter (in.)	Date of construction[1]	Pump type
19-58	573	156	149-194	8	1/59	Sub[2]
19-88	644	134	70-170	8	11/57	Sub
24-95					12/74	Sub
66-103	463	65	65-124	12	1/44	none[3]
S3-25	523	127	114-172	6	2/72	Sub
S24-19	427	20	60-82	6	8/49	none[3]
11-45A	579	170	170-220	6	8/57	Sub

[1]carbon steel casing.
[2]Sub refers to a standard submersible pump used in water supply wells.
[3]A temporary submersible pump was used during the 1985-86 sampling period.

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Table 4-4. Construction Details for Groundwater Wells Selected from the Hanford Groundwater Database. [Data are from McGhan (1989)].

Well no. (699-)	Casing elevation (ft)	Drill depth (ft)	Depth to bottom (ft)	Perforated interval (ft)	Depth to water 1985-1991 (ft)	Completion date (Month/Year)	Casing diameter (in.)	Pump type
S3-25	523.5	174	171	114-171	123-126	2/71	6	Sub
S8-19	503.81	148	134	104-132	106-109	8/50	8	Sub
S12-3	535.52	110	105	55-88	54-57	12/50	8	Sub
S14-20A	492.74	172	138	89-138	91-93	11/58	8	Sub
S19-11	483.74	120	120	94-115	93-95	8/68	6	Sub
S31-1	460.11	228	142	93-103	80-85	1/51	8	Sub
2-33A	536.37	466	180	130-180	132-134	10/58	8	Sub
14-38	514.89	425	165	110-165	110-112	11/58	8	Sub
19-43	551.58	202	183	130-182	146-148	9/50	8	Sub
55-89	617.43	235	215	160-170	162-163	11/48	8	Sub

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5.0 DATA SUMMARY AND EVALUATION

The data and information sources compiled for this study are described and evaluated in this chapter. These data and information sources include groundwater compositions, published data and information, results of experimental tests, and geochemical modeling. This information is described in Section 5.1 and evaluated collectively in Section 5.2. A revised conceptual model for the factors that influence and control groundwater composition is presented in Section 5.3. Provisional groundwater background thresholds estimated from the data obtained through the set selection process and statistical screening are presented in Section 5.4.

The evaluation of these data primarily serves as the basis for understanding the Site-specific controls and parameters that the composition of groundwater at the Hanford Site. Although this chapter is largely devoted to the development and refinement of a conceptual model for understanding the groundwater hydrochemistry, the primary importance of this aspect of the study is to provide a basis for interpreting the groundwater data for the purposes of environmental restoration on the Hanford Site. In this regard, these evaluations are important because the evaluations provide the basis for understanding the extent of natural variation for constituents that are of interest in dangerous waste management activities. These evaluations also provide a basis for constraining where naturally elevated constituent levels might occur in the aquifer and why. This insight can be used to more efficiently characterize and interpret data, and also to guide new data collection efforts. The emphasis in these evaluations is primarily on major and minor constituents of the groundwater, rather than on the trace elements. This is because these constituents provide the most information regarding the natural processes that occur in the natural system, and also because trace element data are often not available or the concentration levels are very low. The relationship between the major, minor, and trace constituents is discussed in Section 5.4

5.1 DATA SUMMARY

The principal features and compositional characteristics of surface waters and groundwater in the unconfined and confined aquifers are presented in this section. The compositional data on natural waters summarized here are from the three sources described in Chapter 4.0. The complete data listing for the wells and sampling periods described in Chapter 4.0 is provided in Appendix A. Summary statistics for major constituents of interest are listed in Table 5-1.

5.1.1 Recharge Water Compositions

As noted in Chapter 3.0, the main sources of natural recharge to unconfined aquifer are surface waters from the Columbia and Yakima Rivers, periodic run-off of meteoric water, and spring water from highland areas on the western side of the Hanford Site.

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5.1.1.1 Meteoric Water. The Pasco Basin is an arid area that receives approximately 6 inches (15.24 centimeters) of precipitation a year. Meteoric water (precipitation) at the Hanford Site contains very few dissolved solids, and these solids are in trace amounts (Table 5-2). The most notable features of meteoric water composition in this region are the levels of zinc (up to 14 milligrams per liter) and tritium (up to 18 tritium units). Although measured chlorine concentrations are all <1 milligram per liter, it is estimated that chlorine concentrations should range from about 0.4 to 1.0 milligram per liter based on from the levels of sodium in the meteoric water and the fallout pattern for chlorine expected from a seawater source and evaporation (DOE 1988).

5.1.1.2 River Waters. Water from the Columbia and Yakima Rivers locally impacts the composition of groundwater in the unconfined aquifer as sidebank recharge. The main features of the water compositions from the Columbia Rivers are that the water contains lower amounts of total dissolved solids. However, composition Yakima River water in the vicinity of Horn Rapids (Table 5-2) is remarkably similar to that of the average groundwater in the unconfined aquifer (Table 5-3), and contains even larger concentrations of sodium, chlorine, nitrate, and boron than the average groundwater. The extent to which inorganic and/or organic anthropogenic constituents are present in the Yakima River is presently not well documented, but is the subject of a pending USGS report, which will serve as an important source of information on the local effects of Yakima River recharge to groundwater on the Hanford Site.

5.1.1.3 Spring Waters. The composition of water from springs that occur in the Cold Creek and Dry Creek drainage systems also serves as recharge sources to the unconfined aquifer. The range of compositions for these spring waters are summarized in Table 5-3. These spring waters differ from the surface waters in that the spring waters contain a range of dissolved solid of cations and anions from reaction with geologic materials (RHO 1986).

The most notable compositional features of these spring waters are that the average concentrations are intermediate between surface waters and water in the unconfined aquifer for some constituents, intermediate between the levels seen in the unconfined and confined aquifers for other constituents, and also have the largest concentrations that are as large or larger than those in either the unconfined or uppermost confined aquifer for constituents such as NO3-, chrome, zinc, lead, and molybdenum (Table 5-3). Another notable characteristic is that some of these waters appear to be relatively old based on their carbon-14 levels (Section 5.1.5). This age factor is important because it implies that at least some of these recharge waters already might be significantly evolved in terms of rock-water interaction. These relationships appear to be consistent with some of the compositional characteristics of the spring waters and are important because they represent an important recharge source to the unconfined aquifer. The compositions of these waters are compared further and contrasted to those in the unconfined and confined aquifers in Section 5.2.

5.1.2 Unconfined Aquifer Groundwater Data

The groundwater data summarized and evaluated in the following sections are primarily those resulting from the data selection screening process. The two main sources of data used in the evaluations presented here are the BWIP database and the HGDB.

As discussed in Chapter 4.0, Section 4.1, the BWIP hydrochemistry data were used to generate the background study subset (BSS). These data are the primary source of information on the isotopic compositions of groundwater, and also on oxidation-reduction potential (ORP). These data include chemical analyses of surface waters, spring waters, and groundwaters from both the unconfined aquifer and the confined aquifer.

Data from selected portions of the HGDB, however, are limited to groundwater samples from the unconfined aquifer. Complete data listings for the 10 HGDB wells included in this study, for the time period of interest, are included in Appendix A. Average compositions for the 10 wells along with statistical parameters are presented in Chapter 4.0.

The analytical data in the BWIP data set and the HGDB data set are the result of different organizations collecting samples for different purposes, and having the analytical work carried out in different laboratories. It is, therefore, fortunate that one of the wells (699-S3-25) is common to both the BWIP and HGDB data sets and also a few analyses for well 699-19-88 in the HGDB data set. Comparison of the data for these wells in the two data sets is presented in Table 5-4, which indicates reasonable agreement between the two sets of data. The BWIP data are composed of high quality complete analyses with excellent charge balance and are believed to be the more reliable data set. Several components in the HGDB analyses tend to be slightly lower than the BWIP values; however, if this is indicative of the entire HGDB data set, it will tend to bias the background numbers toward lower rather than higher concentrations.

5.1.2.1 Test Zone Representativeness. As indicated in Chapter 3.0, Figure 3-4, approximately half of the upper unconfined aquifer at the Hanford Site is within stratigraphic units exhibiting transmissivities characteristic of the Ringold Formation. Areas with similarly low transmissivities include most of the Cold Creek Valley area to half-way between the 200 West and the 200 East Areas, one of the most important upgradient sections of the 'natural' background area for the Hanford Site (i.e., upgradient of the majority of the waste disposal and storage units). Most of the natural groundwater recharge in the unconfined aquifer beneath the Hanford Site in the 200 Areas is conditioned by either previous or current contact with the Ringold Formation. Thus the monitoring well locations along the western boundary selected for this study (Chapter 4.0, Figure 4-1) sample of the aquifer groundwater should be representative of a major portion of 'natural' background groundwater beneath the Hanford Site.

5.1.2.2 Temporal Variation. No significant seasonal variation in groundwater composition is observed within the BWIP wells sampled over a period of 6 to

7 quarters based on the standard deviation of the constituents shown in Figure 5-1.

5.1.2.3 Intra- and Inter-well Variations. The nature of the compositional variation of groundwater between wells in the unconfined aquifer and also the variability within the wells are illustrated in Figure 5-1 for selected major and trace constituents. It is indicated from both the BWIP and HGDB data, and the lack of seasonal variability, that intrawell variation in groundwater composition is much smaller than interwell variation, i.e., the variation in groundwater composition for samples from a given well are largely attributable to variation associated with the measurement processes. All but two monitoring wells near the rivers are completed in similar host rock lithologies (upper to middle Ringold Formation). Thus, the variation in composition between wells is interpreted to represent real variability in the composition of groundwater within the aquifer system, i.e., snapshots of groundwater composition in time and space for the part of the aquifer system sampled by the wells.

Obvious patterns of compositional variation with increasing age or spatial position are not apparent among the other wells located parallel to Rattlesnake Ridge. However, high-chlorine groundwater within the unconfined aquifer appears to be restricted to wells within a 2.5 mile (4 kilometer) radius in the southwestern part of the Hanford Site.

5.1.2.4 Compositional Characteristics of Groundwater. One of the most notable compositional characteristics of groundwater from the unconfined aquifer are the range of compositions in the screened data set (BSS). The average concentrations of many constituents in groundwater from the unconfined aquifer overlap with those of springs and those of groundwater in the confined upper aquifer (Figure 5-2; Table 5-3). However the levels of constituents such as chrome, copper, iron, nickel, strontium, and HCO_3^- in some of the unconfined groundwaters, are as large or larger than those in the upper confined aquifer or spring waters.

Several distinctive patterns, trends, or element correlations are observed with respect to major and minor constituents (Table 5-4). The most notable features are the absolute abundances, the correlations among many of the major and minor constituents, the two population of chlorine concentrations, and the relative abundances and ratios of sodium and chlorine, and chlorine and fluorine. Most of the high correlation between major and minor constituents appears to be indicative of rock-water interaction. One example is the correlation between calcium and magnesium, which also exhibits a linear pattern of molar abundances (Figure 5-3). The strong correlation between calcium and magnesium and the relatively narrow range of molar ratios for calcium:magnesium (1.5:1 to 2.5:1) seen in Figure 5-4 are indicative of the processes and source of these constituents in the groundwater (Section 5.2). Most of these groundwaters appear to have a limited range of concentrations when plotted in variation diagrams (e.g., Figures 5-1 and 5-4).

One of the most distinctive characteristics of groundwater composition from the screened data set is the presence of two chloride populations; one with concentrations that range from 2 milligrams per liter to 9 milligrams per

liter, and another ranging from about 20 milligrams per liter to 30 milligrams per liter. The high-chlorine groundwater appears to occur exclusively in four wells in the southwestern part of the Hanford Site within about a 2.5 mile (4.0 kilometer) radius (Figure 5-1). There is also a close correlation between among sodium, sulfate, and chloride levels in these wells. These relationships are notable because these characteristics are indicative of compositional controls associated with either evapotranspiration and/or the dissolution of salts within the aquifer system (Section 5.2).

The ratios and absolute abundance and ratios of chlorine and fluorine in groundwater from the unconfined aquifer are useful indicators that aid in the evaluation of processes that control groundwater composition because the fluoride is assumed to derive almost exclusively from reaction with basaltic material. Although the maximum fluoride concentration is slightly higher in the high-chlorine groundwaters (0.8 versus 0.6 for low-chlorine waters), the ratio of chlorine:fluorine in the unconfined groundwater of the screened data set fall into two groups as a result of the two chlorine groupings. The majority of the unconfined groundwaters have chlorine:fluorine ratios of about 10. However, the high chloride waters have ratios ranging from about 20 to over 30.

The concentrations of aluminum and iron at low levels in the groundwater are a common and expected feature of most groundwaters because of the tendency for aluminum to be partitioned in a kaolinitic species, and for iron to exist as $Fe3^{+}$in species such as ferrihydrite, which both have low cationic solubilities. The main exceptions are the groundwaters with elevated iron and manganese, which generally reflect the significantly greater solubilities of these constituents as divalent species in more reducing environments (Section 5.1.2.6).

5.1.2.5 Groundwater Age. Tritium and carbon-14 data for the springs and groundwater samples potentially provide some boundary conditions for, or constraints on, rock-water reaction recharge/travel time considerations. The spring and well water age-related data and apparent ages are shown in Table 5-5. Ages and/or residence time calculations and factors are presented in Appendix D.

It is indicated from the age estimates based on carbon-14 data in Table 5-5 that some of the spring water, and especially groundwater in portions of the unconfined aquifer along the western margin of the Hanford Site, might be much older than previously realized, i.e., perhaps as much as a few thousands of years older. The most important implication for groundwater composition in the unconfined aquifer is that the natural residence times and equilibration/buffering times for these parts of the aquifer might be quite long, with recharge rates that are quite low.

The relationship between relative chemical composition of groundwater and apparent age or residence time is equivocal. Without a clearer understanding of the compositional trends and patterns that are expected to occur over time in the aquifer due to rock-water interaction, no firm conclusions are drawn. This information is presented in Section 5.1.5.

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5.1.2.6 Redox Correlations. From the data available on the ORP from the BWIP data, it is indicated that oxygen depleted groundwater exists within the upper unconfined aquifer. Measured values of platinum electrode potential are <100 millivolts, and are positively correlated with elevated concentrations of iron and manganese (Figure 5-5). These relationships are consistent with increased solubilities of Fe^{2+} and Mn^{2+} under reducing conditions.

The relative concentrations of other major cations such as calcium and magnesium also appear to correlate somewhat with increasingly negative ORP (Figure 5-23). These relations are consistent with the influences of reduced oxygen contents on phase relationships and relative mineral solubilities (Sections 5.1.6 and Section 5.4).

The extremely low uranium concentrations in the deeper parts of the confined aquifer system beneath the Hanford Site have been attributed to anoxic conditions (<100 millivolts) (Smith et al. 1989). However, the current data on the redox conditions, dissolved oxygen contents, and compositional data are inadequate to evaluate potential redox effects on uranium solubility in the unconfined aquifer.

5.1.2.7 Redox Couples and Bacterial Mediation. The existence of reducing conditions in the suprabasalt aquifer is probably in part due to a combination of oxygen exclusion and bacterial respiration. The sampled portion of the aquifer might have been effectively 'shielded' from the atmospheric gases because of the extended perforated intervals [about 50 feet (915.2 meters)] and sample pump depth. This inference is supported by the relatively low carbon-14 contents in samples from these wells; i.e., diffusion of atmospheric gases into the sampled portion of the aquifer is highly unlikely with percent modern carbon values approaching 5 percent. Under these conditions, microbial degradation of dissolved and/or sediment- bound organic matter would deplete the dissolved oxygen originally present in aquifer recharge water. Methanogenesis could contribute to the reducing conditions. For example, methanogens reduce bicarbonate to methane, which also might result in a negative ORP value. Although methane was not analyzed in samples evaluated for this study, there is good isotopic evidence for biogenic methane production by this mechanism within the upper Ellensburg Formation beneath the Hanford Site, including some sedimentary interbeds (McKinley 1990, Johnson et al. 1991). Because the Ringold Formation and sedimentary interbeds of the uppermost Ellensburg formation are thought to have similar properties, and given the apparent exclusion of atmospheric gases for at least the wells with negative ORP values, methanogenesis might occur in the Rattlesnake Ridge interbed and portions of the Ringold Formation.

Direct culturing of artesian water from confined aquifers has produced coexistent iron reducing, sulfate reducing, and methanogenic bacteria from the Ellensburg Formation. Cultured samples from the unsaturated zone in the Hanford and Ringold Formations at the Yakima Barricade also produced a diverse microbial community. Although the nature and extent of microbial activity in the saturated zone of the Ringold Formation is undetermined, the presence of elevated iron and manganese, and some very low nitrate concentrations (0.5 part per million) in some of the wells, provide circumstantial evidence for bacteria/redox controls. Additional information is provided in Appendix D.

5.1.2.8 Influence of River Recharge. The two wells located near the Columbia (56-103) and Yakima (S24-19) Rivers show the lowest concentrations for most constituents. This is most likely attributable to the dilution of groundwater by local recharge from the respective rivers.

5.1.3 U.S. Geological Survey Data (Hanford Site Wells)

The USGS results for Hanford Site wells (Chapter 4.0, Section 4.1.3) provided the first reliable site-wide alkalinity and major cation data as well as several trace and minor constituents. These data have been used to evaluate overall trends due to (1) mixing or dilution by waste water or river water influences and (2) potential chemical changes in the upper aquifer because of absorption of carbon dioxide and equilibration with aquifer solid phases. Because of the wide distribution and uniformity of coverage, data from all wells, including those within contaminant plume areas, were used to evaluate the resultant effects of both natural processes as well as waste water disposal.

5.1.3.1 Alkalinity. Alkalinity values for the 1980-1984 sample period are plotted in Figure 5-6 along with free-hand interpretive concentration contours. Four major features are evident in this figure: (1) the influence of mixing or dilution by river water (areas less than 100 milligrams per liter), (2) the relatively uniform distribution of alkalinity across the site from west to east, (3) a zone of higher alkalinity (>140 milligrams per liter) along the western margin of the site, and (4) an anomalous area of >200 milligrams per liter.

Dilution and/or mixing--The lower alkalinities close to the river are attributed to mixing of Columbia River water (average alkalinity of 55 milligrams per liter) with ambient groundwater. In addition, most of the waste water discharged in the 200 Areas was river water used for process cooling, which appears to account for the two low alkalinity zones (<100 milligrams per liter) in the vicinity of the 200 West and 200 East Areas.

Carbon dioxide absorption--The uptake of carbon dioxide by groundwater should be manifest as a progressive increase in alkalinity in the direction of general groundwater movement across the Hanford Site. However, there does not appear to be any obvious trend of this type in the data as plotted in Figure 5-6 and appears to be of only secondary importance as a general control on the chemical composition of at least that portion of the aquifer sampled.

The one exception is the very localized occurrence of measurable carbon dioxide absorption in the upper aquifer observed in the vicinity of the nonradioactive landfill in the central portion of the Hanford Site associated with decaying organic matter in the landfill. The conditions at this locality resulted in increased partial pressure of carbon dioxide, and an increase in alkalinity of the groundwater immediately downgradient from 160 to 270 milligrams per liter (less than the calcium carbonate solubility limit). It is unlikely, however, that the conditions at this locality can significantly increase near-surface groundwater alkalinity because of the arid

conditions in the area and the extremely low organic content of naturally occurring Hanford Site soils (Appendix D).

Anomalous Zone--The anomaly defined by the >200 milligrams per liter contour lies in a zone of fine sediments and a relatively shallow depth to groundwater. Possible explanations for this highly localized area include evaporation of groundwater due to (1) the fine sediment/capillary fringe effect combined with the relatively shallow depth, (2) carbon dioxide absorption (as discussed previously and elsewhere), and (3) unknown past-practice disposal activities. There appears to be no information among which to distinguish these possibilities at the present time. While this feature appears to occur in a very restricted area, any characterization for remediation in the vicinity of this zone should consider the existence of this anomaly.

5.1.3.2 Redox Indicators. The USGS data set included a few measurements of redox couples (e.g., data on nitrate-nitrite and ammonium) that might suggest some additional evidence of bacterially mediated controls on reducing conditions in naturally occurring groundwater on the Hanford Site.

5.1.3.3 Minor and Trace Constituent Trends. Minor and trace constituent trends were not evaluated in the manner discussed previously for alkalinity and major cations/anions because it was considered more likely that such parameters might be influenced by past disposal operations.

5.1.4 Confined Aquifer Groundwater

A brief synopsis of the geochemical characteristics of groundwater in the underlying confined aquifer is presented because these data are valuable in providing information on a related aquifer system that can aid in interpreting the extent to which certain processes control groundwater composition. The unconfined and confined aquifer systems are related because the confined aquifer consists of fractured basalt with porous and permeable interbeds with similar origins and mineralogy to the Ringold Formation, and because clastic basaltic material is a common constituent within the Ringold sediments. Thus, the compositional patterns and trends in the confined aquifer potentially might provide a basis or bounding conditions for evaluating the effects of groundwater evolution involving these components. Such comparisons also appear to be justified because the compositional characteristics of major constituents in groundwater from the unconfined aquifer appear to be indistinguishable from those of groundwater from the uppermost confined aquifer in the vicinity of the study area.

Much of the information in the following paragraphs is summarized from McKinley's studies (1990) of the BWIP groundwater data from the confined aquifer, theoretical considerations, and experimental work on basalt-water interaction. Specific results of experimental work and geochemical modeling are summarized in Sections 5.1.5 and 5.1.6.

The chemistry of groundwater in the confined aquifer primarily reflects three spatially independent paths of chemical evolution:

- Rock-water interaction between meteoric water and basalt in the shallower parts of the aquifer

- Mixing of groundwater with evaporites from interbeds in deeper parts of the aquifer

- Methanogenesis/sufanogenisis associated with microbial processes in the deeper parts.

The chemical characteristics attributable to these processes generally vary in systematic ways with depth in the aquifer. The groundwater in the upper confined aquifer has compositional characteristics dominated by basalt-water interaction, but which has not reacted as extensively with the aquifer as groundwater has deeper in the aquifer. Rock-water interaction is interpreted to be the dominant process and the primary source for most constituents in the groundwater. The rock-water interaction process is characterized initially by covariant patterns of increasing concentrations of calcium, magnesium, silicon, and most minor elements with reaction progress or residence time in the aquifer. This is associated with the dissolution of pyroxene (augite), plagioclase, and the hydration of glass in the basalt. The stabilization of secondary minerals in the more evolved parts of the aquifer causes secondary trends of progressively decreasing concentrations of magnesium, and calcium with reaction progress due to the shift from dominance of dissolution control on composition, to solubility limit controls for magnesium and calcium and attendant ion exchange for sodium with calcium in secondary clay minerals.

The chemistry of groundwater throughout the confined aquifer has related compositional characteristics that primarily reflect the rock-water evolution path with depth, and differ primarily in the extent and type of rock-water interaction. However, the deeper groundwaters (i.e., below the Mabton interbed) also have characteristics reflecting the addition of microbial bicarbonate and evaporate brines. In these deeper groundwaters, elevated sodium and chlorine levels characterized by molar ratios of 1:1 are attributed to the dissolution of interbedded brines that dominates the levels of sodium and chlorine in the deeper groundwater.

Biogenic production of carbonate is interpreted to operate throughout the lithologic column; however, the effects appear to be negligible in the shallow groundwater above the Mabton interbed. In the deeper groundwater beneath this interbed, methanogenic bicarbonate controls calcium through equilibration with calcite and also produces relatively $d^{13}C$ -positive bicarbonate, unless sulfate is present, in which case $d^{13}C$ -negative bicarbonate is produced.

The importance of these characteristics is their potential bearing on the understanding of groundwater chemistry in the overlying unconfined aquifer. Thus, the compositional patterns in the upper unconfined aquifer are of greatest interest for evaluations of unconfined groundwater. The compositional characteristics for this groundwater appear to be dominated by the following aspects of rock-water interaction:

- Initial dissolution reactions involving stoichiometric contributions of most major constituents from basaltic minerals and glass, and attendant saturation or near saturation of water with silica

- Initial increase in essentially all solute components (except for aluminum, and iron, ± silicon) to maximum values

- Secondary decrease in the concentrations of calcium and magnesium with reaction progress due to: (1) the stabilization of clay minerals (smectite) with low magnesium solubilities, that become predominate over pyroxene dissolution and (2) the stabilization of carbonate and other secondary reaction products (e.g., zeolite) and ion exchange of calcium for sodium in clay

- Attenuated increase in sodium (± potassium) concentrations with reaction progress associated with the release of sodium and potassium from the hydration of basaltic glass to palagonitic montmorillonite

- Secondary or tertiary increases in sodium and chlorine in 1:1 molar ratios due to the dissolution of sodium chloride [restricted to depths below 1,804.5 feet (550 meters) in the confined aquifer]

These data, relationships, and interpretations are discussed in greater detail in Appendix D.

5.1.5 Experimental Results

Data from experimental work on rock-water interactions are important to understanding the nature of the compositional variations attributable to one or more processes that can be constrained in the laboratory or by the experimental design. These data provide one of the only sources of information on the nature and extent of the interaction between water and the aquifer materials beneath the Hanford Site. These data also provide a basis for distinguishing the compositional characteristics attributable to rock-water interaction from other processes.

The results of two experimental studies are summarized as follows: (1) basalt-water interaction studies of McKinley (1990) and (2) new rock-water interaction studies initiated in conjunction with this study (Chapter 4.0, Section 4.2). The data from these studies are provided in Appendix D, together with descriptions of the experimental design and interpretation of results.

5.1.5.1 Previous Basalt-Water Interaction Studies. Although many experimental studies on basalt-water interactions were performed in conjunction with BWIP, few of those results are appropriate for the objectives of this study because most of those tests were not designed to evaluate the nature of rock-water interaction in a deep basalt system. More specifically, these tests primarily involved high sodium chloride water comparable to that in the deep confined aquifer as starting material. Thus, the experimental results of McKinley (1990) especially are useful because the objective of that

study was to evaluate compositional characteristics of rock-water interaction for the upper basaltic confined aquifer system.

The main result of these experiments was that the interaction of basalt with water produced water compositions over time (reaction progress) that mimic the compositional trends of groundwater seen in the confined aquifer. In particular, good correlations between magnesium to calcium concentrations were observed, as well as the increasing dominance of sodium and silicon as dissolved elements. Good correlations between dissolved constituents and an increase in pH (from near-neutral to a maximum of 8.9) were observed with reaction progress. Trends of decreasing calcium and magnesium after initially high levels were observed to be coincident with the appearance of secondary minerals (e.g., smectite). These results were interpreted as demonstrating the influence of interstitial glass in the basalt and pyroxene dissolution on groundwater composition (Appendix D).

5.1.5.2 New Rock-Water Interaction Studies. A three-phased series of tests were initiated for this study (Chapter 4.0, Section 4.2). The compositions of waters resulting from these tests are tabulated in Tables 5-6 and 5-7. The preliminary results of two of these tests are summarized in the following paragraphs. These results are discussed in more detail in Appendix D.

Closed-System Tests--The results of closed-system tests between crushed basalt and water and Ringold sediment and water at room temperature indicate that the initial reactions between water and rock/sediment material are dominated by the dissolution of minerals and basaltic glass, and that these reactions initially dominate the chemistry of the water.

The following is a summary of the main observations concerning the closed-system water composition with time.

- Initial (surface) reaction between water and sediment/rock at room temperature occurs rapidly, i.e., within minutes or hours (Figure 5-8)

- Initial reactions within the first 24 hours accounts for 90 to 100 percent of the maximum dissolved solid concentration observed in the closed-system tests for reactions involving both basalt and Ringold sediment.

- Relatively large concentrations of most major and minor constituents are observed in the reacted waters.

- Water-rock interaction with basalt is dominated by the dissolution of plagioclase, interstitial glass, and calcium-rich pyroxene.

- Water-rock interaction with Ringold sediment is dominated by the dissolution of feldspar, basaltic components in the sediment, and micaceous minerals (muscovite and biotite).

Open-System Tests--Preliminary results of open-system leaching tests with basalt and Ringold sediment performed to compare and contrast the compositional characteristics and trends of water analogous to that in a well-

flushed aquifer system are summarized. The following are the most notable observations to date.

- There are significant differences in the composition of water that initially reacts with basalt compared to that reacted with Ringold sediment.

- The compositions of water reacted with basalt and Ringold sediment flushed of earlier soluble components are nearly identical.

- Dissolution of basaltic material and feldspar dominate the water reacted with Ringold sediment after initial flushing.

One of the most important aspects of these test results is the similarity between the composition of water produced in these tests and groundwater from the unconfined and upper confined aquifers. These similarities are discussed in Section 5.2. A more detailed discussion of these preliminary test results is presented in Appendix D.

5.1.6 Geochemical Modeling

It is indicated from the results of geochemical modeling that spring waters and shallow groundwater are saturated or nearly saturated with silica and possibly aluminous clay (allophane), and undersaturated with respect to calcite and fluorite. These relationships are reversed in deeper confined aquifer groundwater and result in a general trend of decreasing bicarbonate and calcium concentrations with depth in the confined aquifer (DOE 1988) due to calcite precipitation and cation exchange that removes calcium from solution. The extent of calcite equilibrium also is important because it influences pH and bicarbonate levels, which in turn affect solubilities and reaction rates that control dissolution and precipitation of secondary minerals.

The modeling of confined aquifer groundwater from the Grande Ronde aquifer is particularly interesting because the chemical characteristics of this groundwater near areas of recharge appear to represent chemically immature precursors to deep groundwater at the Hanford Site. This shallow confined groundwater also is undersaturated with respect to silica, and reflects conditions conducive to the regional dissolution of basaltic glass. Although this groundwater is undersaturated with respect to calcite near the implied recharge areas, the groundwater reaches equilibrium at greater distances downgradient.

It also is indicated from the results of equilibrium reaction path calculations and mass balance calculations that the basalt aquifer hydrochemistry on the plateau can evolve by glass hydrolysis and formation of calcium-zeolites and iron-calcium-magnesium smectites and pyrites (Warner 1986). These modes also indicate that the high sodium chloride groundwaters in the deeper parts of the confined aquifer do not result from dissolution of basalt alone, as proposed by Early and Solomon (1985) and McKinley (1990).

The results of recent modeling efforts also show that the solubility of constituents such as calcium and magnesium in groundwaters that have interacted with basalt are significantly reduced by reaction with air, but that the concentrations of anions largely are unaffected. These relationships are important in evaluating the potential influence of reactions with air (e.g., spring water that becomes surface water before becoming recharge to the unconfined aquifer). The implications of these modeling efforts together with the other information and data are discussed in Section 5.2. A further discussion of these geochemical modeling efforts and findings is presented in Appendix D.

5.1.7 Other Data

Vertical distribution and mixing, artificial recharge, and groundwater compositional trends are discussed in the following sections.

5.1.7.1 Vertical Distribution and Mixing. Evidence for upwelling of deep basalt groundwater in the basalt sequence beneath the Pasco Basin has been found to occur presumably from flow in the deep basalt aquifers that converge on the Pasco Basin (DOE 1988). Vertical hydrochemical profiles for several deep boreholes drilled on the Hanford Site (DOE 1988) suggest the high chloride groundwater does not occur above the lower to middle Saddle Mountain Basalt. However, structural conduits or preferential flowpaths, might permit vertical leakage into shallower groundwater in more localized areas (e.g., along faults). While upward discharge into shallow groundwater by such processes might be possible, little if any evidence for this type of occurrence currently exists. If vertical upwelling into the unconfined aquifer does occur, the relatively small volumes of water available in the deeper aquifers would make it easier for the effect to be masked by the much larger volumes of groundwater in the unconfined aquifer. If the effect is present, it might be detectable only in the lower portions of the unconfined aquifer where mixing would be minimized.

If high chloride, deep water discharges into the unconfined aquifer, mixed groundwater with higher chloride contents and dramatically different relative chemical compositions should be observed (refer to Stiff diagrams for unconfined aquifer versus Priest Rapids [DB-14] and Mabton Interbed [DB-7] (Figure 5-7). In addition to conservative mixing, chemical changes in a mixed groundwater system (i.e., upwelling of deep water into the unconfined aquifer) could include increases in pH and possibly precipitation of calcium carbonate or calcium sulfate. One of the primary indicators of this type of natural mixing likely would be elevated dissolved solids and or significant increases in the sodium/calcium ratio.

5.1.7.2 Artificial Recharge/Groundwater Compositional Trends. Effluent and groundwater solute compositions beneath selected liquid waste disposal sites might provide opportunities to test certain aspects of the conceptual model. Evaluation of effluent water cooling water (Columbia River water) discharged into the vadose zone, for example, can be useful in evaluating rock-water reactions.

9 2 1 2 6 5 1 0 6 2

One example is the evaluation of the average effluent composition into the 216-Z-20 Crib and associated groundwater performed in conjunction with the liquid effluent study (WHC 1990). This example was selected because of the relatively uncontaminated nature of the waste water and the dominance of the water source in the area beneath the crib (i.e., minimal influence from other sources). It is indicated from the results of this evaluation that a significant amount of silica was added to the effluent water during passage through the soil column (about 200 days) before reaching groundwater. The other major rock-forming constituents appear to be consistent with conservative estimates for mixing with groundwater with the exception of sulfate, which appears to have been removed from the waste water during passage through the soil column. A brief description of this evaluation is provided in Appendix D.

5.2 DATA EVALUATION AND INTERPRETATIONS

All available data and information are evaluated collectively in this section. The evaluation of this information and data together potentially reveals relationships, patterns, and trends not otherwise indicated by separate evaluation of this information. The evaluations and interpretations presented combine the results of basic principles with the compositional data on surface and groundwater at the Hanford Site, experimental results, geochemical modeling, and other pertinent information. This approach to the evaluation process yields interpretations and conclusions that are more compelling than the interpretations inferred from separate sources of information, because the information base that is used is much greater.

These evaluations provide a basis for understanding the site-specific controls on groundwater composition in this region. This type of understanding is important to the characterization of natural background because it serves as the basis for explaining the type and extent of compositional variation that exists naturally with respect to all constituents. Most of these interpretations are preliminary, pending the evaluation of test results.

The main processes that are interpreted to potentially influence the chemistry of the groundwater are as follows:

- Extent of open- and/or closed-system behavior within the aquifer
- Variations due to extent of reaction (i.e., reaction path)
- Reduction-oxidation conditions in the aquifer
- Evaporation effects on recharge water
- Microbial processes within the aquifer.

The extent to which these processes can be determined influences groundwater composition in the aquifer system at the Hanford Site can be distinguished is summarized in the following sections.

5.2.1 Compositional Variability Among Surface Waters and Groundwaters

The unconfined groundwater data evaluated here have compositions that extend over most of the compositional range extending between the recharge sources to groundwater in the upper confined aquifer (Figure 5-9). The recharge sources themselves have significant compositional variability because the types of recharge waters range from meteoric water run-off to spring waters. This is an important characteristic of the aquifer system because previously reacted water as a primary source of recharge has important implications for subsequent processes within the aquifer system.

The average concentrations of most major and minor constituents in the surface waters, spring waters, and groundwaters at the Hanford Site tend to increase systematically in the following order:

upper confined > unconfined > springs > surface water

These patterns (Figure 5-10) largely represent increases in individual constituent concentrations and total dissolved solids. However, the effect of direct surface water recharge from the Columbia and Yakima Rivers is to effectively dilute the groundwater.

5.2.2 Composition and Age

The relationships among the composition, age, and type of waters in the aquifer system are illustrated in Figures 5-10 and Figures 5-11. The systematic relationship between groundwater age and the composition expected between waters related by similar processes, i.e., the youngest waters are the surface waters, and the oldest are the confined aquifer groundwaters, are illustrated in Figure 5-10. There appears to be a wide range of apparent ages for groundwater in the unconfined aquifer that is correlated with compositional variability.

The relationship between age and concentration of major constituents within these groups is further illustrated in Figure 5-11. In general, the same sequence of increasing concentration with age from surface waters to the confined aquifer groundwater is evident, with the exception of some of the older, confined aquifer groundwaters that have lower concentrations of calcium and magnesium, but relatively high concentrations of constituents such as potassium. However, these characteristics appear to be consistent with normal rock-water reaction patterns in the confined aquifer for groundwaters somewhat more evolved than those in the unconfined aquifer, provided that the types and sequences of reactions in the unconfined and confined aquifer are comparable.

5.2.3 Open- Versus Closed-System Behavior

It is indicated from the results of the experimental work reported here that nearly all of the compositional variation can be attributed to the differences between open-system and closed- system rock-water interaction. As

seen in Table 5-8 and Figure 5-12, the compositions of waters reacted with Ringold sediment in open and closed systems bracket the compositions of nearly all groundwater compositions in the unconfined aquifer with respect to the major and minor constituents, with the exception of sodium and chlorine in the high-chlorine groundwaters. It is especially notable that the maximum concentrations of the major and minor constituents in water produced in closed-system test with Ringold sediment are strikingly similar to the maximum levels measured in the unconfined aquifer for nearly all constituents (Table 5-8; Figure 5-12). However, the average compositions of groundwater in the unconfined aquifer are much lower and more closely resemble those from the open-system tests that have been flushed of the most readily soluble components.

The results of these tests also indicate that in closed systems the vast majority of water chemistry is controlled by reactions that occur within the first 24 hours, presumably because of the effects of surface reactions and highly soluble constituents. However, in open systems, irreversible flushing of the system occurs with attendant effects on water chemistry by reactions that also occur rapidly, but that produce lower concentrations of dissolved solids. The composition of groundwater resulting from open system reactions as in a dynamic recharge zone are, therefore, likely to be dominated by the composition of the recharge water if it differs significantly from meteoric water. Thus, groundwater in parts of the unconfined aquifer on the Hanford Site that behave as open systems might largely reflect the composition of spring water recharge. This interpretation appears to be supported by the striking similarities between the composition of spring waters and the average composition of groundwater in the unconfined aquifer, as shown in Table 5-2 and illustrated in Figure 5-13.

These results are relevant to these evaluations because the compositions of any localized regime within the natural aquifer system are bounded by open and closed system behavior, and both appear to exist at the Hanford Site over a distance of 1 to 2 miles (1.6 to 3.2 kilometers) beneath the 200 Areas (e.g., Figure 5-14). The similarities between the average composition and those of the experimental results also are compelling because such compositions can only be attributable to open-system behavior of reaction with aquifer material, because any reaction with previously unflushed parts of the aquifer would result in concentrations that are significantly larger, by up to 15 times for certain constituents and up to 1.5 to 3 times larger for most other constituents. It also is indicated that it is essentially impossible for any recharge water reacting with previously flushed solids to have the levels of dissolved constituents obtainable in closed-system reactions, unless the recharge water itself was high in dissolved solids.

It would, therefore, appear that much, if not most, of the compositional variability seen in the unconfined aquifer can be attributed to the effects of rock-water interaction, either before or after entering the aquifer. The largest concentrations in the unconfined aquifer might represent parts of the aquifer that largely behave as closed systems. This model also appears to be generally consistent with the estimated ages for groundwater in the unconfined aquifer [Figure 5-11 (i.e., the stagnant waters with larger concentrations of dissolved solids also should be older)]. Evidence for effective open and

closed-system behavior within the unconfined aquifer on the scale of a few miles (kilometers) in illustrated in Figure 5-13.

5.2.4 Reduction-Oxidation

Relatively reducing conditions appear to exist in parts of the unconfined aquifer. The effects of reaction path and processes such as redox appear largely to serve as a source of variability superimposed on the compositional signature inherited either from the recharge source or from closed system rock-water reaction. It is indicated from these data that the concentration of most major constituents generally vary in systematic patterns with ORP and age (Figures 5-23 and 5-11). However, the effects of open- versus closed-system reaction, groundwater age, and redox effects are difficult to distinguish quantitatively by means other than experimental tests because these effects are interrelated. For example, water in an effectively closed part of the system will have compositions inherently larger than other groundwaters because the closed part retains the highly soluble components, and because these parts of an aquifer system also tend to be the oldest and most reducing.

The presence of elevated iron and manganese, and some very low nitrate concentrations (0.5 part per million) in some of the wells provides circumstantial evidence for bacteria/redox controls. Specific measurements for redox couples would be needed for confirmation of such conditions in the target aquifers. However, it has been long known that certain bacteria are in general capable of reducing the higher oxidation states of several elements of interest (Bowen 1966). Furthermore, in view of the large number of species of bacteria and their well known occurrence in a wide range of aquatic environments, the presence of bacterial populations in Hanford Site unconfined groundwater would not be surprising.

In addition to the obvious or direct regulatory implications for manganese and iron noted previously (Figure 5-4), the existence of reducing conditions in the suprabasalt and upper confined aquifer might have an important influence on the mobility of certain radioactive waste constituents in Hanford Site groundwater (e.g., radioisotopes of uranium, plutonium, technetium, neptunium, americium, selenium).

5.2.5 Reaction Path

Similarities between the nature of rock-water interactions and reaction paths in the upper confined and unconfined aquifers is indicated from the results of the experimental studies, mass balance considerations, geochemical modeling, and the similarities and overlap in composition of groundwater in the unconfined aquifer with upper confined aquifer groundwater. The extent to which the compositions of spring waters and groundwater in the unconfined and upper confined aquifers overlap are presented in Figures 5-9, 5-10, and 5-11. The relationships between the composition of these waters can be attributed to the processes previously described together with reaction path effects.

The effects of reaction path are important in understanding the relationship between the confined and unconfined aquifer, and on compositional variability for major and trace constituents. The implied similarities in reaction path between the these waters appear to be related to the dominance of basaltic components in the reaction between water and Ringold sediments as well as in the basaltic aquifers. This characteristic of the aquifer system is based on the preliminary results of mass balance calculations, which indicate that the composition of water resulting from reaction with Ringold sediments appears to be dominated by reaction with the same basaltic components that dominate the composition of basalt-water interaction. These reactions primarily involve the dissolution of plagioclase, basaltic glass, and calcium-rich pyroxene. For the tests with Ringold sediment, the reactions appear to also involve the dissolution of subordinate amounts of micaceous minerals and additional feldspar minerals (Appendix D).

It is, therefore, indicated that the reaction paths for groundwater in both the confined and the unconfined might be similar, and largely controlled by reaction with basaltic materials, where they exist in the unconfined aquifer, and that these waters should, therefore, have largely comparable reaction paths. These relationships may explain the overlap in composition with both spring waters and groundwater in the upper confined aquifer, as well as the general trends and covariance between the composition and age of the surface waters and groundwaters in the aquifer system.

The compositions of the unconfined aquifer groundwaters might, therefore, also represent the less evolved, more primitive part of a reaction sequence similar to that seen in the confined aquifer. This reaction sequence is characterized by the initial dissolution of minerals and glass, followed by relatively constant or only slightly changing concentrations of constituents until the onset of calcite and/or significant clay (smectite) precipitation. This second stage of the reaction sequence is associated with lower calcium and magnesium contents and higher concentrations of sodium, potassium, and other constituents in accordance with the solubility controls of the stable minerals the aquifer system. This stage of evolution has not been seen in the unconfined aquifer, and is first evident in groundwaters from the upper part of the confined aquifer.

5.2.6 Evaporation and Evaporite Dissolution

The main anomalies in the range of groundwater compositions seen in the unconfined aquifer are those from wells within a 2.5 mile (4.0 kilometer) radius in the southwestern part of the Hanford Site. The primary characteristic of these waters is that the waters contain higher levels of chlorine, sodium, and sulfate, and slightly higher levels of potassium than the average groundwater composition in the unconfined aquifer. The existence of these groundwaters and the recognized importance of the processes that potentially impact the composition of recharge water before entering the aquifer requires the evaluation of evaporation.

The potential evapotranspiration in the Pasco Basin is five to nine times precipitation. Recent work on groundwater recharge through the vadose zone on

the Hanford Site indicates that there appears to be no direct vertical recharge of the unconfined aquifer from modern meteoric water (Routson and Johnson 1990; Fayer et al. 1991). However, evaporation is a potentially important process that could affect groundwater chemistry by modifying the composition of recharge water. Evaporation is primarily a fractionation process that causes the concentration of dissolved constituents to increase exponentially as water is removed by evaporation.

This issue is important because this process has major implications for groundwater chemistry, where it is operative, and also because the main anomalies in the background study subset involve constituents such as chlorine that also are associated with related processes, such as salt dissolution that potentially impacts the aquifer in a very different way. The main difference is that evaporation affects all dissolved constituents, whereas, the dissolution of salts within an aquifer only results in the contribution of those components to the groundwater (e.g., sodium chloride and/or related salts). Thus, it is important to evaluate the extent to which groundwater in the unconfined aquifer is impacted by the effects of the following:

- Evaporative increases in the dissolved solid contents of recharge waters exposed at the surface (e.g., springs) before entering the unconfined aquifer

- Dissolution of salts originally present in the aquifer, and reflected by localized closed-system behavior

- The interaction of water with the vadose zone material.

The effects of evaporation are commonly reflected by relative isotopic fractionation (i.e., enrichment) of oxygen (O-18). Isotopic data on deuterium and O 18 compositions of surface water, spring water, and groundwater from unconfined aquifer indicate that these waters appear to lie on a local meteoric water line, and that O-18 values are bracketed by the compositions of the Columbia and Yakima River waters (Figure 5-15 and 5-16). These data alone are inconclusive for evaluating the relative importance of evaporative preconditioning of recharge water on the composition of groundwater in the unconfined aquifer, because the effects on O-18 fractionation associated with the local meteoric water line are not well constrained. This topic is discussed further in Appendix D.

A related topic is the composition of the high-chlorine waters. It is indicated that the composition of these groundwaters could be affected by dissolution of salts in the aquifer or by evaporation-influenced recharge (Figure 5-17). The high-chlorine waters, however, appear to only be enriched in sodium, chlorine, sulfate, and some potassium, which are common to evaporites, and have concentrations of other major and minor constituents that are similar to the groundwaters with close system-type compositions that do not have anomalous concentrations of sodium, chlorine, sulfate, and potassium. The trends of molar sodium and chlorine contents in groundwater from the unconfined aquifer also are consistent with those obtained experimentally by rock-water interaction (i.e., sodium:chloride ratios of about 4:1) compared to those of the high-chlorine waters (about 2:1) that are shifted in a direction

consistent with the addition of sodium chloride with a molar ratio of 1:1. Mass balance calculations also indicate that the chlorine levels seen in these waters would require 50 percent to over 90 percent evaporation or dissolution of about $3x10^{-5}$ milligrams of sodium chloride per liter of water. This topic is discussed further in Appendix D.

5.3 REVISED CONCEPTUAL MODELS FOR HANFORD SITE GROUNDWATER

This evaluation focuses primarily on compositional characteristics of natural groundwater in the unconfined aquifer system and on the processes and factors that impact the composition of groundwater in this aquifer system. For the purpose of this report, the most relevant parts of the aquifer extend from the surface waters that serve as recharge to the unconfined aquifer, to the uppermost portion of the underlying confined aquifer (i.e., Rattlesnake Ridge interbed). The deeper portions of the confined aquifer are of interest here primarily because of the potential for upwelling and mixing with the shallower aquifers, and also as a frame of reference for compositional variations attributable to the natural evolution of water in the aquifer system.

The determination of natural background concentrations for constituents in Hanford Site groundwater requires the identification of representative areas of the Hanford Site unaffected by onsite operations. The consideration of site geohydrology, well depth, data quality objectives, and the distribution of indicator contaminants in the groundwater (i.e., tritium), and other DQO criteria served as the primary basis for the choice of data suitable for consideration in the evaluation of natural background. As a result of this screening process, the existing groundwater data compiled and evaluated here are largely restricted to an area along the southwestern margin of the Pasco Basin, parallel to the trend of Rattlesnake Ridge, and are restricted to the uppermost parts of the unconfined aquifer upgradient to Hanford Site operations.

This BSS area includes primary recharge zones adjoining drainage areas for surface and spring water and regions of the aquifer with the greatest hydraulic gradients. Groundwater crossing the background study area would, therefore, be the only influent water source under most of the Hanford Site in the absence of the large amount of artificial recharge associated with Hanford Site operations. Groundwater samples from the background study area, therefore, represent the most reliable data sets for the evaluation of natural groundwater composition unimpacted by operations at the Hanford Site. It is anticipated that the estimation of provisional background levels for naturally occurring constituents from this evaluation are likely to be conservative because aquifer systems generally have the lowest concentrations of dissolved solids in the upper parts of the aquifer system closest to recharge zones.

The similarity in average compositions between the BSS and Hanford Site data generated previously (Evans et al. 1989) indicates the BSS data could be applicable to the upper unconfined aquifer across the Hanford Site. The results of this study provide an important baseline for the environmental restoration activities at the Hanford Site, and for understanding the

processes affecting groundwater composition because of the data quality objectives approach to the evaluation. A more complete description of this conceptual model for the natural evolution of groundwater beneath the Hanford Site is presented in Appendix D.

5.3.1 Site-specific Factors Characteristics and Controls on Natural Groundwater Composition

The Pasco Basin, which includes the Hanford Site, is underlain by a multiaquifer system including confined aquifers within the Columbia River Basalt Group and an unconfined aquifer in the suprabasalt sediments (Chapter 3.0). Natural recharge to the unconfined aquifer potentially occurs from several sources that include the following:

- Sidebank recharge along effluent reaches of the Columbia and Yakima Rivers
- Recharge by meteoric waters through the vadose zone within the Pasco Basin
- Recharge by meteoric waters on the basalt ridges surrounding the Pasco Basin
- Upwelling of deep basalt groundwater within the central portion of the Pasco Basin.

The infiltration of meteoric water through the vadose zone is not a significant source of groundwater recharge on most of the Hanford Site. The effect of sidebank recharge is important along stretches of the Columbia and Yakima Rivers, but is limited to the parts of the aquifer system adjacent to these rivers. The principal effect of this source of recharge appears to be dilution of existing groundwater compositions, except for the possible contribution of anthropogenic constituents to the groundwater locally. There is no evidence that upwelling of groundwater from the confined aquifer affects the unconfined aquifer in the background study area. It is also likely that such upwelling would have a minimal impact on groundwater chemistry because of the relatively small volumes of water involved.

Natural recharge of aquifers in the Pasco Basin occurs principally on anticlinal ridges bounding the basin. Infiltration on the ridges, principally of snow melt, feeds the confined and unconfined aquifers and springs that occur on the flanks of the ridges. Spring water also might infiltrate along the margins of the basin (e.g., Rattlesnake Spring, which feeds Dry Creek). No evidence for mixing of deeper groundwater was found in either the unconfined aquifer or in the Rattlesnake Ridge interbed.

5.3.2 Compositional Controls and Relationships

The composition of groundwater in the unconfined aquifer in the region of the BSS appears to contain groundwater with compositions controlled primarily

by the extent to which discrete parts of the aquifer behave as open or closed systems. Both appear to be manifested within the upper parts of the unconfined aquifer within in the recharge zone.

Open-system regimes are the parts of the aquifer with relatively high hydraulic conductivities resulting in flushing by recharge waters. The composition of groundwater in these regimes appears to be dominated by the composition of the recharge water, predominately springs, before entering the unconfined aquifer. The effects of rock-water interaction with these flushed parts of the aquifer system appear to be modest, with most of the compositional characteristics dominated by previous basalt-water interactions. These interaction primarily involve reaction between dilute, carbon dioxide-charged waters and basalt in the anticlinal ridges that form the southwestern and northern margins that emerge as springs. These groundwaters have a range of compositions that extends from those with the lowest dissolved solid contents, and closely resemble and overlap with the compositions of spring waters. Most of these spring waters are generally young (high carbon-14 contents), and are relatively oxidized by the time they enter the unconfined aquifer. Some of the spring waters themselves appear to be relatively old, and many of these characteristics are reflected in the range of compositions seen in these shallow groundwaters.

The closed-system regimes within the aquifer are characterized by groundwater compositions with generally larger concentrations of total dissolved solids, lower carbon-14 levels, and which are relatively deficient in oxygen (i.e., negative ORP values). The compositions of these waters in the BSS region have compositions similar to those produced experimentally by closed-system reaction with Ringold sediment. Based on the experimental results, these compositional characteristics are largely limited to the nature and type of the reactions that occur in closed systems that are dominated by the extremely rapid dissolution of readily soluble constituents (i.e., surface reactions and highly soluble minerals). The distinctive composition of these waters therefore appears to be largely established by the initial reactions, with only moderate changes because of the subsequent evolution by further rock-water reactions.

The characteristics of these groundwaters appear to extend to high-chlorine groundwaters, which have compositional characteristics identical to those of other closed-system groundwaters, but with noticeably elevated levels of sodium, chlorine, sulfate, and potassium to a lesser extent. These characteristics are consistent with the attendant dissolution of evaporites, presumably entrained in the aquifer sediments at the time of deposition that would not be flushed from the groundwater in a closed system, but would be rapidly removed in the dynamic parts of the aquifer affected by the recharge system.

Thus, the upper parts of the unconfined aquifer in the vicinity of the primary recharge zone appear to dominated by open-system type compositional characteristics as might be expected for this part of the aquifer. However, this might be an artifact of the BSS region, i.e., the most dynamic region in the aquifer system. It is possible that the dominance of open-system

groundwaters might be less dominant farther from the recharge areas and deeper in the aquifer.

The similarities between the average composition of the unconfined aquifer groundwater to the average of upper unconfined groundwaters from across the Hanford Site (Evans et al. 1989) might indicate that these compositional characteristics and/or these relationships are common across the Hanford Site. However, further evaluation is required to characterize the effects of interaction of artificial recharge water with the soil in the vadose zone and the underlying aquifer.

The influence of reaction-path considerations on the compositional variability in these data sets appears to be subordinate to the compositional characteristics inherited from the open- versus closed-system influences. Reaction path sequences for basalt-water reactions and for reactions between Ringold sediment-water are expected to be similar because Ringold sediment-water reactions appear to be dominated by dissolution of basaltic components (feldspar, calcium-rich pyroxene, and basaltic glass), and subordinate amounts of micaceous minerals. It is possible that reaction-path influences might have a greater influence on the composition of groundwaters farther from the recharge areas and deeper in the aquifer where hydraulic conductivities are lower and residence times are greater.

The extent to which reaction-path influences affect the composition of groundwater in the unconfined aquifer appears to be bounded by the compositions of groundwater in the confined aquifer. These compositions overlap with those in the unconfined aquifer and extend to the 'water-softening'-type reactions associated with lower calcium and magnesium contents, and somewhat higher concentrations of alkalies in the more evolved groundwater in the confined aquifer.

Reducing conditions exist in even in the shallow parts of the unconfined aquifer in the recharge zone manifested primarily by elevated concentrations of iron and manganese, relatively low sulfate and nitrate levels and low ORP values. These data also are circumstantial evidence for bacteria/redox controls. The more reduced waters tend to be associated with older groundwaters, whereas the younger flushed waters tend to be more oxidizing. Based on the extent to which reduced conditions exist in the BSS region, it is anticipated that groundwater further downgradient and/or deeper in the aquifer is likely to be as low or even lower in oxygen. The extent to which rock-water interactions and/or microbial processes control redox conditions in these groundwaters is not well known at this time.

The compositions of the shallow unconfined groundwaters in the study area appear to be largely undersaturated with respect to calcite. There is also no evidence of important carbon dioxide influences (from air). The effects of microbial activity on increased carbonate stability and attendant reactions are, therefore, not manifested in the study area, but could possibly occur elsewhere in the aquifer if this process is important in the unconfined aquifer. The effects of evaporative preconditioning of recharge water to the unconfined aquifer (i.e., increased concentration levels) are not well constrained at this time and are under evaluation.

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5.3.3 Preliminary Anthropogenic Conceptual Model

A variation on the natural groundwater evolution model summarized in tabulated form involves mixing of natural groundwater with artificial recharge water from waste water disposal on the Hanford Site proper and major agricultural recharge resulting from extensive irrigation along the northern Hanford Site boundary. The latter has resulted in dramatic increases in groundwater elevation as previously discussed and illustrated in Chapter 2.0, Figure 2-9.

5.3.3.1 Waste Water. The principal chemical effect of most of the waste water of Hanford Site origin is to dilute ambient or natural groundwater. (Preliminary evaluations for this study suggest little modification of the artificial recharge water occurs during passage through the vadose zone). Dilution will be limited to the immediate vicinity of disposal areas and to the uppermost few feet (meters) of the aquifer in downgradient plume directions. The relative amount of actual dilution is difficult to determine because of the unknown influence of borehole dilution during sample acquisition (i.e., entrainment of deeper, undiluted natural groundwater with the near-surface plume interval). However, regardless of the degree of actual dilution, it makes little difference in the application of a natural background value because the mixed concentrations will be less than the undiluted ambient groundwater. Further consideration of this variation therefore is deemed to be of only secondary importance for purposes of establishing and/or applying natural background values.

However, uncertainties exist regarding the extent to which the upper unconfined groundwaters across the Hanford Site have been impacted by artificial recharge, and the influence of artificial recharge waters by reaction with soils in the vadose zone also might be important. Judging from the results of experimental studies, the compositions of uncontaminated groundwater resulting from artificial recharge should resemble the open-system compositions where prolonged waste water discharge has occurred, and might closely resemble closed-system compositions in areas of limited discharge and small hydraulic gradients.

5.3.3.2 Irrigation Water. This source of modified groundwater is of concern for establishing a groundwater background within the Hanford Site boundary on the Wahluke Slope (northern portion of Hanford Site). A preliminary conceptual model for near-surface groundwater composition in this area includes the following:

- Evaporative increase in the concentrations of major and minor constituents in average Columbia River water coupled with
- Chemical controls on alkalinity and sulfate concentrations due to solubility limits imposed by calcium carbonate and calcium sulfate, and
- Groundwater components from agricultural chemicals.

The chemical composition of the resulting recharge water should dominate the near-surface groundwater composition. Some evidence for this is provided by the extensive seeps in depressions that have developed on the Wahulke Slope over the last 30 years from Columbia Basin Irrigation Project activities. This type of groundwater composition, which is probably characteristic of much of the Wahluke Slope, represents a different type of background for the Hanford Site than that considered for the 'natural' background and should be considered and/or applied separately.

No existing chemical data could be located to test the proposed irrigation-modified groundwater model and thus no firm conclusions or refinements could be made. Additional sampling and evaluation are needed in this relatively 'unexplored' area of the Hanford Site.

5.4 PROVISIONAL GROUNDWATER BACKGROUND VALUES

Unconfined aquifer data from the BWIP hydrochemistry database and the HGDB (Chapter 4.0, Sections 4.1.1 and 4.1.2) were merged to form a single database for deriving provisional groundwater background threshold values. The uppermost confined aquifer data were not included in this evaluation because of the inadequate number of available analyses for statistical treatment. However, the existing confined aquifer data are adequate for considering trends and testing consistency with groundwater evolution models. Data limitations, as previously discussed, must be kept in mind, especially for regulatory or remediation applications. Statistical methods for treatment of the merged data are described in Appendix B.

As previously indicated (Chapter 1.0 and Section 5.1.1), the 'target population' for statistical evaluation consists of groundwater from all possible locations and depths within the suprabasalt aquifer in the background area (an irregular shaped zone about 3.1 miles (5 kilometers) wide between Horn Rapids and Vernita Bridge, situated upgradient from the influence of Hanford Site WMUs (Figure 5-18). Groundwater within this corridor is outside known contaminant plumes (<tritium detection limit) and is judged to be compositionally homogeneous (Section 5.1.1) (i.e., relative proportions of major anionic and cationic constituents are uniform indicating a common chemical history). For purposes of this evaluation, the available data from monitoring wells within this area constitute the 'sampled population'. Because there is limited coverage within the northern sector of the background area, the sampled population is somewhat less than the target population. However, the combined data for the suprabasalt aquifer evaluated were assumed to be a random sample from the sampled population as defined previously.

A logic diagram for evaluation of each constituent of interest from the combined data is shown in Figure 5-19. The data for each chemical constituent of interest were first examined for outliers and/or indications of multiple concentration groups using a Box-and-Whisker plot (Figure 5-20) and a normal probability plot (Figure 5-21). A fitted normal distribution curve superimposed on the histogram also is presented (Figure 5-22) to aid in identifying deviations from normal distributions. (The fitted curve in Figure 5-22 should be symmetrical for a 'normal' population). If

concentration groups were apparent or suspected, the data were separated and additional box plots made for the different concentration groups. No attempt was made to split the data into groups when distinctions were not obvious. Graphical results of this process for each constituent evaluated are included in Appendix C. Numerical results of the statistical analyses are tabulated in Appendix B. The provisional threshold value assignments resulting from this effort are summarized in Table 5-9.

These efforts clearly identified at least two concentration groups for several chemical constituents (designated as 'low' and 'high' Table 5-9) within the sampled population of groundwater. Additionally, iron and manganese data suggested the possibility of as many as three groupings.

The USGS data for selected wells in the upgradient background study area (sampled during 1980-1984) are shown in column 3 of Table 5-11 for comparison with the combined data (column 4) for the same location. The USGS data are from eight wells in the same area but from different locations than the wells used for column 4. Concentrations of major constituents are very similar between the two data sources. This tends to confirm the sampling and analytical results of the combined HGDB and BWIP data.

The PNL site-wide summary of background means (Evans, et al. 1989) for selected constituents also is provided in Table 5-10 for comparison with results of the present study. The average contents of major constituents for the two background sets appear to be nearly identical when 'all' data are used in the comparison. Notable exceptions include the redox sensitive metals such as iron and manganese. Significant differences also exist for zinc. The higher zinc values for the present study do not appear to be related to redox potential or any other obvious factor. One possibility is that some of the older wells might have galvanized (zinc coated) pump tubing. Significantly lower detection limits exist for several of the metals included in the PNL background data set. This is due to the use of more sensitive analytical instrumentation (ICP emission spectroscopy).

In general, the concentrations of trace elements in natural waters are often much lower than would be expected on the basis of either equilibrium solubilities or of supply to the water from various sources. The most common reason for the low concentrations is adsorption of the elements onto a solid phase (Drever 1982). The extent to which trace elements occur in groundwater also are affected by redox conditions and pH.

The source of most of the trace elements in groundwater at the Hanford Site appears to stem from reaction with igneous materials, including basalt. The site-specific characteristics and compositional controls of the aquifer system beneath the Hanford Site potentially differs from those in many other aquifers due to the role of basaltic materials in these reactions, which can contain extremely large amounts of certain trace elements (e.g., >3,000 parts per million barium, >100 parts per million chrome).

Thus, the extent to which trace elements can be expected to occur in the unconfined aquifer appears to be reasonably bounded by the levels present in the younger more oxidized groundwaters, and by those present in the older more

reduced groundwaters. This is because the maximum concentrations of some trace constituents might be associated with the conditions in one or the other of these environments. The consideration of the trace element contents in more evolved groundwaters similar to those in the confined aquifer also is important because these have some of the largest concentrations of trace elements in the aquifer system (DOE 1988). Evaluation of these relationships for trace elements are in progress. It is, therefore, indicated that the approach for estimating provisional threshold levels described in this section is appropriate in the absence of a more suitable approach.

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Figure 5-1. TBD.

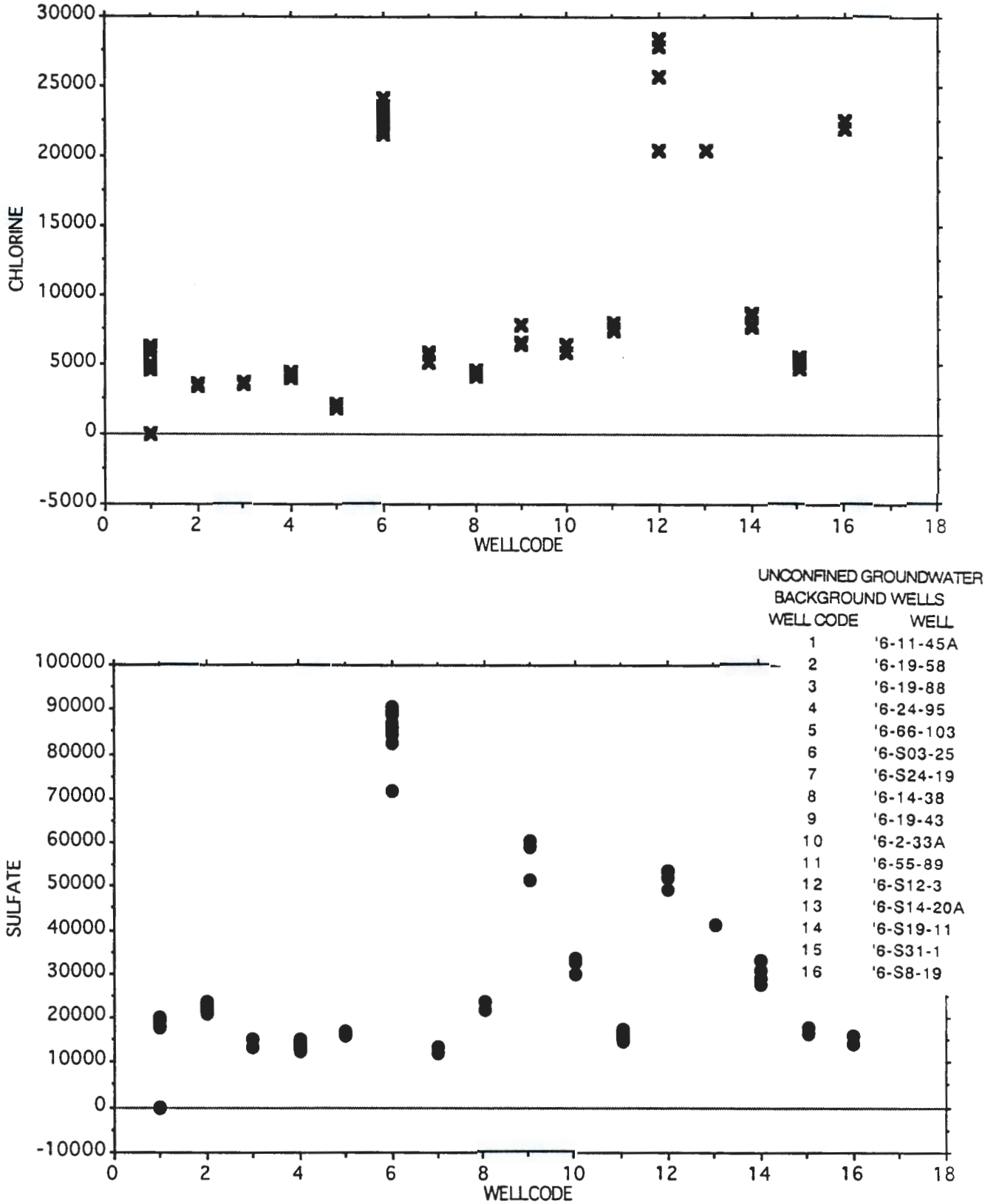
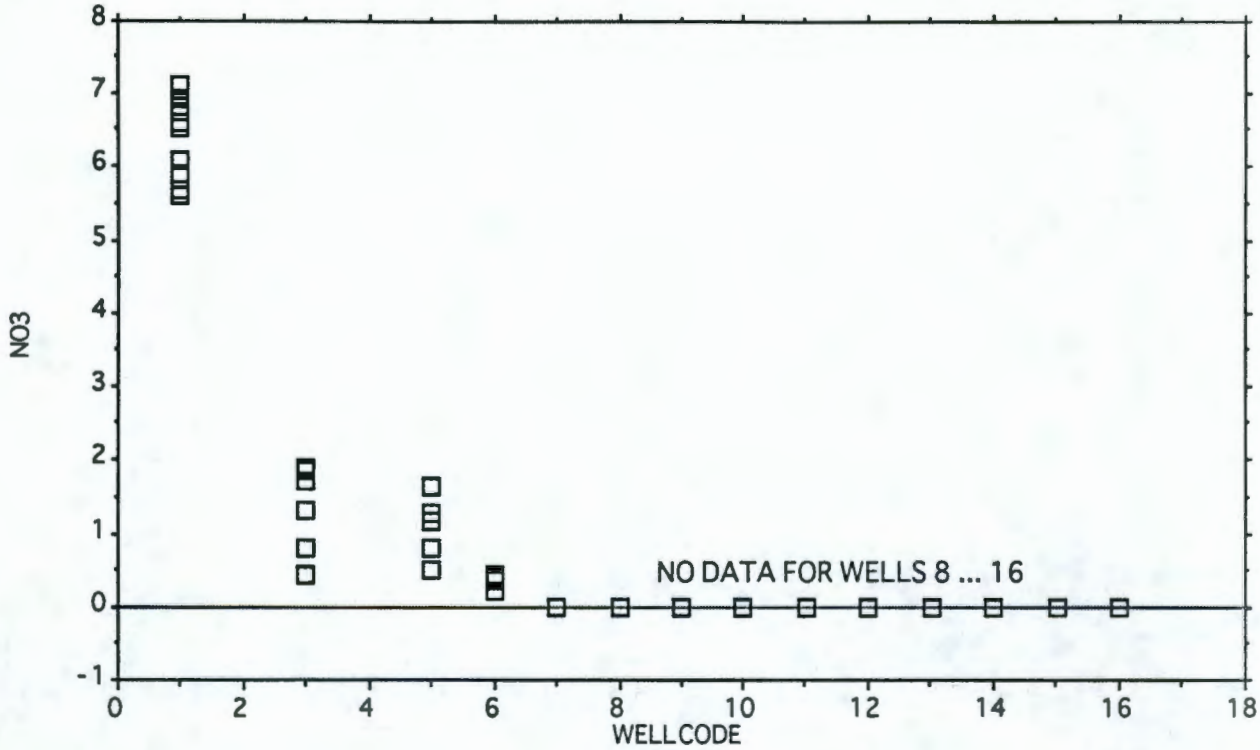


Figure 5-2a. Inter- and Intra-well Comparisons for Selected Major and Trace Constituents. (sheet 1 of 7)



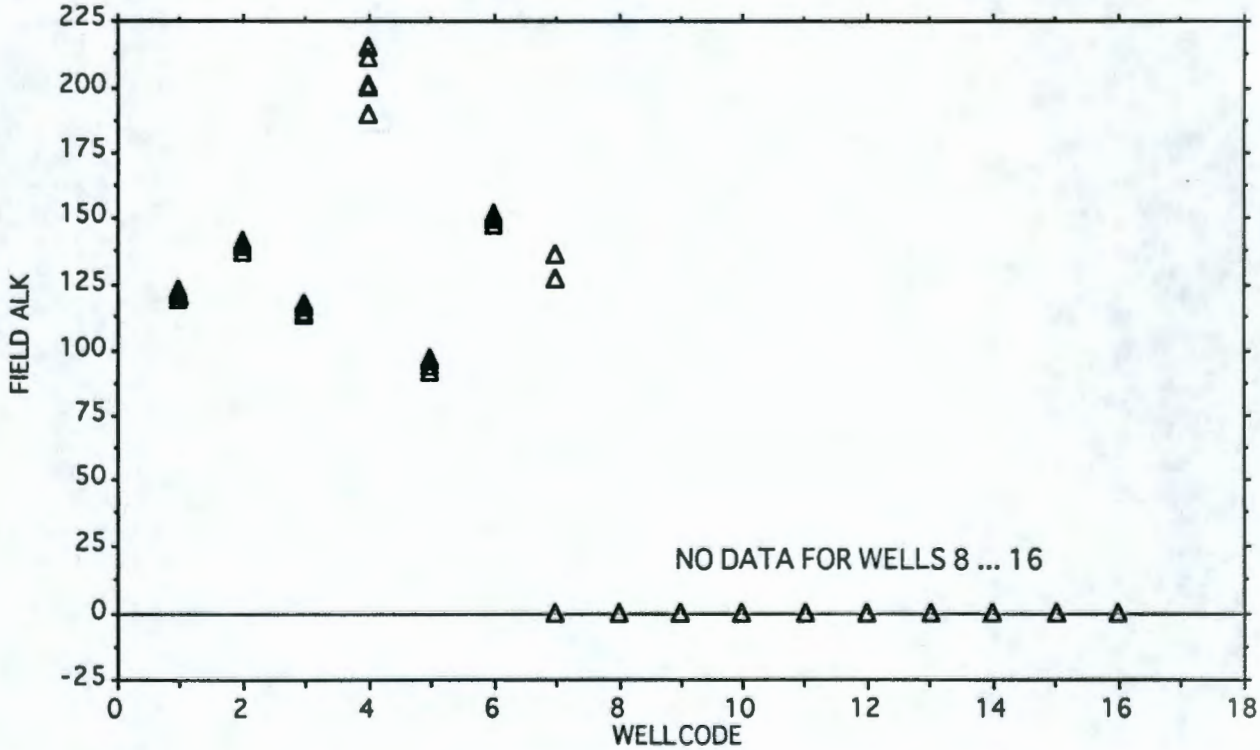


Figure 5-2b. Inter- and Intra-well Comparisons for Selected Major and Trace Constituents. (sheet 2 of 7)

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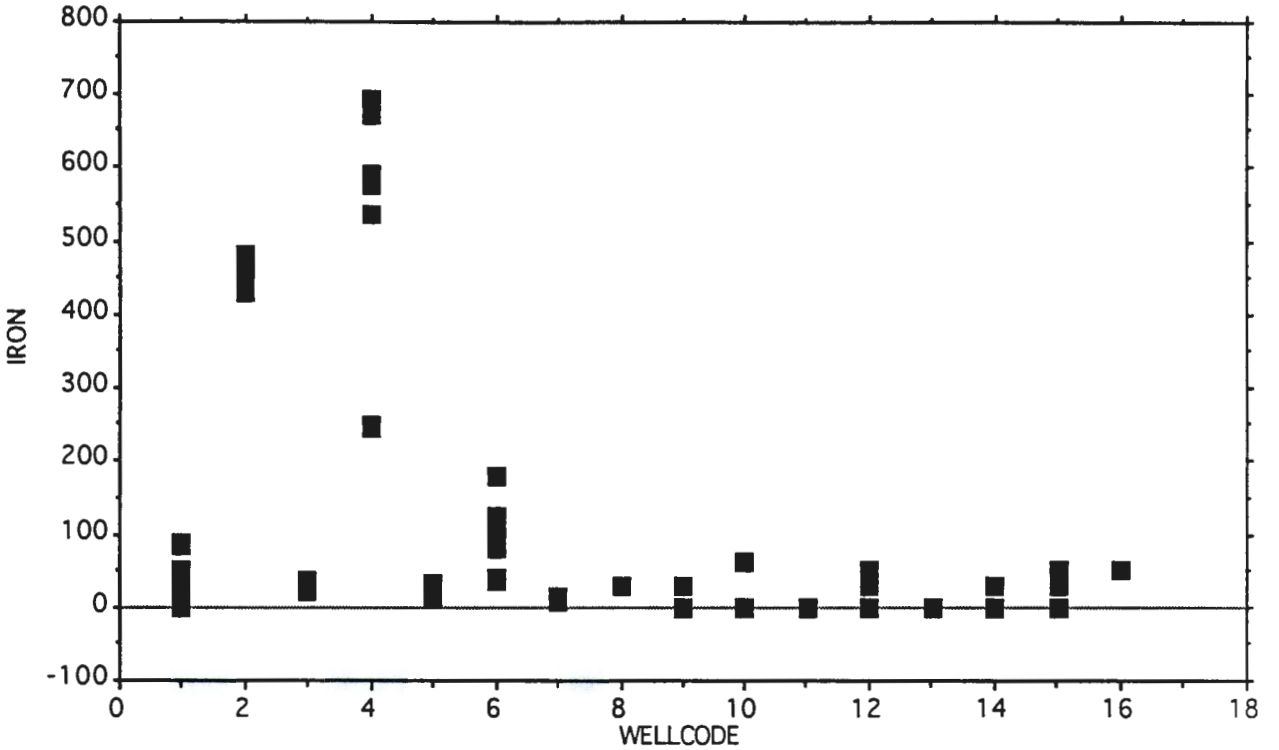


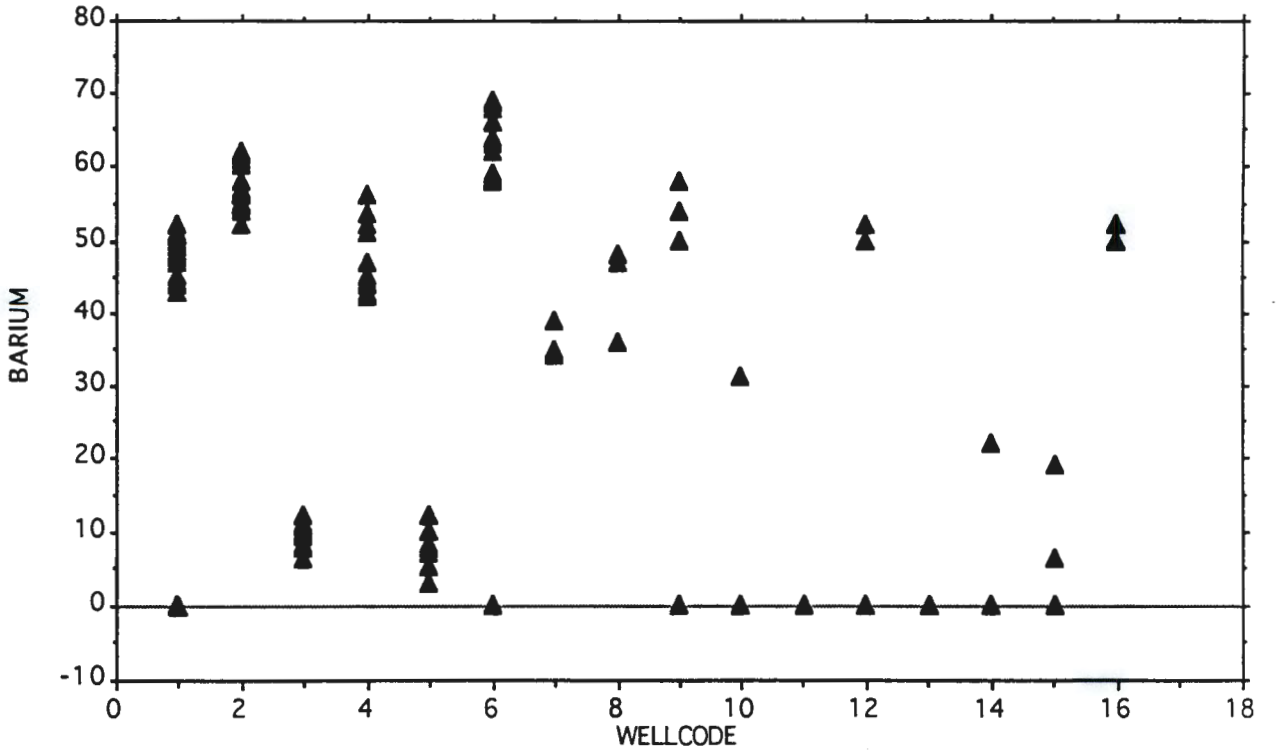
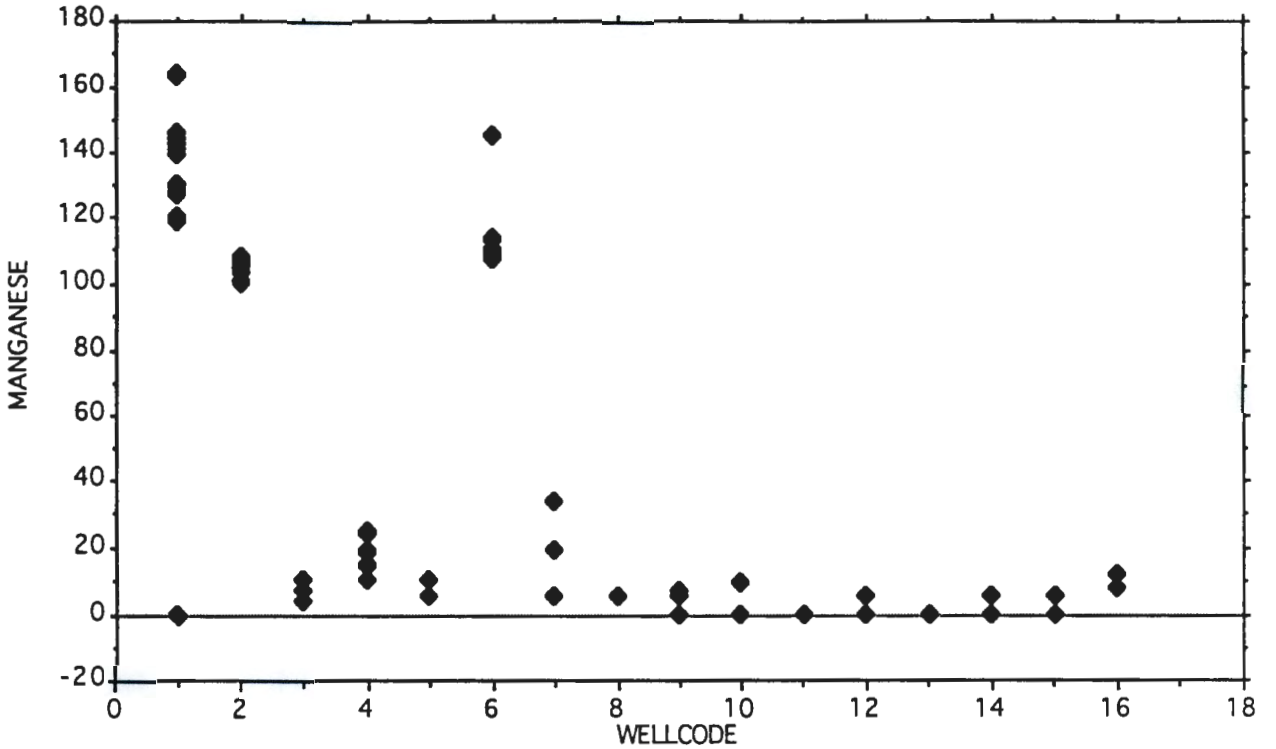


Figure 5-2c. Inter- and Intra-well Comparisons for Selected Major and Trace Constituents. (sheet 3 of 7)



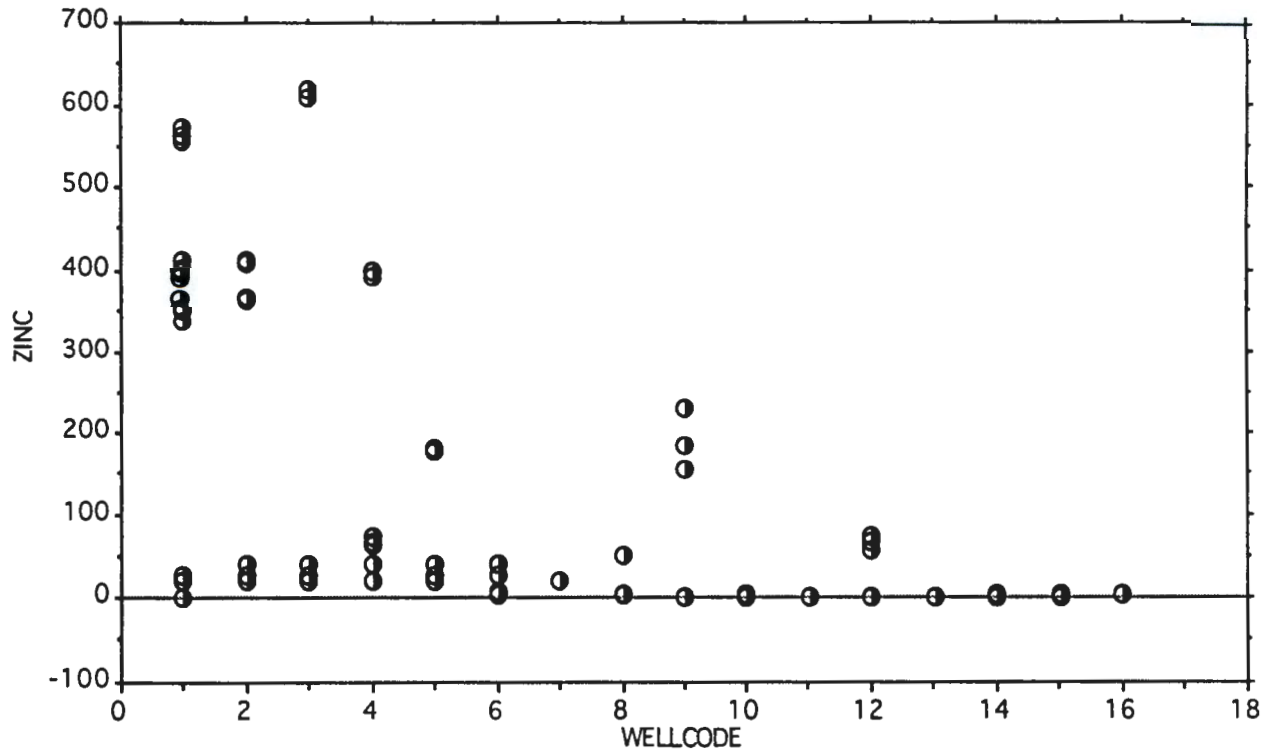
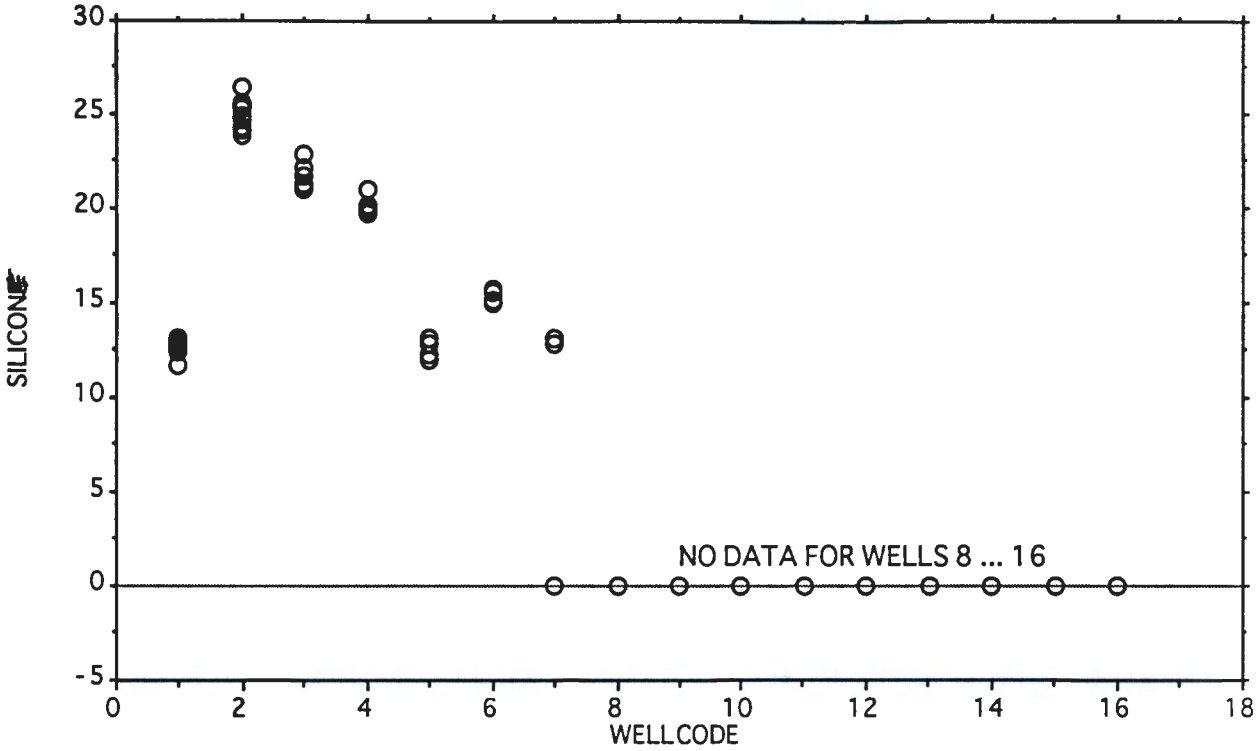


Figure 5-2d. Inter- and Intra-well Comparisons for Selected Major and Trace Constituents. (sheet 4 of 7)



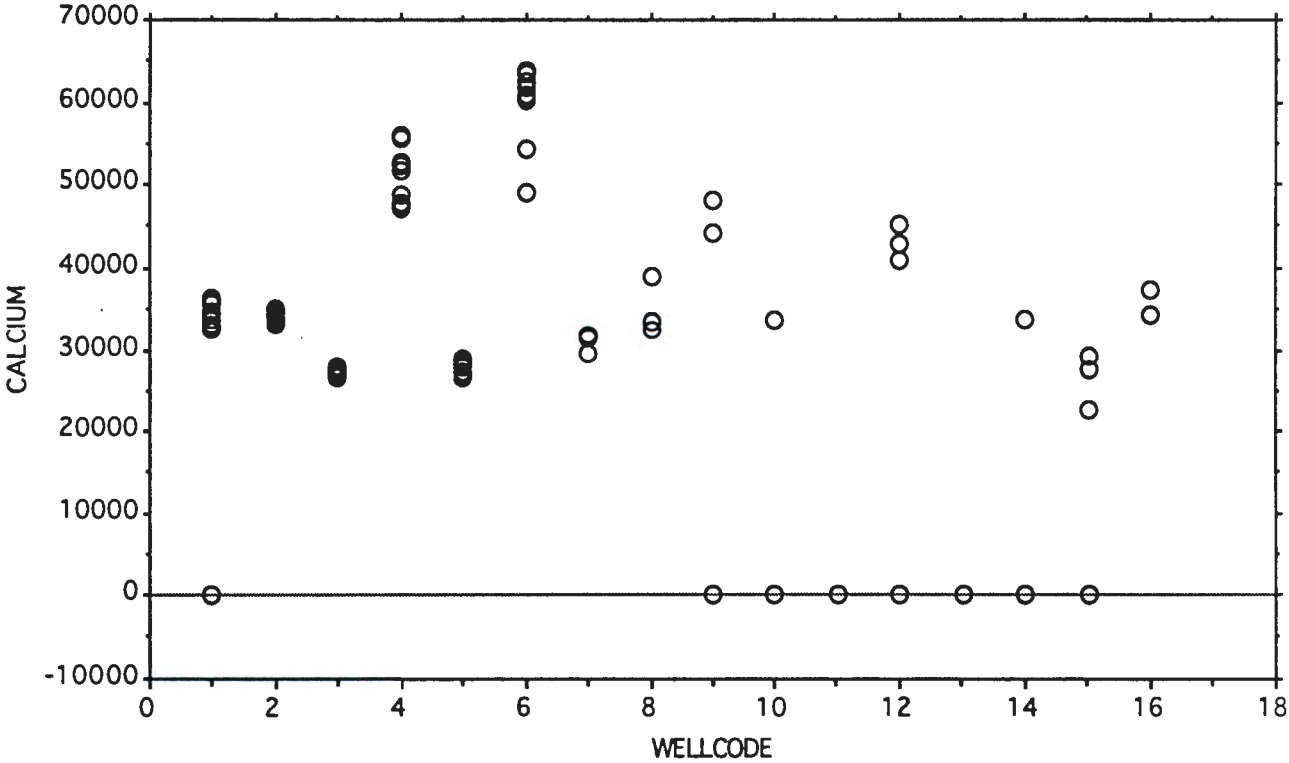
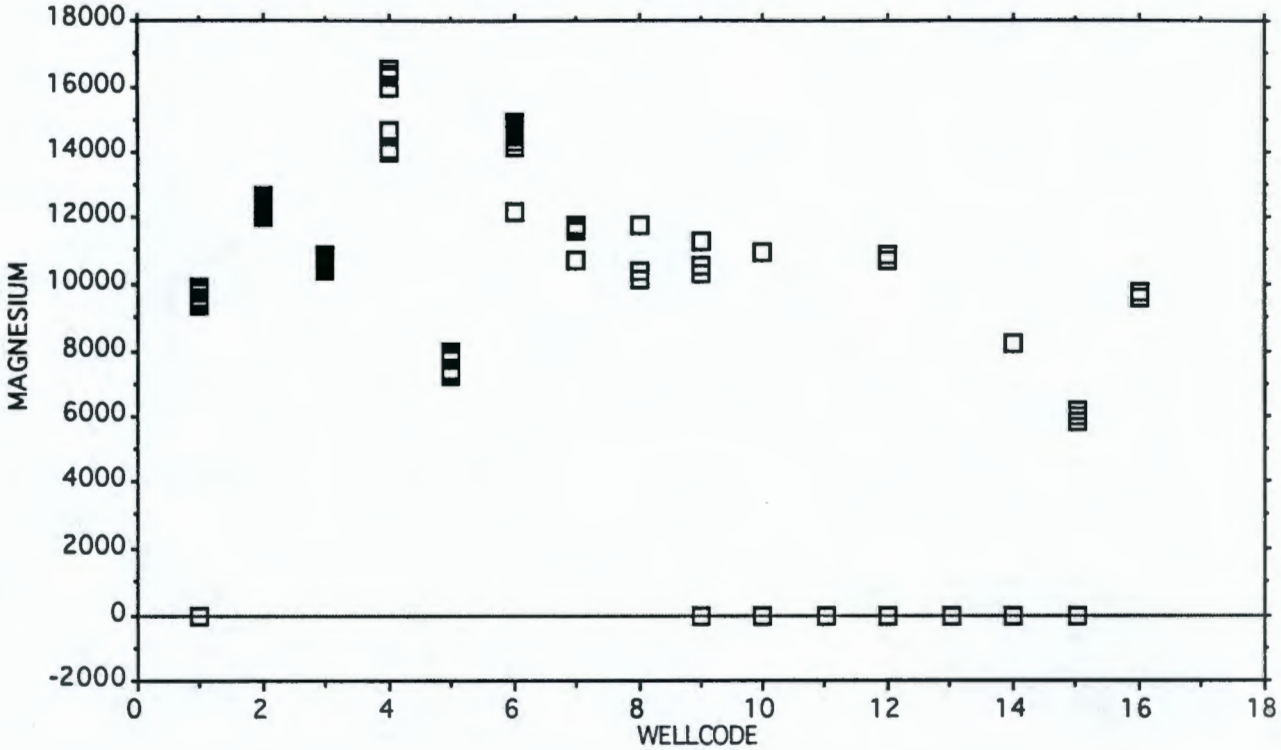


Figure 5-2e. Inter- and Intra-well Comparisons for Selected Major and Trace Constituents. (sheet 5 of 7)



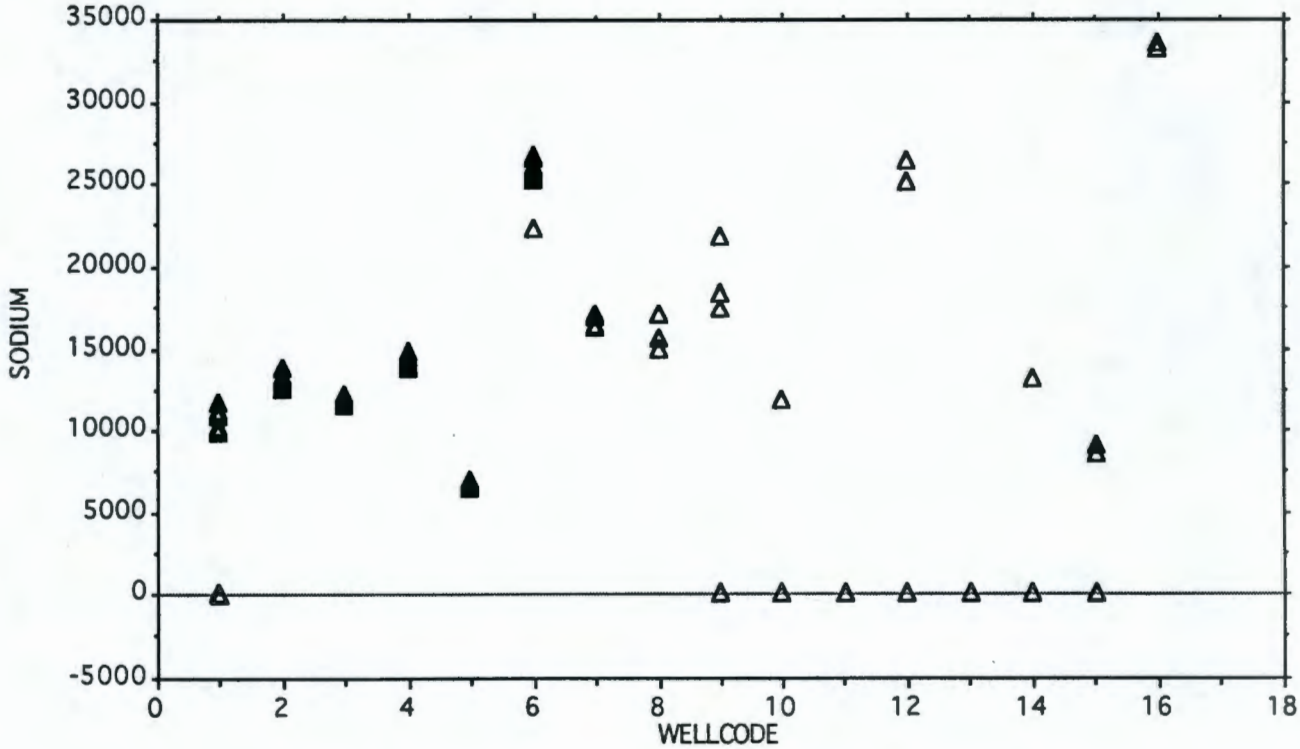


Figure 5-2f. Inter- and Intra-well Comparisons for Selected Major and Trace Constituents. (sheet 6 of 7)

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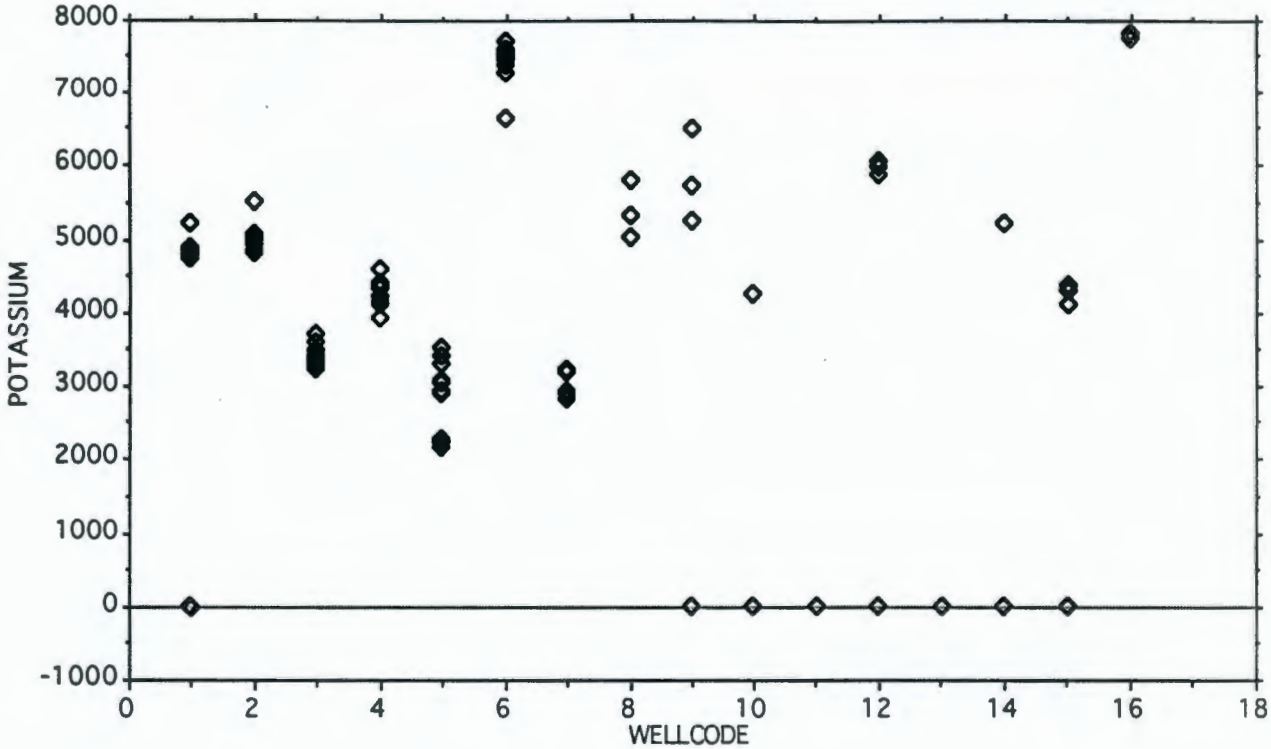

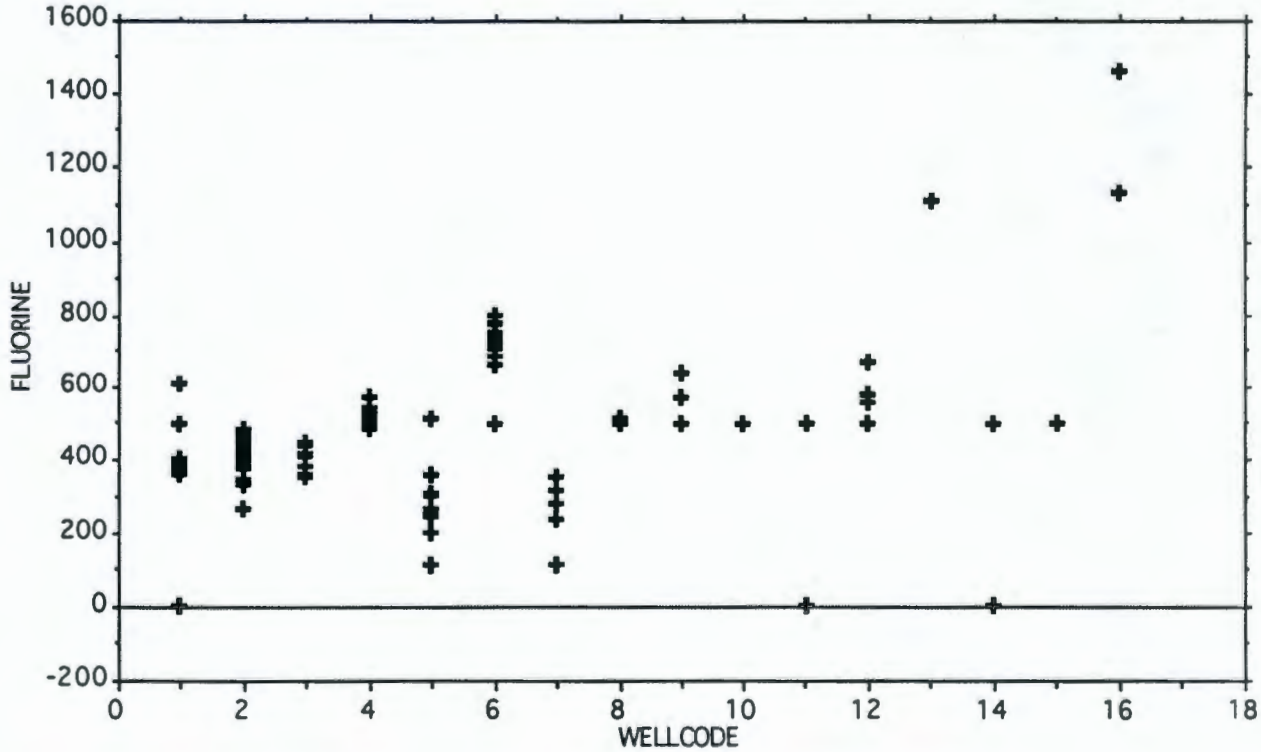

Figure 5-2g. Inter- and Intra-well Comparisons for Selected Major and Trace Constituents. (sheet 7 of 7)

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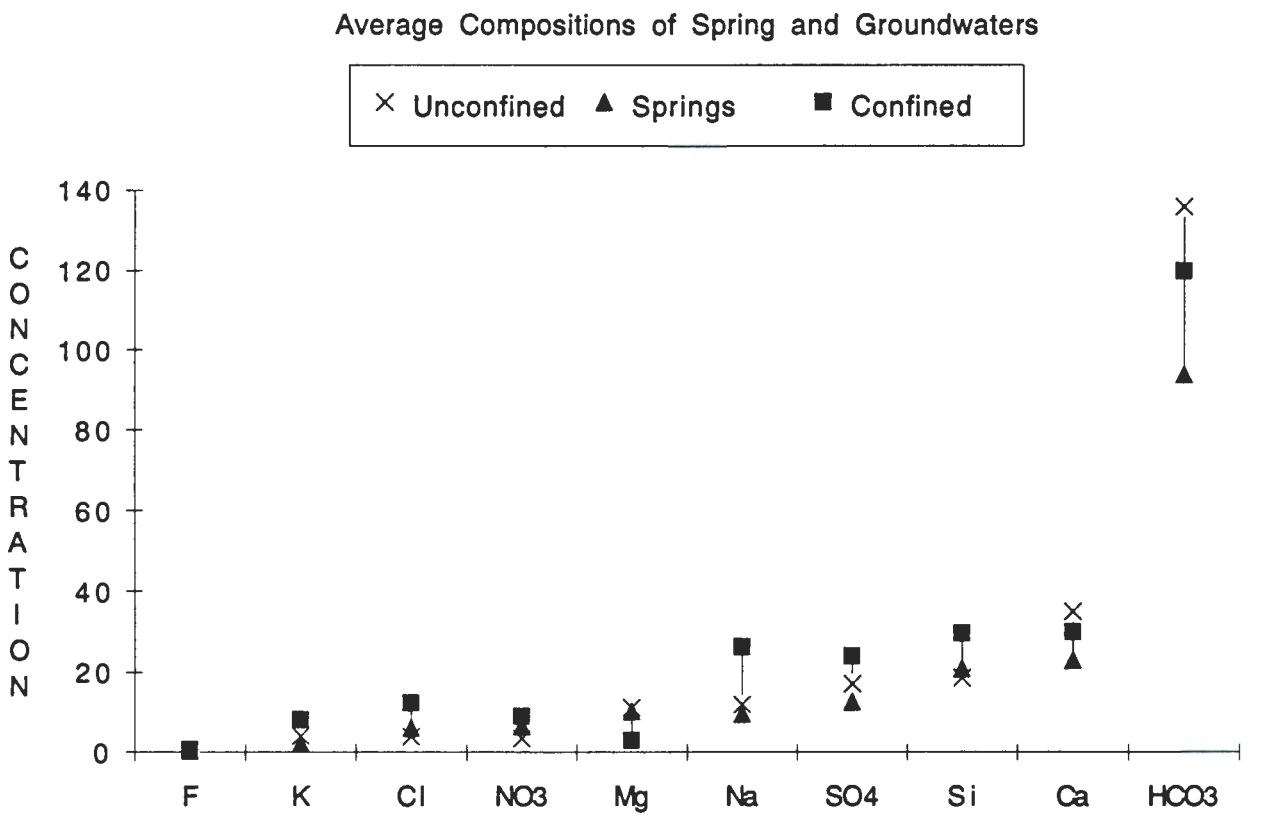

Figure 5-3. Average Compositions of Spring and Groundwaters.

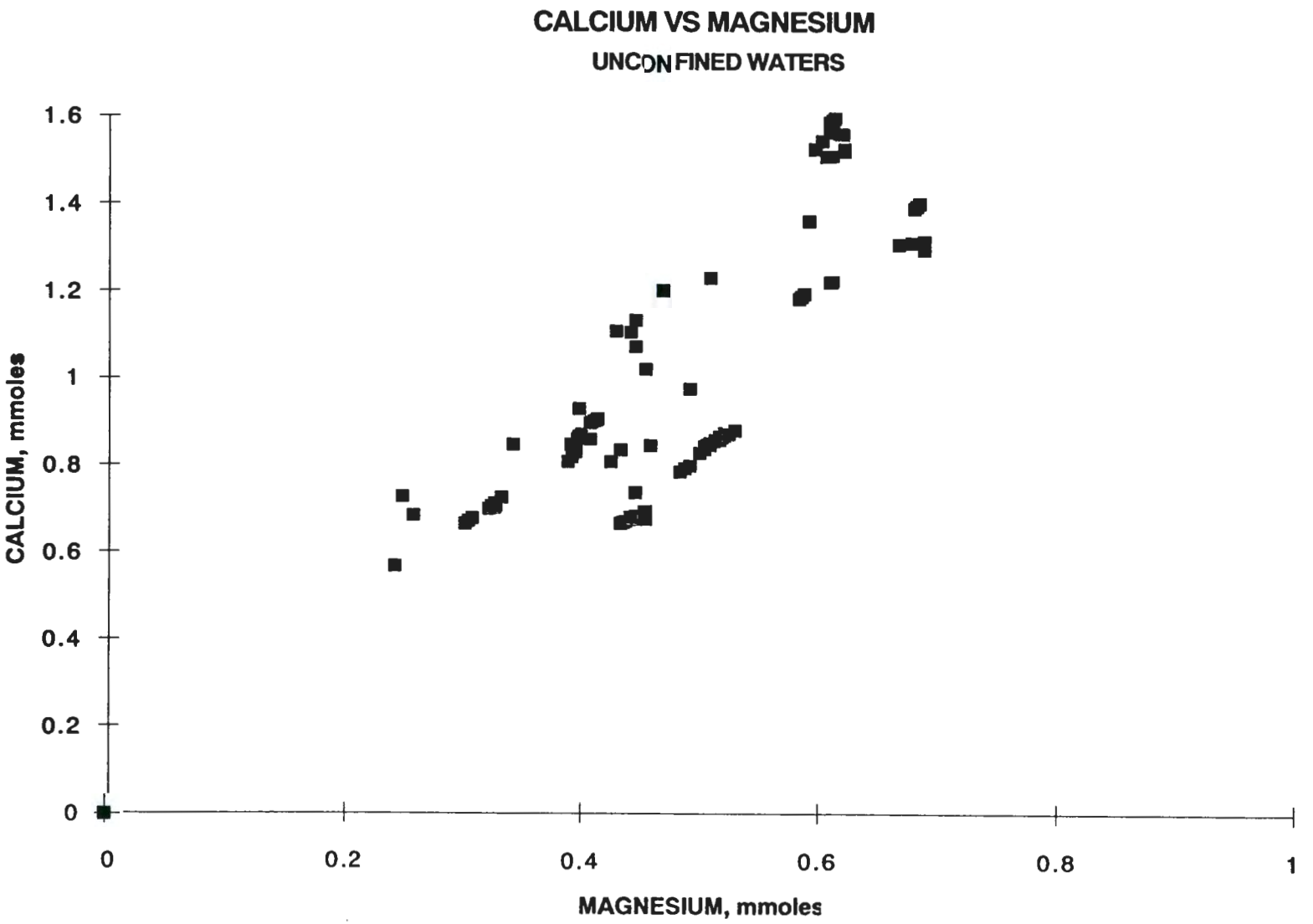

Figure 5-4a. Variation Diagram: Calcium Versus Magnesium (moles), Unconfined Aquifer. (sheet 1 of 4)

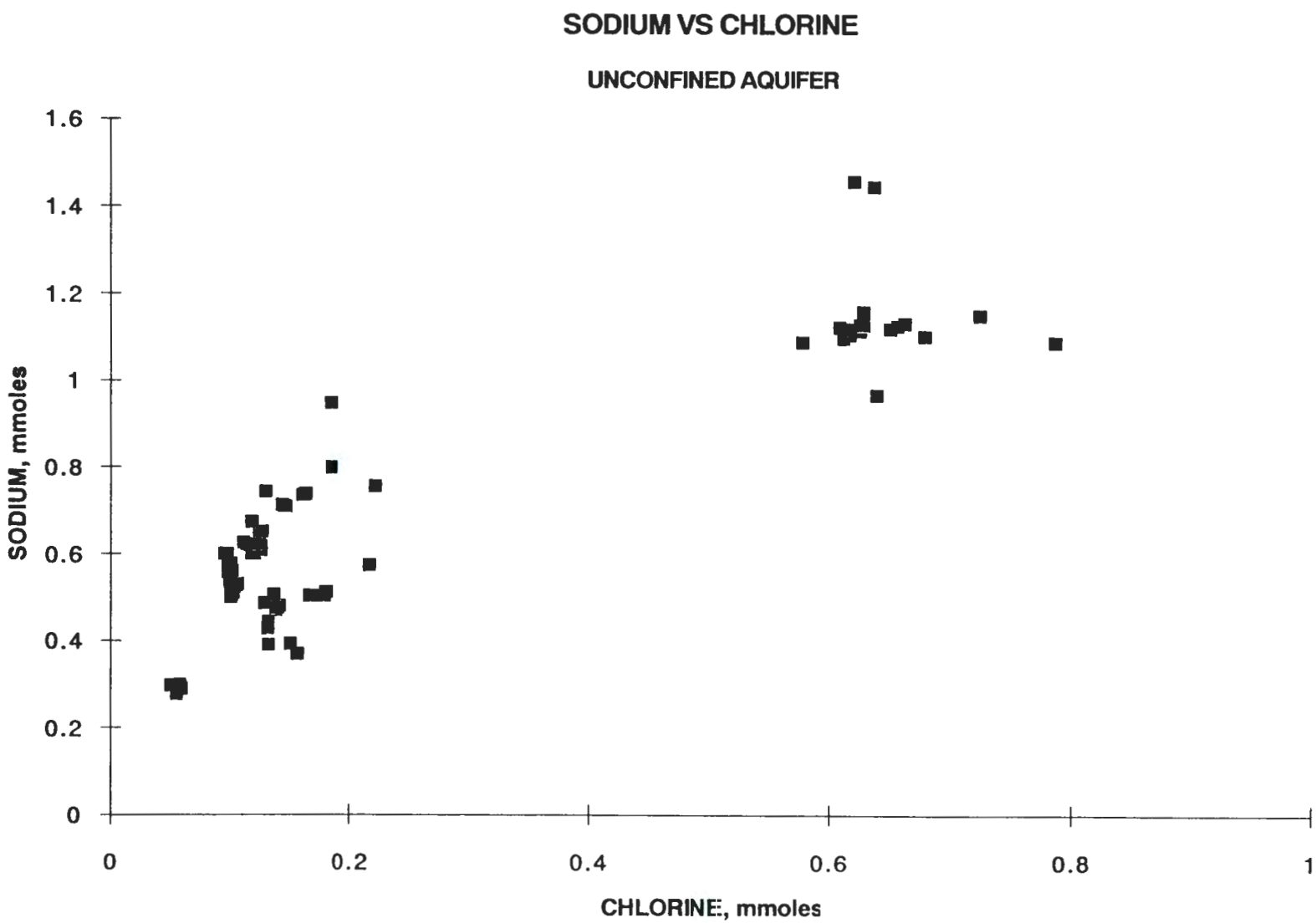

Figure 5-4b. Variation Diagram: Sodium Versus Chlorine (moles), Unconfined Aquifer. (sheet 2 of 4)

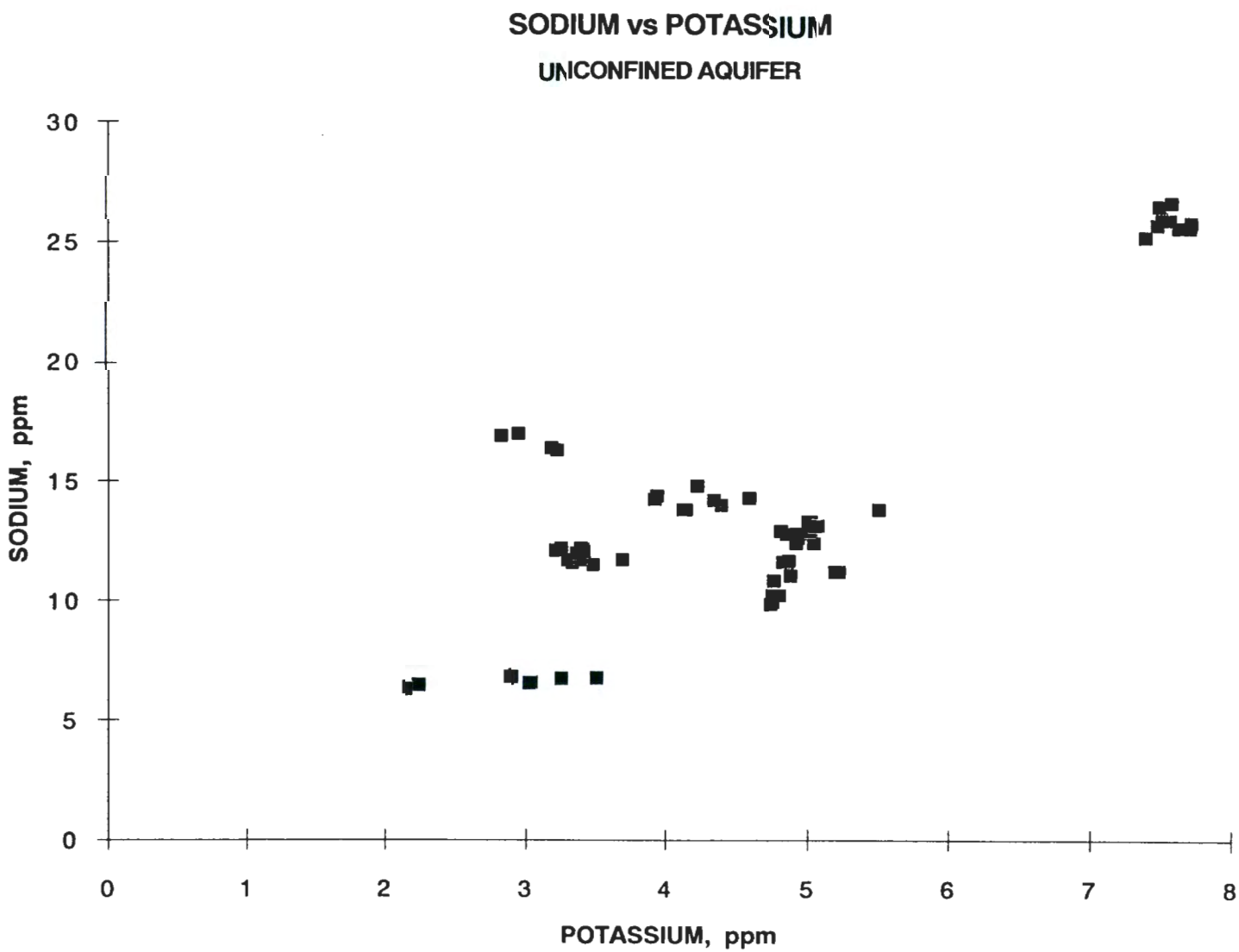

Figure 5-4c. Variation Diagram: Sodium Versus Potassium (moles), Unconfined Aquifer. (sheet 3 of 4)

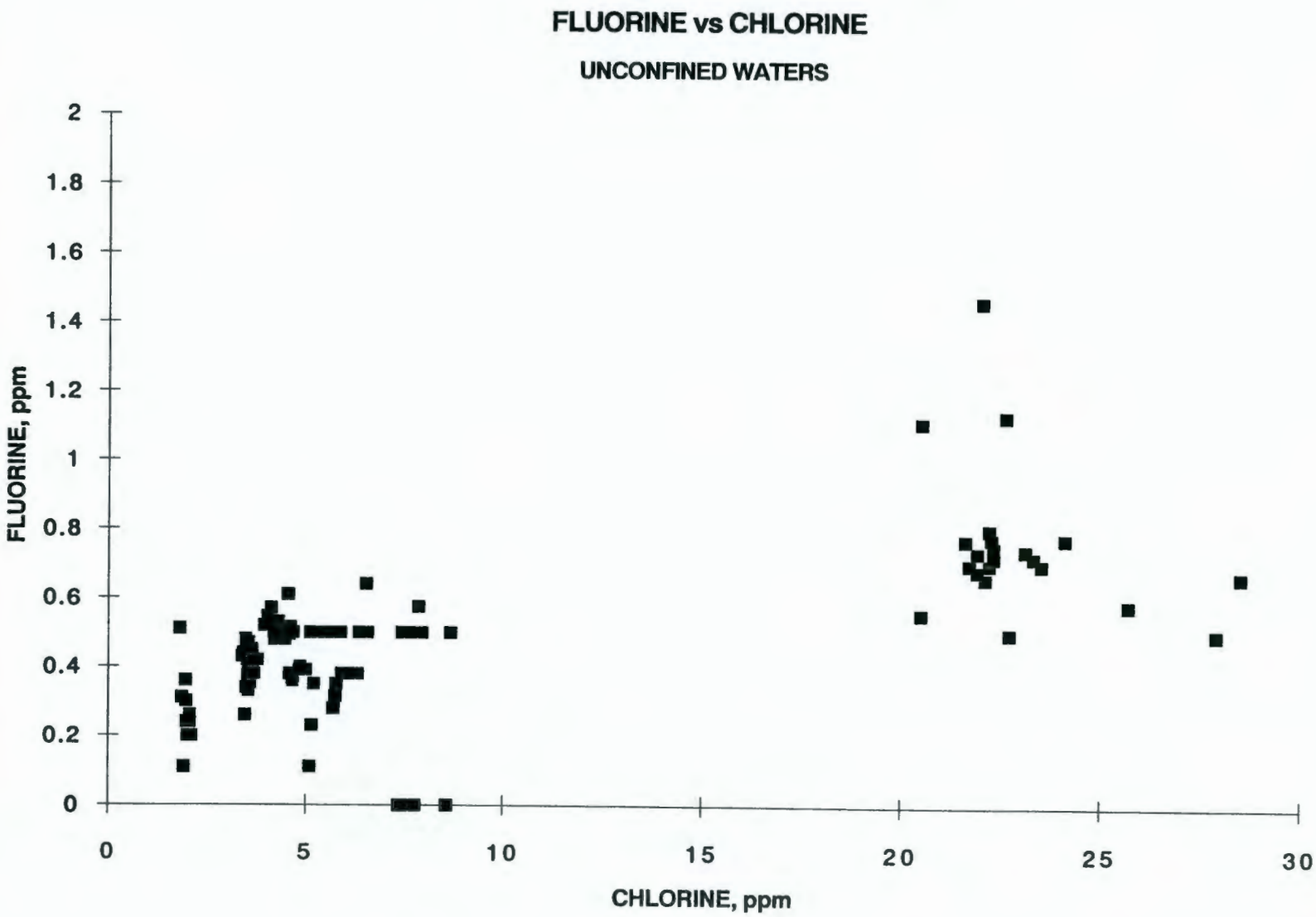

Figure 5-4d. Variation Diagram: Fluorine Versus Chlorine (moles), Unconfined Aquifer. (sheet 4 of 4)

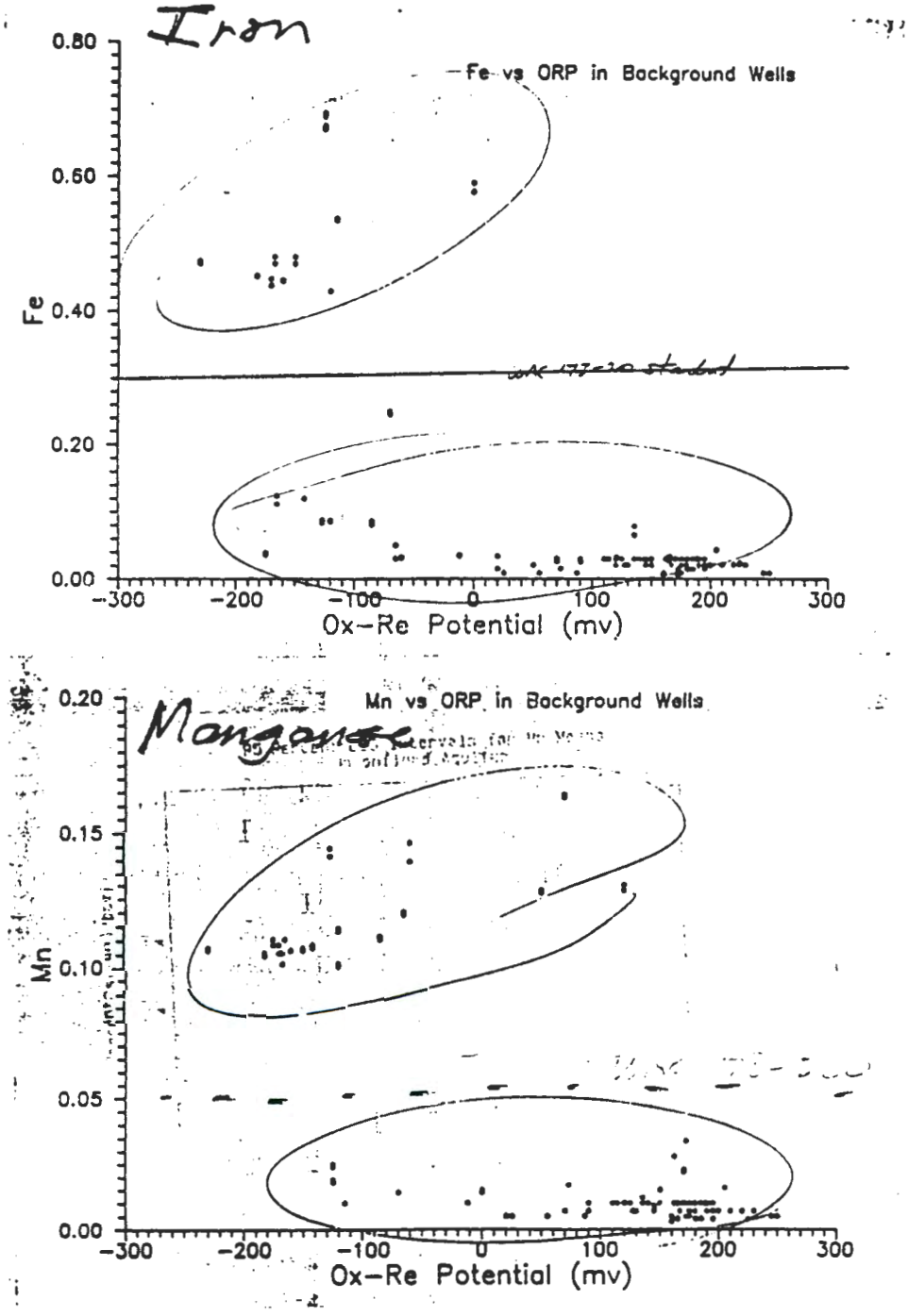

Figure 5-5. Iron, Magnesium Versus Oxidation-Reduction Potential, Unconfined Aquifer.

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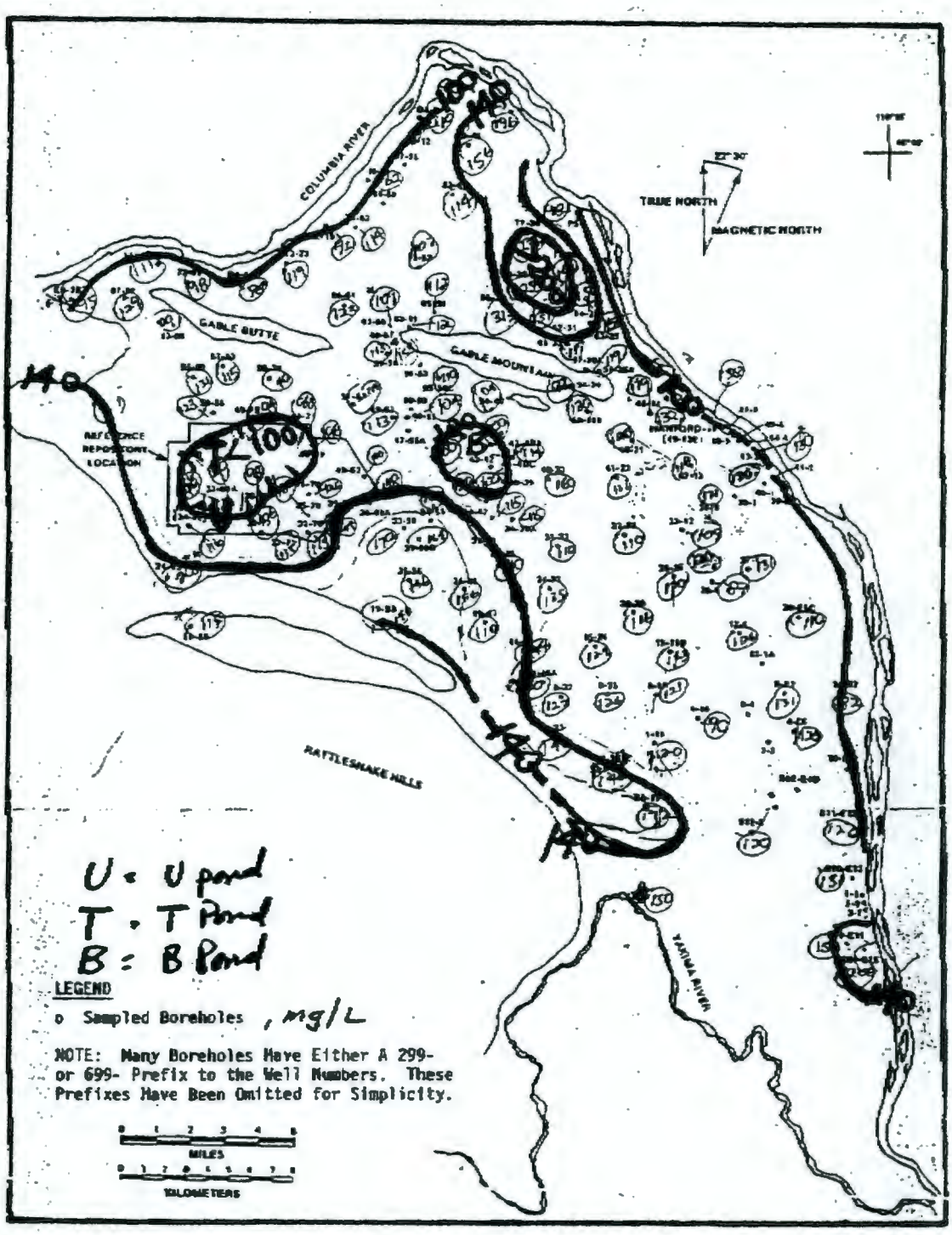

Figure 5-6. Alkalinity Contours Across the Hanford Site.

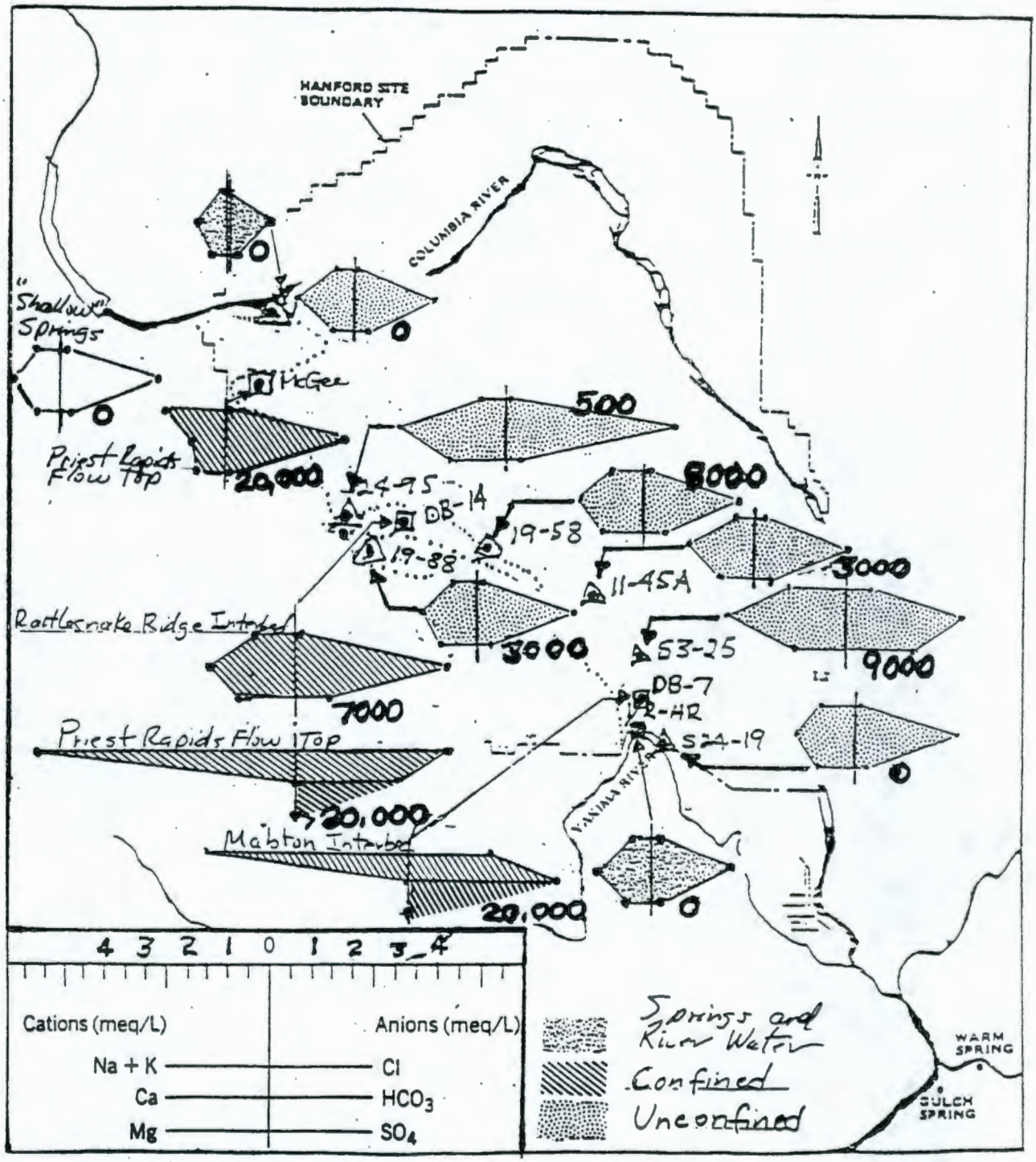

Figure 5-7. Major Hydrologic Regime Stiff Diagrams.

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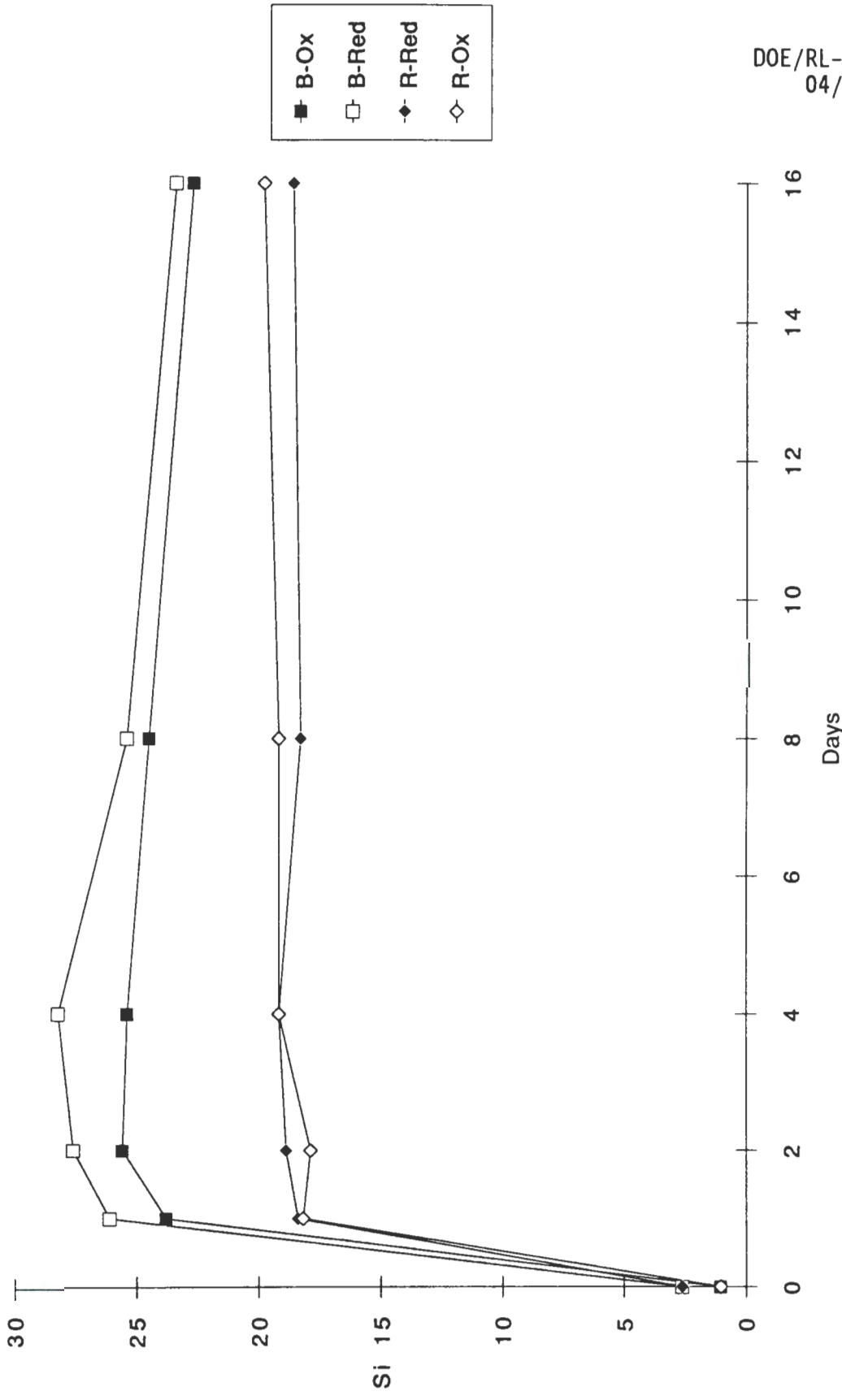

Figure 5-8a. Variation Diagram of Silicon Concentration, in Milligrams per Liter Versus Time for Rock-Water Interaction Experiments. B-Ox is Basalt Under Oxidizing Conditions, R-Red is Ringold Under Reducing Conditions. (sheet 1 of 5)

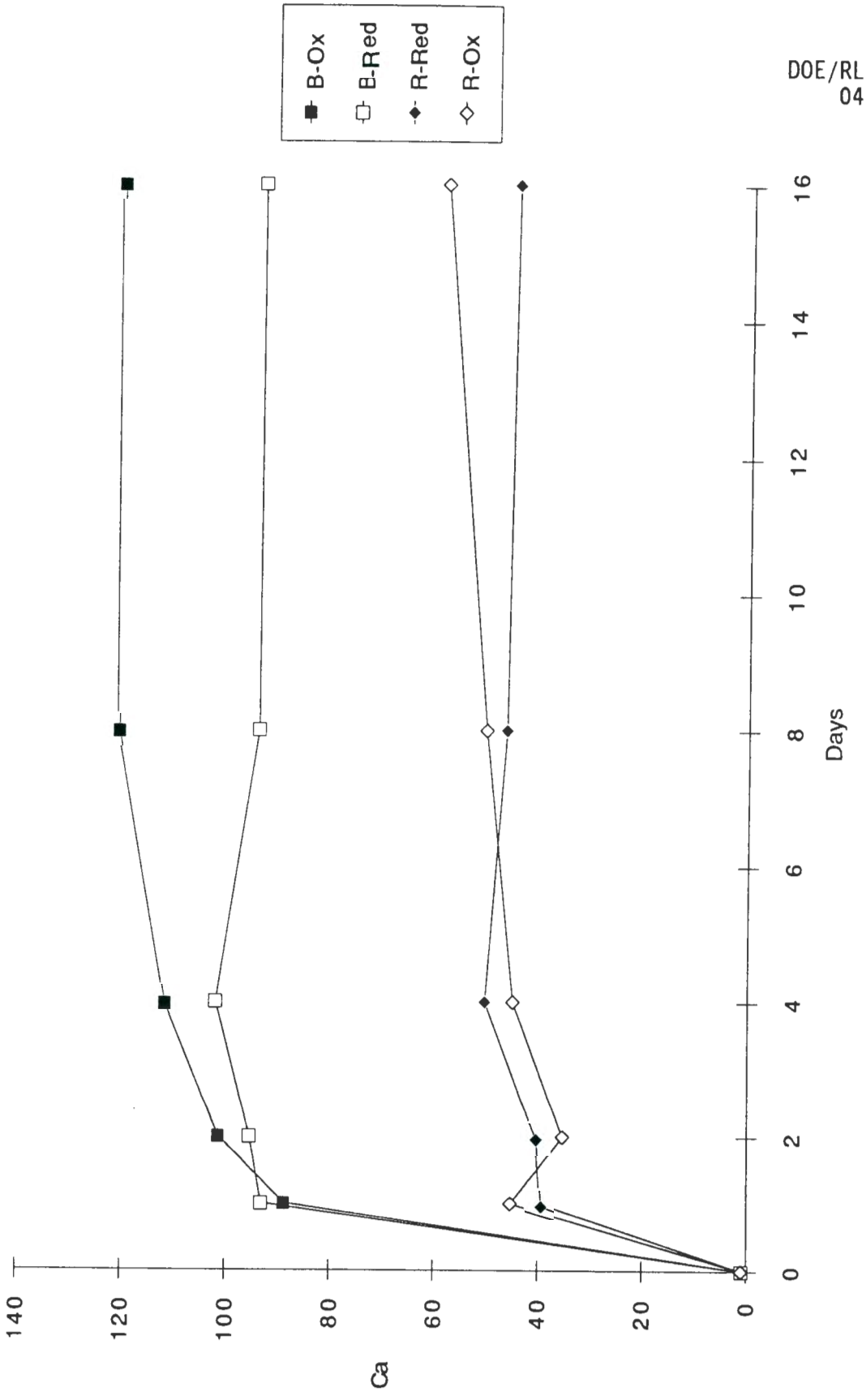

Figure 5-8b. Variation Diagram of Calcium Concentration, in Milligrams per Liter Versus Time for Rock-Water Interaction Experiments. B-Ox is Basalt Under Oxidizing Conditions, R-Red is Ringold Under Reducing Conditions. (sheet 2 of 5)

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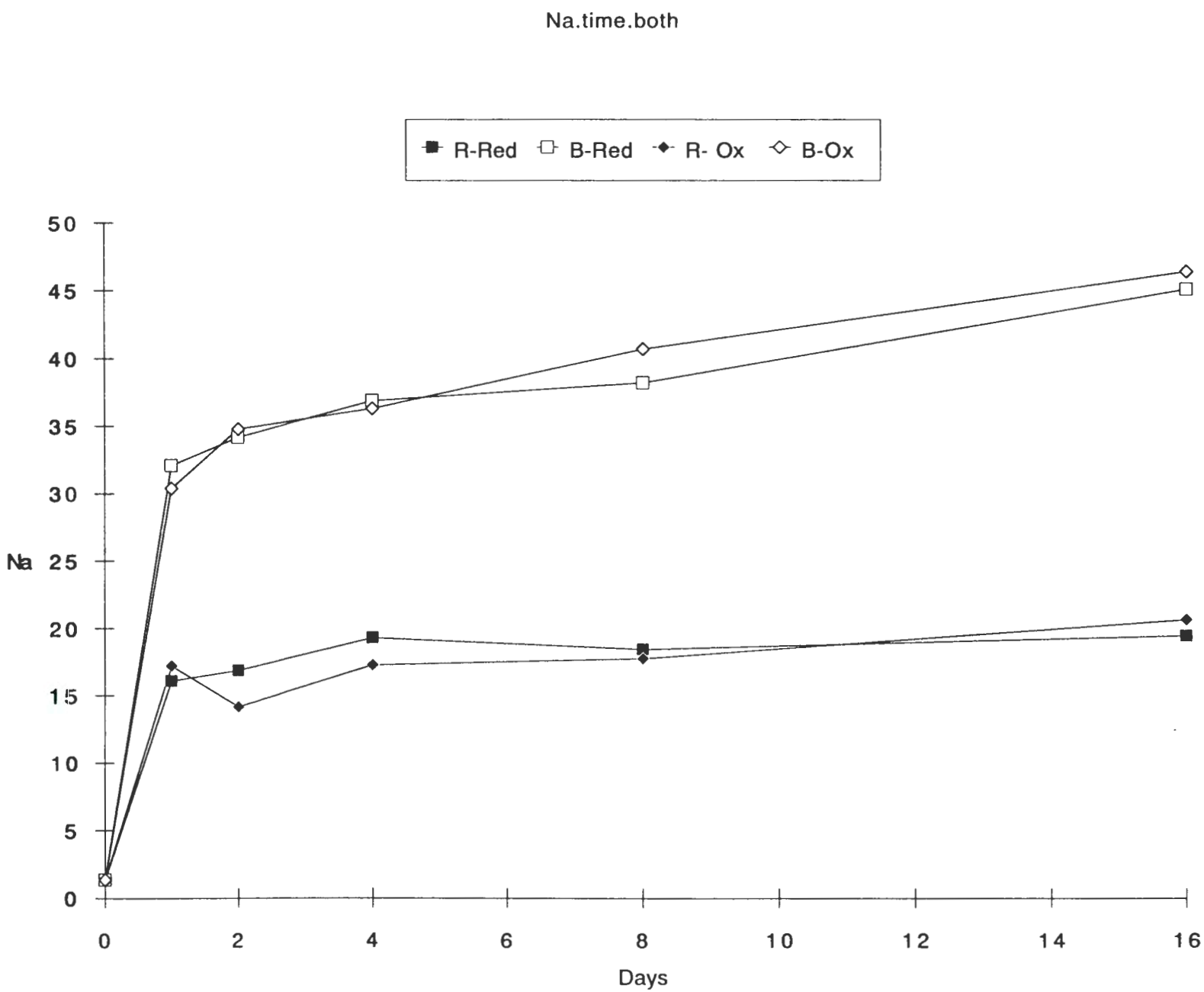

Figure 5-8c. Variation Diagram of Sodium Concentration, in Milligrams per Liter Versus Time for Rock-Water Interaction Experiments. B-Ox is Basalt Under Oxidizing Conditions, R-Red is Ringold Under Reducing Conditions. (sheet 3 of 5)

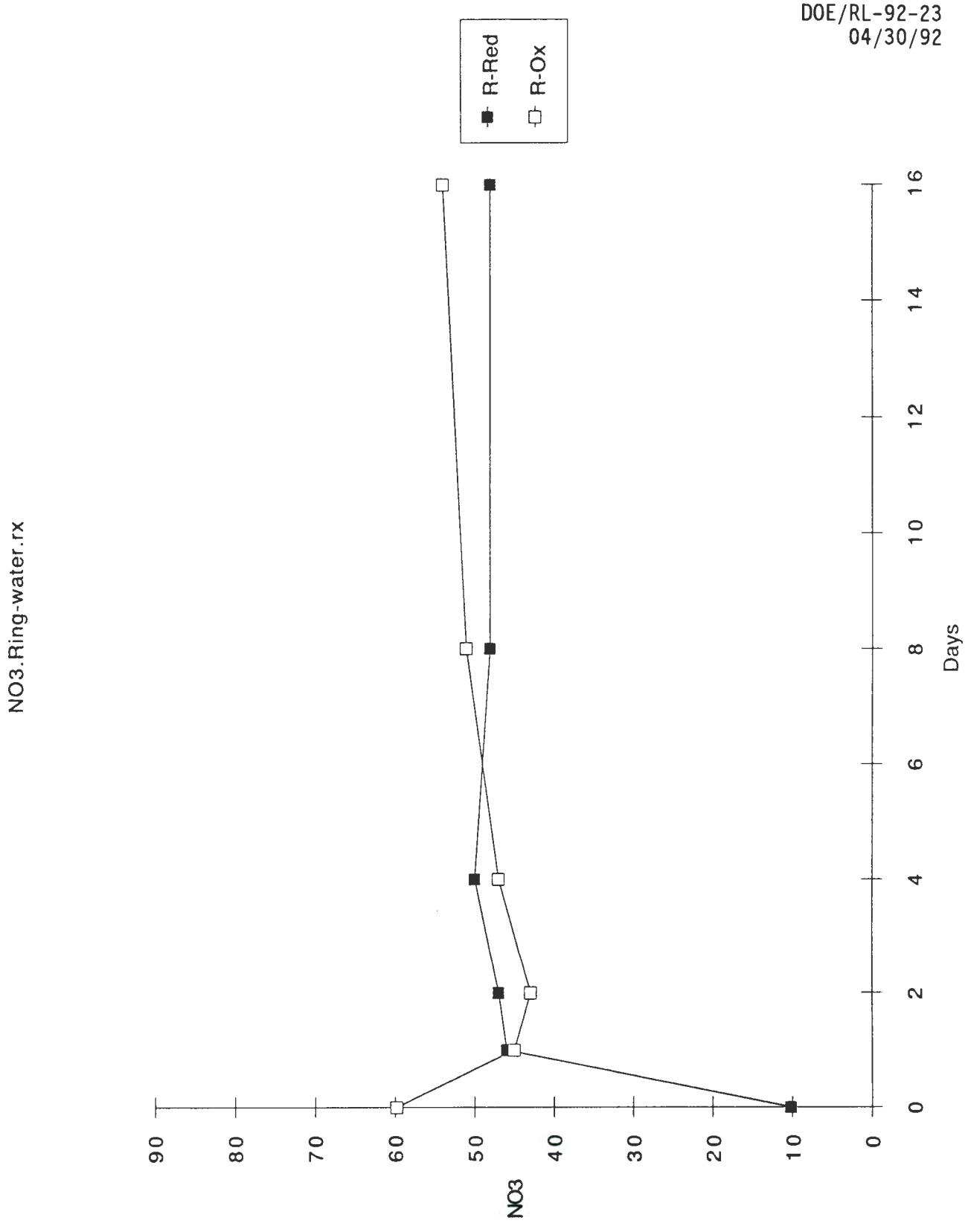

Figure 5-8d. Variation Diagram of Nitrate Concentration, in Milligrams per Liter Versus Time for Rock-Water Interaction Experiments. B-Ox is Basalt Under Oxidizing Conditions, R-Red is Ringold Under Reducing Conditions. (sheet 4 of 5)

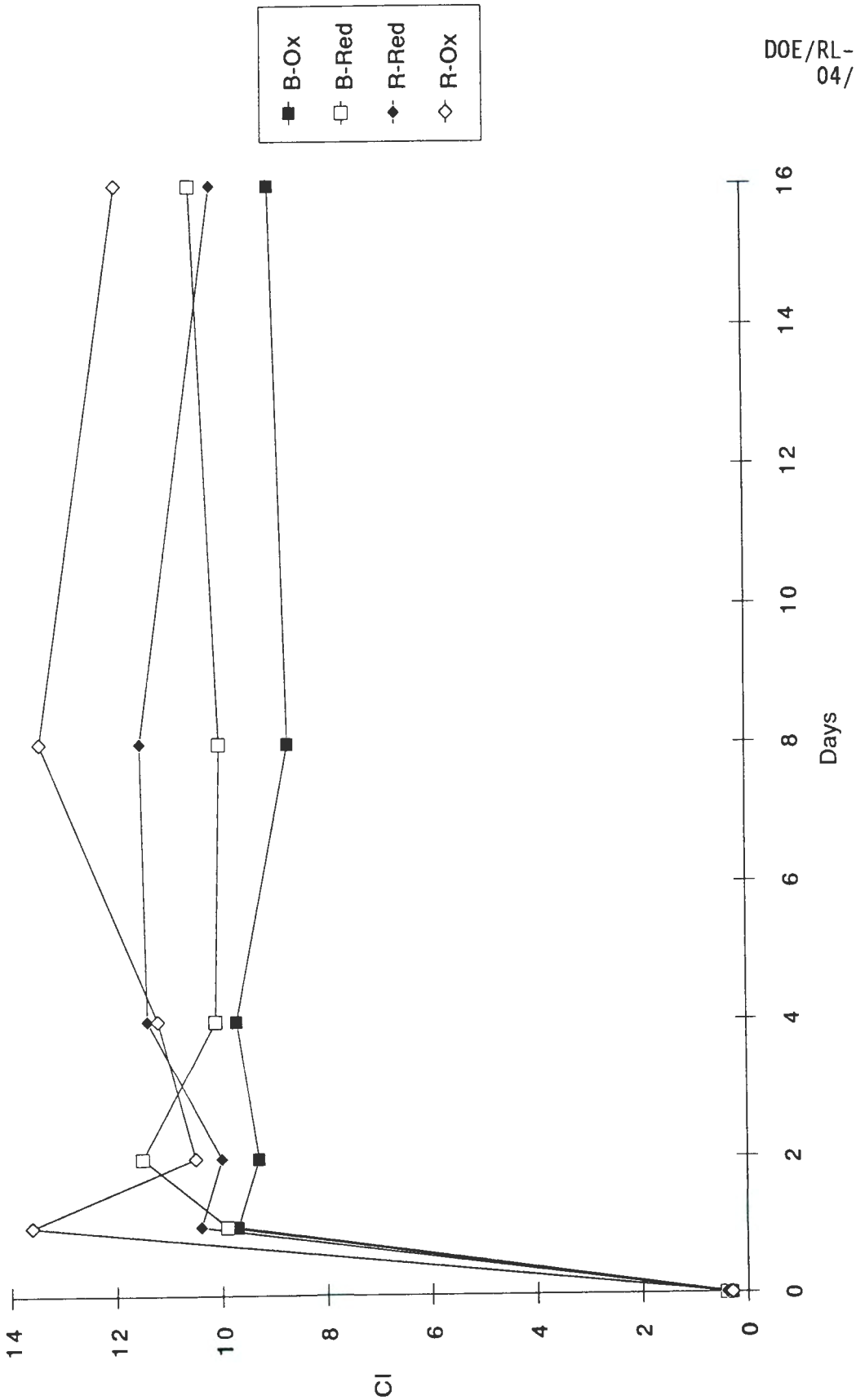

Figure 5-8e. Variation Diagram of Chlorine Concentration, in Milligrams per Liter Versus Time for Rock-Water Interaction Experiments. B-Ox is Basalt Under Oxidizing Conditions, R-Red is Ringold Under Reducing Conditions. (sheet 5 of 5)

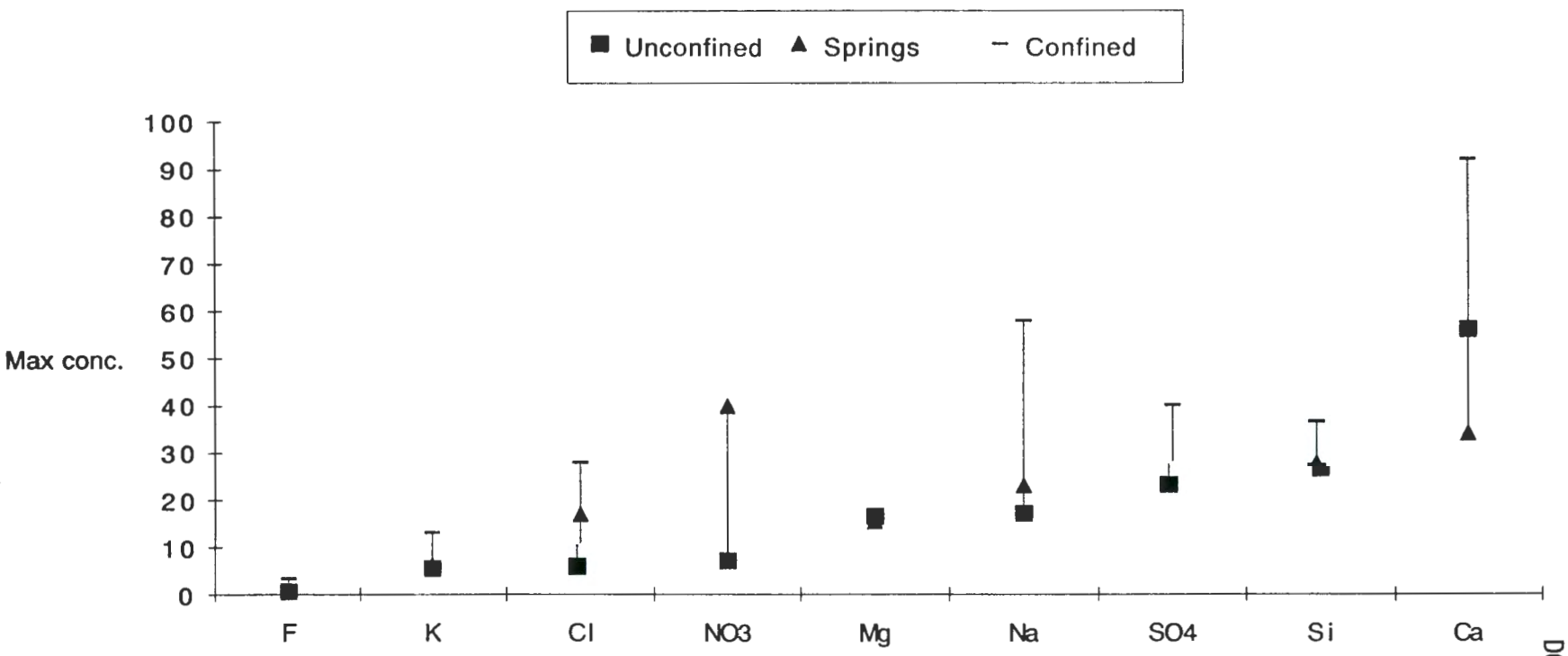

Figure 5-9. Compositional Ranges of Major Constituents in the Recharge and Unconfined Groundwaters.

9 2 1 2 6 5 1 1 0

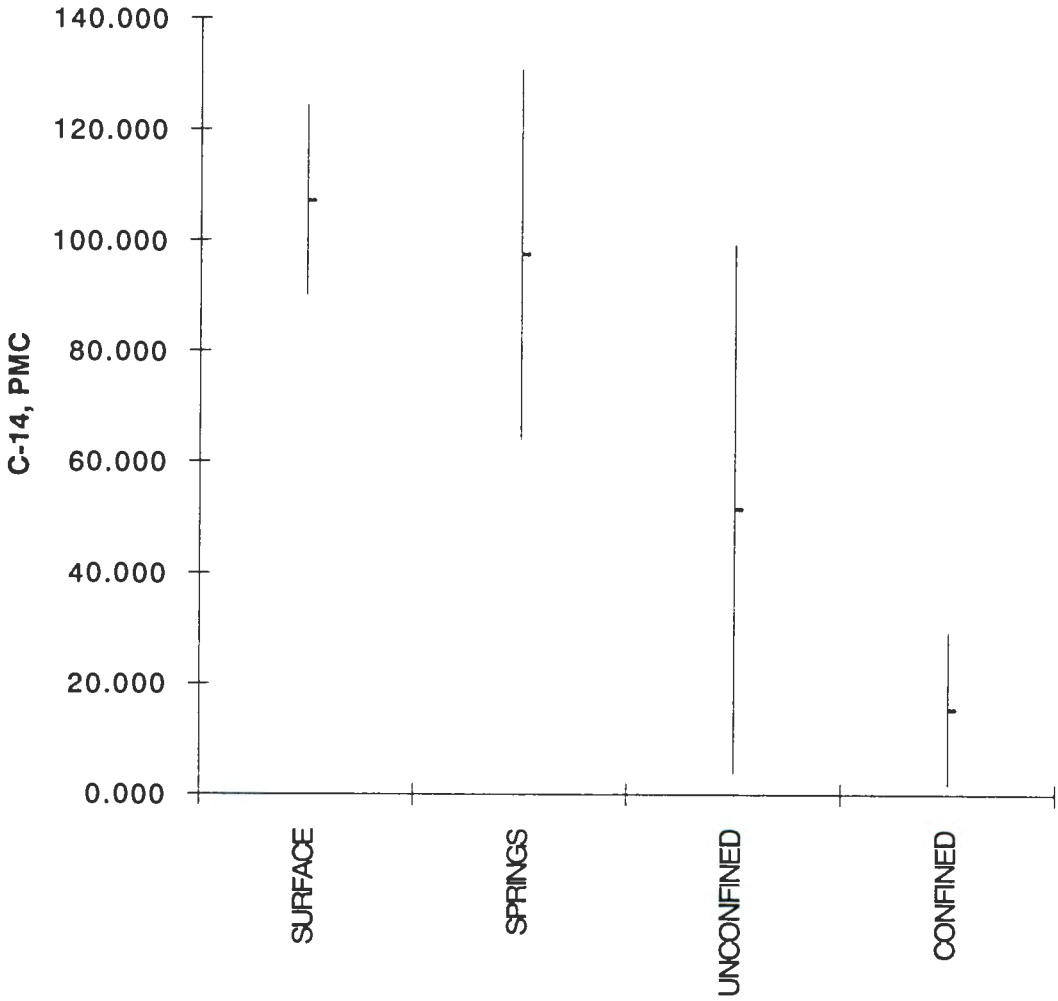

Figure 5-10a. Concentration of Percent Modern Carbon in Surface Waters and Groundwaters. Vertical Bar is Two Standard Deviations, Mark in Center of Bar Represents the Mean Value. (sheet 1 of 6)

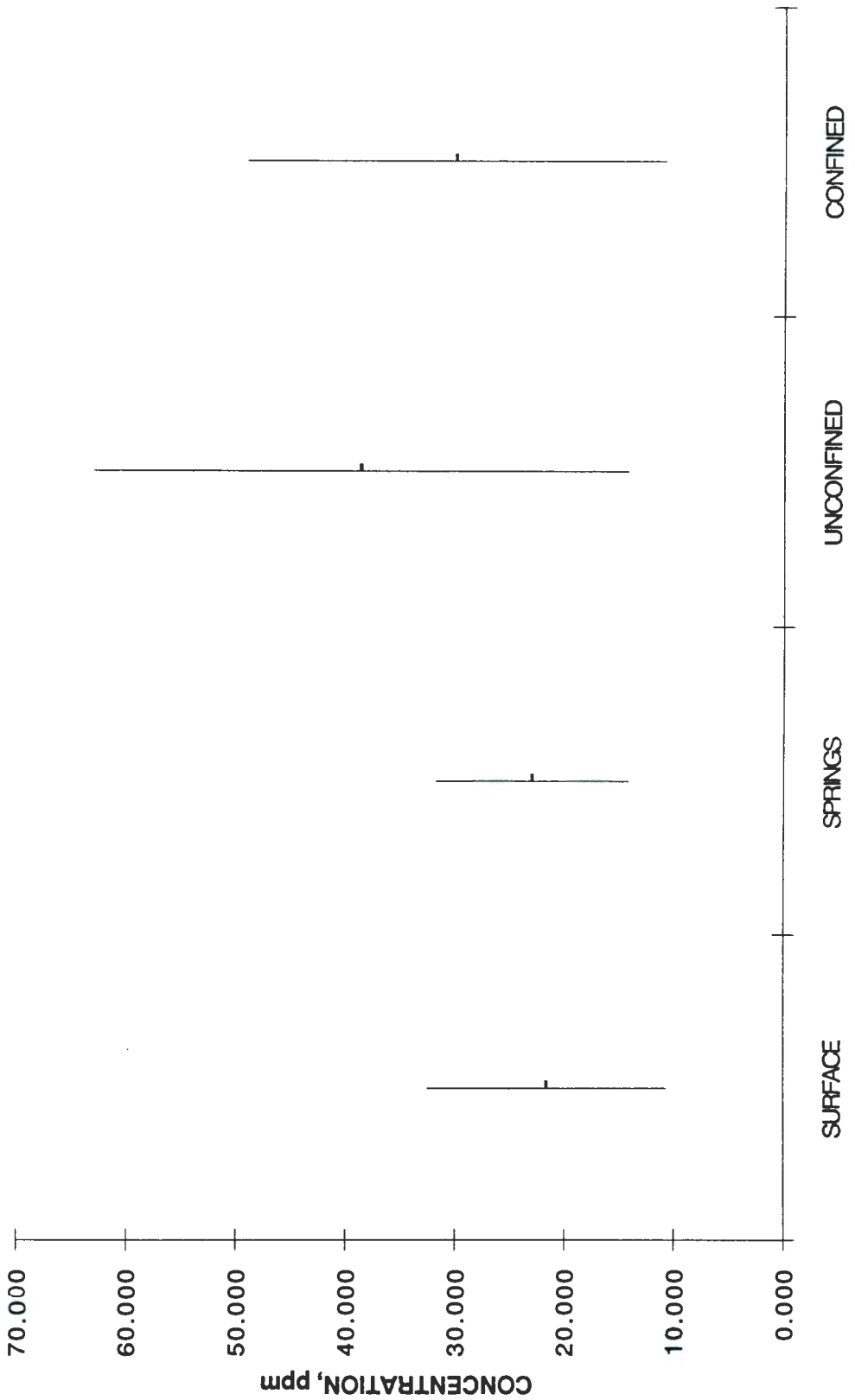

Figure 5-10b. Concentration of Calcium in Parts per Million in Surface Waters and Groundwaters. Vertical Bar is Two Standard Deviations, Mark in Center of Bar Represents the Mean Value. (sheet 2 of 6)

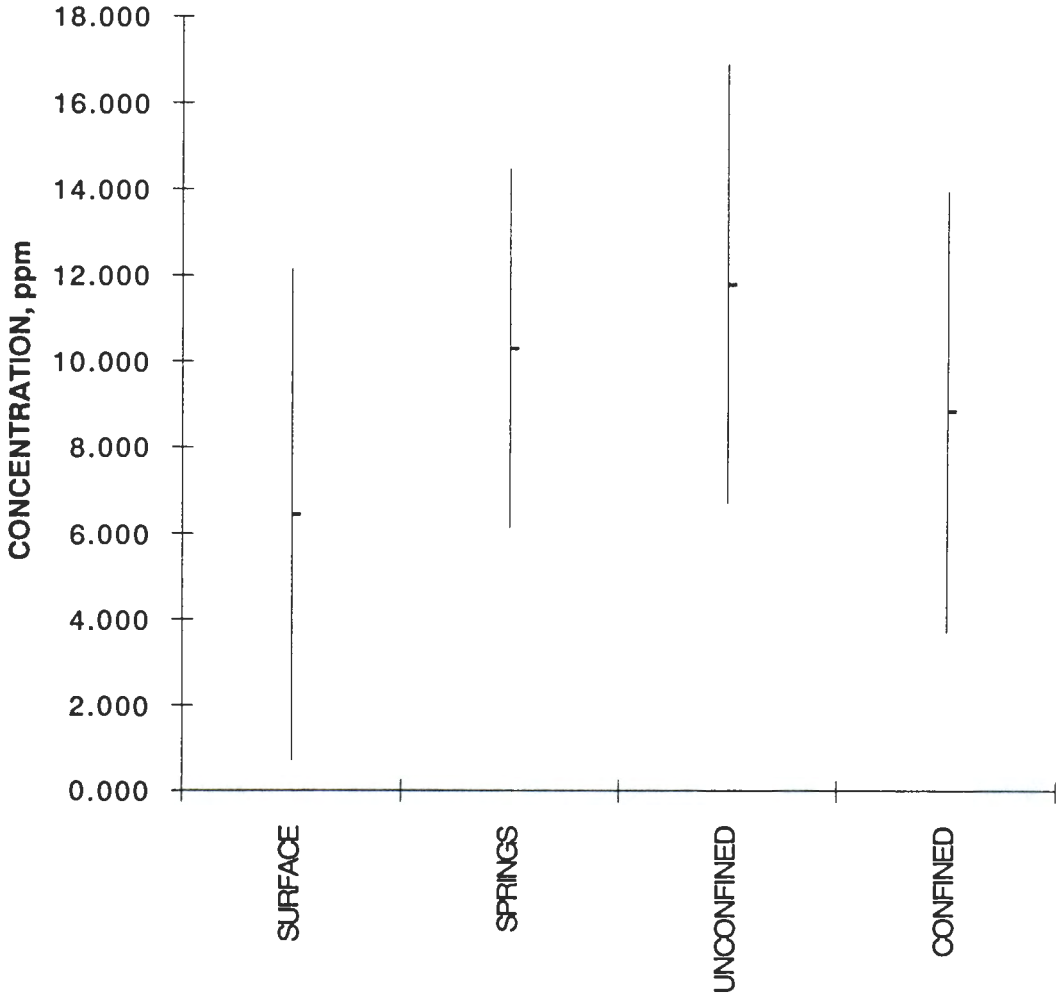

Figure 5-10c. Concentration of Magnesium in Parts per Million in Surface Waters and Groundwaters. Vertical Bar is Two Standard Deviations, Mark in Center of Bar Represents the Mean Value. (sheet 3 of 6)

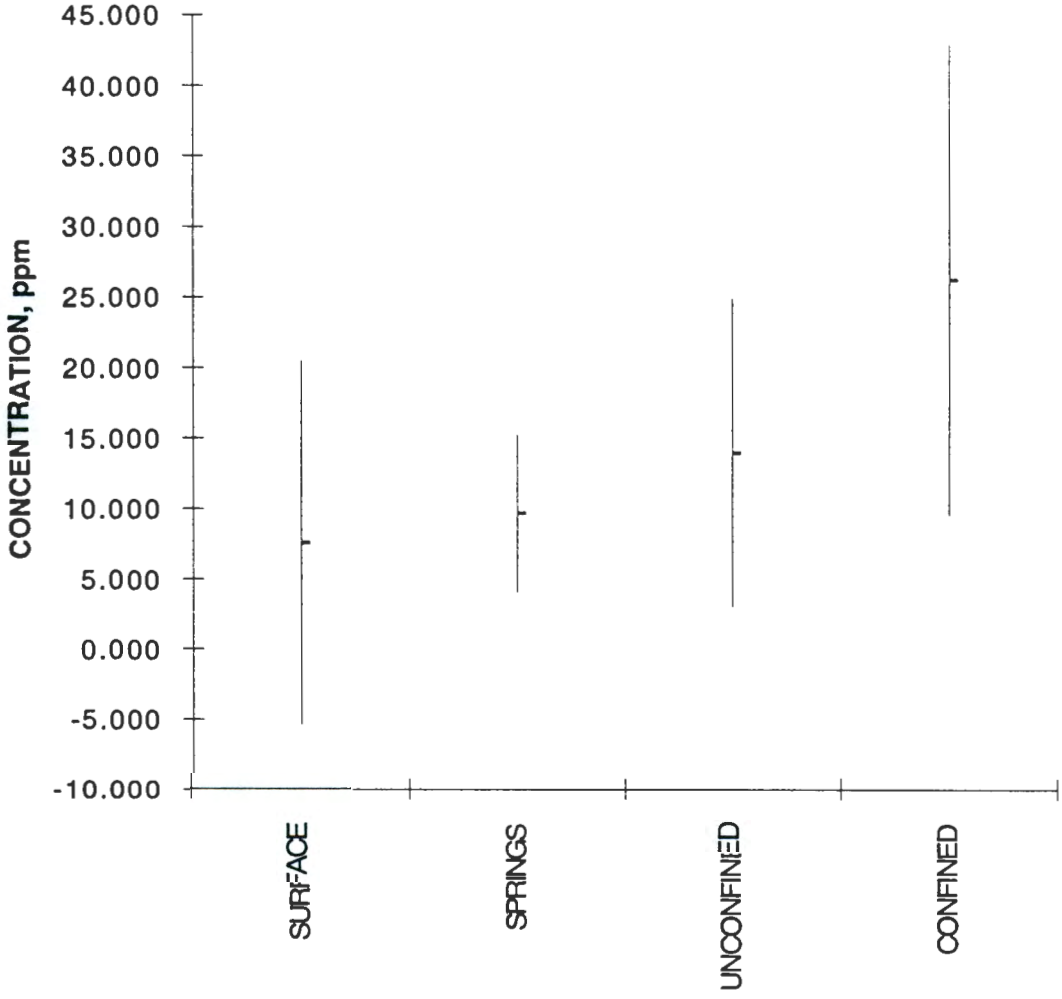

Figure 5-10d. Concentration of Sodium in Parts per Million in Surface Waters and Groundwaters. Vertical Bar is Two Standard Deviations, Mark in Center of Bar Represents the Mean Value. (sheet 4 of 6)

9 2 1 2 6 3 1 1 0 4

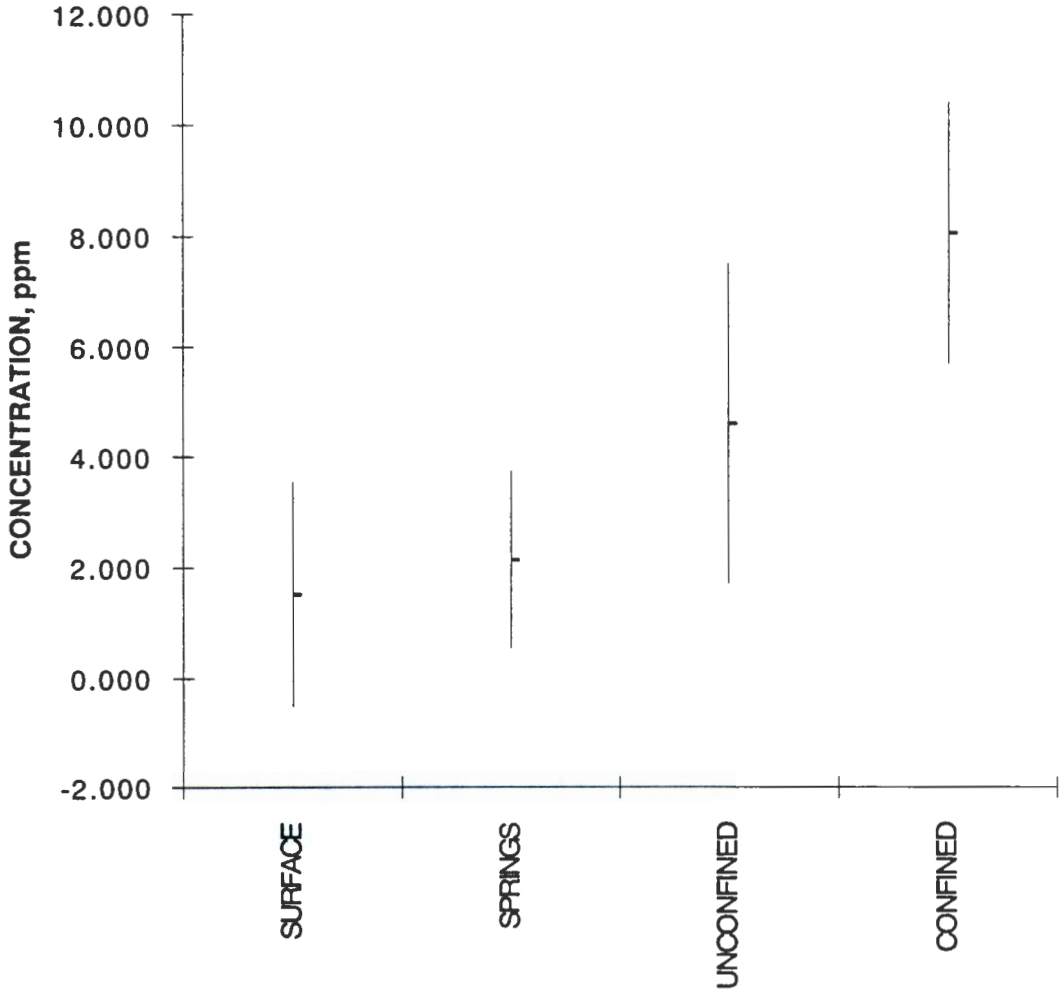

Figure 5-10e. Concentration of Potassium in Parts per Million in Surface Waters and Groundwaters. Vertical Bar is Two Standard Deviations, Mark in Center of Bar Represents the Mean Value. (sheet 5 of 6)

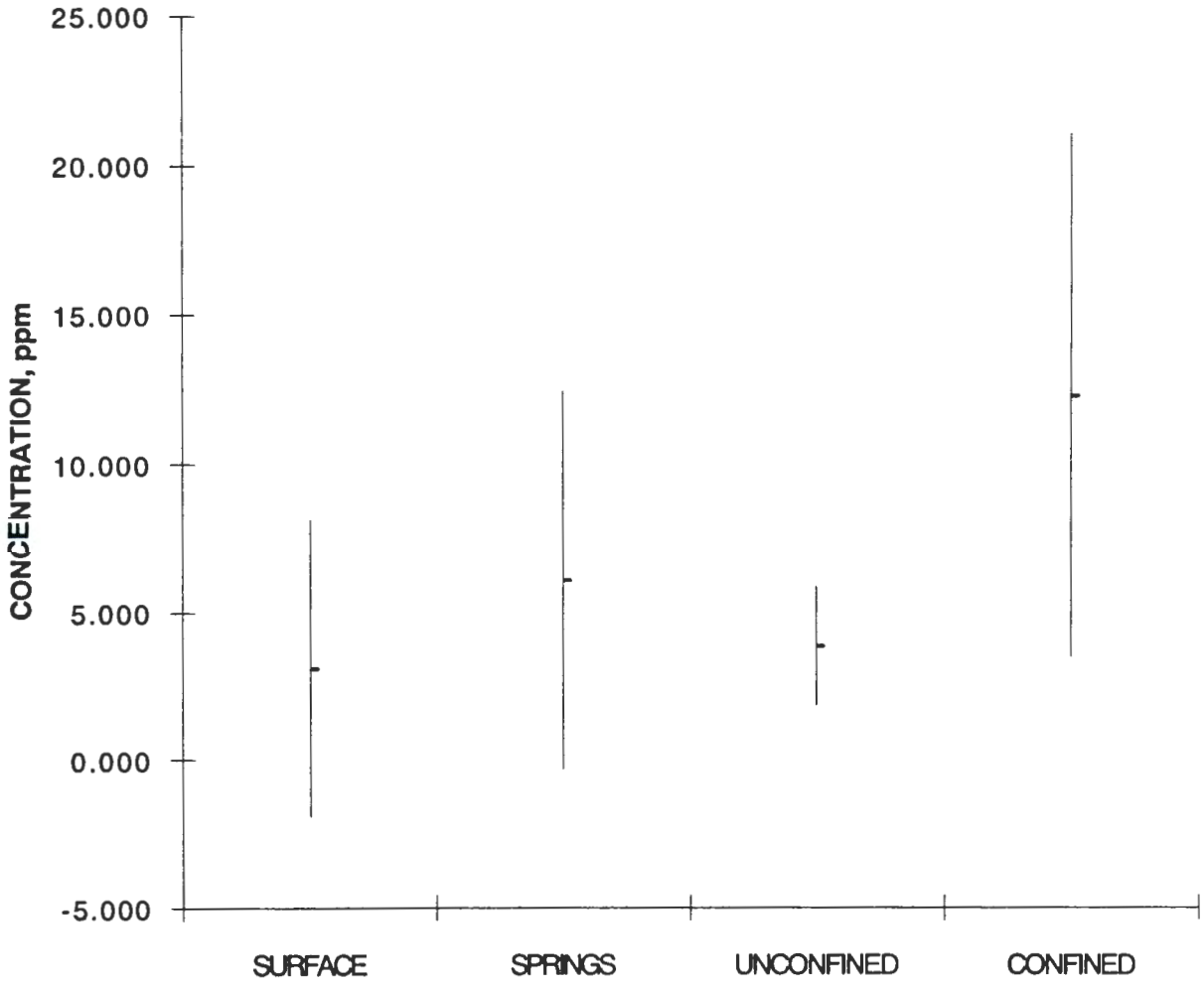

Figure 5-10f. Concentration of Chlorine (without well 6-S03-25) in Parts per Million in Surface Waters and Groundwaters. Vertical Bar is Two Standard Deviations, Mark in Center of Bar Represents the Mean Value. (sheet 6 of 6)

9 2 1 2 6 5 1 1 0 6

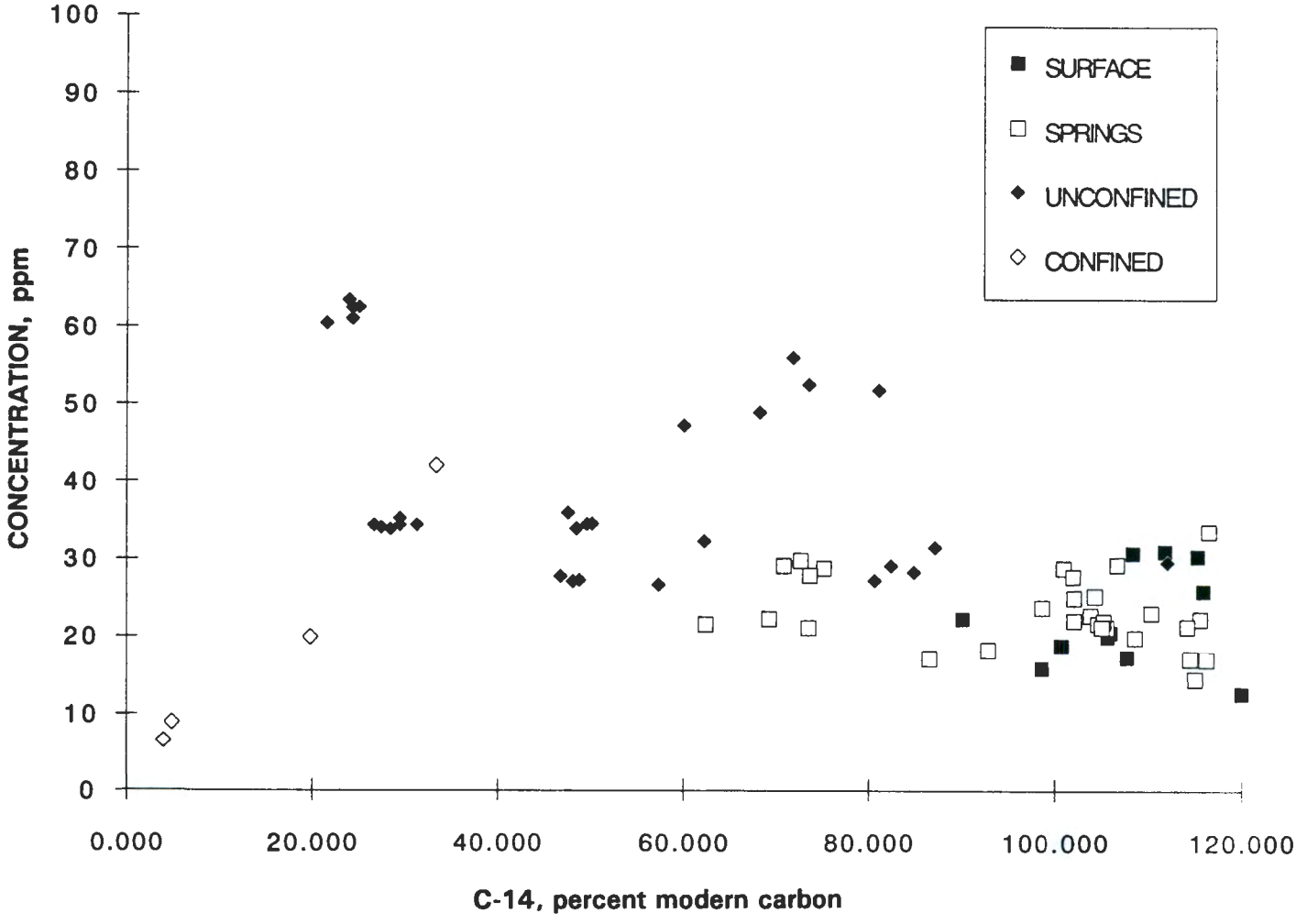

Figure 5-11a. Calcium Versus Carbon-14 Percent Modern Carbon.
(sheet 1 of 4)

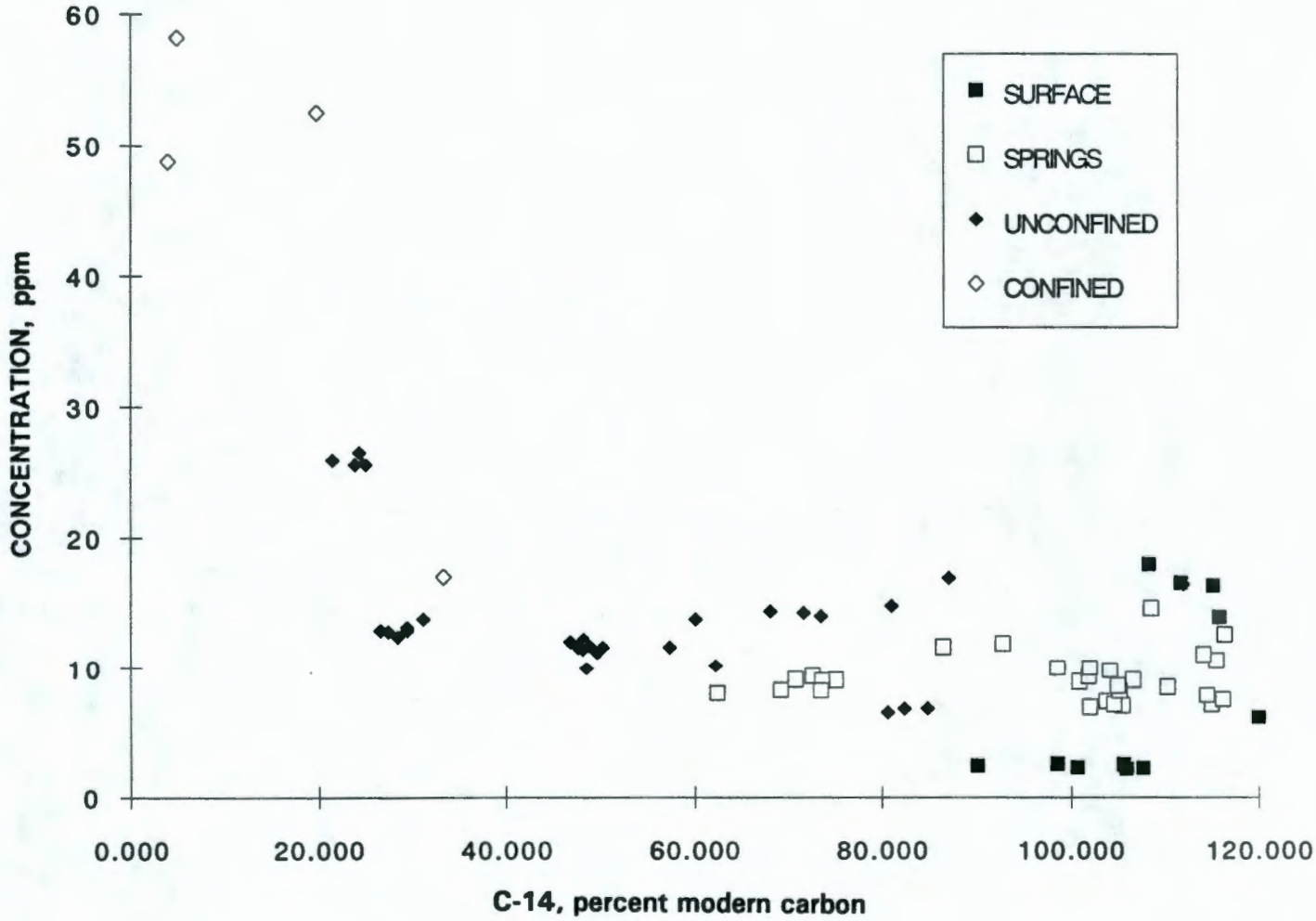

Figure 5-11b. Sodium Versus Carbon-14 Percent Modern Carbon.
(sheet 2 of 4)

9 2 1 2 6 5 1 1 0 8

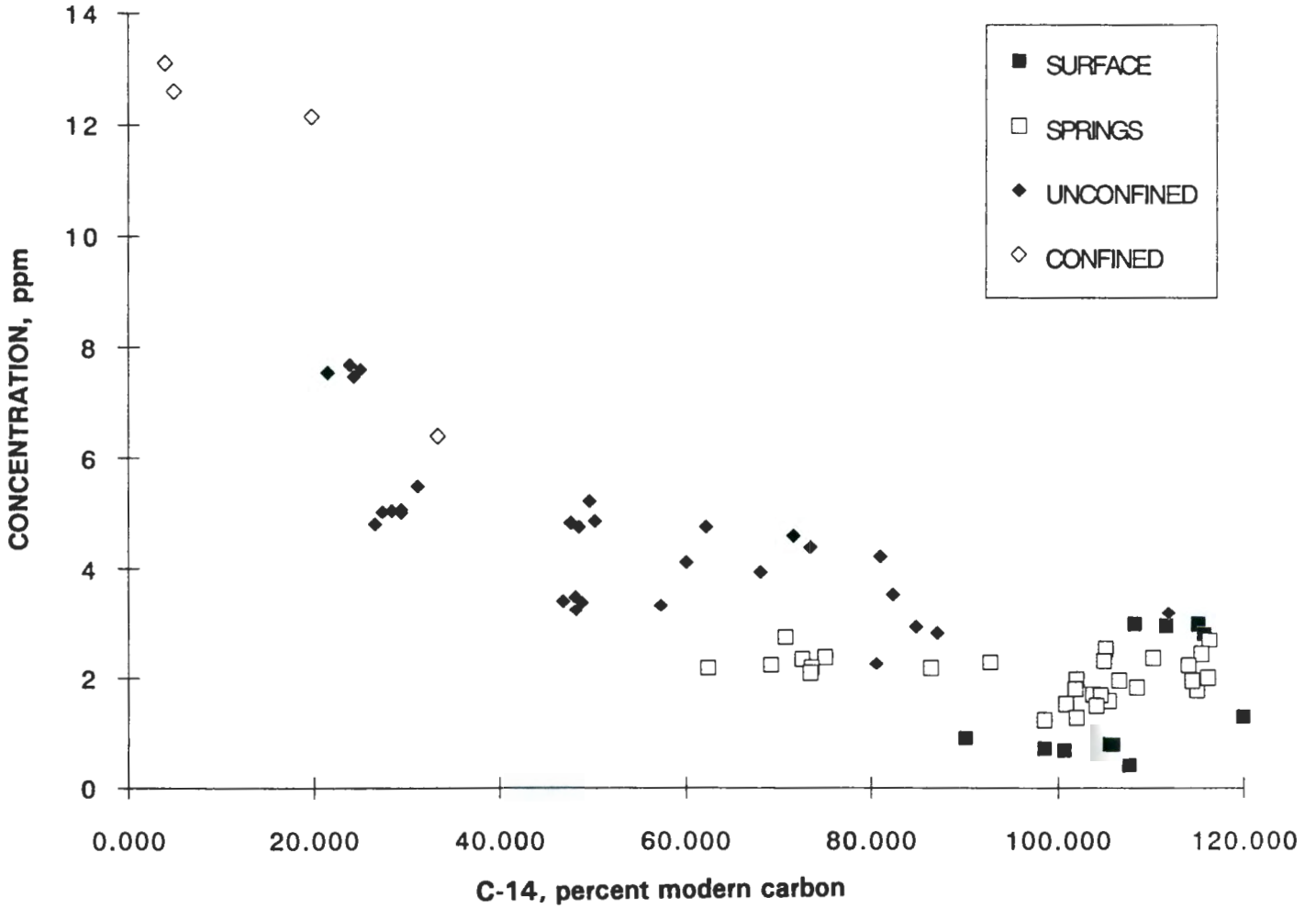

Figure 5-11c. Potassium Versus Carbon-14 Percent Modern Carbon.
(sheet 3 of 4)

9 2 1 2 6 5 1 1 0 9

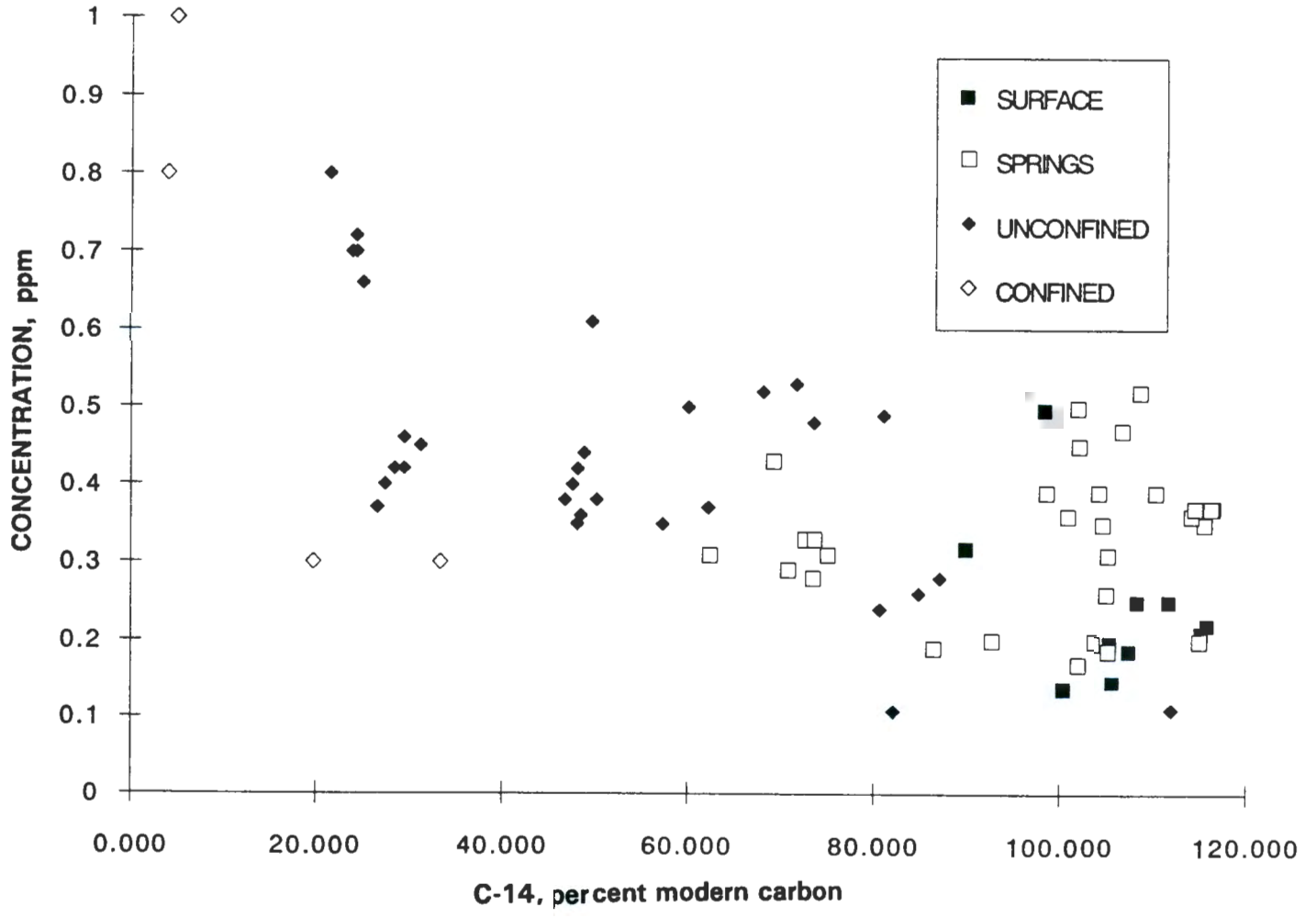

Figure 5-11d. Fluorine Versus Carbon-14 Percent Modern Carbon.
(sheet 4 of 4)

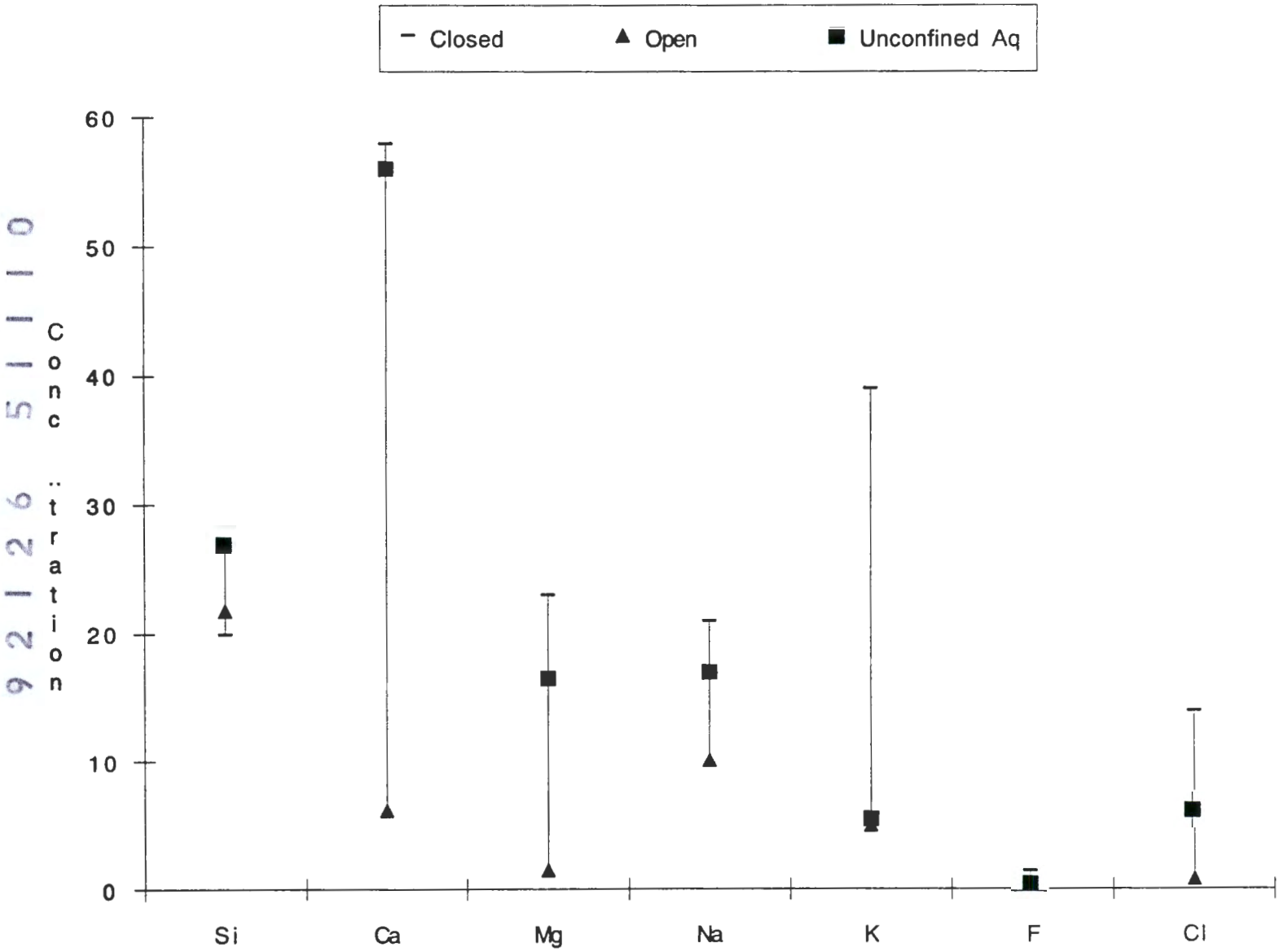

Figure 5-12a. Unconfined Aquifer Maximum Concentrations Compared to Open and Closed System Maxima for Major Ions. (sheet 1 of 2)

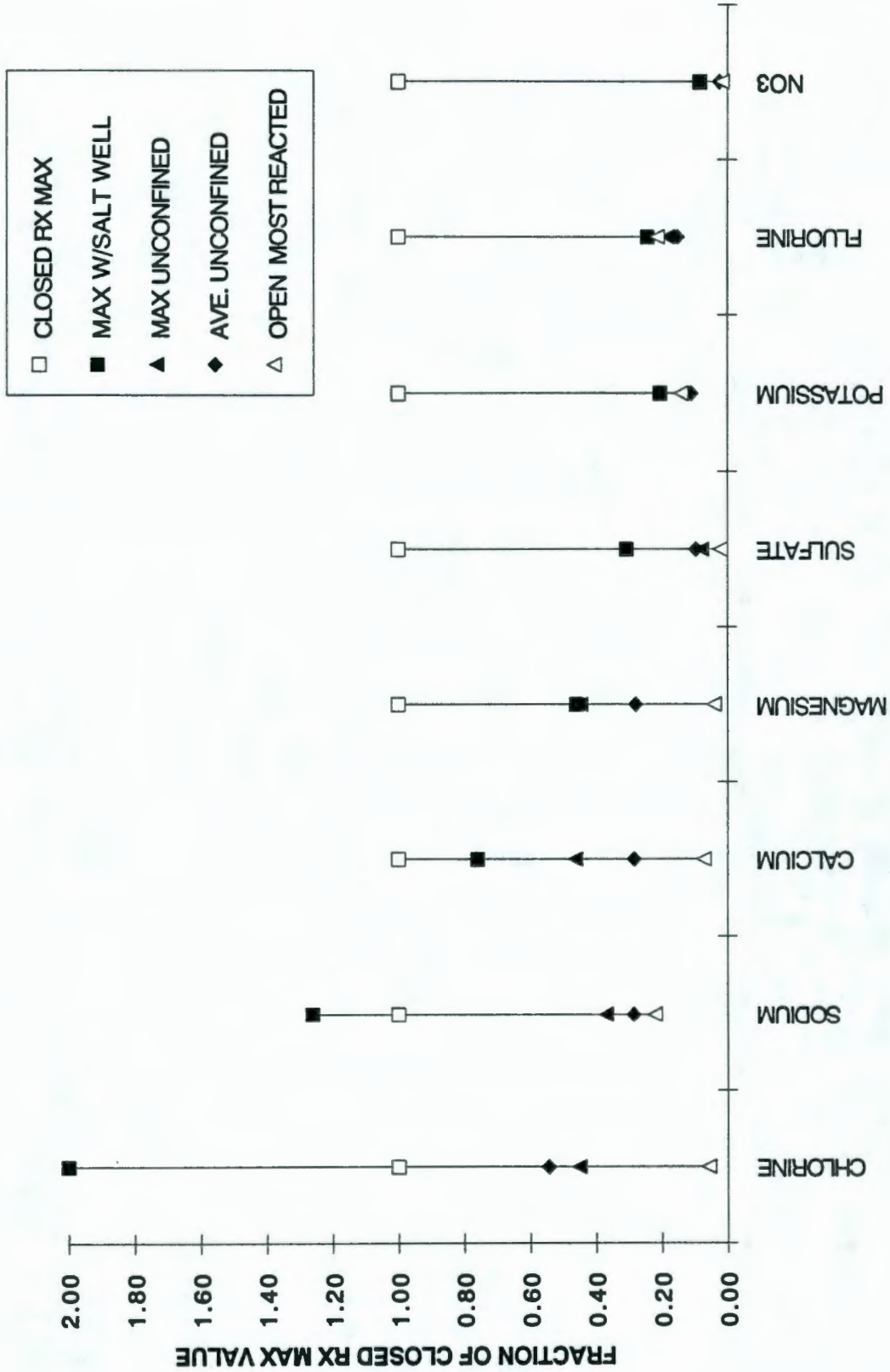

Figure 5-12b. Open and Closed System Limits Versus Unconfined Aquifer Data for Major Ions. (sheet 2 of 2)

9 2 1 2 6 5 1 1 1 1

9 2 1 2 6 5 1 1 1 2

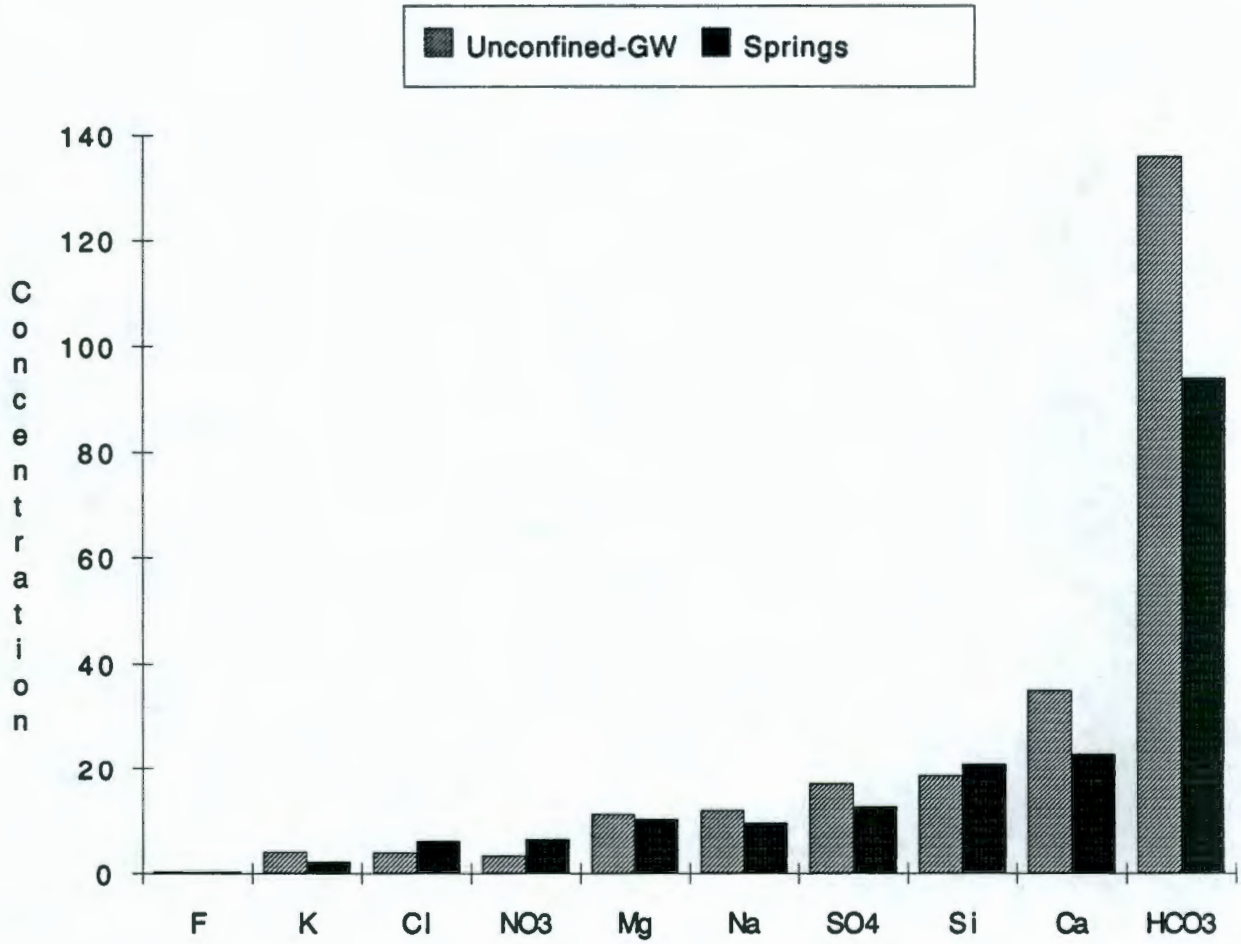

Figure 5-13. Average Compositions of Spring Water and Unconfined Groundwater.

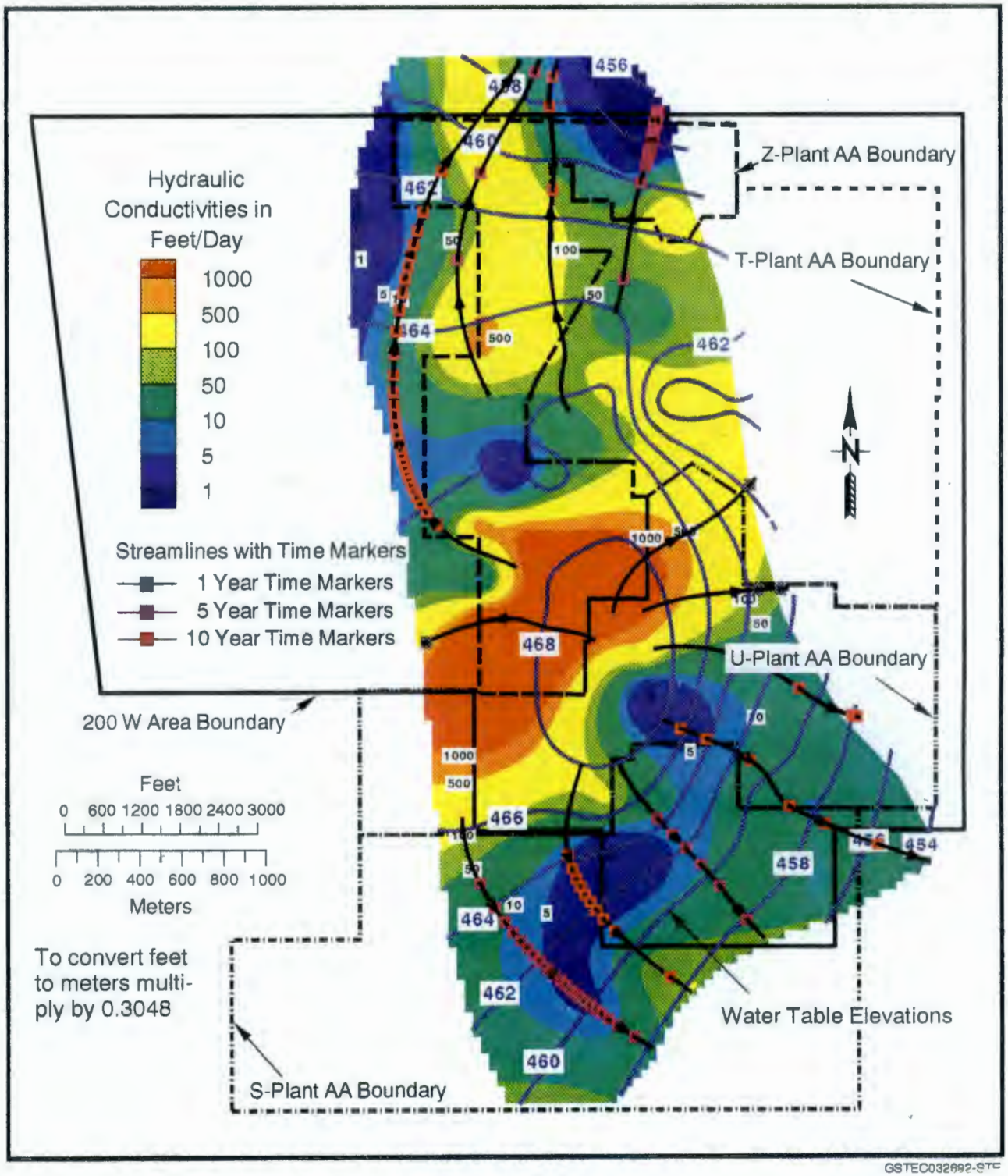

Figure 5-14. Variation in Hydraulic Conductivity Over the Scale of Several Miles.

9 2 1 2 6 5 1 1 1 3

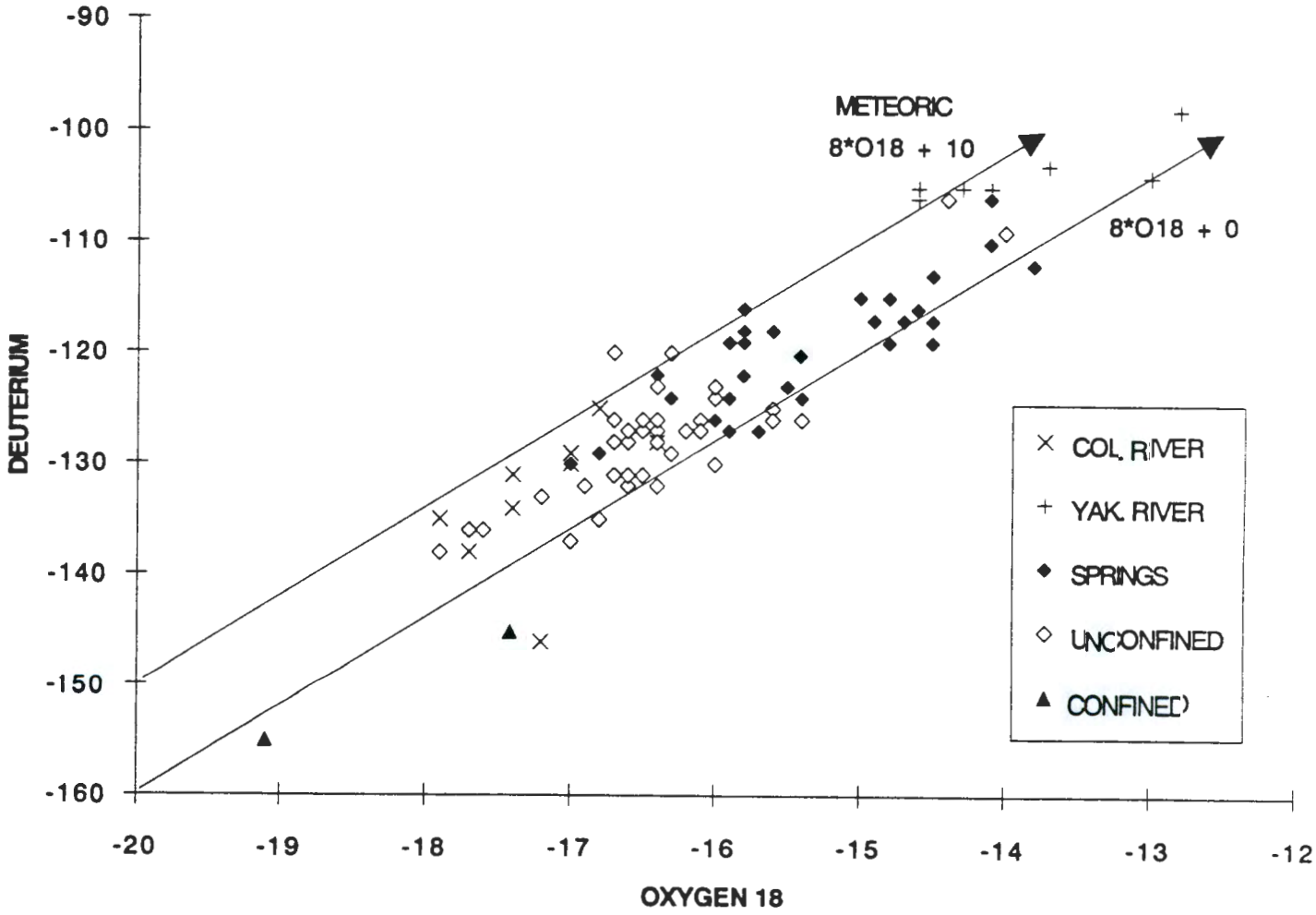

Figure 5-15. Deuterium, O-18 Isotopic Composition of Surface and Groundwaters at the Hanford Site.

9 2 1 2 6 5 1 1 1 5

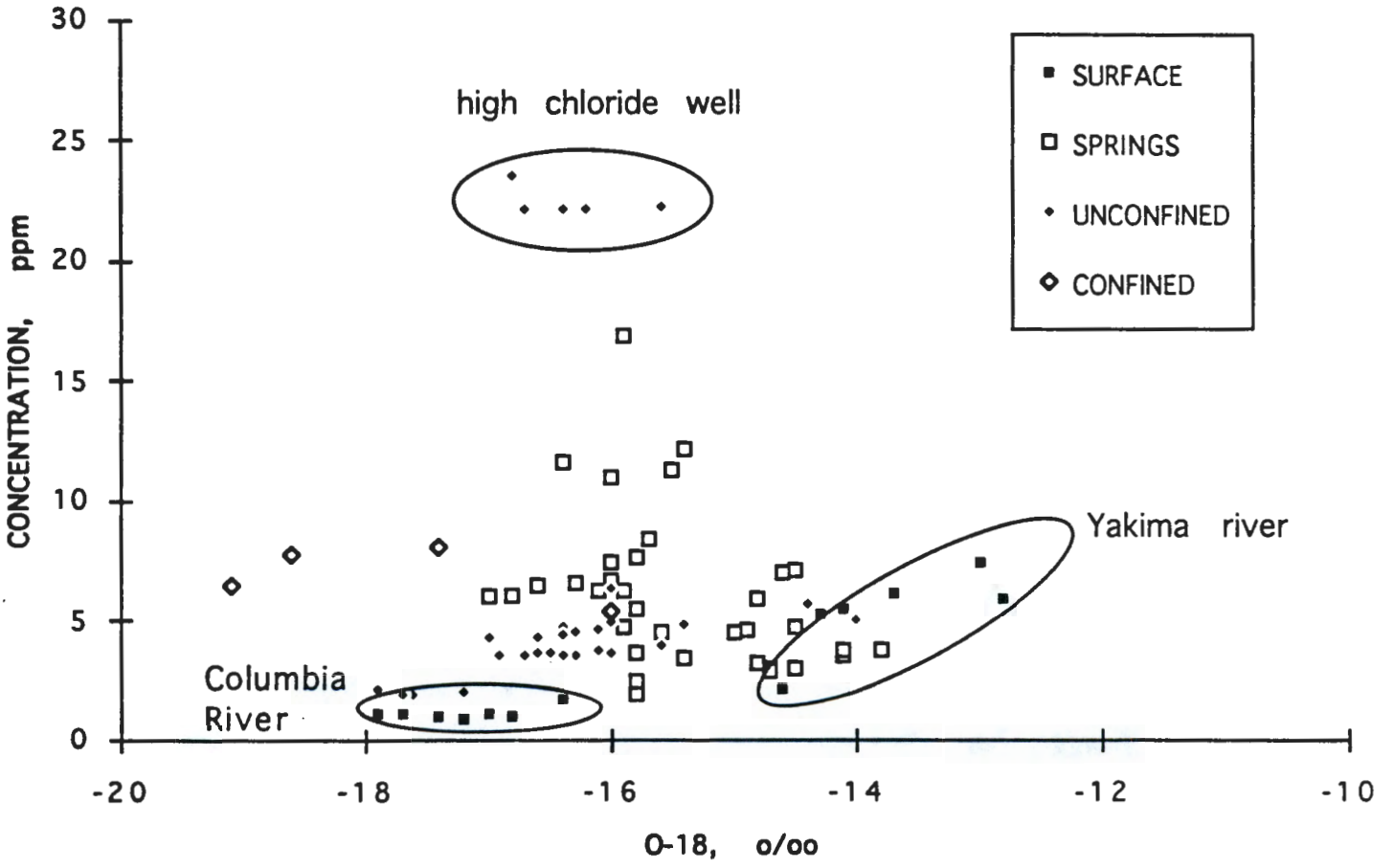

Figure 5-16. Variation Diagram: Chlorine Versus O-18.

9 2 1 2 6 5 1 1 1 6

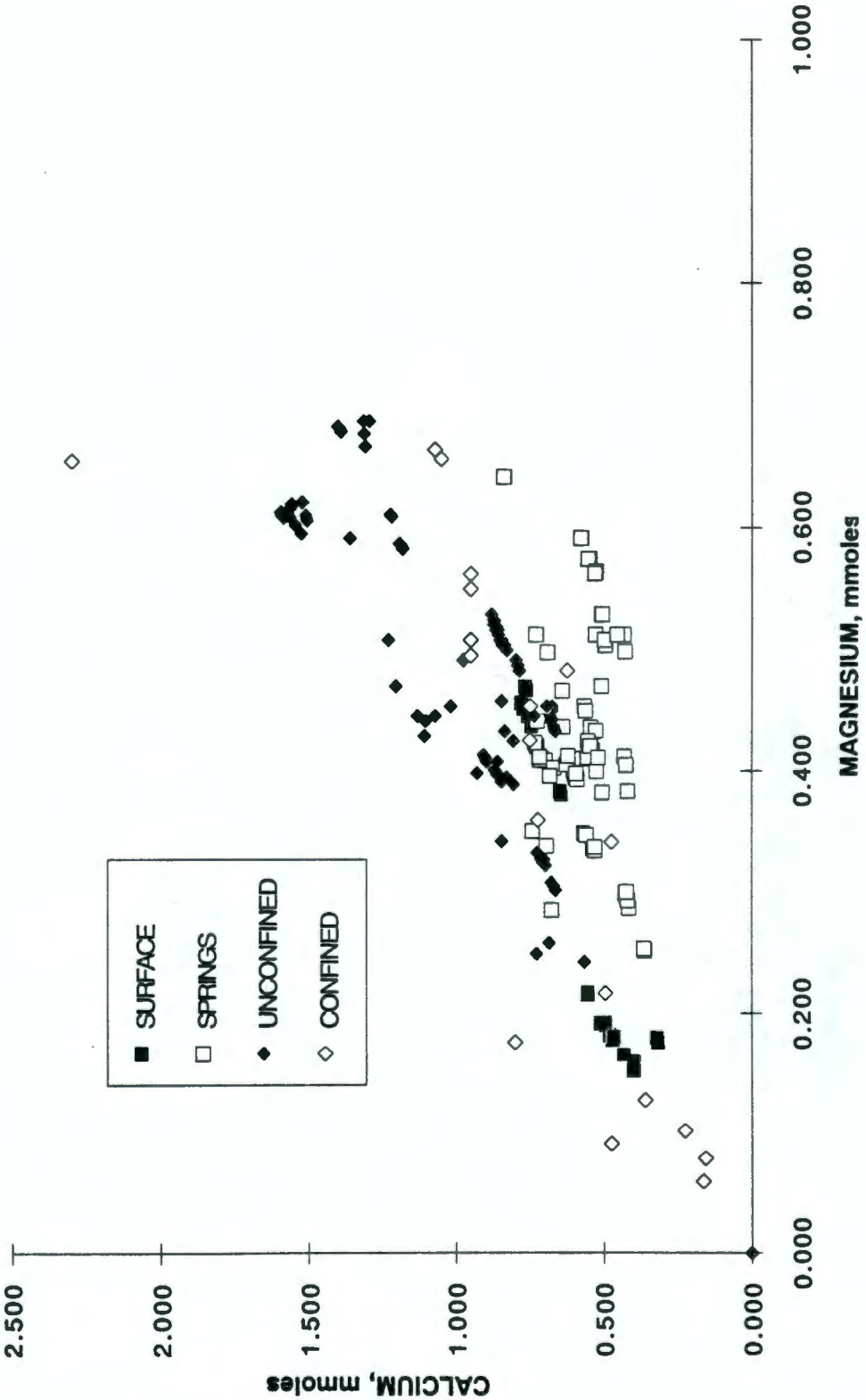

Figure 5-17a. Variation Diagram: Calcium Versus Magnesium (Moles) Surface and Groundwaters at the Hanford Site. (sheet 1 of 3)

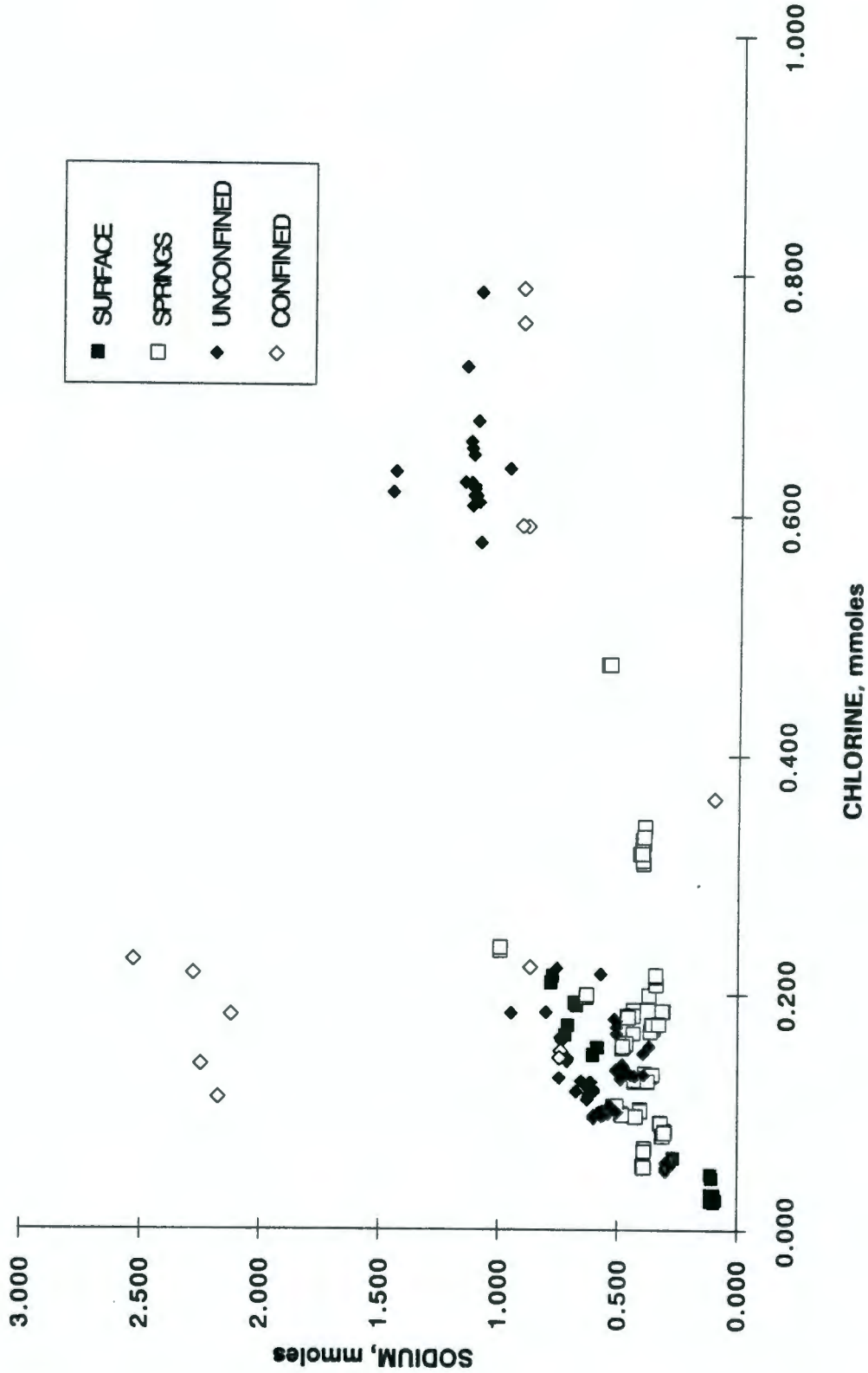

Figure 5-17b. Variation Diagram: Sodium Versus Chlorine (Moles) Surface and Groundwaters at the Hanford Site. (sheet 2 of 3)

9 2 1 2 6 - 5 1 1 1 7

9 2 1 2 6 5 1 1 1 8

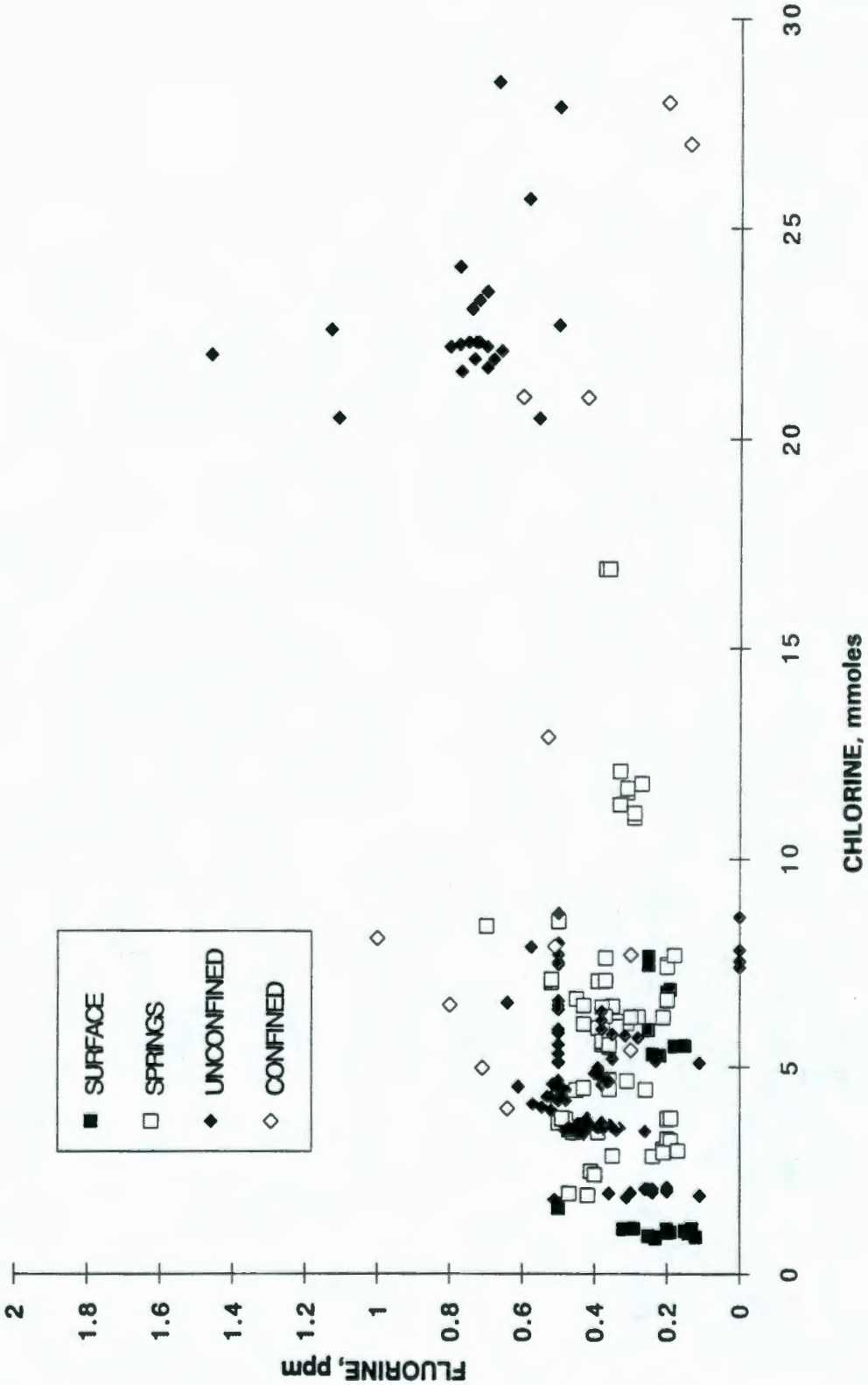

Figure 5-17c. Variation Diagram: Fluorine Versus Chlorine (Parts per Million for Surface and Groundwaters at the Hanford Site. (sheet 3 of 3)

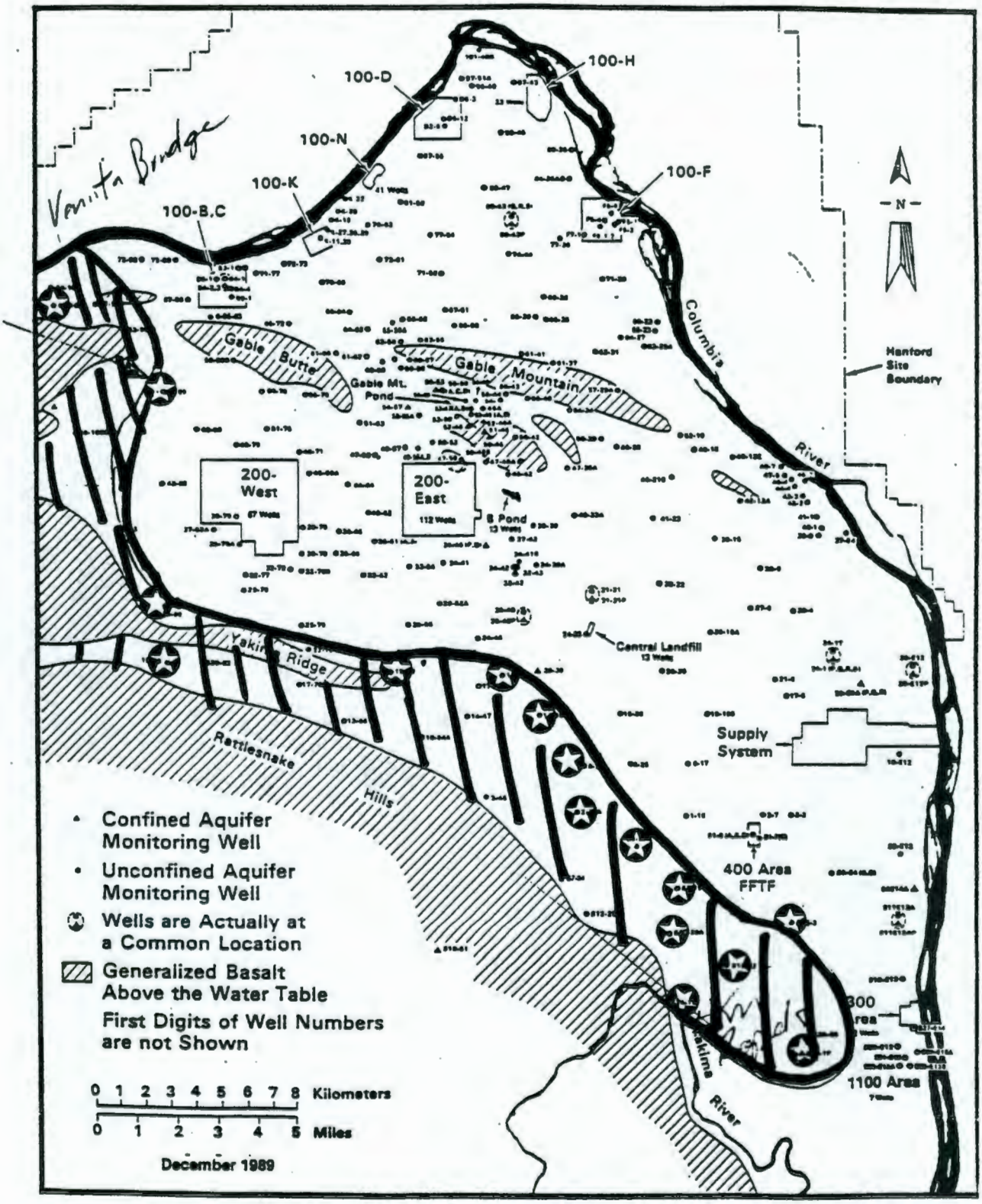

Figure 5-18. Well Locations, Background Data Set.

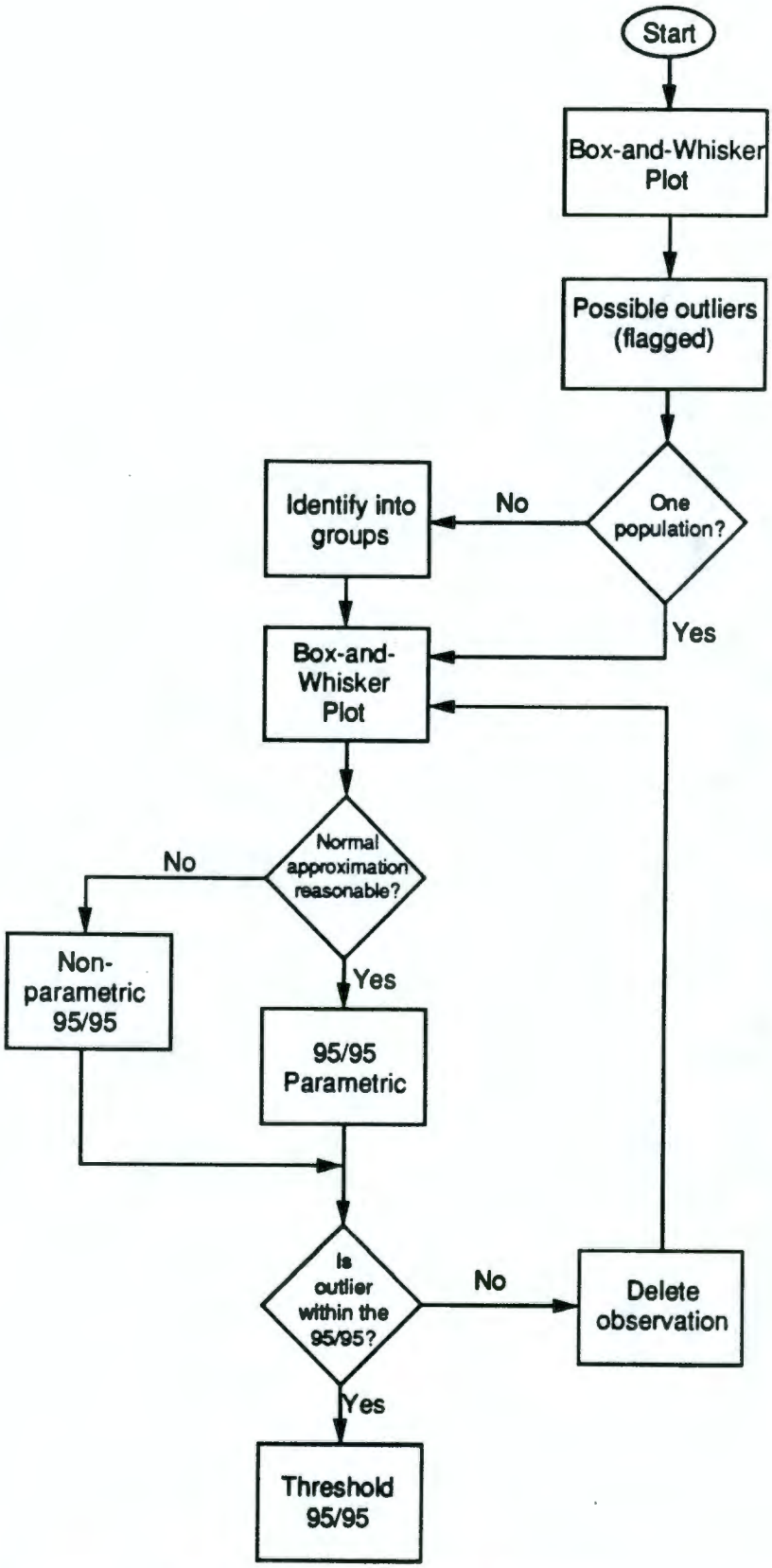

Figure 5-19. Logic Diagram for Statistical Analysis of Background Data Set.

9 2 1 2 6 5 1 1 2 0

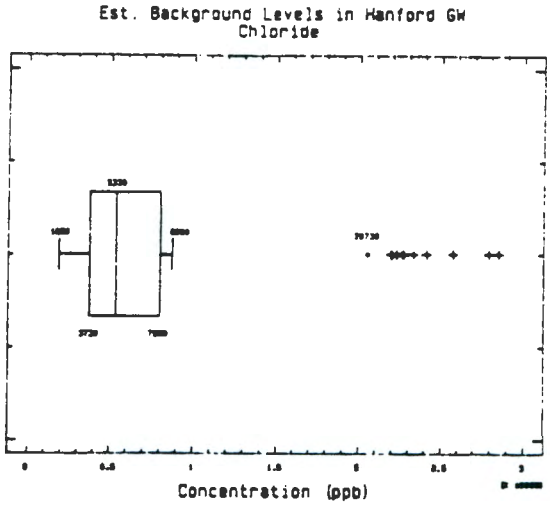

Figure 5-20. Typical Box and Whisker Plot.

9 2 1 2 6 5 1 1 2 2

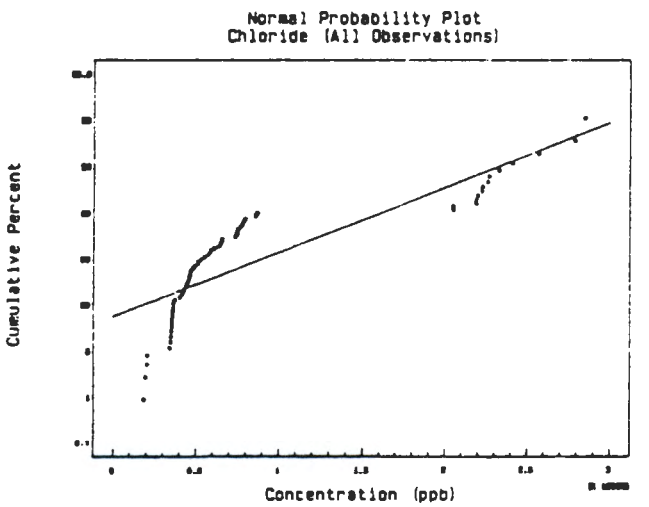

Figure 5-21. Cumulative Distribution Plot.

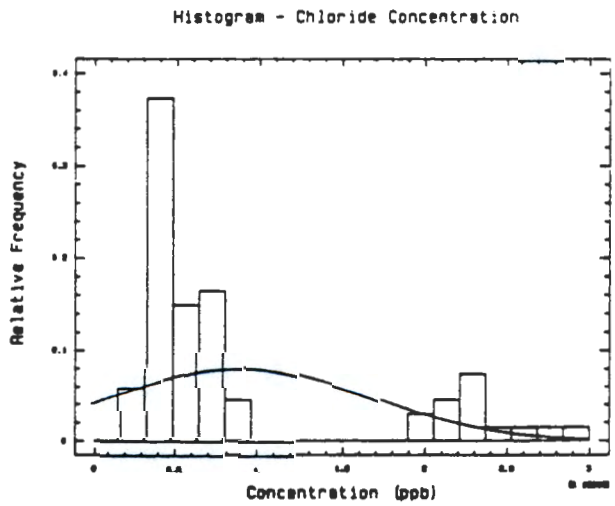

Figure 5-22. Histogram With Superimposed Probability Distribution Function.

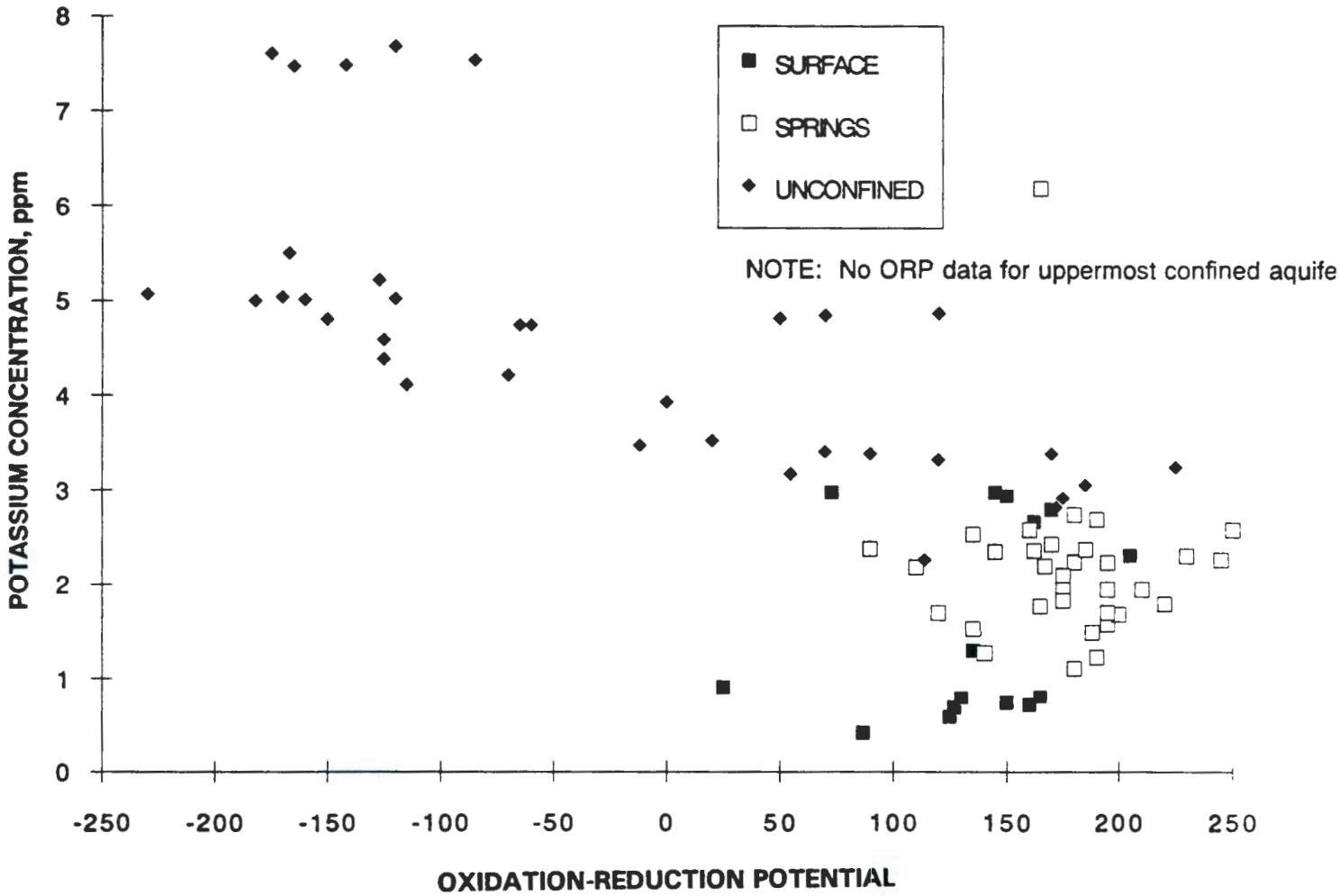

Figure 5-23a. Major Potassium Versus Oxidation-Reduction Potential.
(sheet 1 of 6)

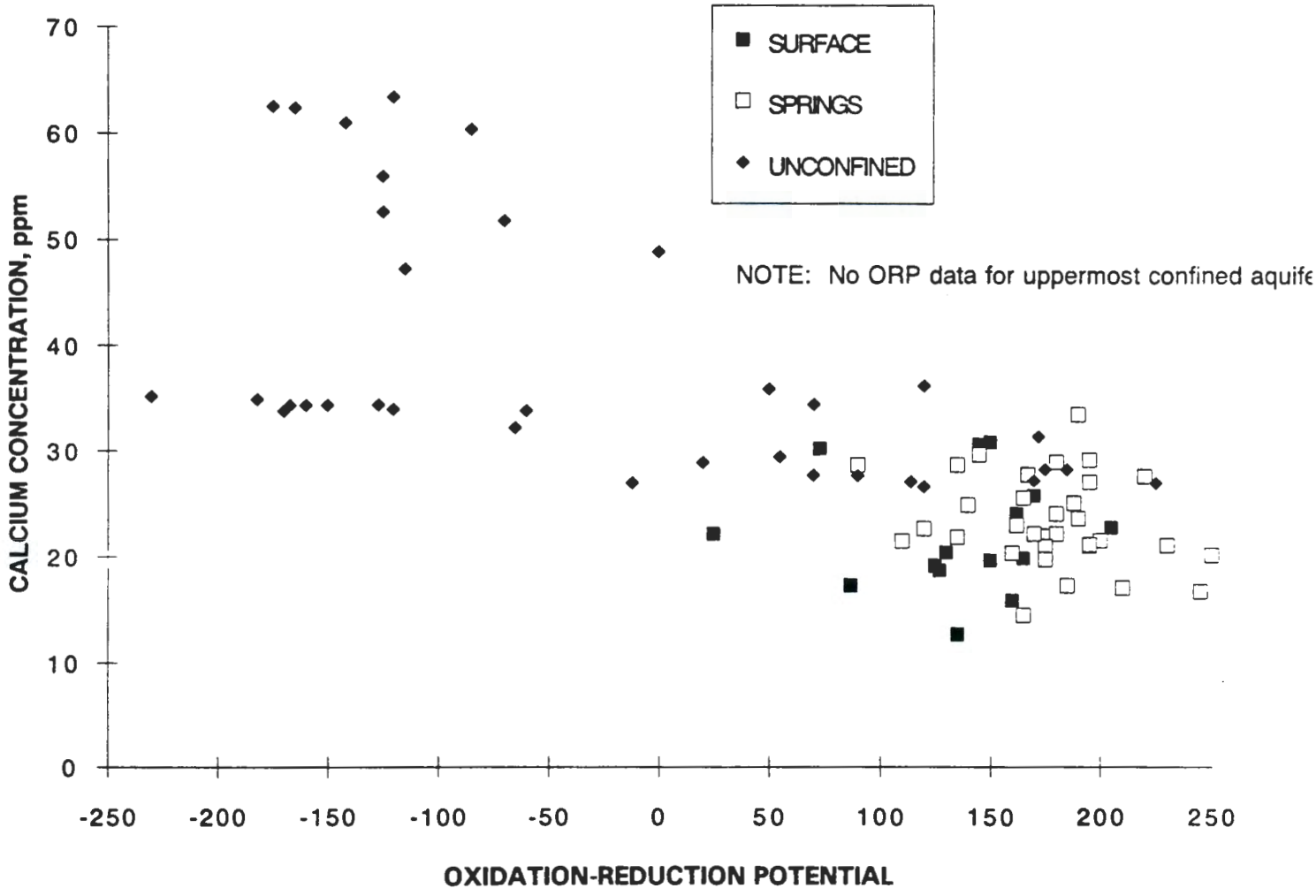

Figure 5-23b. Major Calcium Versus Oxidation-Reduction Potential.
(sheet 2 of 6)

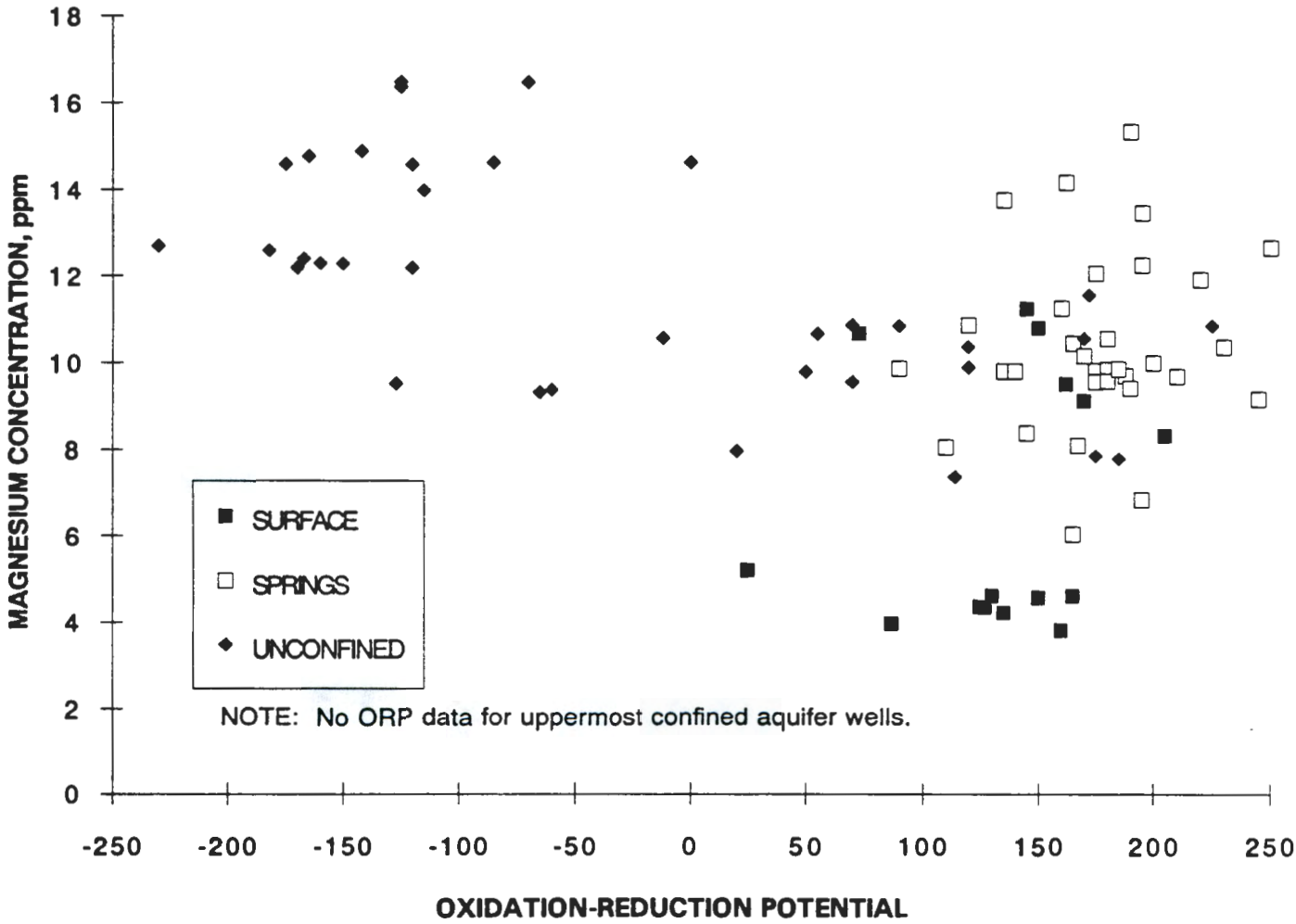

Figure 5-23c. Major Magnesium Versus Oxidation-Reduction Potential. (sheet 3 of 6)

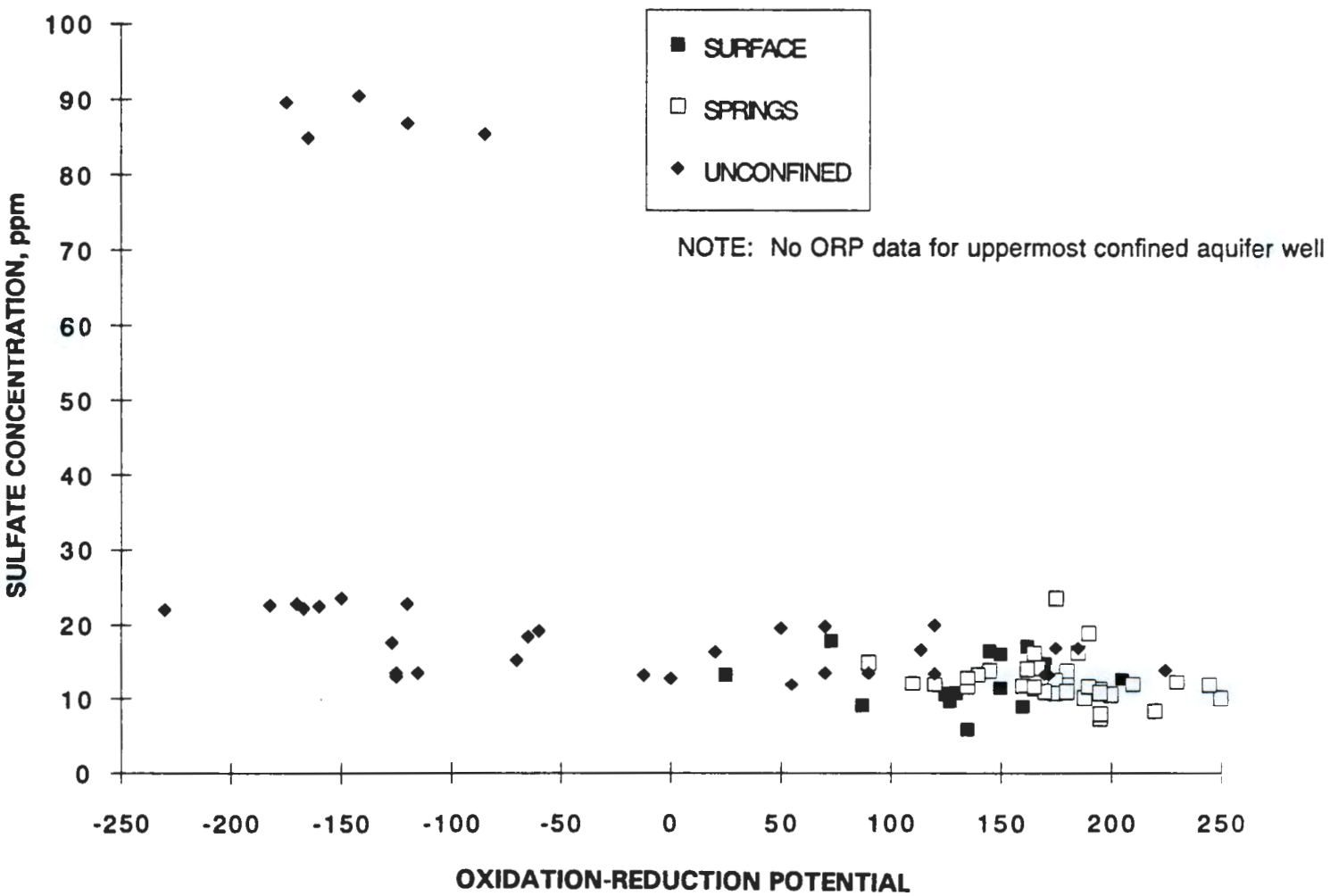

Figure 5-23d. Major Sulfate Versus Oxidation-Reduction Potential.
(sheet 4 of 6)

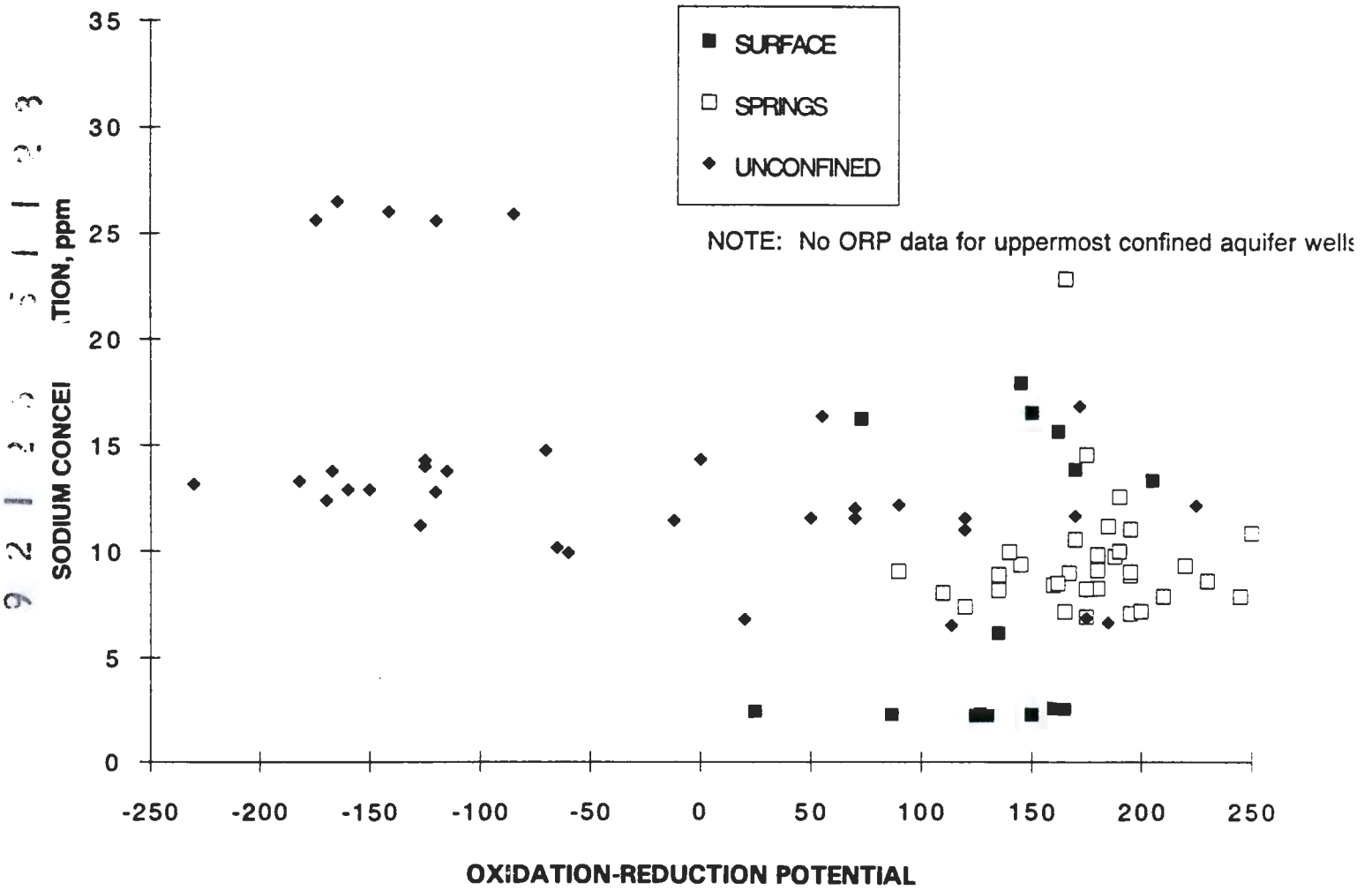

Figure 5-23e. Major Sodium Versus Oxidation-Reduction Potential.
(sheet 5 of 6)

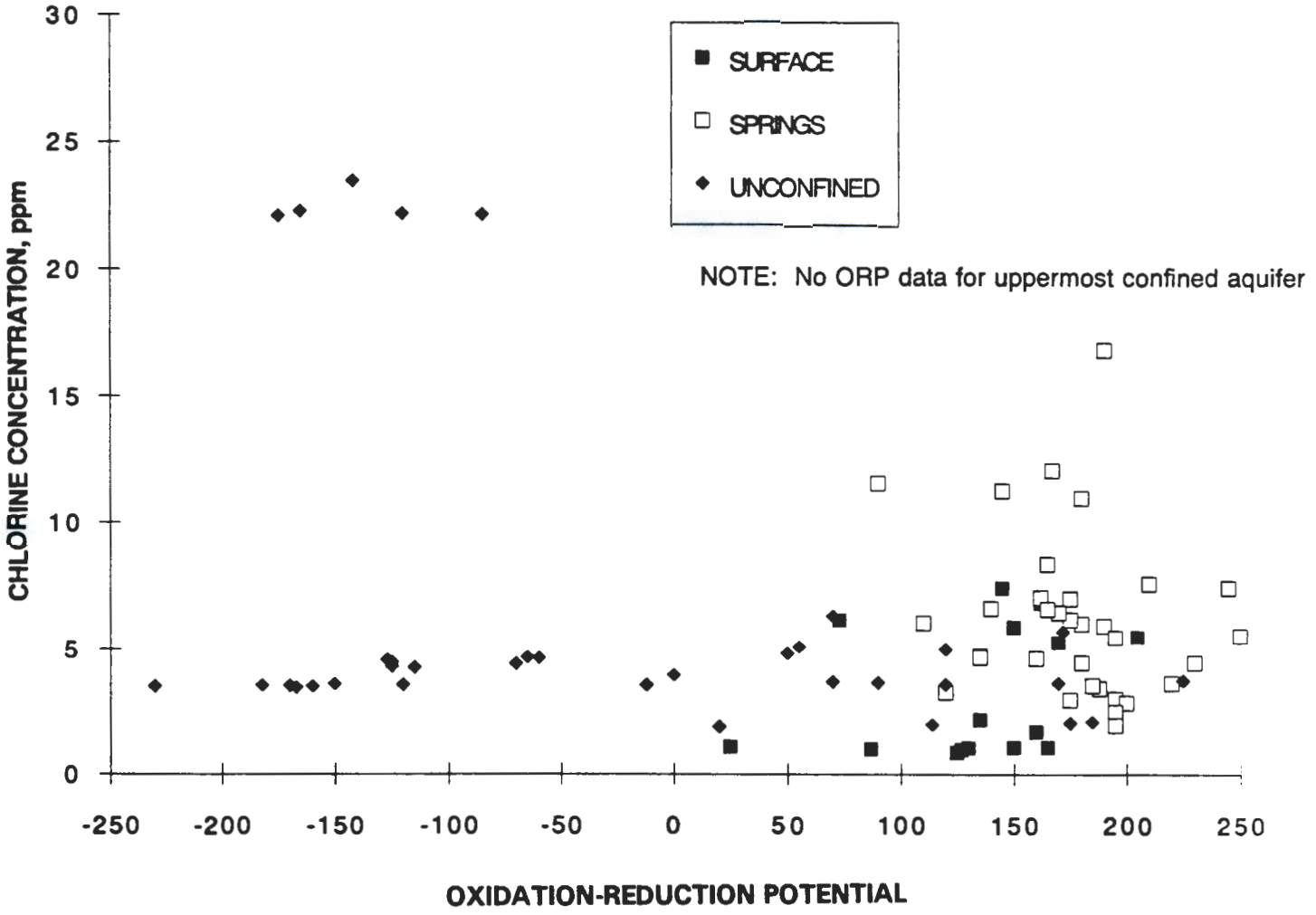

Figure 5-23f. Major Chlorine Versus Oxidation-Reduction Potential.
(sheet 6 of 6)

Table 5-1. Surface Water Concentration Maxima.

CONCENTRATION MAXIMA
SOURCE: RHO-BWI-DP-061

	COLUMBIA RIVER		YAKIMA RIVER		PRECIPITATION	
Analyte	ppm	qualifier	ppm	qualifier	ppm	qualifier
Al	0.2	<	0.2	<	0.233	
B	0.1	<	0.1	<	0.023	<
Ba	0.032	<	0.027	<	0.01	
Ca	22.2		31.2		0.51	
Cl	7		7.65		1	<
Co	0.02	<	0.017	<	0.015	<
Cr	0.034	<	0.032	<	0.03	<
Cu	0.03	<	0.03	<	0.008	<
F	0.5		0.25		1	<
Fe	0.03	<	0.44		1.037	
K	0.91		2.98		0.501	
Li	0.016	<	0.016	<	0.008	<
Mg	5.2		11.3		0.103	<
Mn	0.01	<	28	<	0.024	
Na	2.6		18		0.27	
Ni	0.03	<	0.03	<	0.026	<
NO3	0.16		5.46		1.87	
P	0.54	<		<	0.34	<
Pb	0.2	<	0.18	<	0.155	<
Si	2.8		11.8		0.133	
SO4	13.4		18		1	<
Sr	0.114		0.135		0.002	
Zn	0.04	<	0.04	<	13.76	
Tritium	29.8		14		23.5	tritium units

Tritium unit: 3.23 pCi/L

Table 5-2. Maxima and Average Concentrations for Unconfined, Springs, and Confined Groundwater.

	Unconfined avg	Springs avg	Confined avg	Unconfined max	Springs max	Confined max
Al	0.145	0.15	0.069	0.202	0.2	0.14
B	0.072	0.08	0.009	0.101	0.1	0.02
Ba	0.036	0.01	0.078	0.062	0.025	0.129
Ca	35	23	29.9	56	34	92
Cl	3.9	6.1	12.3	6.3	16.9	28
Co	0.02	0.016	0.026	0.12	34	0.16
Cr	0.032	0.033	0.006	0.033	0.036	0.012
Cu	0.023	0.021	0.003	0.03	0.03	0.01
F	0.39	0.35	0.73	0.61	0.7	3.3
F-alk	136	94	120	215	134	158
Fe	0.215	0.024	0.097	0.695	0.034	0.61
K	4.1	2.2	8.1	5.5	6.2	13.1
Li	0.013	0.013	0.02	0.016	0.016	0.02
Mg	11.3	10.3	8.9	16.5	15.4	15.9
Mn	0.06	0.008	0.18	0.164	0.01	0.5
Mo	0.41		0.11	0.61	0.61	0.2
Na	12	9.6	26.2	17	22.9	58
Ni	0.03	0.03	0.012	0.036	0.03	0.02
NO3	3.4	6.5	3	7.1	39.8	8
Pb	0.18	0.17	0.043	0.2	0.18	0.1
Si	19	21	30	27	28	37
SO4	17	13	24	24	24	40
Sr	0.15	0.08	0.09	0.25	0.12	0.16
Zn	0.018	0.97	0.1	0.62	7.2	0.226

Table 5-3. Correlation Matrix for Selected Analytes in Groundwater from the Unconfined Aquifer.

	CALCIUM	CHLORINE	FLUORINE	IRON	POTASS...	MAGNES...	SODIUM	SO4
CALCIUM	1							
CHLORINE	.747	1						
FLUORINE	.934	.747	1					
IRON	.509	.028	.469	1				
POTASSI...	.936	.778	.94	.414	1			
MAGNESI...	.955	.583	.907	.605	.895	1		
SODIUM	.936	.853	.915	.352	.932	.902	1	
SO4	.748	.98	.753	.067	.81	.587	.839	1
FIELD ALK	.933	.483	.866	.664	.842	.985	.836	.479

9 2 1 2 6 5 1 1 3 2

Table 5-4. Comparison of Chemical Data (ppm) in the BWIP Hydrochemical Database and the Hanford Groundwater Database.

	699-S3-25		699-19-88	
CONSTITUENT	BWIP	HGDB	BWIP	HGDB
Sodium	25.886 ± 0.190[a] (5)[b]	23.750 ± 1.550 (2)	11.890 ± 0.104 (6)	n.d.[c]
Potassium	7.541 ± 0.039 (5)	6.955 ± 0.325 (2)	3.384 ± 0.048 (6)	n.d.
Calcium	61.790 ± 0.571	51.800 ± 2.600 (2)	27.241 ± 0.161 (6)	n.d.
Magnesium	14.684 ± 0.081 (5)	13.200 ± 1.000 (2)	10.722 ± 0.075 (6)	n.d.
Iron	0.089 ± 0.015 (5)	0.180 ± 0.001 (2)	0.029 ± 0.002 (6)	n.d.
Manganese	0.110 ± 0.001 (5)	0.130 ± 0.016 (2)	0.008 ± 0.001 (6)	n.d.
Zinc	0.035 ± 0.003 (5)	0.006 ± 0.001 (2)	0.033 ± 0.003 (6)	n.d.
Barium	0.064 ± 0.002 (5)	0.065 ± 0.001 (2)	0.009 ± 0.001 (6)	n.d.
Chloride	22.330 ± 0.257 (5)	23.400 ± 0.700 (2)	3.637 ± 0.025 (6)	3.900 (1)
Fluoride	0.727 ± 0.015 (5)	0.637 ± 0.137 (2)	0.394 ± 0.016 (6)	<0.500 (1)
Sulfate	87.250 ± 1.073 (5)	77.150 ± 5.250 (2)	13.633 ± 0.189 (6)	14.900 (1)
Nitrate	0.335 ± 0.063 (3)	<0.500 ( )	1.395 ± 0.258 (6)	1.688 ± 0.124 (4)

a. plus/minus one standard deviation on the mean
b. number of analyses in average
c. n.d. = no data

9 2 1 2 6 5 1 1 3 3

Table 5-5. Summary of Carbon Isotope Data and Age Assignments for Major Hanford Site Hydrologic Regimes.

Regime	n	N	[a] C-14, pmc	[a] del C-13	[a] Age (yrs)
River water	2	11	105 ± 7	-8.7 ± 3.2	modern
Shallow springs	7	22	105 ± 7	-15.0±1.5	modern
Mixed RW/GW	2	5	92 ± 1	-13.0± 2.8	modern
Confined springs	3	8	70 ± 3	-11.8± 1.2	600 ±300
Unconfined aquifer (W)	5	25	45 ± 19	-13.4± 2.6	4800 ±3700
Upper confined (West)	1	1	33 ± 1	N/A	6700
Upper confined (East)	4	4	4.9 ± 0.6	-13.6± 2.6	22,000 ±2000
Deep confined	N/A	N/A	N/A	N/A	>100,000[b]

n = number of sample sites
N = total number of samples analyzed
a = mean and one standard deviation of pooled data (N) for each grouping or regime
b = based on chlorine-36 and noble gas isotope data for deep basalt aquifers (>500m), Johnson (1986)
N/A Not available or not applicable
West/East is a general location designation for eastern or western area of Hanford Site

RW = river water
GW = ground water

9 2 1 2 6 5 1 1 3 4

Table 5-6. Preliminary Results of Closed System Rock-Water Interaction Tests (ppm). (sheet 1 of 2)

Starting Material	Atmosphere	SAMPLE NO.	Time (Hours)	Al	Ca	Cu	Fe	K	Mg	Na	Ni	Si	Sr	Zn	As	Ba	Mn	Mo	P	Pb
		Air Blank	0	<	0.951		<	5	<	1.37	<	1.05	0.005	<	<	0.004	<	<	<	<
Basalt	Air	BA-A-1	1	<	88.7		<	26	23.1	30.4	<	23.8	<	<	<	<	0.061	<	<	<
Basalt	Air	BA-A-2	2	<	101.3	0.11	0.11	36	27.6	34.8	<	25.6	<	<	<	0.024	0.138	<	<	<
Basalt	Air	BA-A-4	4	<	112		0.12	31	30.8	36.3	<	25.4	<	<	<	0.02	0.124	<	<	<
Basalt	Air	BA-A-8	8	<	121		<	32	34.7	40.7	<	24.5	<	<	<	0.02	0.11	<	<	<
Basalt	Air	BA-A-16	16	<	121	0.05	0.2	22	36.9	46.4	<	22.7	<	<	<	0.02	0.122	<	<	<
	nitrogen	N2 Blank	0	<	0.929		<	5	<	1.36	<	2.62	0.004	<	<	0.004		<	<	<
Basalt	nitrogen	BA-N-1	1	0.22	93.1	0.112	<	28	25	32.1	<	26.1	0.121	0.092	<	0.025	0.125	<	0.97	<
Basalt	nitrogen	BA-N-2	2	0.22	95.3	0.167	0.11	33	27.3	34.2	<	27.6	0.128	0.061	<	0.026	0.222	<	1.2	<
Basalt	nitrogen	BA-N-4	4	0.26	102	0.126	0.101	32	29.5	36.9	<	28.2	0.133	<.05	<	0.024	0.234	<	1.09	<
Basalt	nitrogen	BA-N-8	8	0.21	94	0.081	0.098	27	28.1	38.2	<	25.4	0.125	<	<	0.024	0.176	<	1.06	<
Basalt	nitrogen	BA-N-16	16	<	93.6	<	0.17	30	30.2	45.1	<	23.4	<	<	<	0.021	0.262	<	<	<
		Air Blank	0	<	0.951	<	<	5	<	1.37	<	1.05	0.005	<	<	0.004		<	<	<
Ringold Sediment	Air	SO-A-1	1	<	45.2	<	<	11	15.4	17.2	<	18.2	<	<	<	0.038		<	<	<
Ringold Sediment	Air	SO-A-2	2	<	35.3	<	<	8	15.5	14.2	<	17.9	<	<	<	0.032		<	<	<
Ringold Sediment	Air	SO-A-4	4	<	45	<	<	14	19	17.3	<	19.2	<	<	<	0.042		<	<	<
Ringold Sediment	Air	SO-A-8	8	<	50.3	<	<	24	20.4	17.7	<	19.2	<	<	<	0.041		<	<	<
Ringold Sediment	Air	SO-A-16	16	<	58.6	<	<	33	23.3	20.6	<	19.8	<	<	<	0.045		<	<	<
	nitrogen	N2 Blank	0	<	0.929	<	<	5	<	1.38	<	2.62	0.004	<	<	0.004		<	<	<
Ringold Sediment	nitrogen	SO-N-1	1	<	39.6	<	<	39	16.3	16.1	<	18.4	0.198	<	<	0.054		<	<	<
Ringold Sediment	nitrogen	SO-N-2	2	<	40.6	<	<	37	16.5	16.9	<	18.9	0.199	<	<	0.045		<	<	<
Ringold Sediment	nitrogen	SO-N-4	4	0.96	50.4	<	<	32	20.6	19.3	<	19.2	0.306	<	<	0.076		<	<	<
Ringold Sediment	nitrogen	SO-N-8	8	<	46.4	<	<	32	19.1	18.4	<	18.3	0.229	<	<	0.043		<	<	<
Ringold Sediment	nitrogen	SO-N-16	16	<	44.8	<	<	16	18.6	19.4	<	18.6	<	<	<	0.038		<	<	<

1- All run temperature = room termperature
* All results subject to verification

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Table 5-6. Preliminary Results of Closed System Rock-Water Interaction Tests (ppm). (sheet 2 of 2)

Starting Material	Atmosphere	SAMPLE	Time (Hours)	F	Cl	NO2	NO3	SO4	pH	TC	TOC	IC	HCO3
		Air Blank	0	0.3	0.3	<2	59.8	0.5	7.11	8.12	6.92	1.2	6.1
Basalt	Air	BA-A-1	1	3.3	9.7	<2	54	277	7.56	54.5	46.2	8.3	42.2
Basalt	Air	BA-A-2	2	1.2	9.3	<2	83	285	7.63	71.5	49.2	22.3	113.4
Basalt	Air	BA-A-4	4	1.7	9.7	2	67	284	8.06	78.2	48.6	29.6	150.5
Basalt	Air	BA-A-8	8	1.6	8.7	2.6	61	289	7.97	73.4	31.2	42.2	214.5
Basalt	Air	BA-A-16	16	2.1	9	2	56	293	8.15	85	34.3	50.7	257.7
	nitrogen	N2 Blank	0	0.3	0.4	<2	10.2	1	6.85	7.7	7.65	0.05	0.3
Basalt	nitrogen	BA-N-1	1	1	9.9	<2	87	291	7.78	58.6	49	9.6	48.8
Basalt	nitrogen	BA-N-2	2	1.2	11.5	1535	62	294	7.86	73.9	56.6	17.3	87.9
Basalt	nitrogen	BA-N-4	4	1.1	10.1	34	4	291	8.1	75.9	50.9	25	127.1
Basalt	nitrogen	BA-N-8	8	1.2	10	4.8	2	291	8.16	81.3	54.4	26.9	136.7
Basalt	nitrogen	BA-N-16	16	2.2	10.5	<2	3.3	296	8.06	84.4	49.9	34.5	175.4
		Air Blank	0	0.3	0.3	<2	59.8	0.5	7.11	8.12	6.92	1.2	6.1
Ringold Sedimen	Air	SO-A-1	1	1.5	13.6	<2	45	119	7.63	73.9	71.1	2.8	14.2
Ringold Sedimen	Air	SO-A-2	2	1.6	10.5	<2	43	101	7.71	68.4	64.2	4.2	21.4
Ringold Sedimen	Air	SO-A-4	4	1.6	11.2	<2	47	146	7.95	64.1	57.1	7	35.6
Ringold Sedimen	Air	SO-A-8	8	1.9	13.4	<2	51	151	7.7	57.1	48.9	8.2	41.7
Ringold Sedimen	Air	SO-A-16	16	1.9	11.9	<2	54	161	7.88	66.3	46.3	20	101.7
	nitrogen	N2 Blank	0	0.3	0.4	<2	10.2	1	6.85	7.7	7.65	0.05	0.3
Ringold Sedimen	nitrogen	SO-N-1	1	0.9	10.4	<2	46	128	7.65	59.2	53.8	5.4	27.5
Ringold Sedimen	nitrogen	SO-N-2	2	0.8	10	<2	47	123	7.98	48.4	40.4	8	40.7
Ringold Sedimen	nitrogen	SO-N-4	4	1.1	11.4	<2	50	151	8.09	50.9	42.8	8.1	41.2
Ringold Sedimen	nitrogen	SO-N-8	8	1.2	11.5	<2	48	121	8.11	56	47.1	8.9	45.2
Ringold Sedimen	nitrogen	SO-N-16	16	1.3	10.1	<2	48	131	8	49.9	34.6	15.3	77.8

1- All run temperature = room termperature
* All results subject to verification

Table 5-7. Preliminary Results of Open-System Rock-Water Interaction.

Starting Material		Sampling Taken at Day:	AL	CA	FE	K	MG	NA	SI	PH	F	CL	PO4	NO3	SO4	TC	TOC	IC	HCO3-
	BLANK	0	0.1	0.4	0.02	1.5	0.09	0.23	0.2	8.05	0.2	0.2	<	0.5	0.5	4.1	3.6	0.5	2.5
Basalt	701-01	1	<	32.4	<	18	7.4	34.2	19.6	8.02	1.5	8.8	<	27	81	51.2	38.0	13.2	67.1
Basalt	701-02	2	<	130	0.053	6	3	22.4	21.1	8.02	1.2	2	<	4	20	35	13.6	21.4	108.8
Basalt	701-03	3	<	10.2	0.052	7	2.4	19.1	20.9	7.81	1.1	0.53	<	1	8.9	26.8	7.4	19.2	97.7
Basalt	701-04	4	<	9.5	0.036	4	2.2	19	21.4	8.09	0.8	0.43	<	0.9	4.2	24.1	7.3	16.8	85.2
Basalt	701-05	5	<	8.89	0.029	4	2.1	18	21.3	8.1	0.7	0.4	<	1	3.3	23.5	6.8	16.7	84.7
Basalt	701-06	6	<	8.53	0.027	4	2	18.9	21.1	8.06	0.55	0.38	<	0.8	2.7	23.1	8.3	14.8	75.1
Basalt	701-07	7	<	7.9	0.022	4.01	1.84	15.5	21.9	7.94	0.38	0.36	<	0.4	2.3	23.5	8.1	15.4	78.3
Basalt	701-08	8	<	7.69	<	4	1.78	14.7	21.7	7.91	0.34	0.37	<	0.6	2.1	22.2	7.0	15.2	77.4
Basalt	701-09	9	<	7.23	<	4.5	1.73	14	21.9	7.93	0.32	0.38	<	0.8	2.2	21.1	8.7	14.5	73.5
Basalt	701-10	10	<	7.02	<	5.3	1.66	12.9	21.9	7.9	0.3	0.45	<	0.9	2	19.8	6.7	13.1	86.7
Basalt	701-11	11	<	6.85	<	5.2	1.62	12.2	22	8.07	0.33	0.38	4.2	0.9	2	20	7.3	12.7	64.8
Basalt	701-12	12	<	6.57	<	5	1.55	11.2	21.9	8.04	0.32	0.4	0.9	0.9	1.7	19.5	7.3	12.2	61.9
Basalt	701-13	13	<	6.46	<	5.5	1.47	10.7	22.2	7.92	0.23	0.48	<	0.4	1.5	19.6	7.6	12.0	61.1
Basalt	701-14	14	<	6.48	<	1.5	1.52	10.2	22	7.68	0.26	0.4	<	0.8	1.5	18.8	7.4	11.4	57.8
Ringold Sediment	801-01	1	0.84	1500	<	46.4	152	565	13.2	7.54	20	790	<	4190	833	211	195.0	18.0	81.3
Ringold Sediment	801-02	2	<	35	<	2	4.55	93.1	14.1	7.54	2	21	<	76	107	52.7	26.7	26.0	132.2
Ringold Sediment	801-03	3	<	14.3	<	3	1.88	57.2	14.1	7.7	1.4	5.4	<	12.5	33	43.2	9.8	33.4	169.8
Ringold Sediment	801-04	4	<	12	<	4	1.74	50	14.8	7.95	1.6	3	<	8.1	24	40.4	10.1	30.3	154.0
Ringold Sediment	801-05	5	<	10.4	<	2	1.51	43.6	14.7	8.06	1.8	2.3	<	5.5	19	36	9.8	26.3	133.4
Ringold Sediment	801-06	6	<	9.42	<	2	1.39	38.2	14.5	7.93	2.2	2.6	<	4.3	15	32.7	8.8	23.9	121.4
Ringold Sediment	801-07	7	0.135	8.9	0.051	1.75	1.315	34.7	15.3	7.94	1.7	1.5	<	3.3	12	30.9	8.7	22.2	113.0
Ringold Sediment	801-08	8	0.31	8.94	0.12	2	1.35	31.6	15.3	7.96	1.5	1.4	<	3.9	11	28.8	7.9	20.9	106.0
Ringold Sediment	801-09	9	0.36	8.71	0.2	2	1.36	28.4	15.6	7.94	1.5	1.5	<	3.3	9.7	28.4	7.7	20.7	105.1

* Distilled water leach tests at 1/2 pore volume/day, room temperature

Table 5-8. Maximum Concentration in Experimental Test Waters and Unconfined Groundwaters.

	Closed System Ringold-Water Rx Max Values (mg/L)	Open System Ringold-Water Rx Most Rctd (mg/L)	Unconfined Aq Max Values (mg/L)
Si	20	2	27
Ca	58	6	56
Mg	23	1.5	16.5
Na	21	10	17
K	39	5	5.5
F	1.6	0.7	0.61
Cl	14	0.8	6.3
alk	102	65	215
NO3	54	1.3	7
SO4	161	6.3	23

Table 5-9. Summary of Provisional Threshold Values.
(sheet 1 of 5)

Constituent (Concentration)	Provisional Threshold Values
Aluminum (ppb)	<200
Ammonium (ppb)	120[b]
Arsenic (ppb)	10[b]
Barium (ppb)	68.5[b]
Beryllium (ppb)	<5
Bismuth (ppb)	<5
Boron (ppb)	<100
Cadmium (ppb)	<10
Calcium (ppb)	63,600[b]
Chloride, Low (ppb)	8,690[b]
Chloride, High (ppb)	28,500[b]
Chromium (ppb)	<30

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Table 5-9. Summary of Provisional Threshold Values.
(sheet 2 of 5)

Constituent (Concentration)	Provisional Threshold Values
Copper (ppb)	<30
Fluoride, LDL (ppb)	1,340[b]
Fluoride, LDL[c] (ppb)	775[bc]
Iron, Low (ppb)	86[b]
Iron, Mid (ppb)	291[a]
Iron, High (ppb)	818[a]
Lead (ppb)	<5
Magnesium (ppb)	16,480[a]
Manganese, Low (ppb)	24.5[b]
Manganese, High (ppb)	163.5[b]
Mercury (ppb)	<0.1
Nickel (ppb)	<30

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Table 5-9. Summary of Provisional Threshold Values.
(sheet 3 of 5)

Constituent (Concentration)	Provisional Threshold Values
Nitrate (ppb)	12,400[b]
Phosphate[e] (ppb)	<1,000[e]
Potassium (ppb)	7,975[a]
Selenium (ppb)	<5
Silver[d] (ppb)	<10[d]
Silicon (ppb)	26,500[b]
Sodium (ppb)	33,500[b]
Strontium (ppb)	264.1[a]
Sulfate (ppb)	90,500[b]
Uranium (pCi/l)	3.43[b]
Vanadium (ppb)	15[b]
Zinc, Low (ppb)	<50

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Table 5-9. Summary of Provisional Threshold Values.
(sheet 4 of 5)

Constituent (Concentration)	Provisional Threshold Values
Zinc, High (ppb)	673[a]
Field Alkalinity (ppb)	215,000[b]
Lab Alkalinity (ppb)	210,000[b]
Field pH	[6.90, 8.24][a]
Lab pH	[7.25, 8.25][a]
TOC (ppb)	2,610[b]
TOC[c] (ppb)	1,610[b]
Field Conductivity (umho/cm)	539[a]
Lab Conductivity (umho/cm)	530[b]

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Table 5-9. Summary of Provisional Threshold Values.
(sheet 5 of 5)

Constituent (Concentration)	Provisional Threshold Values
TOX, LDL	60.8[b]
TOX, LDL[c]	37.6[b]
Total Carbon (ppb)	50,100[b]
Gross Alpha (pCi/l)	63[b]
Gross Alpha[c] (pCi/l)	5.79[ac]
Gross Beta (pCi/l)	35.5[b]
Gross Beta[c] (pCi/l)	12.62[ac]
Radium (pCi/l)	0.23[b]

[a]Based on normal distribution.
[b]Based on non-parametric tolerance interval, maximum value reported.
[c]Potential outlier observation(s) were removed.
[d]From WHC (1990), based on ICP/MS (inductively coupled plasma/mass spectroscopy) data.
[e]From springs data (Early et al. 1986)
<Indicates compound was analyzed for but not detected. Reported value after the "<" sign is the detection limit.
n.s. = not significant at 5%. s. = significant at 5%.
N.C. = not calculated. N.A. = not applicable.

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Table 5-10. Comparisons of Means Using Results from PNL Background Study and Site-wide Background Study. (sheet 1 of 2)

Constituent	PNL results*	Site-wide unconfined	F-stat.[a] Critical value[b]	t-stat.[c] Critical value[d]
Calcium:			1.145 < 1.750 n.s.	0.883 < 1.661 n.s.
Mean	40,400	38,542		
Standard deviation	10,300	11,023		
Sample size	50	53		
Chloride:			1.412 < 1.713 n.s.	1.075 < 1.659 n.s.
Mean	10,300	8,848		
Standard deviation	6,500	7,723		
Sample size	50	67		
Magnesium:			1.739 < 1.743 n.s.	1.030 < 1.660 n.s.
Mean	11,800	11,190		
Standard deviation	3,400	2,578		
Sample size	50	53		
Potassium:			1.373 < 1.752 n.s.	-0.161 < 1.660 n.s.
Mean	4,950	4,993		
Standard deviation	1,240	1,453		
Sample size	50	53		

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Table 5-10. Comparisons of Means Using Results from PNL Background Study and Site-wide Background Study. (sheet 2 of 2)

Constituent	PNL results*	Site-wide unconfined	F-stat.[a] Critical value[b]	t-stat.[c] Critical value[d]
Sodium:			2.239 > 1.743 s.	1.453 < 1.676 n.s.
Mean	18,260	15,774		
Standard deviation	10,150	6,784		
Sample size	50	53		
Sulfate:			1.790 > 1.713 s.	1.012 < 1.672 n.s.
Mean	34,300	30,605		
Standard deviation	16,900	22,611		
Sample size	50	67		
Lab alkalinity:			1.960 > 1.755 s.	-2.125 < 1.676 n.s.
Mean	123,000	133,717		
Standard deviation	21,000	29,399		
Sample size	50	52		

[a]Calculated F-statistic for test of equal variance.
[b]Tabulated value of F-distribution (upper 2.5 percent points).
[c]Calculated t-statistic based on t-test if F-test is not significant.
Calculate t-statistic based on CABF t-test if F-test is significant.
[d]Tabulated value of t-distribution (upper 5 percent points).
*Based on average number of samples
n.s. = not significant.
s. = significant.

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Table 5-11. Comparisons with PNL Site-Wide Background Values and USGS Values. (sheet 1 of 4)

Constituent (Conc.)	PNL Results[b]	USGS Results[c] (Sample Size)	WHC Unconfined (Sample Size)	WHC Confined (Sample Size)
Aluminum (ppb)	<2[d]	110±139 (12)	<200 (50)	69±60 (5)
Ammonium (ppb)	<50	N.A.	<50 (18)	N.A.
Arsenic (ppb)	3.9±2.4[d]	6.7±3.7 (7)	<5 (14)	N.A.
Barium (ppb)	42±20	53±14 (11)	41±20 (53)	80±29 (10)
Beryllium (ppb)	<0.3[d]	N.A.	<5 (16)	N.A.
Bismuth (ppb)	<0.02[d]	N.A.	<5 (4)	N.A.
Boron (ppb)	<50[d]	<50 (14)	<100 (35)	<20 (4)
Cadmium (ppb)	<0.2[d]	<10 (1)	<10 (16)	N.A.
Calcium (ppb)	40,400±10,300	40,857±8,282 (14)	38,542±11,023 (53)	28,151±20,414 (16)
Chloride-Low (ppb)	N.A.	5,825±1,355 (8)	5,032±1,774 (53)	N.A.
Chloride-High (ppb)	N.A.	20,667±2,503 (6)	23,296±2,463 (14)	N.A.
Chloride-All (ppb)	10,300±6,500	12,186±7,842 (14)	8,848±7,723 (67)	11,535±7,996 (11)
Chromium (ppb)	4±2[d]	<50 (11)	<30 (8)	<10 (6)

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Table 5-11. Comparisons with PNL Site-Wide Background Values and USGS Values. (sheet 2 of 4)

Constituent (Conc.)	PNL Results[b]	USGS Results[c] (Sample Size)	WHC Unconfined (Sample Size)	WHC Confined (Sample Size)
Copper (ppb)	<1[d]	<10 (10)	<30 (50)	<10 (10)
Fluoride (ppb)	370±100	550±330 (14)	437±131* (47)	680±436 (11)
Iron-Low (ppb)	N.A.	22±16* (13)	<50 (34)	N.A.
Iron-Mid (ppb)	N.A.	N.A.	115±52 (7)	N.A.
Iron-High (ppb)	N.A.	N.A.	494±118 (12)	N.A.
Iron-All (ppb)	N.A.	N.A.	149±199 (53)	112±184 (11)
Lead (ppb)	<0.5[d]	<30* (6)	<5 (15)	<100 (9)
Magnesium (ppb)	11,800±3,400	10,814±1,813 (14)	11,190±2,578 (53)	7,936±5,056 (16)
Manganese-Low (ppb)	N.A.	26±27 (8)	<20 (33)	N.A.
Manganese-Hgh (ppb)	N.A.	150±87 (3)	118±17 (20)	N.A.
Manganese-All (ppb)	7±5	60±73 (11)	50±55 (53)	<500 (5)
Mercury (ppb)	<0.1	N.A.	<0.1 (14)	N.A.
Nickel (ppb)	<4[d]	<50 (14)	<30 (23)	<20 (10)

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Table 5-11. Comparisons with PNL Site-Wide Background Values and USGS Values. (sheet 3 of 4)

Constituent (Conc.)	PNL Results[b]	USGS Results[c] (Sample Size)	WHC Unconfined (Sample Size)	WHC Confined (Sample Size)
Nitrate (ppb)	N.A.	3,224±3,380 (13)	5,170±3,576 (78)	3,100±2,594 (11)
Phosphate (ppb)	<1,000	140±62 (3)	<1,000[e]	<1,200 (1)
Potassium (ppb)	4,950±1,240	5,900±1,253 (14)	4,993±1,453 (53)	8,321±2,485 (16)
Selenium (ppb)	<2[d]	N.A.	<5 (14)	N.A.
Silver (ppb)	<10	N.A.	<10[f]	N.A.
Silicon (ppb)	N.A.	16,786±3,683 (14)	18,152±4,974 (35)	29,956±4,713 (12)
Sodium (ppb)	18,260±10,150	20,286±7,907 (14)	15,774±6,784 (53)	28,049±17,568 (16)
Strontium (ppb)	236±102	159±78 (14)	164±47 (43)	86±64 (3)
Sulfate (ppb)	34,300±16,900	41,286±27,880 (14)	30,605±22,611 (67)	24,790±10,285 (13)
Uranium (pCi/l)	1.7±0.8	N.A.	1.7±1.2 (10)	N.A.
Vanadium (ppb)	17±9	N.A.	9±4 (18)	N.A.
Zinc-Low (ppb)	N.A.	14±20 (11)	<50 (36)	N.A.
Zinc-High (ppb)	N.A.	373±284 (3)	247±165 (17)	N.A.

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Table 5-11. Comparisons with PNL Site-Wide Background Values and USGS Values. (sheet 4 of 4)

Constituent (Conc.)	PNL Results[b]	USGS Results[c] (Sample Size)	WHC Unconfined (Sample Size)	WHC Confined (Sample Size)
Zinc-All (ppb)	6±2	91±190 (14)	95±140 (53)	100±68 (10)
Field Alk. (ppb)	N.A.	134100±20469 (10)	137,758±33,656 (31)	119,470±21,204 (10)
Lab Alk. (ppb)	123,000±21,000	130,000±8,165 (4)	133,717±29,399 (52)	128,050±2899 (2)
Field pH	N.A.	N.A.	7.57±0.29 (57)	7.94±0.51 (12)
Lab pH	7.64±0.16	N.A.	7.75±0.21 (52)	8.00±0.44 (10)
TOC (ppb)	586±347	N.A.	519±367* (62)	N.A.
Field Cond. (umho/cm)	N.A.	N.A.	344±83 (22)	333±49 (13)
Lab. Cond. (umho/cm)	380±82	N.A.	332±93 (36)	356±30 (2)
TOX,LDL (ppb)	N.A.	N.A.	<20* (14)	N.A.
Total Carbon (ppb)	N.A.	N.A.	31,772±7,022 (48)	N.A.
Gross Alpha (pCi/l)	2.5±1.4	N.A.	2.5±1.5* (36)	N.A.
Gross Beta (pCi/l)	19±12	N.A.	7.1±2.6* (44)	N.A.
Radium (pCi/l)	<0.2	N.A.	N.D. (10)	N.A.

[a]Results shown are mean ± one standard deviation.
[b]From PNL-6886 (Evans et al. 1989).
[c]Based on 8 wells located in the background area upgradient of Hanford facilities.
[d]Based on inductively coupled plasma/mass spectroscopy (ICP/MS) data.
[e]From springs data (Early et al. 1986).
[f]From WHC (1990), based on ICP/MS data.
*Potential outlier observation(s) were removed.
N.A. = not available. N.D. = not detected.

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TABLE

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6.0 CONCLUSIONS AND RECOMMENDATIONS

Preliminary conclusions and/or findings concerning major controls on the composition of Hanford Site groundwater and constraints on establishing natural background thresholds values are summarized and discussed in the Sections 6.1 and 6.2. Preliminary recommendations for additional work and information are included in Section 6.3.

6.1 NATURAL AND ANTHROPOGENIC PROCESSES

The major findings concerning the influence of natural and anthropogenic processes on groundwater chemical composition beneath and contiguous with the Hanford Site are summarized in this section. Major features and effects of the natural and anthropogenic processes are summarized in Table 6-1, the most significant of which are discussed in the following sections.

6.1.1 Natural Recharge and Chemical Controls

Evaluation of existing Hanford Site groundwater data and previous geochemical modeling results for this study suggests the major controls on shallow groundwater chemical composition appear to be the extent to which discrete parts of the aquifer behave as an open or closed system. The open system parts of the aquifer receiving recharge that flushes through the system have compositions dominated by that of the recharge water. Along the western boundary of the Hanford Site, this recharge water is primarily from surface water run-off and springs having compositions controlled by rock-water reactions. Similarly, parts of the aquifer recharged by river waters primarily reflect the composition of these surface waters and the effects of mixing with groundwater. The parts of the aquifer system that behave essentially as closed systems are relatively older stagnant groundwaters that have chemical compositions largely reflecting initial reactions involving readily soluble constituents, which have not been flushed from the system. The extent to which evaporative effects influence the composition of surface recharge waters and the unconfined aquifer are under evaluation. No evidence for mixing of a sodium chloride type, deep water into the unconfined aquifer was found, although localized occurrences are possible along major fault systems.

Other potential controls on composition considered include bacterial activity and diffusion/reaction of atmospheric gases in the upper unconfined aquifer. No conclusion could be reached concerning bacterial effects. Based on observed alkalinity or bicarbonate concentrations over a wide range of groundwater sample locations, depths, and ages across the Hanford Site, additional diffusion of carbon dioxide into the aquifer does not appear to play a significant role in modifying the chemical composition subsequent to initial recharge (precipitation-carbon dioxide/basaltic rock reaction).

6.1.1.1 Spatial Effects. The average composition of groundwater in the study area is comparable to the average composition based on shallow groundwater

monitoring data from across the Hanford Site. This similarity might indicate that the results of this study also are applicable to other parts of the Hanford Site. However, additional documentation on well locations and screening criteria used in past studies will be required to effectively use this type of information. Excluding wells influenced by streambank storage and mixing, concentrations of most major constituents vary by a factor of 2 to 3 within the upper confined and unconfined aquifer wells evaluated for this study. The concentrations of calcium, however, vary by a factor of about 15, characteristic of the compositional differences between the open and closed system parts of the aquifer. Some trace constituents of regulatory interest, however, exhibited wide ranges in concentrations, some of which exceed water quality standards (e.g., iron and manganese). In general, the closed system parts of the aquifer tend to also reflect more reducing conditions.

6.1.1.2 Dilution. Dilution of groundwater by river water might result in a greater localized compositional range in certain wells located near the streambank. In these cases, it might be possible to estimate the fraction of riverwater in the streambank mixture using mixing calculations. However it would be necessary to determine the extent to which constituents are either removed or added to the mixed groundwater by interaction with aquifer solids.

6.1.2 Anthropogenic Processes

Variations in groundwater composition due to artificial recharge include dilution of the near surface unconfined aquifer by large volumes of cooling water (Columbia River water) from Hanford Site operations and infiltration/drainage of evaporated irrigation water from adjacent farmlands.

Waste water recharge and chemical processes are discussed in the following paragraphs, respectively.

Simple mixing. Significant dilution of the uppermost portion of the unconfined aquifer occurs in the vicinity of major waste water discharge sites. The primary effect of these discharges is dilution of the ambient groundwater. This artificial recharge process is similar to streambank mixing because the Columbia River water is the main source of process water used on the Hanford Site. The main difference, however, is the influence of these artificial recharge waters by reaction with the vadose zone soils. In areas of prolonged discharge of large amounts of waste water, the water will pass through the vadose zone with minor chemical changes before entering the aquifer, resulting in a mixed and essentially diluted groundwater composition. However, in areas of limited discharge and low hydraulic gradient, the concentrations of dissolved solids flushed to the groundwater could be significantly large, and even exceed the closed system concentrations.

Evaporated Irrigation Water. Chemical composition of evaporated irrigation water would be expected to increase the amount of dissolved solids in near surface groundwater over that in the source water (primarily Columbia River water). Precipitation of calcium carbonate and other solid phases might be expected to occur under these conditions. The area expected to be the most

strongly impacted by these effects is in the vicinity of the Wahluke Slope. Very little is known about near-surface groundwater composition in this area of the Hanford Site. A combination of geochemical modeling and field observations of groundwater composition in this area would be needed to evaluate this special case.

6.2 PROVISIONAL SITE-WIDE GROUNDWATER BACKGROUND FOR THE HANFORD SITE

The conceptual model of natural and anthropogenic processes discussed previously combined with the evaluation of existing data selected for this study suggests a natural groundwater background for most of the Hanford Site (excluding areas along the Columbia River) can be established based on wells located upgradient from Hanford Site facilities. Additional areal or spatial coverage, resampling, and some additional modeling are needed to confirm the provisional findings for the major naturally occurring chemical constituents and to provide updated analytical results for certain trace constituents.

Provisional background values provide interim data for use in regulatory and/or cleanup applications. These values (Chapter 5.0, Table 5-9) are proposed for use until a more appropriate basis for establishing natural background levels is developed or more comprehensive data are available, or both.

6.3 ADDITIONAL INFORMATION NEEDS

In the context of data quality objectives guidelines, it is indicated from this review of existing information and evaluation of data that some additional data and information needs are required for the development of a technically defensible determination of natural groundwater background for the Hanford Site. A summary of additional information needs is discussed in the following sections.

6.3.1 New Wells and Sampling Requirements

Recommendations regarding specific new wells and sampling requirements are forthcoming pending the completion of evaluating data, and the consideration of the integrated data needs for ongoing programs at the Hanford Site. For the purposes of establishing final background levels for groundwater, it is recognized that the following general types of additional information are needed:

- Groundwater data representative of deeper parts of the unconfined aquifer

- Data representing the most evolved groundwater in the upper unconfined aquifer

- Groundwater data specifically designed to characterize the range of compositions resulting from open- and closed-system behavior within the aquifer

- Groundwater data for the purpose of reducing uncertainty in upper bound estimates to acceptable levels.

Although specific recommendations regarding the well types, locations, and sampling requirement are in progress, one area that will be recommended as a site for the acquisition of new data is the Cold Creek Valley and/or Dry Creek area, and is briefly described here as an example of the potential for collaborative efforts for activities at the Hanford Site and efficiency in the well siting process.

The siting of one or more wells in the recharge zone upgradient from the 200 Areas is under consideration by multiple parties at the Hanford Site for different but related purposes. It is possible that the objectives of many activities could be achieved by involvement of all data users in the siting of such wells, and collaborative efforts in data collection and evaluation efforts. This locality is of interest to onsite organizations because the site would provide key information regarding the chemical changes that occur in an uncontaminated primary recharge zone as rainwater and surface water are transmitted through the unsaturated recharge zone to the underlying aquifer(s). Moreover, a well or wells in this locality, and upgradient of PNL's Yakima Barricade borehole, also would complement ongoing efforts to characterize the saturated and unsaturated zones and groundwater for purposes of evaluating natural microbial processes on the Hanford Site.

6.3.2 Modeling and Experimental Work

It is indicated from the preliminary results of laboratory testing and geochemical modeling that well designed tests can provide invaluable information regarding the site-specific controls on the nature of the processes that control groundwater composition. Recommendation regarding the use of additional tests and modeling efforts will be addressed when the results of the current tests have been received and evaluated.

6.3.3 Data Quality Objectives/Recommendations

In addition to the analytical requirements for regulatory and remediation purposes, the need for inclusion of additional parameters to enhance the use of the groundwater data collected have been identified. These analytical parameters include alkalinity, charge balance, and dissolved oxygen.

A more complete summary of the results of this study, recommendations, and justifications will be provided in the final report, which will incorporate the results of outstanding data, and will incorporate these data in the evaluation of the information and data summarized in this report.

1 Table 6-1. To be determined.

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7.2 FEDERAL AND STATE ACTS

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601 et seq.

Resource Conservation and Recovery Act of 1976, 42 USC 6901 et seq.

7.3 WASHINGTON ADMINISTRATIVE CODE

WAC 173-162, *Regulations and Licensing of Well Contractors and Operators*

WAC 173-200, *Water Quality Standards of the State of Washington*

WAC 173-303, *Dangerous Waste Regulations*

WAC 173-340, *The Model Toxics Control Act Regulation*

APPENDIX A

BASALT WASTE ISOLATION PROJECT HYDROCHEMSITRY DATABASE SUBSET

APPENDIX A

BASALT WASTE ISOLATION PROJECT HYDROCHEMSITRY DATABASE SUBSET

This appendix contains a complete listing of the analytical results for (1) springs and surface water and (2) unconfined and confined aquifer monitoring wells, as described in Chapter 3.0, Section 3.1.1 of this report. The data are not included in any other functioning database at the present time and thus are reproduced here in their entirety.

Notes on use of the attached data tables are as follows:

Sample date: the information indicated in the "date" column is the date of sample collection.

Analyte order: Constituents are listed in alphabetical sequence by well or sampling location arranged in four groupings: (1) springs, (2) surface water, (3) unconfined, and (4) confined (Rattlesnake Ridge interbed only).

Duplicates: more than one result for the same sample date indicates replicate samples (usually duplicates). Duplicate samples on the same date are differentiated by a separate alphanumeric sample identification.

Significant figures: no more than three significant figures analytically are justifed; additional places are computer generated.

Less than detection limit: indicated with a < in the "LT" column.

Error: One sigma counting errors; for radionuclides only.

Chemical and isotopic constituent units and explanatory notes are as indicated in the following.

Units and Definitions for Data Tables.

CONSTITUENT	DESCRIPTION	UNITS
AL	aluminum	mg/L
B	boron	mg/L
BA	barium	mg/L
C13	carbon-13	del $^{13}C/12^{C}$, o/oo
C14PMC	carbon-14	pmc(percent modern carbon)
CA	calcium	mg/L

	CONSTITUENT	DESCRIPTION	UNITS
1	CHG BAL	charge balance	percent
2	CL	chloride	mg/L
3	CU	copper	mg/L
4	D	deuterium	del $2H/^{1}H$, o/oo
5	F	fluoride	mg/L
6	FE	iron	mg/L
7	FIELD ALK	field alkalinity	mg/L (as $CaCO_3$)
8	K	potassium	mg/L
9	LAB ALK	lab alkalinity	mg/L (as $CaCO_3$)
10	LAB COND	lab conductivity	microsiemens/cm @ 25^{oC}
11	LAB PH	laboratory pH	pH units @ room temp.
12	LI	lithium	mg/L
13	MG	magnesium	mg/L
14	MN	manganese	mg/L
15	MO	molybdenum	mg/L
16	NA	sodium	mg/L
17	NO3	nitrate	mg/L
18	O18	oxygen-18	del $180/^{16}O$, o/oo
19	ORP	oxidation-reduction potential	mV (Pt/sat calomel reference electrode)
20	S34	sulfur-34	del $^{34}S/_{32}S$, o/oo
21	SAMP TEMP	sample temperature	^{oC}, at collection
22	SI	silicon	mg/L (as Si)
23	SO4	sulfate	mg/L
24	SR	strontium	mg/L
25	T	tritium	TU, international tritium units (1 TU = 3.23 pCi/L

CONSTITUENT	DESCRIPTION	UNITS
TC	total carbon	mg/L
TURB	turbidity	NTU, nephelometric turbidity units (1 NTU ca. = 1 mg/L clay).
ZN	zinc	mg/L

NOTE: only limited results for isotopic uranium, radon, and radium: all reported as dpm/L.

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A-4 SPRING WATERS . . . . . APP A A-4.i

APPENDIX A

A-1 UNCONFINED AQUIFER

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UNCONFINED AQUIFER (sheet 1 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	25-Jul-85	P85-264	AL	0.06	<	
6-11-45A	25-Jul-85	P85-263	AL	0.06	<	
6-11-45A	24-Oct-85	B86-44	AL	0.2	<	
6-11-45A	24-Oct-85	B86-43	AL	0.2	<	
6-11-45A	07-Feb-86	B86-124	AL	0.2	<	
6-11-45A	07-Feb-86	B86-125	AL	0.2	<	
6-11-45A	14-May-86	B86-226	AL	0.2	<	
6-11-45A	14-May-86	B86-225	AL	0.2	<	
6-11-45A	19-Aug-86	B86-317	AL	0.141	<	
6-11-45A	19-Aug-86	B86-318	AL	0.141	<	
6-11-45A	07-Nov-86	B87-020	AL	0.14	<	
6-11-45A	07-Nov-86	B87-019	AL	0.14	<	
6-11-45A	25-Jul-85	P85-263	B	0.015	<	
6-11-45A	25-Jul-85	P85-264	B	0.015	<	
6-11-45A	24-Oct-85	B86-44	B	0.1	<	
6-11-45A	24-Oct-85	B86-43	B	0.1	<	
6-11-45A	07-Feb-86	B86-125	B	0.1	<	
6-11-45A	07-Feb-86	B86-124	B	0.1	<	
6-11-45A	14-May-86	B86-226	B	0.1	<	
6-11-45A	14-May-86	B86-225	B	0.1	<	
6-11-45A	19-Aug-86	B86-317	B	0.071	<	
6-11-45A	19-Aug-86	B86-318	B	0.071	<	
6-11-45A	07-Nov-86	B87-019	B	0.07	<	
6-11-45A	25-Jul-85	P85-264	BA	0.045		
6-11-45A	25-Jul-85	P85-263	BA	0.044		
6-11-45A	24-Oct-85	B86-43	BA	0.045		
6-11-45A	24-Oct-85	B86-44	BA	0.045		
6-11-45A	07-Feb-86	B86-125	BA	0.052		
6-11-45A	07-Feb-86	B86-124	BA	0.043		

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UNCONFINED AQUIFER (sheet 2 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	14-May-86	B86-226	BA	0.049		
6-11-45A	14-May-86	B86-225	BA	0.048		
6-11-45A	19-Aug-86	B86-317	BA	0.051		
6-11-45A	19-Aug-86	B86-318	BA	0.05		
6-11-45A	07-Nov-86	B87-020	BA	0.047		
6-11-45A	07-Nov-86	B87-019	BA	0.047		
6-11-45A	25-Jul-85	P85-263	C13	-10.2		
6-11-45A	24-Oct-85	B86-43	C13	-10.5		
6-11-45A	07-Feb-86	B86-124	C13	-10.1		
6-11-45A	14-May-86	B86-225	C13	-10.2		
6-11-45A	19-Aug-86	B86-317	C13	-11.5		
6-11-45A	07-Nov-86	B87-019	C13	-10.2		
6-11-45A	25-Jul-85	P85-263	C14-PMC	49.6		45
6-11-45A	24-Oct-85	B86-43	C14-PMC	62.2		4.9
6-11-45A	07-Feb-86	B86-124	C14-PMC	48.5		1.6
6-11-45A	14-May-86	B86-225	C14-PMC	50.2		1.6
6-11-45A	07-Nov-86	B87-019	C14-PMC	47.6		1.8
6-11-45A	25-Jul-85	P85-263	CA	34.4		
6-11-45A	25-Jul-85	P85-264	CA	34.6		
6-11-45A	24-Oct-85	B86-44	CA	33.2		
6-11-45A	24-Oct-85	B86-43	CA	32.3		
6-11-45A	07-Feb-86	B86-125	CA	33.9		
6-11-45A	07-Feb-86	B86-124	CA	33.9		
6-11-45A	14-May-86	B86-225	CA	34.5		
6-11-45A	14-May-86	B86-226	CA	34.8		
6-11-45A	19-Aug-86	B86-317	CA	36.232		
6-11-45A	19-Aug-86	B86-318	CA	35.858		
6-11-45A	07-Nov-86	B87-019	CA	35.944		
6-11-45A	07-Nov-86	B87-020	CA	36.173		

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UNCONFINED AQUIFER (sheet 3 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	25-Jul-85	P85-263	CHG BAL	1.025		
6-11-45A	25-Jul-85	P85-264	CHG BAL	1.5		
6-11-45A	24-Oct-85	B86-43	CHG BAL	-1.688		
6-11-45A	07-Feb-86	B86-124	CHG BAL	-1.651		
6-11-45A	14-May-86	B86-226	CHG BAL	-0.051		
6-11-45A	14-May-86	B86-225	CHG BAL	-0.126		
6-11-45A	19-Aug-86	B86-318	CHG BAL	2.09		
6-11-45A	19-Aug-86	B86-317	CHG BAL	2.543		
6-11-45A	07-Nov-86	B87-019	CHG BAL	1.156		
6-11-45A	25-Jul-85	P85-263	CL	4.55		
6-11-45A	25-Jul-85	P85-264	CL	4.59		
6-11-45A	24-Oct-85	B86-43	CL	4.68		
6-11-45A	07-Feb-86	B86-124	CL	4.66		
6-11-45A	07-Feb-86	B86-125	CL	4.65		
6-11-45A	14-May-86	B86-226	CL	5.9		
6-11-45A	14-May-86	B86-225	CL	6.34		
6-11-45A	19-Aug-86	B86-317	CL	4.99		
6-11-45A	19-Aug-86	B86-318	CL	4.9		
6-11-45A	07-Nov-86	B87-019	CL	4.85		
6-11-45A	07-Nov-86	B87-021	CL	4.82		
6-11-45A	25-Jul-85	P85-264	CO	0.02	<	
6-11-45A	25-Jul-85	P85-263	CO	0.02	<	
6-11-45A	24-Oct-85	B86-43	CO	0.02	<	
6-11-45A	25-Jul-85	P85-264	CR	0.03	<	
6-11-45A	25-Jul-85	P85-263	CR	0.03	<	
6-11-45A	25-Jul-85	P85-263	CU	0.006	<	
6-11-45A	25-Jul-85	P85-264	CU	0.006	<	
6-11-45A	24-Oct-85	B86-44	CU	0.012	<	
6-11-45A	24-Oct-85	B86-43	CU	0.012	<	

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UNCONFINED AQUIFER (sheet 4 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	07-Feb-86	B86-125	CU	0.03	<	
6-11-45A	07-Feb-86	B86-124	CU	0.03	<	
6-11-45A	14-May-86	B86-225	CU	0.03	<	
6-11-45A	14-May-86	B86-226	CU	0.03	<	
6-11-45A	19-Aug-86	B86-317	CU	0.021	<	
6-11-45A	19-Aug-86	B86-318	CU	0.021	<	
6-11-45A	07-Nov-86	B87-019	CU	0.021	<	
6-11-45A	07-Nov-86	B87-020	CU	0.021	<	
6-11-45A	25-Jul-85	P85-263	D	-129		
6-11-45A	24-Oct-85	B86-43	D	-132		
6-11-45A	07-Feb-86	B86-124	D	-126		
6-11-45A	14-May-86	B86-225	D	-124		
6-11-45A	19-Aug-86	B86-317	D	-130		
6-11-45A	07-Nov-86	B87-019	D	-126		
6-11-45A	25-Jul-85	P85-264	F	0.38		
6-11-45A	25-Jul-85	P85-263	F	0.61		
6-11-45A	24-Oct-85	B86-43	F	0.37		
6-11-45A	07-Feb-86	B86-124	F	0.36		
6-11-45A	07-Feb-86	B86-125	F	0.37		
6-11-45A	14-May-86	B86-226	F	0.38		
6-11-45A	14-May-86	B86-225	F	0.38		
6-11-45A	19-Aug-86	B86-318	F	0.39		
6-11-45A	19-Aug-86	B86-317	F	0.39		
6-11-45A	07-Nov-86	B87-021	F	0.38		
6-11-45A	07-Nov-86	B87-019	F	0.4		
6-11-45A	25-Jul-85	P85-264	FE	0.084		
6-11-45A	25-Jul-85	P85-263	FE	0.088		
6-11-45A	24-Oct-85	B86-44	FE	0.03		
6-11-45A	24-Oct-85	B86-43	FE	0.05		

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UNCONFINED AQUIFER (sheet 5 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	07-Feb-86	B86-124	FE	0.033		
6-11-45A	07-Feb-86	B86-125	FE	0.031		
6-11-45A	14-May-86	B86-226	FE	0.03	<	
6-11-45A	14-May-86	B86-225	FE	0.03	<	
6-11-45A	19-Aug-86	B86-318	FE	0.021	<	
6-11-45A	19-Aug-86	B86-317	FE	0.021	<	
6-11-45A	07-Nov-86	B87-019	FE	0.021	<	
6-11-45A	07-Nov-86	B87-020	FE	0.021	<	
6-11-45A	25-Jul-85	P85-263	FIELD ALK	121		
6-11-45A	24-Oct-85	B86-43	FIELD ALK	121		
6-11-45A	07-Feb-86	B86-124	FIELD ALK	123		
6-11-45A	14-May-86	B86-225	FIELD ALK	122		
6-11-45A	19-Aug-86	B86-317	FIELD ALK	119		
6-11-45A	25-Jul-85	P85-263	FIELD PH	7.65		
6-11-45A	24-Oct-85	B86-43	FIELD PH	7.7		
6-11-45A	07-Feb-86	B86-124	FIELD PH	7.82		
6-11-45A	14-May-86	B86-225	FIELD PH	7.82		
6-11-45A	19-Aug-86	B86-317	FIELD PH	7.86		
6-11-45A	07-Nov-86	B87-019	FIELD PH	7.5		
6-11-45A	25-Jul-85	P85-264	K	5.19		
6-11-45A	25-Jul-85	P85-263	K	5.22		
6-11-45A	24-Oct-85	B86-43	K	4.75		
6-11-45A	24-Oct-85	B86-44	K	4.8		
6-11-45A	07-Feb-86	B86-124	K	4.75		
6-11-45A	07-Feb-86	B86-125	K	4.74		
6-11-45A	14-May-86	B86-225	K	4.86		
6-11-45A	14-May-86	B86-226	K	4.86		
6-11-45A	19-Aug-86	B86-317	K	4.88		
6-11-45A	19-Aug-86	B86-318	K	4.764		

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UNCONFINED AQUIFER (sheet 6 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	07-Nov-86	B87-020	K	4.865		
6-11-45A	07-Nov-86	B87-019	K	4.826		
6-11-45A	25-Jul-85	P85-263	LAB ALK	121		
6-11-45A	24-Oct-85	B86-43	LAB ALK	118		
6-11-45A	07-Feb-86	B86-124	LAB ALK	121		
6-11-45A	14-May-86	B86-225	LAB ALK	120		
6-11-45A	19-Aug-86	B86-317	LAB ALK	119		
6-11-45A	07-Nov-86	B87-019	LAB ALK	124		
6-11-45A	25-Jul-85	P85-263	LAB COND	288		
6-11-45A	24-Oct-85	B86-43	LAB COND	287		
6-11-45A	07-Feb-86	B86-124	LAB COND	291		
6-11-45A	14-May-86	B86-225	LAB COND	300		
6-11-45A	19-Aug-86	B86-317	LAB COND	298		
6-11-45A	07-Nov-86	B87-019	LAB COND	295		
6-11-45A	25-Jul-85	P85-263	LAB PH	7.8		
6-11-45A	24-Oct-85	B86-43	LAB PH	7.82		
6-11-45A	07-Feb-86	B86-124	LAB PH	7.86		
6-11-45A	14-May-86	B86-225	LAB PH	7.85		
6-11-45A	19-Aug-86	B86-317	LAB PH	7.74		
6-11-45A	07-Nov-86	B87-019	LAB PH	7.7		
6-11-45A	25-Jul-85	P85-264	LI	0.008	<	
6-11-45A	25-Jul-85	P85-263	LI	0.008	<	
6-11-45A	24-Oct-85	B86-44	LI	0.016	<	
6-11-45A	24-Oct-85	B86-43	LI	0.016	<	
6-11-45A	07-Feb-86	B86-125	LI	0.016	<	
6-11-45A	07-Feb-86	B86-124	LI	0.016	<	
6-11-45A	14-May-86	B86-225	LI	0.016	<	
6-11-45A	14-May-86	B86-226	LI	0.016	<	
6-11-45A	19-Aug-86	B86-317	LI	0.011	<	

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UNCONFINED AQUIFER (sheet 7 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	19-Aug-86	B86-318	LI	0.011	<	
6-11-45A	07-Nov-86	B87-020	LI	0.011	<	
6-11-45A	07-Nov-86	B87-019	LI	0.011	<	
6-11-45A	25-Jul-85	P85-264	MG	9.56		
6-11-45A	25-Jul-85	P85-263	MG	9.53		
6-11-45A	24-Oct-85	B86-44	MG	9.49		
6-11-45A	24-Oct-85	B86-43	MG	9.34		
6-11-45A	07-Feb-86	B86-124	MG	9.39		
6-11-45A	07-Feb-86	B86-125	MG	9.4		
6-11-45A	14-May-86	B86-225	MG	9.58		
6-11-45A	14-May-86	B86-226	MG	9.62		
6-11-45A	19-Aug-86	B86-318	MG	9.791		
6-11-45A	19-Aug-86	B86-317	MG	9.928		
6-11-45A	07-Nov-86	B87-019	MG	9.823		
6-11-45A	07-Nov-86	B87-020	MG	9.906		
6-11-45A	25-Jul-85	P85-263	MN	0.141		
6-11-45A	25-Jul-85	P85-264	MN	0.144		
6-11-45A	24-Oct-85	B86-43	MN	0.12		
6-11-45A	24-Oct-85	B86-44	MN	0.119		
6-11-45A	07-Feb-86	B86-124	MN	0.139		
6-11-45A	07-Feb-86	B86-125	MN	0.146		
6-11-45A	14-May-86	B86-226	MN	0.164		
6-11-45A	14-May-86	B86-225	MN	0.163		
6-11-45A	19-Aug-86	B86-318	MN	0.128		
6-11-45A	19-Aug-86	B86-317	MN	0.13		
6-11-45A	07-Nov-86	B87-020	MN	0.128		
6-11-45A	07-Nov-86	B87-019	MN	0.127		
6-11-45A	25-Jul-85	P85-263	MO	0.03	<	
6-11-45A	25-Jul-85	P85-264	MO	0.03	<	

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UNCONFINED AQUIFER (sheet 8 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	24-Oct-85	B86-44	MO	0.6	<	
6-11-45A	24-Oct-85	B86-43	MO	0.6	<	
6-11-45A	07-Feb-86	B86-125	MO	0.6	<	
6-11-45A	07-Feb-86	B86-124	MO	0.6	<	
6-11-45A	14-May-86	B86-226	MO	0.6	<	
6-11-45A	14-May-86	B86-225	MO	0.6	<	
6-11-45A	19-Aug-86	B86-317	MO	0.424	<	
6-11-45A	19-Aug-86	B86-318	MO	0.424	<	
6-11-45A	07-Nov-86	B87-019	MO	0.42	<	
6-11-45A	07-Nov-86	B87-020	MO	0.42	<	
6-11-45A	25-Jul-85	P85-263	NA	11.2		
6-11-45A	25-Jul-85	P85-264	NA	11.2		
6-11-45A	24-Oct-85	B86-43	NA	10.2		
6-11-45A	24-Oct-85	B86-44	NA	10.2		
6-11-45A	07-Feb-86	B86-124	NA	9.94		
6-11-45A	07-Feb-86	B86-125	NA	9.83		
6-11-45A	14-May-86	B86-226	NA	11.6		
6-11-45A	14-May-86	B86-225	NA	11.6		
6-11-45A	19-Aug-86	B86-317	NA	11.044		
6-11-45A	19-Aug-86	B86-318	NA	10.842		
6-11-45A	07-Nov-86	B87-019	NA	11.61		
6-11-45A	07-Nov-86	B87-020	NA	11.667		
6-11-45A	25-Jul-85	P85-264	NI	0.03	<	
6-11-45A	25-Jul-85	P85-263	NI	0.03	<	
6-11-45A	25-Jul-85	P85-264	NO3	6.08		
6-11-45A	25-Jul-85	P85-263	NO3	6.75		
6-11-45A	24-Oct-85	B86-43	NO3	5.69		
6-11-45A	07-Feb-86	B86-124	NO3	5.62		
6-11-45A	07-Feb-86	B86-125	NO3	6.54		

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UNCONFINED AQUIFER (sheet 9 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	14-May-86	B86-225	NO3	5.91		
6-11-45A	14-May-86	B86-226	NO3	7.13		
6-11-45A	19-Aug-86	B86-318	NO3	6.61		
6-11-45A	19-Aug-86	B86-317	NO3	6.94		
6-11-45A	07-Nov-86	B87-019	NO3	6.84		
6-11-45A	07-Nov-86	B87-021	NO3	6.83		
6-11-45A	25-Jul-85	P85-263	O18	-16.3		
6-11-45A	24-Oct-85	B86-43	O18	-16.4		
6-11-45A	07-Feb-86	B86-124	O18	-16.1		
6-11-45A	14-May-86	B86-225	O18	-16		
6-11-45A	19-Aug-86	B86-317	O18	-16		
6-11-45A	07-Nov-86	B87-019	O18	-15.4		
6-11-45A	25-Jul-85	P85-263	ORP	-127		
6-11-45A	24-Oct-85	B86-43	ORP	-65		
6-11-45A	07-Feb-86	B86-124	ORP	-60		
6-11-45A	14-May-86	B86-225	ORP	70		
6-11-45A	19-Aug-86	B86-317	ORP	120		
6-11-45A	07-Nov-86	B87-019	ORP	50		
6-11-45A	25-Jul-85	P85-264	PB	0.2	<	
6-11-45A	25-Jul-85	P85-263	PB	0.2	<	
6-11-45A	19-Aug-86	B86-317	RA226	0.085		0.02
6-11-45A	19-Aug-86	B86-317	RN222	870		100
6-11-45A	25-Jul-85	P85-263	S34	3.6		
6-11-45A	24-Oct-85	B86-43	S34	4.4		
6-11-45A	07-Feb-86	B86-124	S34	-1.4		
6-11-45A	14-May-86	B86-225	S34	-2.2		
6-11-45A	19-Aug-86	B86-317	S34	5		
6-11-45A	25-Jul-85	P85-263	SAMP.TEMP	19.4		
6-11-45A	24-Oct-85	B86-43	SAMP.TEMP	19.4		

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UNCONFINED AQUIFER (sheet 10 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	07-Feb-86	B86-124	SAMP.TEMP	18.6		
6-11-45A	14-May-86	B86-225	SAMP.TEMP	19.7		
6-11-45A	19-Aug-86	B86-317	SAMP.TEMP	19.5		
6-11-45A	07-Nov-86	B87-019	SAMP.TEMP	20.9		
6-11-45A	25-Jul-85	P85-263	SI	13		
6-11-45A	25-Jul-85	P85-264	SI	13.1		
6-11-45A	24-Oct-85	B86-43	SI	12.4		
6-11-45A	24-Oct-85	B86-44	SI	12.8		
6-11-45A	07-Feb-86	B86-124	SI	12.6		
6-11-45A	07-Feb-86	B86-125	SI	12.7		
6-11-45A	14-May-86	B86-226	SI	11.7		
6-11-45A	14-May-86	B86-225	SI	11.7		
6-11-45A	19-Aug-86	B86-317	SI	12.993		
6-11-45A	19-Aug-86	B86-318	SI	12.817		
6-11-45A	07-Nov-86	B87-020	SI	12.725		
6-11-45A	07-Nov-86	B87-019	SI	12.64		
6-11-45A	25-Jul-85	P85-264	SO4	17.9		
6-11-45A	25-Jul-85	P85-263	SO4	17.7		
6-11-45A	24-Oct-85	B86-43	SO4	18.4		
6-11-45A	07-Feb-86	B86-125	SO4	19.1		
6-11-45A	07-Feb-86	B86-124	SO4	19.2		
6-11-45A	14-May-86	B86-225	SO4	19.8		
6-11-45A	14-May-86	B86-226	SO4	20.1		
6-11-45A	19-Aug-86	B86-317	SO4	20		
6-11-45A	19-Aug-86	B86-318	SO4	19.8		
6-11-45A	07-Nov-86	B87-021	SO4	19.6		
6-11-45A	07-Nov-86	B87-019	SO4	19.6		
6-11-45A	25-Jul-85	P85-263	SR	0.19		
6-11-45A	25-Jul-85	P85-264	SR	0.191		

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UNCONFINED AQUIFER (sheet 11 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	24-Oct-85	B86-43	SR	0.177		
6-11-45A	24-Oct-85	B86-44	SR	0.18		
6-11-45A	07-Feb-86	B86-124	SR	0.181		
6-11-45A	07-Feb-86	B86-125	SR	0.181		
6-11-45A	14-May-86	B86-225	SR	0.193		
6-11-45A	14-May-86	B86-226	SR	0.194		
6-11-45A	19-Aug-86	B86-318	SR	0.183		
6-11-45A	19-Aug-86	B86-317	SR	0.185		
6-11-45A	07-Nov-86	B87-020	SR	0.184		
6-11-45A	07-Nov-86	B87-019	SR	0.183		
6-11-45A	25-Jul-85	P85-263	T	0.01		0.09
6-11-45A	24-Oct-85	B86-43	T	0.07		0.08
6-11-45A	07-Feb-86	B86-124	T	0		0.06
6-11-45A	14-May-86	B86-225	T	0.06		0.09
6-11-45A	19-Aug-86	B86-317	T	0.03		0.09
6-11-45A	07-Nov-86	B87-019	T	-0.1		0.09
6-11-45A	25-Jul-85	P85-263	TC	27.6		
6-11-45A	24-Oct-85	B86-43	TC	28		
6-11-45A	07-Feb-86	B86-124	TC	27.6		
6-11-45A	14-May-86	B86-225	TC	27.4		
6-11-45A	19-Aug-86	B86-317	TC	28		
6-11-45A	25-Jul-85	P85-263	TOC	0.34		
6-11-45A	24-Oct-85	B86-43	TOC	0.28		
6-11-45A	07-Feb-86	B86-124	TOC	0.32		
6-11-45A	14-May-86	B86-225	TOC	0.55		
6-11-45A	19-Aug-86	B86-317	TOC	0.45		
6-11-45A	25-Jul-85	P85-263	TURB	1.3		
6-11-45A	24-Oct-85	B86-43	TURB	6.2		
6-11-45A	07-Feb-86	B86-124	TURB	6.3		

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UNCONFINED AQUIFER (sheet 12 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-11-45A	14-May-86	B86-225	TURB	3.6		
6-11-45A	19-Aug-86	B86-317	TURB	5.9		
6-11-45A	07-Nov-86	B87-019	TURB	13		
6-11-45A	19-Aug-86	B86-317	U234	4.2		0.08
6-11-45A	19-Aug-86	B86-317	U238	3.1		0.06
6-11-45A	25-Jul-85	P85-264	ZN	0.368		
6-11-45A	25-Jul-85	P85-263	ZN	0.363		
6-11-45A	24-Oct-85	B86-44	ZN	0.556		
6-11-45A	24-Oct-85	B86-43	ZN	0.572		
6-11-45A	07-Feb-86	B86-124	ZN	0.354		
6-11-45A	07-Feb-86	B86-125	ZN	0.35		
6-11-45A	14-May-86	B86-226	ZN	0.338		
6-11-45A	14-May-86	B86-225	ZN	0.337		
6-11-45A	19-Aug-86	B86-317	ZN	0.402		
6-11-45A	19-Aug-86	B86-318	ZN	0.394		
6-11-45A	07-Nov-86	B87-019	ZN	0.409		
6-11-45A	07-Nov-86	B87-020	ZN	0.414		
6-19-58	06-May-85	P85-230	AL	0.06	<	
6-19-58	06-May-85	P85-229	AL	0.06	<	
6-19-58	24-Jul-85	P85-260	AL	0.06	<	
6-19-58	24-Jul-85	P85-261	AL	0.06	<	
6-19-58	30-Oct-85	B86-41	AL	0.2	<	
6-19-58	30-Oct-85	B86-40	AL	0.2	<	
6-19-58	07-Feb-86	B86-121	AL	0.2	<	
6-19-58	07-Feb-86	B86-122	AL	0.2	<	
6-19-58	14-May-86	B86-223	AL	0.2	<	
6-19-58	14-May-86	B86-222	AL	0.2	<	
6-19-58	19-Aug-86	B86-314	AL	0.141	<	
6-19-58	19-Aug-86	B86-315	AL	0.141	<	

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UNCONFINED AQUIFER (sheet 13 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	07-Nov-86	B87-017	AL	0.14	<	
6-19-58	07-Nov-86	B87-016	AL	0.14	<	
6-19-58	06-May-85	P85-229	B	0.02		
6-19-58	06-May-85	P85-230	B	0.023		
6-19-58	24-Jul-85	P85-261	B	0.015	<	
6-19-58	24-Jul-85	P85-260	B	0.015	<	
6-19-58	30-Oct-85	B86-41	B	0.1	<	
6-19-58	30-Oct-85	B86-40	B	0.1	<	
6-19-58	07-Feb-86	B86-122	B	0.1	<	
6-19-58	07-Feb-86	B86-121	B	0.1	<	
6-19-58	14-May-86	B86-223	B	0.1	<	
6-19-58	14-May-86	B86-222	B	0.1	<	
6-19-58	19-Aug-86	B86-315	B	0.071	<	
6-19-58	19-Aug-86	B86-314	B	0.071	<	
6-19-58	07-Nov-86	B87-016	B	0.07	<	
6-19-58	07-Nov-86	B87-017	B	0.07	<	
6-19-58	06-May-85	P85-229	BA	0.061		
6-19-58	06-May-85	P85-230	BA	0.062		
6-19-58	24-Jul-85	P85-260	BA	0.056		
6-19-58	24-Jul-85	P85-261	BA	0.057		
6-19-58	30-Oct-85	B86-41	BA	0.058		
6-19-58	30-Oct-85	B86-40	BA	0.058		
6-19-58	07-Feb-86	B86-121	BA	0.055		
6-19-58	07-Feb-86	B86-122	BA	0.054		
6-19-58	14-May-86	B86-222	BA	0.052		
6-19-58	14-May-86	B86-223	BA	0.052		
6-19-58	19-Aug-86	B86-315	BA	0.06		
6-19-58	19-Aug-86	B86-314	BA	0.06		
6-19-58	07-Nov-86	B87-017	BA	0.058		

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UNCONFINED AQUIFER (sheet 14 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	07-Nov-86	B87-016	BA	0.058		
6-19-58	06-May-85	P85-229	C13	-12.3		
6-19-58	24-Jul-85	P85-260	C13	-12.4		
6-19-58	30-Oct-85	B86-40	C13	-12.5		
6-19-58	07-Feb-86	B86-121	C13	-12.5		
6-19-58	14-May-86	B86-222	C13	-12.4		
6-19-58	19-Aug-86	B86-314	C13	-12.9		
6-19-58	07-Nov-86	B87-016	C13	-12.2		
6-19-58	06-May-85	P85-229	C14-PMC	26.6		2.5
6-19-58	24-Jul-85	P85-260	C14-PMC	31.2		3.1
6-19-58	30-Oct-85	B86-40	C14-PMC	27.4		2.4
6-19-58	07-Feb-86	B86-121	C14-PMC	28.4		1.4
6-19-58	14-May-86	B86-222	C14-PMC	29.4		1.4
6-19-58	07-Nov-86	B87-016	C14-PMC	29.4		1
6-19-58	06-May-85	P85-229	CA	34.3		
6-19-58	06-May-85	P85-230	CA	34.9		
6-19-58	24-Jul-85	P85-261	CA	34.7		
6-19-58	24-Jul-85	P85-260	CA	34.3		
6-19-58	30-Oct-85	B86-41	CA	33.7		
6-19-58	30-Oct-85	B86-40	CA	34		
6-19-58	07-Feb-86	B86-122	CA	33.1		
6-19-58	07-Feb-86	B86-121	CA	33.8		
6-19-58	14-May-86	B86-223	CA	34.2		
6-19-58	14-May-86	B86-222	CA	34.3		
6-19-58	19-Aug-86	B86-314	CA	34.879		
6-19-58	19-Aug-86	B86-315	CA	34.805		
6-19-58	07-Nov-86	B87-016	CA	35.156		
6-19-58	07-Nov-86	B87-017	CA	35.156		
6-19-58	06-May-85	P85-229	CHG BAL	0.847		

9 2 1 2 6 3 5 1 1 3 4

UNCONFINED AQUIFER (sheet 15 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	06-May-85	P85-230	CHG BAL	1.435		
6-19-58	24-Jul-85	P85-260	CHG BAL	1.599		
6-19-58	24-Jul-85	P85-261	CHG BAL	2.017		
6-19-58	30-Oct-85	B86-40	CHG BAL	0.127		
6-19-58	30-Oct-85	B86-41	CHG BAL	-0.356		
6-19-58	07-Feb-86	B86-122	CHG BAL	-1.785		
6-19-58	07-Feb-86	B86-121	CHG BAL	-0.851		
6-19-58	14-May-86	B86-223	CHG BAL	0.261		
6-19-58	14-May-86	B86-222	CHG BAL	0.312		
6-19-58	19-Aug-86	B86-314	CHG BAL	1.569		
6-19-58	19-Aug-86	B86-315	CHG BAL	1.45		
6-19-58	07-Nov-86	B87-017	CHG BAL	3.111		
6-19-58	07-Nov-86	B87-016	CHG BAL	2.654		
6-19-58	06-May-85	P85-229	CL	3.6		
6-19-58	06-May-85	P85-230	CL	3.6		
6-19-58	24-Jul-85	P85-261	CL	3.38		
6-19-58	24-Jul-85	P85-260	CL	3.45		
6-19-58	30-Oct-85	B86-41	CL	3.54		
6-19-58	30-Oct-85	B86-40	CL	3.58		
6-19-58	07-Feb-86	B86-121	CL	3.52		
6-19-58	07-Feb-86	B86-122	CL	3.53		
6-19-58	14-May-86	B86-223	CL	3.47		
6-19-58	14-May-86	B86-222	CL	3.5		
6-19-58	19-Aug-86	B86-314	CL	3.55		
6-19-58	19-Aug-86	B86-315	CL	3.53		
6-19-58	07-Nov-86	B87-016	CL	3.51		
6-19-58	07-Nov-86	B87-017	CL	3.46		
6-19-58	06-May-85	P85-229	CO	0.017	<	
6-19-58	06-May-85	P85-230	CO	0.017	<	

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UNCONFINED AQUIFER (sheet 16 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	24-Jul-85	P85-261	CO	0.02	<	
6-19-58	24-Jul-85	P85-260	CO	0.02	<	
6-19-58	06-May-85	P85-230	CR	0.032	<	
6-19-58	06-May-85	P85-229	CR	0.032	<	
6-19-58	24-Jul-85	P85-260	CR	0.03	<	
6-19-58	24-Jul-85	P85-261	CR	0.03	<	
6-19-58	06-May-85	P85-230	CU	0.006	<	
6-19-58	06-May-85	P85-229	CU	0.006	<	
6-19-58	24-Jul-85	P85-261	CU	0.006	<	
6-19-58	24-Jul-85	P85-260	CU	0.006	<	
6-19-58	30-Oct-85	B86-40	CU	0.012	<	
6-19-58	30-Oct-85	B86-41	CU	0.12	<	
6-19-58	07-Feb-86	B86-121	CU	0.03	<	
6-19-58	07-Feb-86	B86-122	CU	0.03	<	
6-19-58	14-May-86	B86-223	CU	0.03	<	
6-19-58	14-May-86	B86-222	CU	0.03	<	
6-19-58	19-Aug-86	B86-314	CU	0.021	<	
6-19-58	19-Aug-86	B86-315	CU	0.021	<	
6-19-58	07-Nov-86	B87-016	CU	0.021	<	
6-19-58	07-Nov-86	B87-017	CU	0.021	<	
6-19-58	06-May-85	P85-229	D	-127		
6-19-58	24-Jul-85	P85-260	D	-131		
6-19-58	30-Oct-85	B86-40	D	-132		
6-19-58	07-Feb-86	B86-122	D	-126		
6-19-58	07-Feb-86	B86-121	D	-120		
6-19-58	14-May-86	B86-222	D	-120		
6-19-58	19-Aug-86	B86-314	D	-127		
6-19-58	07-Nov-86	B87-016	D	-123		
6-19-58	06-May-85	P85-229	F	0.37		

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UNCONFINED AQUIFER (sheet 17 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	06-May-85	P85-230	F	0.38		
6-19-58	24-Jul-85	P85-260	F	0.45		
6-19-58	24-Jul-85	P85-261	F	0.43		
6-19-58	30-Oct-85	B86-41	F	0.39		
6-19-58	30-Oct-85	B86-40	F	0.4		
6-19-58	07-Feb-86	B86-121	F	0.42		
6-19-58	07-Feb-86	B86-122	F	0.33		
6-19-58	14-May-86	B86-222	F	0.46		
6-19-58	14-May-86	B86-223	F	0.48		
6-19-58	19-Aug-86	B86-314	F	0.47		
6-19-58	19-Aug-86	B86-315	F	0.45		
6-19-58	07-Nov-86	B87-016	F	0.42		
6-19-58	07-Nov-86	B87-017	F	0.26		
6-19-58	06-May-85	P85-230	FE	0.48		
6-19-58	06-May-85	P85-229	FE	0.47		
6-19-58	24-Jul-85	P85-261	FE	0.48		
6-19-58	24-Jul-85	P85-260	FE	0.47		
6-19-58	30-Oct-85	B86-40	FE	0.43		
6-19-58	30-Oct-85	B86-41	FE	0.429		
6-19-58	07-Feb-86	B86-122	FE	0.438		
6-19-58	07-Feb-86	B86-121	FE	0.448		
6-19-58	14-May-86	B86-222	FE	0.444		
6-19-58	14-May-86	B86-223	FE	0.446		
6-19-58	19-Aug-86	B86-315	FE	0.451		
6-19-58	19-Aug-86	B86-314	FE	0.453		
6-19-58	07-Nov-86	B87-017	FE	0.47		
6-19-58	07-Nov-86	B87-016	FE	0.474		
6-19-58	06-May-85	P85-229	FIELD ALK	137		
6-19-58	24-Jul-85	P85-260	FIELD ALK	139		

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UNCONFINED AQUIFER (sheet 18 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	30-Oct-85	B86-40	FIELD ALK	139		
6-19-58	07-Feb-86	B86-121	FIELD ALK	141		
6-19-58	14-May-86	B86-222	FIELD ALK	140		
6-19-58	19-Aug-86	B86-314	FIELD ALK	139		
6-19-58	06-May-85	P85-229	FIELD PH	7.15		
6-19-58	24-Jul-85	P85-260	FIELD PH	7.5		
6-19-58	30-Oct-85	B86-40	FIELD PH	7.25		
6-19-58	07-Feb-86	B86-121	FIELD PH	7.67		
6-19-58	14-May-86	B86-222	FIELD PH	7.67		
6-19-58	19-Aug-86	B86-314	FIELD PH	7.63		
6-19-58	07-Nov-86	B87-016	FIELD PH	7.57		
6-19-58	06-May-85	P85-230	K	4.85		
6-19-58	06-May-85	P85-229	K	4.81		
6-19-58	24-Jul-85	P85-260	K	5.5		
6-19-58	24-Jul-85	P85-261	K	5.5		
6-19-58	30-Oct-85	B86-40	K	5.02		
6-19-58	30-Oct-85	B86-41	K	4.93		
6-19-58	07-Feb-86	B86-122	K	4.92		
6-19-58	07-Feb-86	B86-121	K	5.04		
6-19-58	14-May-86	B86-223	K	4.92		
6-19-58	14-May-86	B86-222	K	5.01		
6-19-58	19-Aug-86	B86-315	K	5.021		
6-19-58	19-Aug-86	B86-314	K	5		
6-19-58	07-Nov-86	B87-017	K	5.047		
6-19-58	07-Nov-86	B87-016	K	5.067		
6-19-58	06-May-85	P85-229	LAB ALK	134		
6-19-58	24-Jul-85	P85-260	LAB ALK	139		
6-19-58	30-Oct-85	B86-40	LAB ALK	139		
6-19-58	07-Feb-86	B86-121	LAB ALK	138		

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UNCONFINED AQUIFER (sheet 19 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	14-May-86	B86-222	LAB ALK	137		
6-19-58	19-Aug-86	B86-314	LAB ALK	137		
6-19-58	07-Nov-86	B87-016	LAB ALK	137		
6-19-58	06-May-85	P85-229	LAB COND	315		
6-19-58	24-Jul-85	P85-260	LAB COND	316		
6-19-58	30-Oct-85	B86-40	LAB COND	317		
6-19-58	07-Feb-86	B86-121	LAB COND	311		
6-19-58	14-May-86	B86-222	LAB COND	312		
6-19-58	19-Aug-86	B86-314	LAB COND	316		
6-19-58	07-Nov-86	B87-016	LAB COND	312		
6-19-58	06-May-85	P85-229	LAB PH	7.3		
6-19-58	24-Jul-85	P85-260	LAB PH	7.5		
6-19-58	30-Oct-85	B86-40	LAB PH	7.65		
6-19-58	07-Feb-86	B86-121	LAB PH	7.64		
6-19-58	14-May-86	B86-222	LAB PH	7.67		
6-19-58	19-Aug-86	B86-314	LAB PH	7.69		
6-19-58	07-Nov-86	B87-016	LAB PH	7.84		
6-19-58	06-May-85	P85-229	LI	0.008	<	
6-19-58	06-May-85	P85-230	LI	0.009		
6-19-58	24-Jul-85	P85-260	LI	0.008	<	
6-19-58	24-Jul-85	P85-261	LI	0.008	<	
6-19-58	30-Oct-85	B86-41	LI	0.016	<	
6-19-58	30-Oct-85	B86-40	LI	0.016	<	
6-19-58	07-Feb-86	B86-122	LI	0.016	<	
6-19-58	07-Feb-86	B86-121	LI	0.016	<	
6-19-58	14-May-86	B86-222	LI	0.016	<	
6-19-58	14-May-86	B86-223	LI	0.016	<	
6-19-58	19-Aug-86	B86-315	LI	0.011	<	
6-19-58	19-Aug-86	B86-314	LI	0.011	<	

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UNCONFINED AQUIFER (sheet 20 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	07-Nov-86	B87-016	LI	0.011	<	
6-19-58	07-Nov-86	B87-017	LI	0.011	<	
6-19-58	06-May-85	P85-230	MG	12.5		
6-19-58	06-May-85	P85-229	MG	12.3		
6-19-58	24-Jul-85	P85-260	MG	12.4		
6-19-58	24-Jul-85	P85-261	MG	12.5		
6-19-58	30-Oct-85	B86-40	MG	12.2		
6-19-58	30-Oct-85	B86-41	MG	12.1		
6-19-58	07-Feb-86	B86-121	MG	12.2		
6-19-58	07-Feb-86	B86-122	MG	12		
6-19-58	14-May-86	B86-223	MG	12.3		
6-19-58	14-May-86	B86-222	MG	12.3		
6-19-58	19-Aug-86	B86-314	MG	12.596		
6-19-58	19-Aug-86	B86-315	MG	12.57		
6-19-58	07-Nov-86	B87-016	MG	12.697		
6-19-58	07-Nov-86	B87-017	MG	12.715		
6-19-58	06-May-85	P85-230	MN	0.107		
6-19-58	06-May-85	P85-229	MN	0.106		
6-19-58	24-Jul-85	P85-261	MN	0.105		
6-19-58	24-Jul-85	P85-260	MN	0.101		
6-19-58	30-Oct-85	B86-41	MN	0.1		
6-19-58	30-Oct-85	B86-40	MN	0.101		
6-19-58	07-Feb-86	B86-121	MN	0.108	<	
6-19-58	07-Feb-86	B86-122	MN	0.105		
6-19-58	14-May-86	B86-222	MN	0.106		
6-19-58	14-May-86	B86-223	MN	0.106		
6-19-58	19-Aug-86	B86-315	MN	0.104		
6-19-58	19-Aug-86	B86-314	MN	0.105		
6-19-58	07-Nov-86	B87-017	MN	0.107		

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UNCONFINED AQUIFER (sheet 21 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	07-Nov-86	B87-016	MN	0.106		
6-19-58	06-May-85	P85-229	MO	0.034	<	
6-19-58	06-May-85	P85-230	MO	0.034	<	
6-19-58	24-Jul-85	P85-261	MO	0.034	<	
6-19-58	24-Jul-85	P85-260	MO	0.034	<	
6-19-58	30-Oct-85	B86-40	MO	0.6	<	
6-19-58	30-Oct-85	B86-41	MO	0.6	<	
6-19-58	07-Feb-86	B86-122	MO	0.6	<	
6-19-58	07-Feb-86	B86-121	MO	0.6	<	
6-19-58	14-May-86	B86-223	MO	0.6	<	
6-19-58	14-May-86	B86-222	MO	0.6	<	
6-19-58	19-Aug-86	B86-315	MO	0.424	<	
6-19-58	19-Aug-86	B86-314	MO	0.424	<	
6-19-58	07-Nov-86	B87-017	MO	0.42	<	
6-19-58	07-Nov-86	B87-016	MO	0.42	<	
6-19-58	06-May-85	P85-230	NA	12.8		
6-19-58	06-May-85	P85-229	NA	12.9		
6-19-58	24-Jul-85	P85-260	NA	13.8		
6-19-58	24-Jul-85	P85-261	NA	13.8		
6-19-58	30-Oct-85	B86-41	NA	12.6		
6-19-58	30-Oct-85	B86-40	NA	12.8		
6-19-58	07-Feb-86	B86-122	NA	12.4		
6-19-58	07-Feb-86	B86-121	NA	12.4		
6-19-58	14-May-86	B86-222	NA	12.9		
6-19-58	14-May-86	B86-223	NA	12.8		
6-19-58	19-Aug-86	B86-315	NA	13.295		
6-19-58	19-Aug-86	B86-314	NA	13.301		
6-19-58	07-Nov-86	B87-017	NA	13.113		
6-19-58	07-Nov-86	B87-016	NA	13.146		

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UNCONFINED AQUIFER (sheet 22 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	06-May-85	P85-230	NI	0.03	<	
6-19-58	06-May-85	P85-229	NI	0.03	<	
6-19-58	24-Jul-85	P85-260	NI	0.03	<	
6-19-58	24-Jul-85	P85-261	NI	0.03	<	
6-19-58	06-May-85	P85-229	O18	-16.5		
6-19-58	24-Jul-85	P85-260	O18	-16.5		
6-19-58	30-Oct-85	B86-40	O18	-16.6		
6-19-58	07-Feb-86	B86-122	O18	-16.7		
6-19-58	07-Feb-86	B86-121	O18	-16.7		
6-19-58	14-May-86	B86-222	O18	-16.3		
6-19-58	19-Aug-86	B86-314	O18	-16.4		
6-19-58	07-Nov-86	B87-016	O18	-16.4		
6-19-58	06-May-85	P85-229	ORP	-150		
6-19-58	24-Jul-85	P85-260	ORP	-167		
6-19-58	30-Oct-85	B86-40	ORP	-120		
6-19-58	07-Feb-86	B86-121	ORP	-170		
6-19-58	14-May-86	B86-222	ORP	-160		
6-19-58	19-Aug-86	B86-314	ORP	-182		
6-19-58	07-Nov-86	B87-016	ORP	-230		
6-19-58	06-May-85	P85-230	PB	0.18	<	
6-19-58	06-May-85	P85-229	PB	0.18	<	
6-19-58	24-Jul-85	P85-260	PB	0.18	<	
6-19-58	24-Jul-85	P85-261	PB	0.18	<	
6-19-58	19-Aug-86	B86-314	RA226	0.2		0.02
6-19-58	19-Aug-86	B86-314	RN222	2690		200
6-19-58	06-May-85	P85-229	S34	6.4		
6-19-58	24-Jul-85	P85-260	S34	5.2		
6-19-58	30-Oct-85	B86-40	S34	6.5		
6-19-58	07-Feb-86	B86-121	S34	2.4		

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UNCONFINED AQUIFER (sheet 23 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	14-May-86	B86-222	S34	-7.7		
6-19-58	19-Aug-86	B86-314	S34	6.5		
6-19-58	06-May-85	P85-229	SAMP.TEMP	21.5		
6-19-58	24-Jul-85	P85-260	SAMP.TEMP	20.4		
6-19-58	30-Oct-85	B86-40	SAMP.TEMP	19.7		
6-19-58	07-Feb-86	B86-121	SAMP.TEMP	20		
6-19-58	14-May-86	B86-222	SAMP.TEMP	19.5		
6-19-58	19-Aug-86	B86-314	SAMP.TEMP	20.9		
6-19-58	07-Nov-86	B87-016	SAMP.TEMP	21		
6-19-58	06-May-85	P85-230	SI	25.6		
6-19-58	06-May-85	P85-229	SI	25.4		
6-19-58	24-Jul-85	P85-261	SI	26.5		
6-19-58	24-Jul-85	P85-260	SI	26.5		
6-19-58	30-Oct-85	B86-40	SI	25.3		
6-19-58	30-Oct-85	B86-41	SI	25.3		
6-19-58	07-Feb-86	B86-122	SI	24.3		
6-19-58	07-Feb-86	B86-121	SI	24.2		
6-19-58	14-May-86	B86-223	SI	23.8		
6-19-58	14-May-86	B86-222	SI	23.9		
6-19-58	19-Aug-86	B86-315	SI	24.776		
6-19-58	19-Aug-86	B86-314	SI	24.825		
6-19-58	07-Nov-86	B87-016	SI	24.819		
6-19-58	07-Nov-86	B87-017	SI	24.84		
6-19-58	06-May-85	P85-229	SO4	23.5		
6-19-58	06-May-85	P85-230	SO4	23.6		
6-19-58	24-Jul-85	P85-261	SO4	22.3		
6-19-58	24-Jul-85	P85-260	SO4	22.2		
6-19-58	30-Oct-85	B86-40	SO4	22.8		
6-19-58	30-Oct-85	B86-41	SO4	22.8		

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UNCONFINED AQUIFER (sheet 24 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	07-Feb-86	B86-121	SO4	22.8		
6-19-58	07-Feb-86	B86-122	SO4	23.4		
6-19-58	14-May-86	B86-223	SO4	22.1		
6-19-58	14-May-86	B86-222	SO4	22.5		
6-19-58	19-Aug-86	B86-314	SO4	22.6		
6-19-58	19-Aug-86	B86-315	SO4	22.8		
6-19-58	07-Nov-86	B87-016	SO4	22		
6-19-58	07-Nov-86	B87-017	SO4	21		
6-19-58	06-May-85	P85-230	SR	0.141		
6-19-58	06-May-85	P85-229	SR	0.14		
6-19-58	24-Jul-85	P85-260	SR	0.139		
6-19-58	24-Jul-85	P85-261	SR	0.14		
6-19-58	30-Oct-85	B86-41	SR	0.135		
6-19-58	30-Oct-85	B86-40	SR	0.136		
6-19-58	07-Feb-86	B86-122	SR	0.135		
6-19-58	07-Feb-86	B86-121	SR	0.137		
6-19-58	14-May-86	B86-223	SR	0.14		
6-19-58	14-May-86	B86-222	SR	0.141		
6-19-58	19-Aug-86	B86-315	SR	0.138		
6-19-58	19-Aug-86	B86-314	SR	0.139		
6-19-58	07-Nov-86	B87-016	SR	0.137		
6-19-58	07-Nov-86	B87-017	SR	0.137		
6-19-58	06-May-85	P85-229	T	0.2		0.08
6-19-58	24-Jul-85	P85-260	T	-0.2		0.1
6-19-58	30-Oct-85	B86-40	T	-0.08		0.06
6-19-58	07-Feb-86	B86-121	T	0		0.09
6-19-58	14-May-86	B86-222	T	0.06		0.09
6-19-58	19-Aug-86	B86-314	T	0.01		0.09
6-19-58	07-Nov-86	B87-016	T	-0.09		0.1

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UNCONFINED AQUIFER (sheet 25 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	06-May-85	P85-229	TC	33.03		
6-19-58	24-Jul-85	P85-260	TC	32.3		
6-19-58	30-Oct-85	B86-40	TC	32.9		
6-19-58	07-Feb-86	B86-121	TC	32.1		
6-19-58	14-May-86	B86-222	TC	31.2		
6-19-58	19-Aug-86	B86-314	TC	32.15		
6-19-58	07-Nov-86	B87-016	TC	32.7		
6-19-58	06-May-85	P85-229	TOC	0.43		
6-19-58	24-Jul-85	P85-260	TOC	0.51		
6-19-58	30-Oct-85	B86-40	TOC	0.26		
6-19-58	07-Feb-86	B86-121	TOC	0.27		
6-19-58	14-May-86	B86-222	TOC	0.52		
6-19-58	19-Aug-86	B86-314	TOC	0.27		
6-19-58	07-Nov-86	B87-016	TOC	0.6		
6-19-58	06-May-85	P85-229	TURB	0.5		
6-19-58	24-Jul-85	P85-260	TURB	0.6		
6-19-58	30-Oct-85	B86-40	TURB	1.2		
6-19-58	07-Feb-86	B86-121	TURB	1.1		
6-19-58	14-May-86	B86-222	TURB	1.7		
6-19-58	19-Aug-86	B86-314	TURB	0.75		
6-19-58	07-Nov-86	B87-016	TURB	1.75		
6-19-58	19-Aug-86	B86-314	U234	0.29		0.023
6-19-58	19-Aug-86	B86-314	U238	0.139		0.011
6-19-58	06-May-85	P85-229	ZN	0.02	<	
6-19-58	06-May-85	P85-230	ZN	0.02	<	
6-19-58	24-Jul-85	P85-260	ZN	0.02	<	
6-19-58	24-Jul-85	P85-261	ZN	0.02	<	
6-19-58	30-Oct-85	B86-40	ZN	0.04	<	
6-19-58	30-Oct-85	B86-41	ZN	0.04	<	

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UNCONFINED AQUIFER (sheet 26 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-58	07-Feb-86	B86-121	ZN	0.04	<	
6-19-58	07-Feb-86	B86-122	ZN	0.04	<	
6-19-58	14-May-86	B86-223	ZN	0.04	<	
6-19-58	14-May-86	B86-222	ZN	0.04	<	
6-19-58	19-Aug-86	B86-314	ZN	0.028	<	
6-19-58	19-Aug-86	B86-315	ZN	0.028	<	
6-19-58	07-Nov-86	B87-016	ZN	0.028	<	
6-19-58	07-Nov-86	B87-017	ZN	0.028	<	
6-19-88	01-Aug-85	P85-279	AL	0.1	<	
6-19-88	01-Aug-85	P85-278	AL	0.1	<	
6-19-88	01-Nov-85	B86-65	AL	0.02	<	
6-19-88	01-Nov-85	B86-64	AL	0.2	<	
6-19-88	12-Feb-86	B86-128	AL	0.2	<	
6-19-88	12-Feb-86	B86-127	AL	0.2	<	
6-19-88	16-May-86	B86-234	AL	0.2	<	
6-19-88	16-May-86	B86-235	AL	0.2	<	
6-19-88	21-Aug-86	B86-320	AL	0.141	<	
6-19-88	21-Aug-86	B86-321	AL	0.141	<	
6-19-88	17-Nov-86	B87-032	AL	0.141	<	
6-19-88	17-Nov-86	B87-031	AL	0.141	<	
6-19-88	01-Aug-85	P85-278	B	0.05	<	
6-19-88	01-Aug-85	P85-279	B	0.05	<	
6-19-88	01-Nov-85	B86-64	B	0.1	<	
6-19-88	01-Nov-85	B86-65	B	0.1	<	
6-19-88	12-Feb-86	B86-127	B	0.1	<	
6-19-88	12-Feb-86	B86-128	B	0.1	<	
6-19-88	16-May-86	B86-235	B	0.1	<	
6-19-88	16-May-86	B86-234	B	0.1	<	
6-19-88	21-Aug-86	B86-321	B	0.071	<	

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UNCONFINED AQUIFER (sheet 27 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-88	21-Aug-86	B86-320	B	0.071	<	
6-19-88	17-Nov-86	B87-032	B	0.071	<	
6-19-88	17-Nov-86	B87-031	B	0.071	<	
6-19-88	01-Aug-85	P85-279	BA	0.006		
6-19-88	01-Aug-85	P85-278	BA	0.009		
6-19-88	01-Nov-85	B86-64	BA	0.011		
6-19-88	01-Nov-85	B86-65	BA	0.01		
6-19-88	12-Feb-86	B86-127	BA	0.008		
6-19-88	12-Feb-86	B86-128	BA	0.008		
6-19-88	16-May-86	B86-234	BA	0.008	<	
6-19-88	16-May-86	B86-235	BA	0.008	<	
6-19-88	21-Aug-86	B86-321	BA	0.012		
6-19-88	21-Aug-86	B86-320	BA	0.012		
6-19-88	17-Nov-86	B87-031	BA	0.01		
6-19-88	17-Nov-86	B87-032	BA	0.009		
6-19-88	01-Aug-85	P85-278	C13	-12.8		
6-19-88	01-Nov-85	B86-64	C13	-14.5		
6-19-88	12-Feb-86	B86-127	C13	-12.7		
6-19-88	16-May-86	B86-234	C13	-12.8		
6-19-88	21-Aug-86	B86-320	C13	-13.7		
6-19-88	17-Nov-86	B87-031	C13	-12.6		
6-19-88	01-Aug-85	P85-278	C14-PMC	48.2		4
6-19-88	01-Nov-85	B86-64	C14-PMC	57.3		4.1
6-19-88	12-Feb-86	B86-127	C14-PMC	48.1		1.4
6-19-88	16-May-86	B86-234	C14-PMC	48.8		1.5
6-19-88	17-Nov-86	B87-031	C14-PMC	46.8		1.4
6-19-88	01-Aug-85	P85-279	CA	27		
6-19-88	01-Aug-85	P85-278	CA	27		
6-19-88	01-Nov-85	B86-65	CA	26.8		

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UNCONFINED AQUIFER (sheet 28 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-88	01-Nov-85	B86-64	CA	26.6		
6-19-88	12-Feb-86	B86-128	CA	27.3		
6-19-88	12-Feb-86	B86-127	CA	27		
6-19-88	16-May-86	B86-234	CA	27.2		
6-19-88	16-May-86	B86-235	CA	27.2		
6-19-88	21-Aug-86	B86-321	CA	27.591		
6-19-88	21-Aug-86	B86-320	CA	27.713		
6-19-88	17-Nov-86	B87-031	CA	27.743		
6-19-88	17-Nov-86	B87-032	CA	27.743		
6-19-88	01-Aug-85	P85-279	CHG BAL	2.584		
6-19-88	01-Aug-85	P85-278	CHG BAL	3.09		
6-19-88	01-Nov-85	B86-64	CHG BAL	1.447		
6-19-88	01-Nov-85	B86-65	CHG BAL	1.746		
6-19-88	12-Feb-86	B86-128	CHG BAL	1.381		
6-19-88	12-Feb-86	B86-127	CHG BAL	0.72		
6-19-88	16-May-86	B86-234	CHG BAL	1.419		
6-19-88	16-May-86	B86-235	CHG BAL	1.4		
6-19-88	21-Aug-86	B86-321	CHG BAL	1.639		
6-19-88	21-Aug-86	B86-320	CHG BAL	1.717		
6-19-88	17-Nov-86	B87-032	CHG BAL	1.732		
6-19-88	17-Nov-86	B87-031	CHG BAL	1.717		
6-19-88	01-Aug-85	P85-278	CL	3.76		
6-19-88	01-Aug-85	P85-279	CL	3.7		
6-19-88	01-Nov-85	B86-65	CL	3.6		
6-19-88	01-Nov-85	B86-64	CL	3.59		
6-19-88	12-Feb-86	B86-127	CL	3.56		
6-19-88	12-Feb-86	B86-128	CL	3.55		
6-19-88	16-May-86	B86-235	CL	3.62		
6-19-88	16-May-86	B86-234	CL	3.63		

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UNCONFINED AQUIFER (sheet 29 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-88	21-Aug-86	B86-321	CL	3.66		
6-19-88	21-Aug-86	B86-320	CL	3.66		
6-19-88	17-Nov-86	B87-031	CL	3.68		
6-19-88	17-Nov-86	B87-032	CL	3.63		
6-19-88	01-Aug-85	P85-279	CU	0.006	<	
6-19-88	01-Aug-85	P85-278	CU	0.006	<	
6-19-88	01-Nov-85	B86-64	CU	0.012	<	
6-19-88	01-Nov-85	B86-65	CU	0.012	<	
6-19-88	12-Feb-86	B86-127	CU	0.03	<	
6-19-88	12-Feb-86	B86-128	CU	0.03	<	
6-19-88	16-May-86	B86-234	CU	0.03	<	
6-19-88	16-May-86	B86-235	CU	0.03	<	
6-19-88	21-Aug-86	B86-320	CU	0.021	<	
6-19-88	21-Aug-86	B86-321	CU	0.021	<	
6-19-88	17-Nov-86	B87-032	CU	0.021	<	
6-19-88	17-Nov-86	B87-031	CU	0.021	<	
6-19-88	01-Aug-85	P85-278	D	-127		
6-19-88	01-Nov-85	B86-64	D	-132		
6-19-88	12-Feb-86	B86-127	D	-128		
6-19-88	16-May-86	B86-234	D	-128		
6-19-88	21-Aug-86	B86-320	D	-123		
6-19-88	17-Nov-86	B87-031	D	-126		
6-19-88	01-Aug-85	P85-278	F	0.42		
6-19-88	01-Aug-85	P85-279	F	0.42		
6-19-88	01-Nov-85	B86-64	F	0.35		
6-19-88	01-Nov-85	B86-65	F	0.36		
6-19-88	12-Feb-86	B86-128	F	0.35		
6-19-88	12-Feb-86	B86-127	F	0.35		
6-19-88	16-May-86	B86-234	F	0.44		

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UNCONFINED AQUIFER (sheet 30 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-88	16-May-86	B86-235	F	0.45		
6-19-88	21-Aug-86	B86-320	F	0.42		
6-19-88	21-Aug-86	B86-321	F	0.41		
6-19-88	17-Nov-86	B87-032	F	0.38		
6-19-88	17-Nov-86	B87-031	F	0.38		
6-19-88	01-Aug-85	P85-278	FE	0.022		
6-19-88	01-Aug-85	P85-279	FE	0.024		
6-19-88	01-Nov-85	B86-64	FE	0.033		
6-19-88	01-Nov-85	B86-65	FE	0.03	<	
6-19-88	12-Feb-86	B86-128	FE	0.035		
6-19-88	12-Feb-86	B86-127	FE	0.034		
6-19-88	16-May-86	B86-234	FE	0.03	<	
6-19-88	16-May-86	B86-235	FE	0.03	<	
6-19-88	21-Aug-86	B86-321	FE	0.028		
6-19-88	21-Aug-86	B86-320	FE	0.025		
6-19-88	17-Nov-86	B87-032	FE	0.028		
6-19-88	17-Nov-86	B87-031	FE	0.026		
6-19-88	01-Aug-85	P85-278	FIELD ALK	113		
6-19-88	01-Nov-85	B86-64	FIELD ALK	114		
6-19-88	12-Feb-86	B86-127	FIELD ALK	117		
6-19-88	16-May-86	B86-234	FIELD ALK	116		
6-19-88	21-Aug-86	B86-320	FIELD ALK	118		
6-19-88	01-Aug-85	P85-278	FIELD PH	7.3		
6-19-88	01-Nov-85	B86-64	FIELD PH	7.35		
6-19-88	12-Feb-86	B86-127	FIELD PH	7.49		
6-19-88	16-May-86	B86-234	FIELD PH	7.36		
6-19-88	21-Aug-86	B86-320	FIELD PH	7.69		
6-19-88	17-Nov-86	B87-031	FIELD PH	7.44		
6-19-88	01-Aug-85	P85-279	K	3.21		

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UNCONFINED AQUIFER (sheet 31 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-88	01-Aug-85	P85-278	K	3.25		
6-19-88	01-Nov-85	B86-65	K	3.3		
6-19-88	01-Nov-85	B86-64	K	3.33		
6-19-88	12-Feb-86	B86-128	K	3.69		
6-19-88	12-Feb-86	B86-127	K	3.48		
6-19-88	16-May-86	B86-234	K	3.39		
6-19-88	16-May-86	B86-235	K	3.39		
6-19-88	21-Aug-86	B86-321	K	3.405		
6-19-88	21-Aug-86	B86-320	K	3.392		
6-19-88	17-Nov-86	B87-032	K	3.361		
6-19-88	17-Nov-86	B87-031	K	3.413		
6-19-88	01-Aug-85	P85-278	LAB ALK	116		
6-19-88	01-Nov-85	B86-64	LAB ALK	116		
6-19-88	12-Feb-86	B86-127	LAB ALK	118		
6-19-88	16-May-86	B86-234	LAB ALK	116		
6-19-88	21-Aug-86	B86-320	LAB ALK	116		
6-19-88	17-Nov-86	B87-031	LAB ALK	118		
6-19-88	01-Aug-85	P85-278	LAB COND	264		
6-19-88	01-Nov-85	B86-64	LAB COND	239		
6-19-88	12-Feb-86	B86-127	LAB COND	260		
6-19-88	16-May-86	B86-234	LAB COND	259		
6-19-88	21-Aug-86	B86-320	LAB COND	265		
6-19-88	17-Nov-86	B87-031	LAB COND	262		
6-19-88	01-Aug-85	P85-278	LAB PH	7.7		
6-19-88	01-Nov-85	B86-64	LAB PH	7.74		
6-19-88	12-Feb-86	B86-127	LAB PH	7.77		
6-19-88	16-May-86	B86-234	LAB PH	7.75		
6-19-88	21-Aug-86	B86-320	LAB PH	7.76		
6-19-88	17-Nov-86	B87-031	LAB PH	7.75		

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Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-88	01-Aug-85	P85-279	LI	0.008	<	
6-19-88	01-Aug-85	P85-278	LI	0.008	<	
6-19-88	01-Nov-85	B86-65	LI	0.016	<	
6-19-88	01-Nov-85	B86-64	LI	0.016	<	
6-19-88	12-Feb-86	B86-127	LI	0.016	<	
6-19-88	12-Feb-86	B86-128	LI	0.016	<	
6-19-88	16-May-86	B86-234	LI	0.016	<	
6-19-88	16-May-86	B86-235	LI	0.016	<	
6-19-88	21-Aug-86	B86-320	LI	0.011	<	
6-19-88	21-Aug-86	B86-321	LI	0.011	<	
6-19-88	17-Nov-86	B87-032	LI	0.011	<	
6-19-88	17-Nov-86	B87-031	LI	0.011	<	
6-19-88	01-Aug-85	P85-279	MG	10.8		
6-19-88	01-Aug-85	P85-278	MG	10.9		
6-19-88	01-Nov-85	B86-65	MG	10.5		
6-19-88	01-Nov-85	B86-64	MG	10.4		
6-19-88	12-Feb-86	B86-127	MG	10.6		
6-19-88	12-Feb-86	B86-128	MG	10.7		
6-19-88	16-May-86	B86-235	MG	10.6		
6-19-88	16-May-86	B86-234	MG	10.6		
6-19-88	21-Aug-86	B86-320	MG	10.887		
6-19-88	21-Aug-86	B86-321	MG	10.882		
6-19-88	17-Nov-86	B87-032	MG	10.899		
6-19-88	17-Nov-86	B87-031	MG	10.9		
6-19-88	01-Aug-85	P85-278	MN	0.004	<	
6-19-88	01-Aug-85	P85-279	MN	0.004	<	
6-19-88	01-Nov-85	B86-65	MN	0.01	<	
6-19-88	01-Nov-85	B86-64	MN	0.01	<	
6-19-88	12-Feb-86	B86-128	MN	0.01	<	

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UNCONFINED AQUIFER (sheet 33 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-88	12-Feb-86	B86-127	MN	0.01	<	
6-19-88	16-May-86	B86-234	MN	0.01	<	
6-19-88	16-May-86	B86-235	MN	0.01	<	
6-19-88	21-Aug-86	B86-321	MN	0.007	<	
6-19-88	21-Aug-86	B86-320	MN	0.007	<	
6-19-88	17-Nov-86	B87-032	MN	0.007	<	
6-19-88	17-Nov-86	B87-031	MN	0.007	<	
6-19-88	01-Aug-85	P85-278	MO	0.3	<	
6-19-88	01-Aug-85	P85-279	MO	0.3	<	
6-19-88	01-Nov-85	B86-64	MO	0.6	<	
6-19-88	01-Nov-85	B86-65	MO	0.6	<	
6-19-88	12-Feb-86	B86-127	MO	0.6	<	
6-19-88	12-Feb-86	B86-128	MO	0.6	<	
6-19-88	16-May-86	B86-234	MO	0.6	<	
6-19-88	16-May-86	B86-235	MO	0.6	<	
6-19-88	21-Aug-86	B86-320	MO	0.424	<	
6-19-88	21-Aug-86	B86-321	MO	0.424	<	
6-19-88	17-Nov-86	B87-031	MO	0.424	<	
6-19-88	17-Nov-86	B87-032	MO	0.424	<	
6-19-88	01-Aug-85	P85-278	NA	12.2		
6-19-88	01-Aug-85	P85-279	NA	12.1		
6-19-88	01-Nov-85	B86-65	NA	11.7		
6-19-88	01-Nov-85	B86-64	NA	11.6		
6-19-88	12-Feb-86	B86-128	NA	11.7		
6-19-88	12-Feb-86	B86-127	NA	11.5		
6-19-88	16-May-86	B86-234	NA	11.7		
6-19-88	16-May-86	B86-235	NA	11.8		
6-19-88	21-Aug-86	B86-321	NA	12.144		
6-19-88	21-Aug-86	B86-320	NA	12.206		

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UNCONFINED AQUIFER (sheet 34 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-88	17-Nov-86	B87-032	NA	11.983		
6-19-88	17-Nov-86	B87-031	NA	12.044		
6-19-88	01-Aug-85	P85-278	NO3	0.42		
6-19-88	01-Nov-85	B86-65	NO3	0.79		
6-19-88	01-Nov-85	B86-64	NO3	0.79		
6-19-88	12-Feb-86	B86-128	NO3	1.9		
6-19-88	12-Feb-86	B86-127	NO3	1.89		
6-19-88	16-May-86	B86-235	NO3	1.88		
6-19-88	16-May-86	B86-234	NO3	1.32		
6-19-88	21-Aug-86	B86-320	NO3	1.85		
6-19-88	21-Aug-86	B86-321	NO3	1.88		
6-19-88	17-Nov-86	B87-031	NO3	1.71		
6-19-88	17-Nov-86	B87-032	NO3	1.89		
6-19-88	01-Aug-85	P85-278	O18	-16.1		
6-19-88	01-Nov-85	B86-64	O18	-16.9		
6-19-88	12-Feb-86	B86-127	O18	-16.7		
6-19-88	16-May-86	B86-234	O18	-16.6		
6-19-88	21-Aug-86	B86-320	O18	-16		
6-19-88	17-Nov-86	B87-031	O18	-16.5		
6-19-88	01-Aug-85	P85-278	ORP	225		
6-19-88	01-Nov-85	B86-64	ORP	120		
6-19-88	12-Feb-86	B86-127	ORP	-12		
6-19-88	16-May-86	B86-234	ORP	170		
6-19-88	21-Aug-86	B86-320	ORP	90		
6-19-88	17-Nov-86	B87-031	ORP	70		
6-19-88	21-Aug-86	B86-320	RN222	2700		200
6-19-88	01-Aug-85	P85-278	S34	1.6		
6-19-88	01-Nov-85	B86-64	S34	7.5		
6-19-88	12-Feb-86	B86-127	S34	-1.4		

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UNCONFINED AQUIFER (sheet 35 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-88	21-Aug-86	B86-320	S34	2.8		
6-19-88	01-Aug-85	P85-278	SAMP.TEMP	17.6		
6-19-88	01-Nov-85	B86-64	SAMP.TEMP	17.2		
6-19-88	12-Feb-86	B86-127	SAMP.TEMP	17.4		
6-19-88	16-May-86	B86-234	SAMP.TEMP	17.5		
6-19-88	21-Aug-86	B86-320	SAMP.TEMP	18.3		
6-19-88	17-Nov-86	B87-031	SAMP.TEMP	17.8		
6-19-88	01-Aug-85	P85-278	SI	22.8		
6-19-88	01-Aug-85	P85-279	SI	22.8		
6-19-88	01-Nov-85	B86-65	SI	22.2		
6-19-88	01-Nov-85	B86-64	SI	22.2		
6-19-88	12-Feb-86	B86-128	SI	21.3		
6-19-88	12-Feb-86	B86-127	SI	21.1		
6-19-88	16-May-86	B86-234	SI	21		
6-19-88	16-May-86	B86-235	SI	21.1		
6-19-88	21-Aug-86	B86-320	SI	21.784		
6-19-88	21-Aug-86	B86-321	SI	21.725		
6-19-88	17-Nov-86	B87-031	SI	21.755		
6-19-88	17-Nov-86	B87-032	SI	21.741		
6-19-88	01-Aug-85	P85-279	SO4	15.1		
6-19-88	01-Aug-85	P85-278	SO4	14		
6-19-88	01-Nov-85	B86-65	SO4	13.7		
6-19-88	01-Nov-85	B86-64	SO4	13.5		
6-19-88	12-Feb-86	B86-128	SO4	13.4		
6-19-88	12-Feb-86	B86-127	SO4	13.4		
6-19-88	16-May-86	B86-235	SO4	13.2		
6-19-88	16-May-86	B86-234	SO4	13.4		
6-19-88	21-Aug-86	B86-320	SO4	13.6		
6-19-88	21-Aug-86	B86-321	SO4	13.4		

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UNCONFINED AQUIFER (sheet 36 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-88	17-Nov-86	B87-032	SO4	13.3		
6-19-88	17-Nov-86	B87-031	SO4	13.6		
6-19-88	01-Aug-85	P85-278	SR	0.107		
6-19-88	01-Aug-85	P85-279	SR	0.107		
6-19-88	01-Nov-85	B86-65	SR	0.105		
6-19-88	01-Nov-85	B86-64	SR	0.104		
6-19-88	12-Feb-86	B86-128	SR	0.107		
6-19-88	12-Feb-86	B86-127	SR	0.106		
6-19-88	16-May-86	B86-234	SR	0.107		
6-19-88	16-May-86	B86-235	SR	0.108		
6-19-88	21-Aug-86	B86-321	SR	0.106		
6-19-88	21-Aug-86	B86-320	SR	0.106		
6-19-88	17-Nov-86	B87-031	SR	0.106		
6-19-88	17-Nov-86	B87-032	SR	0.106		
6-19-88	01-Aug-85	P85-278	T	-0.04		0.09
6-19-88	01-Nov-85	B86-64	T	0		0.07
6-19-88	12-Feb-86	B86-127	T	0.01		0.09
6-19-88	16-May-86	B86-234	T	0.17		0.09
6-19-88	21-Aug-86	B86-320	T	-0.13		0.09
6-19-88	17-Nov-86	B87-031	T	0.03		0.09
6-19-88	01-Aug-85	P85-278	TC	27.56		
6-19-88	01-Nov-85	B86-64	TC	28		
6-19-88	12-Feb-86	B86-127	TC	28.1		
6-19-88	16-May-86	B86-234	TC	27.2		
6-19-88	21-Aug-86	B86-320	TC	27.6		
6-19-88	17-Nov-86	B87-031	TC	28.2		
6-19-88	01-Aug-85	P85-278	TOC	0.29		
6-19-88	01-Nov-85	B86-64	TOC	0.31		
6-19-88	12-Feb-86	B86-127	TOC	0.3		

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UNCONFINED AQUIFER (sheet 37 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-19-88	16-May-86	B86-234	TOC	0.32		
6-19-88	21-Aug-86	B86-320	TOC	0.31		
6-19-88	17-Nov-86	B87-031	TOC	0.39		
6-19-88	01-Aug-85	P85-278	TURB	0.35		
6-19-88	01-Nov-85	B86-64	TURB	0.7		
6-19-88	12-Feb-86	B86-127	TURB	0.69		
6-19-88	16-May-86	B86-234	TURB	0.6		
6-19-88	21-Aug-86	B86-320	TURB	0.5		
6-19-88	17-Nov-86	B87-031	TURB	0.27		
6-19-88	21-Aug-86	B86-320	U234	3.56		0.1
6-19-88	21-Aug-86	B86-320	U238	1.12		0.03
6-19-88	01-Aug-85	P85-279	ZN	0.02	<	
6-19-88	01-Aug-85	P85-278	ZN	0.02	<	
6-19-88	01-Nov-85	B86-65	ZN	0.04	<	
6-19-88	01-Nov-85	B86-64	ZN	0.04	<	
6-19-88	12-Feb-86	B86-127	ZN	0.04	<	
6-19-88	12-Feb-86	B86-128	ZN	0.04	<	
6-19-88	16-May-86	B86-235	ZN	0.04	<	
6-19-88	16-May-86	B86-234	ZN	0.04	<	
6-19-88	21-Aug-86	B86-321	ZN	0.028	<	
6-19-88	21-Aug-86	B86-320	ZN	0.028	<	
6-19-88	17-Nov-86	B87-032	ZN	0.028	<	
6-19-88	17-Nov-86	B87-031	ZN	0.028	<	
6-24-95	13-Aug-85	P85-289	AL	0.06	<	
6-24-95	13-Aug-85	P85-288	AL	0.06	<	
6-24-95	01-Nov-85	B86-62	AL	0.2	<	
6-24-95	01-Nov-85	B86-61	AL	0.2	<	
6-24-95	29-Jan-86	B86-115	AL	0.2	<	
6-24-95	29-Jan-86	B86-116	AL	0.2	<	

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UNCONFINED AQUIFER (sheet 38 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-24-95	04-Jun-86	B86-240	AL	0.202	<	
6-24-95	04-Jun-86	B86-241	AL	0.202	<	
6-24-95	05-Sep-86	B86-323	AL	0.141	<	
6-24-95	05-Sep-86	B86-324	AL	0.141	<	
6-24-95	13-Aug-85	P85-288	B	0.05	<	
6-24-95	13-Aug-85	P85-289	B	0.05	<	
6-24-95	01-Nov-85	B86-62	B	0.1	<	
6-24-95	01-Nov-85	B86-61	B	0.1	<	
6-24-95	29-Jan-86	B86-116	B	0.1	<	
6-24-95	29-Jan-86	B86-115	B	0.1	<	
6-24-95	04-Jun-86	B86-240	B	0.101	<	
6-24-95	04-Jun-86	B86-241	B	0.101	<	
6-24-95	05-Sep-86	B86-323	B	0.071	<	
6-24-95	05-Sep-86	B86-324	B	0.071	<	
6-24-95	13-Aug-85	P85-289	BA	0.056		
6-24-95	13-Aug-85	P85-288	BA	0.051		
6-24-95	01-Nov-85	B86-61	BA	0.042		
6-24-95	01-Nov-85	B86-62	BA	0.043		
6-24-95	29-Jan-86	B86-115	BA	0.047		
6-24-95	29-Jan-86	B86-116	BA	0.047		
6-24-95	04-Jun-86	B86-240	BA	0.052		
6-24-95	04-Jun-86	B86-241	BA	0.052		
6-24-95	05-Sep-86	B86-324	BA	0.045		
6-24-95	05-Sep-86	B86-323	BA	0.044		
6-24-95	13-Aug-85	P85-288	C13	-16.3		
6-24-95	01-Nov-85	B86-61	C13	-14.7		
6-24-95	29-Jan-86	B86-115	C13	-15.6		
6-24-95	04-Jun-86	B86-240	C13	-15.8		
6-24-95	05-Sep-86	B86-323	C13	-15.3		

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UNCONFINED AQUIFER (sheet 39 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-24-95	13-Aug-85	P85-288	C14-PMC	81		4.4
6-24-95	01-Nov-85	B86-61	C14-PMC	60.1		4
6-24-95	29-Jan-86	B86-115	C14-PMC	73.5		1.3
6-24-95	04-Jun-86	B86-240	C14-PMC	71.7		0.9
6-24-95	05-Sep-86	B86-323	C14-PMC	68.1		1
6-24-95	13-Aug-85	P85-289	CA	51.8		
6-24-95	13-Aug-85	P85-288	CA	51.8		
6-24-95	01-Nov-85	B86-61	CA	47.3		
6-24-95	01-Nov-85	B86-62	CA	47.7		
6-24-95	29-Jan-86	B86-115	CA	52.6		
6-24-95	29-Jan-86	B86-116	CA	52.3		
6-24-95	04-Jun-86	B86-241	CA	55.6		
6-24-95	04-Jun-86	B86-240	CA	56		
6-24-95	05-Sep-86	B86-324	CA	48.78		
6-24-95	05-Sep-86	B86-323	CA	48.914		
6-24-95	13-Aug-85	P85-288	CHG BAL	2.687		
6-24-95	13-Aug-85	P85-289	CHG BAL	2.68		
6-24-95	01-Nov-85	B86-61	CHG BAL	0.091		
6-24-95	01-Nov-85	B86-62	CHG BAL	0.469		
6-24-95	29-Jan-86	B86-115	CHG BAL	0.524		
6-24-95	29-Jan-86	B86-116	CHG BAL	-0.024		
6-24-95	04-Jun-86	B86-241	CHG BAL	1.431		
6-24-95	04-Jun-86	B86-240	CHG BAL	1.673		
6-24-95	05-Sep-86	B86-324	CHG BAL	-0.792		
6-24-95	05-Sep-86	B86-323	CHG BAL	-0.614		
6-24-95	13-Aug-85	P85-289	CL	4.39		
6-24-95	13-Aug-85	P85-288	CL	4.42		
6-24-95	01-Nov-85	B86-62	CL	4.19		
6-24-95	01-Nov-85	B86-61	CL	4.27		

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UNCONFINED AQUIFER (sheet 40 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-24-95	29-Jan-86	B86-116	CL	4.46		
6-24-95	29-Jan-86	B86-115	CL	4.46		
6-24-95	04-Jun-86	B86-240	CL	4.31		
6-24-95	04-Jun-86	B86-241	CL	4.26		
6-24-95	05-Sep-86	B86-323	CL	3.95		
6-24-95	05-Sep-86	B86-324	CL	4.11		
6-24-95	13-Aug-85	P85-289	CO	0.017	<	
6-24-95	13-Aug-85	P85-288	CO	0.017	<	
6-24-95	13-Aug-85	P85-288	CR	0.032	<	
6-24-95	13-Aug-85	P85-289	CR	0.032	<	
6-24-95	13-Aug-85	P85-288	CU	0.006	<	
6-24-95	13-Aug-85	P85-289	CU	0.006	<	
6-24-95	01-Nov-85	B86-62	CU	0.012	<	
6-24-95	01-Nov-85	B86-61	CU	0.012	<	
6-24-95	29-Jan-86	B86-115	CU	0.03	<	
6-24-95	29-Jan-86	B86-116	CU	0.03	<	
6-24-95	04-Jun-86	B86-241	CU	0.03	<	
6-24-95	04-Jun-86	B86-240	CU	0.03	<	
6-24-95	05-Sep-86	B86-323	CU	0.021	<	
6-24-95	05-Sep-86	B86-324	CU	0.021	<	
6-24-95	13-Aug-85	P85-288	D	-128		
6-24-95	01-Nov-85	B86-61	D	-137		
6-24-95	29-Jan-86	B86-115	D	-131		
6-24-95	04-Jun-86	B86-240	D	-127		
6-24-95	05-Sep-86	B86-323	D	-125		
6-24-95	13-Aug-85	P85-289	F	0.49		
6-24-95	13-Aug-85	P85-288	F	0.49		
6-24-95	01-Nov-85	B86-62	F	0.48		
6-24-95	01-Nov-85	B86-61	F	0.5		

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UNCONFINED AQUIFER (sheet 41 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-24-95	29-Jan-86	B86-116	F	0.49		
6-24-95	29-Jan-86	B86-115	F	0.48		
6-24-95	04-Jun-86	B86-241	F	0.51		
6-24-95	04-Jun-86	B86-240	F	0.53		
6-24-95	05-Sep-86	B86-323	F	0.52		
6-24-95	05-Sep-86	B86-324	F	0.57		
6-24-95	13-Aug-85	P85-289	FE	0.25		
6-24-95	13-Aug-85	P85-288	FE	0.245		
6-24-95	01-Nov-85	B86-62	FE	0.535		
6-24-95	01-Nov-85	B86-61	FE	0.537		
6-24-95	29-Jan-86	B86-115	FE	0.695		
6-24-95	29-Jan-86	B86-116	FE	0.69		
6-24-95	04-Jun-86	B86-240	FE	0.671		
6-24-95	04-Jun-86	B86-241	FE	0.676		
6-24-95	05-Sep-86	B86-324	FE	0.59		
6-24-95	05-Sep-86	B86-323	FE	0.577		
6-24-95	13-Aug-85	P85-288	FIELD ALK	199		
6-24-95	01-Nov-85	B86-61	FIELD ALK	189		
6-24-95	29-Jan-86	B86-115	FIELD ALK	211		
6-24-95	04-Jun-86	B86-240	FIELD ALK	215		
6-24-95	05-Sep-86	B86-323	FIELD ALK	201		
6-24-95	13-Aug-85	P85-288	FIELD PH	7.35		
6-24-95	01-Nov-85	B86-61	FIELD PH	7		
6-24-95	29-Jan-86	B86-115	FIELD PH	7.45		
6-24-95	04-Jun-86	B86-240	FIELD PH	7.38		
6-24-95	05-Sep-86	B86-323	FIELD PH	7.35		
6-24-95	13-Aug-85	P85-288	K	4.22		
6-24-95	13-Aug-85	P85-289	K	4.22		
6-24-95	01-Nov-85	B86-62	K	4.14		

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Well	Date	Sample ID	Constituent	Result	LT	Error
6-24-95	01-Nov-85	B86-61	K	4.12		
6-24-95	29-Jan-86	B86-115	K	4.39		
6-24-95	29-Jan-86	B86-116	K	4.34		
6-24-95	04-Jun-86	B86-240	K	4.59		
6-24-95	04-Jun-86	B86-241	K	4.59		
6-24-95	05-Sep-86	B86-323	K	3.934		
6-24-95	05-Sep-86	B86-324	K	3.921		
6-24-95	13-Aug-85	P85-288	LAB ALK	206		
6-24-95	01-Nov-85	B86-61	LAB ALK	189		
6-24-95	29-Jan-86	B86-115	LAB ALK	209		
6-24-95	04-Jun-86	B86-240	LAB ALK	210		
6-24-95	05-Sep-86	B86-323	LAB ALK	200		
6-24-95	13-Aug-85	P85-288	LAB COND	418		
6-24-95	01-Nov-85	B86-61	LAB COND	351		
6-24-95	29-Jan-86	B86-115	LAB COND	415		
6-24-95	04-Jun-86	B86-240	LAB COND	426		
6-24-95	05-Sep-86	B86-323	LAB COND	397		
6-24-95	13-Aug-85	P85-288	LAB PH	7.54		
6-24-95	01-Nov-85	B86-61	LAB PH	7.47		
6-24-95	29-Jan-86	B86-115	LAB PH	7.46		
6-24-95	04-Jun-86	B86-240	LAB PH	7.38		
6-24-95	05-Sep-86	B86-323	LAB PH	7.4		
6-24-95	13-Aug-85	P85-289	LI	0.008	<	
6-24-95	13-Aug-85	P85-288	LI	0.008	<	
6-24-95	01-Nov-85	B86-61	LI	0.016	<	
6-24-95	01-Nov-85	B86-62	LI	0.016	<	
6-24-95	29-Jan-86	B86-115	LI	0.016	<	
6-24-95	29-Jan-86	B86-116	LI	0.016	<	
6-24-95	04-Jun-86	B86-240	LI	0.016	<	

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UNCONFINED AQUIFER (sheet 43 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-24-95	04-Jun-86	B86-241	LI	0.016	<	
6-24-95	05-Sep-86	B86-324	LI	0.011	<	
6-24-95	05-Sep-86	B86-323	LI	0.011	<	
6-24-95	13-Aug-85	P85-289	MG	16.5		
6-24-95	13-Aug-85	P85-288	MG	16.5		
6-24-95	01-Nov-85	B86-61	MG	14		
6-24-95	01-Nov-85	B86-62	MG	14.1		
6-24-95	29-Jan-86	B86-115	MG	16.5		
6-24-95	29-Jan-86	B86-116	MG	16		
6-24-95	04-Jun-86	B86-240	MG	16.4		
6-24-95	04-Jun-86	B86-241	MG	16.3		
6-24-95	05-Sep-86	B86-323	MG	14.662		
6-24-95	05-Sep-86	B86-324	MG	14.624		
6-24-95	13-Aug-85	P85-288	MN	0.014		
6-24-95	13-Aug-85	P85-289	MN	0.014		
6-24-95	01-Nov-85	B86-62	MN	0.01	<	
6-24-95	01-Nov-85	B86-61	MN	0.01	<	
6-24-95	29-Jan-86	B86-116	MN	0.018		
6-24-95	29-Jan-86	B86-115	MN	0.019		
6-24-95	04-Jun-86	B86-241	MN	0.025		
6-24-95	04-Jun-86	B86-240	MN	0.024		
6-24-95	05-Sep-86	B86-323	MN	0.014		
6-24-95	05-Sep-86	B86-324	MN	0.015		
6-24-95	13-Aug-85	P85-289	MO	0.035	<	
6-24-95	13-Aug-85	P85-288	MO	0.035	<	
6-24-95	01-Nov-85	B86-61	MO	0.6	<	
6-24-95	01-Nov-85	B86-62	MO	0.6	<	
6-24-95	29-Jan-86	B86-116	MO	0.6	<	
6-24-95	29-Jan-86	B86-115	MO	0.6	<	

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UNCONFINED AQUIFER (sheet 44 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-24-95	04-Jun-86	B86-241	MO	0.606	<	
6-24-95	04-Jun-86	B86-240	MO	0.606	<	
6-24-95	05-Sep-86	B86-323	MO	0.424	<	
6-24-95	05-Sep-86	B86-324	MO	0.424	<	
6-24-95	13-Aug-85	P85-288	NA	14.8		
6-24-95	13-Aug-85	P85-289	NA	14.8		
6-24-95	01-Nov-85	B86-61	NA	13.8		
6-24-95	01-Nov-85	B86-62	NA	13.8		
6-24-95	29-Jan-86	B86-115	NA	14		
6-24-95	29-Jan-86	B86-116	NA	14.2		
6-24-95	04-Jun-86	B86-240	NA	14.3		
6-24-95	04-Jun-86	B86-241	NA	14.3		
6-24-95	05-Sep-86	B86-323	NA	14.386		
6-24-95	05-Sep-86	B86-324	NA	14.237		
6-24-95	13-Aug-85	P85-289	NI	0.03	<	
6-24-95	13-Aug-85	P85-288	NI	0.03	<	
6-24-95	13-Aug-85	P85-288	O18	-16.4		
6-24-95	01-Nov-85	B86-61	O18	-17		
6-24-95	29-Jan-86	B86-115	O18	-16.6		
6-24-95	04-Jun-86	B86-240	O18	-16.6		
6-24-95	05-Sep-86	B86-323	O18	-15.6		
6-24-95	13-Aug-85	P85-288	ORP	-70		
6-24-95	01-Nov-85	B86-61	ORP	-115		
6-24-95	29-Jan-86	B86-115	ORP	-125		
6-24-95	04-Jun-86	B86-240	ORP	-125		
6-24-95	05-Sep-86	B86-323	ORP	0		
6-24-95	13-Aug-85	P85-288	PB	0.18	<	
6-24-95	13-Aug-85	P85-289	PB	0.18	<	
6-24-95	13-Aug-85	P85-288	S34	7.4		

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UNCONFINED AQUIFER (sheet 45 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-24-95	01-Nov-85	B86-61	S34	5.9		
6-24-95	29-Jan-86	B86-115	S34	9.1		
6-24-95	13-Aug-85	P85-288	SAMP.TEMP	19.7		
6-24-95	01-Nov-85	B86-61	SAMP.TEMP	13.8		
6-24-95	29-Jan-86	B86-115	SAMP.TEMP	12.9		
6-24-95	04-Jun-86	B86-240	SAMP.TEMP	14.8		
6-24-95	05-Sep-86	B86-323	SAMP.TEMP	14.5		
6-24-95	13-Aug-85	P85-288	SI	20.2		
6-24-95	13-Aug-85	P85-289	SI	20.2		
6-24-95	01-Nov-85	B86-61	SI	21		
6-24-95	01-Nov-85	B86-62	SI	21		
6-24-95	29-Jan-86	B86-116	SI	20		
6-24-95	29-Jan-86	B86-115	SI	20		
6-24-95	04-Jun-86	B86-240	SI	19.9		
6-24-95	04-Jun-86	B86-241	SI	19.8		
6-24-95	05-Sep-86	B86-323	SI	19.867		
6-24-95	05-Sep-86	B86-324	SI	19.759		
6-24-95	13-Aug-85	P85-288	SO4	15.26		
6-24-95	13-Aug-85	P85-289	SO4	15.33		
6-24-95	01-Nov-85	B86-62	SO4	13.6		
6-24-95	01-Nov-85	B86-61	SO4	13.6		
6-24-95	29-Jan-86	B86-115	SO4	13.6		
6-24-95	29-Jan-86	B86-116	SO4	13.7		
6-24-95	04-Jun-86	B86-241	SO4	13		
6-24-95	04-Jun-86	B86-240	SO4	13.1		
6-24-95	05-Sep-86	B86-323	SO4	12.9		
6-24-95	05-Sep-86	B86-324	SO4	12.5		
6-24-95	13-Aug-85	P86-61	SR	0.15		
6-24-95	13-Aug-85	P85-289	SR	0.173		

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UNCONFINED AQUIFER (sheet 46 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-24-95	13-Aug-85	P85-288	SR	0.173		
6-24-95	13-Aug-85	P86-62	SR	0.152		
6-24-95	29-Jan-86	B86-115	SR	0.169		
6-24-95	29-Jan-86	B86-116	SR	0.17		
6-24-95	04-Jun-86	B86-240	SR	0.185		
6-24-95	04-Jun-86	B86-241	SR	0.184		
6-24-95	05-Sep-86	B86-324	SR	0.164		
6-24-95	05-Sep-86	B86-323	SR	0.165		
6-24-95	13-Aug-85	P85-288	T	0.68		0.11
6-24-95	01-Nov-85	B86-61	T	0.65		0.1
6-24-95	29-Jan-86	B86-115	T	0.46		0.06
6-24-95	04-Jun-86	B86-240	T	0.64		0.09
6-24-95	05-Sep-86	B86-323	T	0.53		0.09
6-24-95	13-Aug-85	P85-288	TC	48.6		
6-24-95	01-Nov-85	B86-61	TC	45.1		
6-24-95	29-Jan-86	B86-115	TC	50.1		
6-24-95	04-Jun-86	B86-240	TC	50.1		
6-24-95	05-Sep-86	B86-323	TC	47.5		
6-24-95	13-Aug-85	P85-288	TOC	1.61		
6-24-95	01-Nov-85	B86-61	TOC	0.7		
6-24-95	29-Jan-86	B86-115	TOC	0.63		
6-24-95	04-Jun-86	B86-240	TOC	0.65		
6-24-95	05-Sep-86	B86-323	TOC	0.72		
6-24-95	13-Aug-85	P85-288	TURB	19		
6-24-95	01-Nov-85	B86-61	TURB	2.3		
6-24-95	29-Jan-86	B86-115	TURB	1.35		
6-24-95	04-Jun-86	B86-240	TURB	1.5		
6-24-95	05-Sep-86	B86-323	TURB	14		
6-24-95	13-Aug-85	P85-288	ZN	0.608		

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UNCONFINED AQUIFER (sheet 47 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-24-95	13-Aug-85	P86-61	ZN	0.177		
6-24-95	13-Aug-85	P86-62	ZN	0.182		
6-24-95	13-Aug-85	P85-289	ZN	0.618		
6-24-95	29-Jan-86	B86-116	ZN	0.074		
6-24-95	29-Jan-86	B86-115	ZN	0.074		
6-24-95	04-Jun-86	B86-240	ZN	0.062		
6-24-95	04-Jun-86	B86-241	ZN	0.062		
6-24-95	05-Sep-86	B86-323	ZN	0.066		
6-24-95	05-Sep-86	B86-324	ZN	0.067		
6-66-103	11-Apr-85	P85-204	AL	0.06	<	
6-66-103	11-Apr-85	P85-203	AL	0.15		
6-66-103	15-Aug-85	P85-294	AL	0.06	<	
6-66-103	15-Aug-85	P85-295	AL	0.06	<	
6-66-103	06-Nov-85	B86-73	AL	0.2	<	
6-66-103	06-Nov-85	B86-74	AL	0.2	<	
6-66-103	27-Jan-86	B86-113	AL	0.2	<	
6-66-103	27-Jan-86	B86-112	AL	0.2	<	
6-66-103	11-Apr-85	P85-203	B	0.04		
6-66-103	11-Apr-85	P85-204	B	0.024	<	
6-66-103	15-Aug-85	P85-295	B	0.016	<	
6-66-103	15-Aug-85	P85-294	B	0.016	<	
6-66-103	06-Nov-85	B86-74	B	0.1	<	
6-66-103	06-Nov-85	B86-73	B	0.1	<	
6-66-103	27-Jan-86	B86-113	B	0.1	<	
6-66-103	27-Jan-86	B86-112	B	0.1	<	
6-66-103	11-Apr-85	P85-204	BA	0.008		
6-66-103	11-Apr-85	P85-203	BA	0.012		
6-66-103	15-Aug-85	P85-294	BA	0.003		
6-66-103	15-Aug-85	P85-295	BA	0.003	<	

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UNCONFINED AQUIFER (sheet 48 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-66-103	06-Nov-85	B86-73	BA	0.005		
6-66-103	06-Nov-85	B86-74	BA	0.005		
6-66-103	27-Jan-86	B86-112	BA	0.008		
6-66-103	27-Jan-86	B86-113	BA	0.007		
6-66-103	11-Apr-85	P85-203	C13	-10.5		
6-66-103	15-Aug-85	P85-294	C13	-10.5		
6-66-103	06-Nov-85	B86-73	C13	-11		
6-66-103	11-Apr-85	P85-203	C14-PMC	82.4		2.4
6-66-103	15-Aug-85	P85-294	C14-PMC	84.8		6.7
6-66-103	06-Nov-85	B86-73	C14-PMC	80.6		6.5
6-66-103	11-Apr-85	P85-204	CA	28		
6-66-103	11-Apr-85	P85-203	CA	29		
6-66-103	15-Aug-85	P85-294	CA	28.3		
6-66-103	15-Aug-85	P85-295	CA	28.1		
6-66-103	06-Nov-85	B86-74	CA	26.6		
6-66-103	06-Nov-85	B86-73	CA	27.1		
6-66-103	27-Jan-86	B86-112	CA	28.3		
6-66-103	27-Jan-86	B86-113	CA	28.2		
6-66-103	11-Apr-85	P85-203	CHG BAL	4.867		
6-66-103	11-Apr-85	P85-204	CHG BAL	2.83		
6-66-103	15-Aug-85	P85-295	CHG BAL	1.886		
6-66-103	15-Aug-85	P85-294	CHG BAL	1.89		
6-66-103	06-Nov-85	B86-74	CHG BAL	0.015		
6-66-103	06-Nov-85	B86-73	CHG BAL	1.068		
6-66-103	27-Jan-86	B86-113	CHG BAL	1.287		
6-66-103	27-Jan-86	B86-112	CHG BAL	0.927		
6-66-103	11-Apr-85	P85-204	CL	1.8		
6-66-103	11-Apr-85	P85-203	CL	1.9		
6-66-103	15-Aug-85	P85-294	CL	2.05		

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UNCONFINED AQUIFER (sheet 49 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-66-103	15-Aug-85	P85-295	CL	2.06		
6-66-103	06-Nov-85	B86-74	CL	1.95		
6-66-103	06-Nov-85	B86-73	CL	1.97		
6-66-103	27-Jan-86	B86-112	CL	2.1		
6-66-103	27-Jan-86	B86-113	CL	2		
6-66-103	11-Apr-85	P85-204	CO	0.017	<	
6-66-103	11-Apr-85	P85-203	CO	0.017	<	
6-66-103	15-Aug-85	P85-294	CO	0.017	<	
6-66-103	15-Aug-85	P85-295	CO	0.017	<	
6-66-103	11-Apr-85	P85-203	CR	0.032	<	
6-66-103	11-Apr-85	P85-204	CR	0.032	<	
6-66-103	15-Aug-85	P85-295	CR	0.032	<	
6-66-103	15-Aug-85	P85-294	CR	0.032	<	
6-66-103	11-Apr-85	P85-204	CU	0.012		
6-66-103	11-Apr-85	P85-203	CU	0.025		
6-66-103	15-Aug-85	P85-294	CU	0.006	<	
6-66-103	15-Aug-85	P85-295	CU	0.006	<	
6-66-103	06-Nov-85	B86-73	CU	0.012	<	
6-66-103	06-Nov-85	B86-74	CU	0.012	<	
6-66-103	27-Jan-86	B86-113	CU	0.03	<	
6-66-103	27-Jan-86	B86-112	CU	0.03	<	
6-66-103	11-Apr-85	P85-203	D	-136		
6-66-103	15-Aug-85	P85-294	D	-133		
6-66-103	06-Nov-85	B86-73	D	-136		
6-66-103	27-Jan-86	B86-112	D	-138		
6-66-103	11-Apr-85	P85-204	F	0.51		
6-66-103	11-Apr-85	P85-203	F	0.11		
6-66-103	15-Aug-85	P85-294	F	0.26		
6-66-103	15-Aug-85	P85-295	F	0.24		

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UNCONFINED AQUIFER (sheet 50 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-66-103	06-Nov-85	B86-73	F	0.24		
6-66-103	06-Nov-85	B86-74	F	0.36		
6-66-103	27-Jan-86	B86-112	F	0.2		
6-66-103	27-Jan-86	B86-113	F	0.2		
6-66-103	11-Apr-85	P85-203	FE	0.034		
6-66-103	11-Apr-85	P85-204	FE	0.015		
6-66-103	15-Aug-85	P85-294	FE	0.009	<	
6-66-103	15-Aug-85	P85-295	FE	0.009	<	
6-66-103	06-Nov-85	B86-74	FE	0.03	<	
6-66-103	06-Nov-85	B86-73	FE	0.03	<	
6-66-103	27-Jan-86	B86-112	FE	0.03	<	
6-66-103	27-Jan-86	B86-113	FE	0.03	<	
6-66-103	11-Apr-85	P85-203	FIELD ALK	93		
6-66-103	15-Aug-85	P85-294	FIELD ALK	95		
6-66-103	06-Nov-85	B86-73	FIELD ALK	91		
6-66-103	27-Jan-86	B86-112	FIELD ALK	96.5		
6-66-103	11-Apr-85	P85-203	FIELD PH	7.95		
6-66-103	15-Aug-85	P85-294	FIELD PH	7.8		
6-66-103	06-Nov-85	B86-73	FIELD PH	7.65		
6-66-103	27-Jan-86	B86-112	FIELD PH	8.16		
6-66-103	11-Apr-85	P85-203	K	3.53		
6-66-103	11-Apr-85	P85-204	K	3.28		
6-66-103	15-Aug-85	P85-294	K	2.92		
6-66-103	15-Aug-85	P85-295	K	2.89		
6-66-103	06-Nov-85	B86-74	K	2.17		
6-66-103	06-Nov-85	B86-73	K	2.26		
6-66-103	27-Jan-86	B86-113	K	3.05		
6-66-103	27-Jan-86	B86-112	K	3.06		
6-66-103	11-Apr-85	P85-203	LAB ALK	90		

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UNCONFINED AQUIFER (sheet 51 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-66-103	15-Aug-85	P85-294	LAB ALK	98		
6-66-103	06-Nov-85	B86-73	LAB ALK	96		
6-66-103	27-Jan-86	B86-112	LAB ALK	96.7		
6-66-103	11-Apr-85	P85-203	LAB COND	219		
6-66-103	15-Aug-85	P85-294	LAB COND	228		
6-66-103	06-Nov-85	B86-73	LAB COND	206		
6-66-103	27-Jan-86	B86-112	LAB COND	228		
6-66-103	11-Apr-85	P85-203	LAB PH	7.95		
6-66-103	15-Aug-85	P85-294	LAB PH	8.03		
6-66-103	06-Nov-85	B86-73	LAB PH	8.03		
6-66-103	27-Jan-86	B86-112	LAB PH	7.89		
6-66-103	11-Apr-85	P85-203	LI	0.016		
6-66-103	11-Apr-85	P85-204	LI	0.008	<	
6-66-103	15-Aug-85	P85-294	LI	0.008	<	
6-66-103	15-Aug-85	P85-295	LI	0.008	<	
6-66-103	06-Nov-85	B86-74	LI	0.016	<	
6-66-103	06-Nov-85	B86-73	LI	0.016	<	
6-66-103	27-Jan-86	B86-113	LI	0.016	<	
6-66-103	27-Jan-86	B86-112	LI	0.016	<	
6-66-103	11-Apr-85	P85-203	MG	7.99		
6-66-103	11-Apr-85	P85-204	MG	7.73		
6-66-103	15-Aug-85	P85-294	MG	7.88		
6-66-103	15-Aug-85	P85-295	MG	7.84		
6-66-103	06-Nov-85	B86-73	MG	7.4		
6-66-103	06-Nov-85	B86-74	MG	7.25		
6-66-103	27-Jan-86	B86-112	MG	7.81		
6-66-103	27-Jan-86	B86-113	MG	7.78		
6-66-103	11-Apr-85	P85-204	MN	0.005	<	
6-66-103	11-Apr-85	P85-203	MN	0.005	<	

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UNCONFINED AQUIFER (sheet 52 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-66-103	15-Aug-85	P85-294	MN	0.005	<	
6-66-103	15-Aug-85	P85-295	MN	0.005	<	
6-66-103	06-Nov-85	B86-74	MN	0.01	<	
6-66-103	06-Nov-85	B86-73	MN	0.01	<	
6-66-103	27-Jan-86	B86-113	MN	0.01	<	
6-66-103	27-Jan-86	B86-112	MN	0.01	<	
6-66-103	11-Apr-85	P85-203	MO	0.073		
6-66-103	11-Apr-85	P85-204	MO	0.038		
6-66-103	15-Aug-85	P85-294	MO	0.034	<	
6-66-103	15-Aug-85	P85-295	MO	0.034	<	
6-66-103	06-Nov-85	B86-74	MO	0.6	<	
6-66-103	06-Nov-85	B86-73	MO	0.6	<	
6-66-103	27-Jan-86	B86-113	MO	0.6	<	
6-66-103	27-Jan-86	B86-112	MO	0.6	<	
6-66-103	11-Apr-85	P85-204	NA	6.83		
6-66-103	11-Apr-85	P85-203	NA	6.84		
6-66-103	15-Aug-85	P85-294	NA	6.88		
6-66-103	15-Aug-85	P85-295	NA	6.83		
6-66-103	06-Nov-85	B86-73	NA	6.54		
6-66-103	06-Nov-85	B86-74	NA	6.39		
6-66-103	27-Jan-86	B86-113	NA	6.64		
6-66-103	27-Jan-86	B86-112	NA	6.66		
6-66-103	11-Apr-85	P85-204	NI	0.03	<	
6-66-103	11-Apr-85	P85-203	NI	0.036		
6-66-103	15-Aug-85	P85-294	NI	0.03	<	
6-66-103	15-Aug-85	P85-295	NI	0.03	<	
6-66-103	15-Aug-85	P85-295	NO3	0.5		
6-66-103	15-Aug-85	P85-294	NO3	1.27		
6-66-103	06-Nov-85	B86-73	NO3	1.16		

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UNCONFINED AQUIFER (sheet 53 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-66-103	06-Nov-85	B86-74	NO3	0.79		
6-66-103	27-Jan-86	B86-112	NO3	1.64		
6-66-103	27-Jan-86	B86-113	NO3	1.27		
6-66-103	11-Apr-85	P85-203	O18	-17.6		
6-66-103	15-Aug-85	P85-294	O18	-17.2		
6-66-103	06-Nov-85	B86-73	O18	-17.7		
6-66-103	27-Jan-86	B86-112	O18	-17.9		
6-66-103	11-Apr-85	P85-203	ORP	20		
6-66-103	15-Aug-85	P85-294	ORP	175		
6-66-103	06-Nov-85	B86-73	ORP	114		
6-66-103	27-Jan-86	B86-112	ORP	185		
6-66-103	11-Apr-85	P85-203	PB	0.18	<	
6-66-103	11-Apr-85	P85-204	PB	0.18	<	
6-66-103	15-Aug-85	P85-295	PB	0.18	<	
6-66-103	15-Aug-85	P85-294	PB	0.18	<	
6-66-103	11-Apr-85	P85-203	S34	1		
6-66-103	15-Aug-85	P85-294	S34	5.4		
6-66-103	06-Nov-85	B86-73	S34	7.5		
6-66-103	11-Apr-85	P85-203	SAMP.TEMP	14.5		
6-66-103	15-Aug-85	P85-294	SAMP.TEMP	16.4		
6-66-103	06-Nov-85	B86-73	SAMP.TEMP	13.4		
6-66-103	27-Jan-86	B86-112	SAMP.TEMP	12.8		
6-66-103	11-Apr-85	P85-203	SI	13.2		
6-66-103	11-Apr-85	P85-204	SI	12.9		
6-66-103	15-Aug-85	P85-294	SI	12.8		
6-66-103	15-Aug-85	P85-295	SI	12.8		
6-66-103	06-Nov-85	B86-74	SI	12.3		
6-66-103	06-Nov-85	B86-73	SI	12.3		
6-66-103	27-Jan-86	B86-112	SI	12		

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UNCONFINED AQUIFER (sheet 54 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-66-103	27-Jan-86	B86-113	SI	12		
6-66-103	11-Apr-85	P85-203	SO4	16.4		
6-66-103	11-Apr-85	P85-204	SO4	16.5		
6-66-103	15-Aug-85	P85-294	SO4	16.9		
6-66-103	15-Aug-85	P85-295	SO4	16.8		
6-66-103	06-Nov-85	B86-74	SO4	16.8		
6-66-103	06-Nov-85	B86-73	SO4	16.7		
6-66-103	27-Jan-86	B86-112	SO4	16.9		
6-66-103	27-Jan-86	B86-113	SO4	16.1		
6-66-103	11-Apr-85	P85-204	SR	0.111		
6-66-103	11-Apr-85	P85-203	SR	0.113		
6-66-103	15-Aug-85	P85-294	SR	0.108		
6-66-103	15-Aug-85	P85-295	SR	0.108		
6-66-103	06-Nov-85	B86-74	SR	0.102		
6-66-103	06-Nov-85	B86-73	SR	0.104		
6-66-103	27-Jan-86	B86-113	SR	0.11		
6-66-103	27-Jan-86	B86-112	SR	0.11		
6-66-103	11-Apr-85	P85-203	T	54.4		1.3
6-66-103	15-Aug-85	P85-294	T	65.3		2
6-66-103	06-Nov-85	B86-73	T	39.4		1.1
6-66-103	27-Jan-86	B86-112	T	56.4		1.6
6-66-103	11-Apr-85	P85-203	TC	22.39		
6-66-103	15-Aug-85	P85-294	TC	22.3		
6-66-103	06-Nov-85	B86-73	TC	22.6		
6-66-103	27-Jan-86	B86-112	TC	22.7		
6-66-103	11-Apr-85	P85-203	TOC	0.39		
6-66-103	15-Aug-85	P85-294	TOC	0.55		
6-66-103	06-Nov-85	B86-73	TOC	0.37		
6-66-103	27-Jan-86	B86-112	TOC	0.43		

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UNCONFINED AQUIFER (sheet 55 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-66-103	11-Apr-85	P85-203	TURB	0.23		
6-66-103	15-Aug-85	P85-294	TURB	0.19		
6-66-103	06-Nov-85	B86-73	TURB	0.9		
6-66-103	27-Jan-86	B86-112	TURB	0.22		
6-66-103	11-Apr-85	P85-203	ZN	0.02	<	
6-66-103	11-Apr-85	P85-204	ZN	0.02	<	
6-66-103	15-Aug-85	P85-295	ZN	0.02	<	
6-66-103	15-Aug-85	P85-294	ZN	0.02	<	
6-66-103	06-Nov-85	B86-74	ZN	0.04	<	
6-66-103	06-Nov-85	B86-73	ZN	0.04	<	
6-66-103	27-Jan-86	B86-112	ZN	0.04	<	
6-66-103	27-Jan-86	B86-113	ZN	0.04	<	
6-S03-25	31-Oct-85	B86-56	AL	0.2	<	
6-S03-25	31-Oct-85	B86-55	AL	0.2	<	
6-S03-25	13-Feb-86	B86-130	AL	0.2	<	
6-S03-25	13-Feb-86	B86-131	AL	0.2	<	
6-S03-25	15-May-86	B86-229	AL	0.2	<	
6-S03-25	15-May-86	B86-228	AL	0.2	<	
6-S03-25	27-Sep-86	B86-351	AL	0.141	<	
6-S03-25	27-Sep-86	B86-352	AL	0.141	<	
6-S03-25	10-Nov-86	B87-023	AL	0.14	<	
6-S03-25	10-Nov-86	B87-022	AL	0.14	<	
6-S03-25	31-Oct-85	B86-55	B	0.1	<	
6-S03-25	31-Oct-85	B86-56	B	0.1	<	
6-S03-25	13-Feb-86	B86-131	B	0.1	<	
6-S03-25	13-Feb-86	B86-130	B	0.1	<	
6-S03-25	15-May-86	B86-229	B	0.1	<	
6-S03-25	15-May-86	B86-228	B	0.1	<	
6-S03-25	27-Sep-86	B86-352	B	0.071	<	

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UNCONFINED AQUIFER (sheet 56 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S03-25	27-Sep-86	B86-351	B	0.071	<	
6-S03-25	10-Nov-86	B87-023	B	0.079		
6-S03-25	10-Nov-86	B87-022	B	0.08		
6-S03-25	31-Oct-85	B86-56	BA	0.063		
6-S03-25	31-Oct-85	B86-55	BA	0.063		
6-S03-25	13-Feb-86	B86-130	BA	0.059		
6-S03-25	13-Feb-86	B86-131	BA	0.058		
6-S03-25	15-May-86	B86-228	BA	0.068		
6-S03-25	15-May-86	B86-229	BA	0.069		
6-S03-25	27-Sep-86	B86-351	BA	0.062		
6-S03-25	10-Nov-86	B87-023	BA	0.066		
6-S03-25	10-Nov-86	B87-022	BA	0.066		
6-S03-25	31-Oct-85	B86-55	C13	-15.3		
6-S03-25	13-Feb-86	B86-130	C13	-15.6		
6-S03-25	15-May-86	B86-228	C13	-15.7		
6-S03-25	27-Sep-86	B86-351	C13	-16.2		
6-S03-25	10-Nov-86	B87-022	C13	-16		
6-S03-25	31-Oct-85	B86-55	C14-PMC	24.3		1.9
6-S03-25	13-Feb-86	B86-130	C14-PMC	25		1.2
6-S03-25	15-May-86	B86-228	C14-PMC	23.9		1.3
6-S03-25	27-Sep-86	B86-351	C14-PMC	21.5		1.5
6-S03-25	10-Nov-86	B87-022	C14-PMC	24.3		1.3
6-S03-25	31-Oct-85	B86-55	CA	61		
6-S03-25	31-Oct-85	B86-56	CA	60.8		
6-S03-25	13-Feb-86	B86-131	CA	61		
6-S03-25	13-Feb-86	B86-130	CA	62.5		
6-S03-25	15-May-86	B86-228	CA	63.4		
6-S03-25	15-May-86	B86-229	CA	63.8		
6-S03-25	27-Sep-86	B86-351	CA	60.383		

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UNCONFINED AQUIFER (sheet 57 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S03-25	27-Sep-86	B86-352	CA	60.281		
6-S03-25	10-Nov-86	B87-023	CA	62.334		
6-S03-25	10-Nov-86	B87-022	CA	62.401		
6-S03-25	31-Oct-85	B86-55	CHG BAL	0.554		
6-S03-25	31-Oct-85	B86-56	CHG BAL	0.43		
6-S03-25	13-Feb-86	B86-130	CHG BAL	1.056		
6-S03-25	13-Feb-86	B86-131	CHG BAL	0.206		
6-S03-25	15-May-86	B86-228	CHG BAL	1.786		
6-S03-25	15-May-86	B86-229	CHG BAL	2.76		
6-S03-25	27-Sep-86	B86-352	CHG BAL	0.349		
6-S03-25	27-Sep-86	B86-351	CHG BAL	0.457		
6-S03-25	10-Nov-86	B87-022	CHG BAL	1.757		
6-S03-25	10-Nov-86	B87-023	CHG BAL	1.609		
6-S03-25	31-Oct-85	B86-55	CL	23.5		
6-S03-25	31-Oct-85	B86-56	CL	23.1		
6-S03-25	13-Feb-86	B86-131	CL	21.7		
6-S03-25	13-Feb-86	B86-130	CL	22.1		
6-S03-25	15-May-86	B86-228	CL	22.2		
6-S03-25	15-May-86	B86-229	CL	21.6		
6-S03-25	27-Sep-86	B86-351	CL	22.2		
6-S03-25	27-Sep-86	B86-352	CL	22.3		
6-S03-25	10-Nov-86	B87-022	CL	22.3		
6-S03-25	10-Nov-86	B87-023	CL	22.3		
6-S03-25	31-Oct-85	B86-55	CU	0.012	<	
6-S03-25	31-Oct-85	B86-56	CU	0.012	<	
6-S03-25	13-Feb-86	B86-130	CU	0.03	<	
6-S03-25	13-Feb-86	B86-131	CU	0.03	<	
6-S03-25	15-May-86	B86-229	CU	0.03	<	
6-S03-25	15-May-86	B86-228	CU	0.03	<	

9 2 1 2 6 5 1 2 2 7

UNCONFINED AQUIFER (sheet 58 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S03-25	27-Sep-86	B86-351	CU	0.021	<	
6-S03-25	27-Sep-86	B86-352	CU	0.021	<	
6-S03-25	10-Nov-86	B87-023	CU	0.021	<	
6-S03-25	10-Nov-86	B87-022	CU	0.021	<	
6-S03-25	31-Oct-85	B86-55	D	-135		
6-S03-25	13-Feb-86	B86-130	D	-131		
6-S03-25	15-May-86	B86-228	D	-126		
6-S03-25	27-Sep-86	B86-351	D	-127		
6-S03-25	10-Nov-86	B87-022	D	-126		
6-S03-25	31-Oct-85	B86-55	F	0.7		
6-S03-25	31-Oct-85	B86-56	F	0.74		
6-S03-25	13-Feb-86	B86-130	F	0.66		
6-S03-25	13-Feb-86	B86-131	F	0.7		
6-S03-25	15-May-86	B86-229	F	0.77		
6-S03-25	15-May-86	B86-228	F	0.7		
6-S03-25	27-Sep-86	B86-352	F	0.75		
6-S03-25	27-Sep-86	B86-351	F	0.8		
6-S03-25	10-Nov-86	B87-023	F	0.73		
6-S03-25	10-Nov-86	B87-022	F	0.72		
6-S03-25	31-Oct-85	B86-55	FE	0.12		
6-S03-25	31-Oct-85	B86-56	FE	0.12		
6-S03-25	13-Feb-86	B86-130	FE	0.039		
6-S03-25	13-Feb-86	B86-131	FE	0.036		
6-S03-25	15-May-86	B86-228	FE	0.087		
6-S03-25	15-May-86	B86-229	FE	0.086		
6-S03-25	27-Sep-86	B86-351	FE	0.081		
6-S03-25	27-Sep-86	B86-352	FE	0.086		
6-S03-25	10-Nov-86	B87-023	FE	0.124		
6-S03-25	10-Nov-86	B87-022	FE	0.112		

9 2 1 2 6 3 5 1 2 2 8

UNCONFINED AQUIFER (sheet 59 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S03-25	31-Oct-85	B86-55	FIELD ALK	147		
6-S03-25	13-Feb-86	B86-130	FIELD ALK	149		
6-S03-25	15-May-86	B86-228	FIELD ALK	150		
6-S03-25	27-Sep-86	B86-351	FIELD ALK	152		
6-S03-25	31-Oct-85	B86-55	FIELD PH	7.75		
6-S03-25	13-Feb-86	B86-130	FIELD PH	7.49		
6-S03-25	15-May-86	B86-228	FIELD PH	7.79		
6-S03-25	27-Sep-86	B86-351	FIELD PH	7.73		
6-S03-25	10-Nov-86	B87-022	FIELD PH	7.57		
6-S03-25	31-Oct-85	B86-56	K	7.46		
6-S03-25	31-Oct-85	B86-55	K	7.49		
6-S03-25	13-Feb-86	B86-130	K	7.61		
6-S03-25	13-Feb-86	B86-131	K	7.38		
6-S03-25	15-May-86	B86-228	K	7.69		
6-S03-25	15-May-86	B86-229	K	7.7		
6-S03-25	27-Sep-86	B86-351	K	7.55		
6-S03-25	27-Sep-86	B86-352	K	7.491		
6-S03-25	10-Nov-86	B87-022	K	7.475		
6-S03-25	10-Nov-86	B87-023	K	7.56		
6-S03-25	31-Oct-85	B86-55	LAB ALK	148		
6-S03-25	13-Feb-86	B86-130	LAB ALK	152		
6-S03-25	15-May-86	B86-228	LAB ALK	149		
6-S03-25	27-Sep-86	B86-351	LAB ALK	150		
6-S03-25	10-Nov-86	B87-022	LAB ALK	152		
6-S03-25	31-Oct-85	B86-55	LAB COND	530		
6-S03-25	13-Feb-86	B86-130	LAB COND	521		
6-S03-25	15-May-86	B86-228	LAB COND	519		
6-S03-25	27-Sep-86	B86-351	LAB COND	517		
6-S03-25	10-Nov-86	B87-022	LAB COND	518		

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UNCONFINED AQUIFER (sheet 60 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S03-25	31-Oct-85	B86-55	LAB PH	7.82		
6-S03-25	13-Feb-86	B86-130	LAB PH	7.8		
6-S03-25	15-May-86	B86-228	LAB PH	7.8		
6-S03-25	27-Sep-86	B86-351	LAB PH	7.94		
6-S03-25	10-Nov-86	B87-022	LAB PH	7.98		
6-S03-25	31-Oct-85	B86-56	LI	0.016	<	
6-S03-25	31-Oct-85	B86-55	LI	0.016	<	
6-S03-25	13-Feb-86	B86-131	LI	0.016	<	
6-S03-25	13-Feb-86	B86-130	LI	0.016	<	
6-S03-25	15-May-86	B86-228	LI	0.017		
6-S03-25	15-May-86	B86-229	LI	0.016	<	
6-S03-25	27-Sep-86	B86-351	LI	0.011	<	
6-S03-25	27-Sep-86	B86-352	LI	0.011	<	
6-S03-25	10-Nov-86	B87-023	LI	0.011	<	
6-S03-25	10-Nov-86	B87-022	LI	0.011	<	
6-S03-25	31-Oct-85	B86-55	MG	14.9		
6-S03-25	31-Oct-85	B86-56	MG	14.9		
6-S03-25	13-Feb-86	B86-130	MG	14.6		
6-S03-25	13-Feb-86	B86-131	MG	14.3		
6-S03-25	15-May-86	B86-228	MG	14.6		
6-S03-25	15-May-86	B86-229	MG	14.7		
6-S03-25	27-Sep-86	B86-352	MG	14.54		
6-S03-25	27-Sep-86	B86-351	MG	14.65		
6-S03-25	10-Nov-86	B87-023	MG	14.861		
6-S03-25	10-Nov-86	B87-022	MG	14.786		
6-S03-25	31-Oct-85	B86-56	MN	0.107		
6-S03-25	31-Oct-85	B86-55	MN	0.108		
6-S03-25	13-Feb-86	B86-131	MN	0.108		
6-S03-25	13-Feb-86	B86-130	MN	0.11		

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UNCONFINED AQUIFER (sheet 61 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S03-25	15-May-86	B86-228	MN	0.113		
6-S03-25	15-May-86	B86-229	MN	0.114		
6-S03-25	27-Sep-86	B86-351	MN	0.111		
6-S03-25	27-Sep-86	B86-352	MN	0.11		
6-S03-25	10-Nov-86	B87-023	MN	0.11		
6-S03-25	10-Nov-86	B87-022	MN	0.11		
6-S03-25	31-Oct-85	B86-56	MO	0.6	<	
6-S03-25	31-Oct-85	B86-55	MO	0.6	<	
6-S03-25	13-Feb-86	B86-131	MO	0.6	<	
6-S03-25	13-Feb-86	B86-130	MO	0.6	<	
6-S03-25	15-May-86	B86-229	MO	0.6	<	
6-S03-25	15-May-86	B86-228	MO	0.6	<	
6-S03-25	27-Sep-86	B86-351	MO	0.424	<	
6-S03-25	27-Sep-86	B86-352	MO	0.424	<	
6-S03-25	10-Nov-86	B87-022	MO	0.42	<	
6-S03-25	10-Nov-86	B87-023	MO	0.42	<	
6-S03-25	10-Nov-86	B87-022	N 03	0.2		
6-S03-25	31-Oct-85	B86-56	NA	25.7		
6-S03-25	31-Oct-85	B86-55	NA	26		
6-S03-25	13-Feb-86	B86-130	NA	25.6		
6-S03-25	13-Feb-86	B86-131	NA	25.2		
6-S03-25	15-May-86	B86-229	NA	25.8		
6-S03-25	15-May-86	B86-228	NA	25.6		
6-S03-25	27-Sep-86	B86-352	NA	25.916		
6-S03-25	27-Sep-86	B86-351	NA	25.922		
6-S03-25	10-Nov-86	B87-022	NA	26.494		
6-S03-25	10-Nov-86	B87-023	NA	26.623		
6-S03-25	31-Oct-85	B86-55	NO3	0.4		
6-S03-25	31-Oct-85	B86-56	NO3	0.36		

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UNCONFINED AQUIFER (sheet 62 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S03-25	13-Feb-86	B86-130	NO3	0.41		
6-S03-25	13-Feb-86	B86-131	NO3	0.42		
6-S03-25	15-May-86	B86-228	NO3	0.21		
6-S03-25	31-Oct-85	B86-55	O18	-16.8		
6-S03-25	13-Feb-86	B86-130	O18	-16.7		
6-S03-25	15-May-86	B86-228	O18	-16.4		
6-S03-25	27-Sep-86	B86-351	O18	-16.2		
6-S03-25	10-Nov-86	B87-022	O18	-15.6		
6-S03-25	31-Oct-85	B86-55	ORP	-142		
6-S03-25	13-Feb-86	B86-130	ORP	-175		
6-S03-25	15-May-86	B86-228	ORP	-120		
6-S03-25	27-Sep-86	B86-351	ORP	-85		
6-S03-25	10-Nov-86	B87-022	ORP	-165		
6-S03-25	31-Oct-85	B86-55	S34	-0.7		
6-S03-25	13-Feb-86	B86-130	S34	-1.3		
6-S03-25	15-May-86	B86-228	S34	3		
6-S03-25	31-Oct-85	B86-55	SAMP.TEMP	19.5		
6-S03-25	13-Feb-86	B86-130	SAMP.TEMP	18.6		
6-S03-25	15-May-86	B86-228	SAMP.TEMP	18.7		
6-S03-25	27-Sep-86	B86-351	SAMP.TEMP	18.7		
6-S03-25	10-Nov-86	B87-022	SAMP.TEMP	18.2		
6-S03-25	31-Oct-85	B86-55	SI	15.5		
6-S03-25	31-Oct-85	B86-56	SI	15.5		
6-S03-25	13-Feb-86	B86-130	SI	15		
6-S03-25	13-Feb-86	B86-131	SI	15		
6-S03-25	15-May-86	B86-228	SI	15		
6-S03-25	15-May-86	B86-229	SI	15.1		
6-S03-25	27-Sep-86	B86-351	SI	15.717		
6-S03-25	27-Sep-86	B86-352	SI	15.69		

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UNCONFINED AQUIFER (sheet 63 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S03-25	10-Nov-86	B87-023	SI	15.754		
6-S03-25	10-Nov-86	B87-022	SI	15.71		
6-S03-25	31-Oct-85	B86-56	SO4	90.5		
6-S03-25	31-Oct-85	B86-55	SO4	90.5		
6-S03-25	13-Feb-86	B86-130	SO4	89.6		
6-S03-25	13-Feb-86	B86-131	SO4	88.7		
6-S03-25	15-May-86	B86-229	SO4	84.3		
6-S03-25	15-May-86	B86-228	SO4	86.9		
6-S03-25	27-Sep-86	B86-351	SO4	85.5		
6-S03-25	27-Sep-86	B86-352	SO4	85.3		
6-S03-25	10-Nov-86	B87-023	SO4	86.3		
6-S03-25	10-Nov-86	B87-022	SO4	84.9		
6-S03-25	31-Oct-85	B86-55	SR	0.251		
6-S03-25	31-Oct-85	B86-56	SR	0.249		
6-S03-25	13-Feb-86	B86-131	SR	0.25		
6-S03-25	13-Feb-86	B86-130	SR	0.254		
6-S03-25	15-May-86	B86-229	SR	0.257		
6-S03-25	15-May-86	B86-228	SR	0.254		
6-S03-25	27-Sep-86	B86-352	SR	0.247		
6-S03-25	27-Sep-86	B86-351	SR	0.246		
6-S03-25	10-Nov-86	B87-022	SR	0.251		
6-S03-25	10-Nov-86	B87-023	SR	0.252		
6-S03-25	31-Oct-85	B86-55	T	0.13		0.09
6-S03-25	13-Feb-86	B86-130	T	0.03		0.1
6-S03-25	15-May-86	B86-228	T	-0.07		0.09
6-S03-25	27-Sep-86	B86-351	T	0.07		0.09
6-S03-25	10-Nov-86	B87-022	T	0.07		0.09
6-S03-25	31-Oct-85	B86-55	TC	34.27		
6-S03-25	13-Feb-86	B86-130	TC	34.8		

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UNCONFINED AQUIFER (sheet 64 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S03-25	15-May-86	B86-228	TC	34.1		
6-S03-25	27-Sep-86	B86-351	TC	34.5		
6-S03-25	10-Nov-86	B87-022	TC	34.7		
6-S03-25	31-Oct-85	B86-55	TOC	0.28		
6-S03-25	13-Feb-86	B86-130	TOC	0.45		
6-S03-25	15-May-86	B86-228	TOC	0.53		
6-S03-25	27-Sep-86	B86-351	TOC	0.62		
6-S03-25	10-Nov-86	B87-022	TOC	0.37		
6-S03-25	31-Oct-85	B86-55	TURB	9.5		
6-S03-25	13-Feb-86	B86-130	TURB	34		
6-S03-25	15-May-86	B86-228	TURB	5.7		
6-S03-25	27-Sep-86	B86-351	TURB	3.2		
6-S03-25	10-Nov-86	B87-022	TURB	2.2		
6-S03-25	31-Oct-85	B86-55	ZN	0.04	<	
6-S03-25	31-Oct-85	B86-56	ZN	0.04	<	
6-S03-25	13-Feb-86	B86-131	ZN	0.04	<	
6-S03-25	13-Feb-86	B86-130	ZN	0.04	<	
6-S03-25	15-May-86	B86-229	ZN	0.04	<	
6-S03-25	15-May-86	B86-228	ZN	0.04	<	
6-S03-25	27-Sep-86	B86-351	ZN	0.028	<	
6-S03-25	27-Sep-86	B86-352	ZN	0.028	<	
6-S03-25	10-Nov-86	B87-022	ZN	0.028	<	
6-S03-25	10-Nov-86	B87-023	ZN	0.028	<	
6-S24-19	18-Apr-85	P85-213	AL	0.06	<	
6-S24-19	18-Apr-85	P85-214	AL	0.06	<	
6-S24-19	14-Aug-85	P85-292	AL	0.1	<	
6-S24-19	14-Aug-85	P85-291	AL	0.1	<	
6-S24-19	18-Apr-85	P85-213	B	0.024		
6-S24-19	18-Apr-85	P85-214	B	0.025		

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UNCONFINED AQUIFER (sheet 65 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S24-19	14-Aug-85	P85-292	B	0.05	<	
6-S24-19	14-Aug-85	P85-291	B	0.05	<	
6-S24-19	18-Apr-85	P85-213	BA	0.039		
6-S24-19	18-Apr-85	P85-214	BA	0.039		
6-S24-19	14-Aug-85	P85-291	BA	0.034		
6-S24-19	14-Aug-85	P85-292	BA	0.035		
6-S24-19	18-Apr-85	P85-213	C13	-14.9		
6-S24-19	14-Aug-85	P85-291	C13	-14.8		
6-S24-19	18-Apr-85	P85-213	C14-PMC	112		6.2
6-S24-19	14-Aug-85	P85-291	C14-PMC	87.1		5
6-S24-19	18-Apr-85	P85-213	CA	29.5		
6-S24-19	18-Apr-85	P85-214	CA	29.4		
6-S24-19	14-Aug-85	P85-291	CA	31.4		
6-S24-19	14-Aug-85	P85-292	CA	31.9		
6-S24-19	18-Apr-85	P85-213	CHG BAL	3.408		
6-S24-19	18-Apr-85	P85-214	CHG BAL	2.803		
6-S24-19	14-Aug-85	P85-291	CHG BAL	2.397		
6-S24-19	14-Aug-85	P85-292	CHG BAL	2.985		
6-S24-19	18-Apr-85	P85-213	CL	5.1		
6-S24-19	18-Apr-85	P85-214	CL	5.2		
6-S24-19	14-Aug-85	P85-292	CL	5.79		
6-S24-19	14-Aug-85	P85-291	CL	5.71		
6-S24-19	18-Apr-85	P85-214	CO	0.017	<	
6-S24-19	18-Apr-85	P85-213	CO	0.017	<	
6-S24-19	14-Aug-85	P85-291	CO	0.017	<	
6-S24-19	14-Aug-85	P85-292	CO	0.017	<	
6-S24-19	18-Apr-85	P85-214	CR	0.032	<	
6-S24-19	18-Apr-85	P85-213	CR	0.032	<	
6-S24-19	14-Aug-85	P85-292	CR	0.033	<	

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UNCONFINED AQUIFER (sheet 66 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S24-19	14-Aug-85	P85-291	CR	0.033	<	
6-S24-19	18-Apr-85	P85-213	CU	0.006	<	
6-S24-19	18-Apr-85	P85-214	CU	0.006	<	
6-S24-19	14-Aug-85	P85-291	CU	0.006	<	
6-S24-19	14-Aug-85	P85-292	CU	0.006	<	
6-S24-19	18-Apr-85	P85-213	D	-109		
6-S24-19	14-Aug-85	P85-291	D	-106		
6-S24-19	18-Apr-85	P85-213	F	0.11		
6-S24-19	18-Apr-85	P85-214	F	0.35		
6-S24-19	14-Aug-85	P85-291	F	0.28		
6-S24-19	14-Aug-85	P85-292	F	0.35		
6-S24-19	18-Apr-85	P85-213	FE	0.009	<	
6-S24-19	18-Apr-85	P85-214	FE	0.009	<	
6-S24-19	14-Aug-85	P85-291	FE	0.006	<	
6-S24-19	14-Aug-85	P85-292	FE	0.015	<	
6-S24-19	18-Apr-85	P85-213	FIELD ALK	127		
6-S24-19	14-Aug-85	P85-291	FIELD ALK	136		
6-S24-19	18-Apr-85	P85-213	FIELD PH	7		
6-S24-19	18-Apr-85	P85-213	FIELD PH	7.1		
6-S24-19	14-Aug-85	P85-291	FIELD PH	7		
6-S24-19	18-Apr-85	P85-213	K	3.18		
6-S24-19	18-Apr-85	P85-214	K	3.22		
6-S24-19	14-Aug-85	P85-292	K	2.94		
6-S24-19	14-Aug-85	P85-291	K	2.82		
6-S24-19	18-Apr-85	P85-213	LAB ALK	127		
6-S24-19	14-Aug-85	P85-291	LAB ALK	140		
6-S24-19	18-Apr-85	P85-213	LAB COND	309		
6-S24-19	18-Apr-85	P85-213	LAB COND	281		
6-S24-19	14-Aug-85	P85-291	LAB COND	309		

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UNCONFINED AQUIFER (sheet 67 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S24-19	18-Apr-85	P85-213	LAB PH	7.1		
6-S24-19	18-Apr-85	P85-213	LAB PH	7.27		
6-S24-19	14-Aug-85	P85-291	LAB PH	7.27		
6-S24-19	18-Apr-85	P85-213	LI	0.008	<	
6-S24-19	18-Apr-85	P85-214	LI	0.008	<	
6-S24-19	14-Aug-85	P85-291	LI	0.008	<	
6-S24-19	14-Aug-85	P85-292	LI	0.008	<	
6-S24-19	18-Apr-85	P85-213	MG	10.7		
6-S24-19	18-Apr-85	P85-214	MG	10.7		
6-S24-19	14-Aug-85	P85-292	MG	11.8		
6-S24-19	14-Aug-85	P85-291	MG	11.6		
6-S24-19	18-Apr-85	P85-213	MN	0.005	<	
6-S24-19	18-Apr-85	P85-214	MN	0.005	<	
6-S24-19	14-Aug-85	P85-292	MN	0.034	<	
6-S24-19	14-Aug-85	P85-291	MN	0.005	<	
6-S24-19	18-Apr-85	P85-214	MO	0.034	<	
6-S24-19	18-Apr-85	P85-213	MO	0.034	<	
6-S24-19	14-Aug-85	P85-291	MO	0.034	<	
6-S24-19	18-Apr-85	P85-213	NA	16.4		
6-S24-19	18-Apr-85	P85-214	NA	16.3		
6-S24-19	14-Aug-85	P85-291	NA	16.9		
6-S24-19	14-Aug-85	P85-292	NA	17		
6-S24-19	18-Apr-85	P85-214	NI	0.03	<	
6-S24-19	18-Apr-85	P85-213	NI	0.03	<	
6-S24-19	14-Aug-85	P85-292	NI	0.03	<	
6-S24-19	14-Aug-85	P85-291	NI	0.03	<	
6-S24-19	18-Apr-85	P85-213	O18	-14		
6-S24-19	14-Aug-85	P85-291	O18	-14.4		
6-S24-19	18-Apr-85	P85-213	ORP	55		

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UNCONFINED AQUIFER (sheet 68 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S24-19	18-Apr-85	P85-213	ORP	172		
6-S24-19	14-Aug-85	P85-291	ORP	172		
6-S24-19	18-Apr-85	P85-214	PB	0.18	<	
6-S24-19	18-Apr-85	P85-213	PB	0.18	<	
6-S24-19	14-Aug-85	P85-291	PB	0.18	<	
6-S24-19	14-Aug-85	P85-292	PB	0.18	<	
6-S24-19	18-Apr-85	P85-213	S34	5.8		
6-S24-19	14-Aug-85	P85-291	S34	5.8		
6-S24-19	18-Apr-85	P85-213	SAMP.TEMP	16.3		
6-S24-19	18-Apr-85	P85-213	SAMP.TEMP	14		
6-S24-19	14-Aug-85	P85-291	SAMP.TEMP	16.3		
6-S24-19	18-Apr-85	P85-213	SI	12.8		
6-S24-19	18-Apr-85	P85-214	SI	12.8		
6-S24-19	14-Aug-85	P85-292	SI	13.2		
6-S24-19	14-Aug-85	P85-291	SI	13.1		
6-S24-19	18-Apr-85	P85-214	SO4	12.6		
6-S24-19	18-Apr-85	P85-213	SO4	12		
6-S24-19	14-Aug-85	P85-292	SO4	13.4		
6-S24-19	14-Aug-85	P85-291	SO4	13.29		
6-S24-19	18-Apr-85	P85-213	SR	0.144		
6-S24-19	18-Apr-85	P85-214	SR	0.144		
6-S24-19	14-Aug-85	P85-292	SR	0.152		
6-S24-19	14-Aug-85	P85-291	SR	0.151		
6-S24-19	18-Apr-85	P85-213	T	16.4		0.5
6-S24-19	14-Aug-85	P85-291	T	16.9		0.5
6-S24-19	18-Apr-85	P85-213	TC	32.67		
6-S24-19	14-Aug-85	P85-291	TC	35.7		
6-S24-19	18-Apr-85	P85-213	TOC	0.66		
6-S24-19	14-Aug-85	P85-291	TOC	1.49		

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UNCONFINED AQUIFER (sheet 69 of 69)

Well	Date	Sample ID	Constituent	Result	LT	Error
6-S24-19	18-Apr-85	P85-213	TURB	0.55		
6-S24-19	18-Apr-85	P85-213	TURB	0.24		
6-S24-19	14-Aug-85	P85-291	TURB	0.24		
6-S24-19	18-Apr-85	P85-214	ZN	0.02	<	
6-S24-19	18-Apr-85	P85-213	ZN	0.02	<	
6-S24-19	14-Aug-85	P85-291	ZN	0.02	<	
6-S24-19	14-Aug-85	P85-292	ZN	0.02	<	

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APPENDIX A

A-2 CONFINED AQUIFER

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CONFINED AQUIFER (sheet 1 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
DB-14	10-Sep-78	CASP-94	AL	0.13		
DB-14	10-Sep-78	CASP-93	AL	0.14		
DB-14	10-Sep-78	CASP-93	B	0.005	<	
DB-14	10-Sep-78	CASP-94	B	0.005	<	
DB-14	10-Sep-78	CASP-93	BA	0.034		
DB-14	10-Sep-78	CASP-94	BA	0.038		
DB-14	10-Sep-78	CASP-93	C14PMC	33.3		
DB-14	10-Sep-78	CASP-93	CA	42		
DB-14	10-Sep-78	CASP-94	CA	42.9		
DB-14	10-Sep-78	CASP-94	CHG BAL	6.308		
DB-14	10-Sep-78	CASP-93	CHG BAL	7.862		
DB-14	10-Sep-78	CASP-94	CL	5.2		
DB-14	10-Sep-78	CASP-93	CL	5.4		
DB-14	10-Sep-78	CASP-94	CO	0.02	<	
DB-14	10-Sep-78	CASP-93	CO	0.02	<	
DB-14	10-Sep-78	CASP-93	CR	0.005	<	
DB-14	10-Sep-78	CASP-94	CR	0.005	<	
DB-14	10-Sep-78	CASP-93	CU	0.005	<	
DB-14	10-Sep-78	CASP-94	CU	0.005	<	
DB-14	10-Sep-78	CASP-94	F	3.3		
DB-14	10-Sep-78	CASP-93	F	0.3		
DB-14	10-Sep-78	CASP-94	FE	0.005	<	
DB-14	10-Sep-78	CASP-93	FE	0.005	<	
DB-14	10-Sep-78	CASP-93	I-127	4.8		
DB-14	10-Sep-78	CASP-94	I-127	3.3		
DB-14	10-Sep-78	CASP-94	K	6.4		
DB-14	10-Sep-78	CASP-93	K	6.4		
DB-14	10-Sep-78	CASP-93	LAB ALK	130.4		
DB-14	10-Sep-78	CASP-94	LAB ALK	129.8		

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CONFINED AQUIFER (sheet 2 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
DB-14	10-Sep-78	CASP-93	LAB COND	388		
DB-14	10-Sep-78	CASP-94	LAB COND	367		
DB-14	10-Sep-78	CASP-93	LAB PH	8.41		
DB-14	10-Sep-78	CASP-94	LAB PH	8.42		
DB-14	10-Sep-78	CASP-94	MG	15.93		
DB-14	10-Sep-78	CASP-93	MG	15.75		
DB-14	10-Sep-78	CASP-94	MN	0.5	<	
DB-14	10-Sep-78	CASP-93	MN	0.5	<	
DB-14	10-Sep-78	CASP-94	MO	0.1		
DB-14	10-Sep-78	CASP-93	MO	0.13		
DB-14	10-Sep-78	CASP-94	NA	17.1		
DB-14	10-Sep-78	CASP-93	NA	17		
DB-14	10-Sep-78	CASP-94	NI	0.005	<	
DB-14	10-Sep-78	CASP-93	NI	0.016		
DB-14	10-Sep-78	CASP-94	NO3	6.1		
DB-14	10-Sep-78	CASP-93	NO3	5.5		
DB-14	10-Sep-78	CASP-93	O18	-16		
DB-14	10-Sep-78	CASP-94	SI	31.74		
DB-14	10-Sep-78	CASP-93	SI	31.35		
DB-14	10-Sep-78	CASP-94	SO4	39.7		
DB-14	10-Sep-78	CASP-93	SO4	38.6		
DB-14	10-Sep-78	CASP-93	T	-0.01		
DB-14	10-Sep-78	CASP-94	ZN	0.015		
DB-14	10-Sep-78	CASP-93	ZN	0.018		
DB-15	26-Apr-79	CASP-106	AL	0.026		
DB-15	26-Apr-79	CASP-106	B	0.01	<	
DB-15	26-Apr-79	CASP-106	BA	0.116		
DB-15	26-Apr-79	CASP-106	C14PMC	19.8		
DB-15	26-Apr-79	CASP-106	CA	19.85		

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CONFINED AQUIFER (sheet 3 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
DB-15	26-Apr-79	CASP-106	CHG BAL	4.987		
DB-15	26-Apr-79	CASP-106	CL	7.7		
DB-15	26-Apr-79	CASP-106	CO	0.01	<	
DB-15	26-Apr-79	CASP-106	CR	0.012		
DB-15	26-Apr-79	CASP-106	CU	0.01	<	
DB-15	26-Apr-79	CASP-106	F	0.3	<	
DB-15	26-Apr-79	CASP-106	FE	0.025		
DB-15	26-Apr-79	CASP-106	I-127	6.8		
DB-15	26-Apr-79	CASP-106	K	12.15		
DB-15	26-Apr-79	CASP-106	LAB ALK	126		
DB-15	26-Apr-79	CASP-106	LAB COND	335		
DB-15	26-Apr-79	CASP-106	LAB PH	7.9		
DB-15	26-Apr-79	CASP-106	MG	5.219		
DB-15	26-Apr-79	CASP-106	MN	0.005	<	
DB-15	26-Apr-79	CASP-106	MO	0.2	<	
DB-15	26-Apr-79	CASP-106	NA	52.45		
DB-15	26-Apr-79	CASP-106	NI	0.01	<	
DB-15	26-Apr-79	CASP-106	NO3	6.8		
DB-15	26-Apr-79	CASP-106	O18	-18.6		
DB-15	26-Apr-79	CASP-106	PB	0.1	<	
DB-15	26-Apr-79	CASP-106	PO4	1.2	<	
DB-15	26-Apr-79	CASP-106	SI	27.13		
DB-15	26-Apr-79	CASP-106	SO4	36.9		
DB-15	26-Apr-79	CASP-106	SR	0.16		
DB-15	26-Apr-79	CASP-106	T	10.3		
DB-15	26-Apr-79	CASP-106	ZN	0.092		
DC-14	18-Jan-80	CSG80-53	AL	0.03		
DC-14	18-Jan-80	CSG80-53	B	0.005	<	
DC-14	18-Jan-80	CSG80-53	BA	0.061		

9 2 1 2 6 5 1 2 4 4

CONFINED AQUIFER (sheet 4 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
DC-14	18-Jan-80	CSG80-53	C13	-11		
DC-14	18-Jan-80	CSG80-53	C14PMC	4		
DC-14	18-Jan-80	CSG80-53	CA	6.5		
DC-14	18-Jan-80	CSG80-53	CHG BAL	-0.003		
DC-14	18-Jan-80	CSG80-53	CL	6.5		
DC-14	18-Jan-80	CSG80-53	CO	0.01	<	
DC-14	18-Jan-80	CSG80-53	CR	0.003	<	
DC-14	18-Jan-80	CSG80-53	CU	0.002	<	
DC-14	18-Jan-80	CSG80-53	D	-155		
DC-14	18-Jan-80	CSG80-53	F	0.8		
DC-14	18-Jan-80	CSG80-53	FE	0.61		
DC-14	18-Jan-80	CSG80-53	FIELD ALK	109.3		
DC-14	18-Jan-80	CSG80-53	FIELD COND	258		
DC-14	18-Jan-80	CSG80-53	FIELD PH	8.1		
DC-14	18-Jan-80	CSG80-53	K	13.1		
DC-14	18-Jan-80	CSG80-53	LI	0.02	<	
DC-14	18-Jan-80	CSG80-53	MG	1.44		
DC-14	18-Jan-80	CSG80-53	MN	0.02	<	
DC-14	18-Jan-80	CSG80-53	MO	0.07		
DC-14	18-Jan-80	CSG80-53	NA	48.8		
DC-14	18-Jan-80	CSG80-53	NI	0.02	<	
DC-14	18-Jan-80	CSG80-53	O18	-19.1		
DC-14	18-Jan-80	CSG80-53	P	0.2	<	
DC-14	18-Jan-80	CSG80-53	PB	0.1	<	
DC-14	18-Jan-80	CSG80-53	SAMP.TEMP	16.7		
DC-14	18-Jan-80	CSG80-53	SI	31.8		
DC-14	18-Jan-80	CSG80-53	SO4	23.5		
DC-14	18-Jan-80	CSG80-53	SR	0.048		
DC-14	18-Jan-80	CSG80-53	T	-0.08		

9 2 1 2 6 5 5 1 2 4 5

CONFINED AQUIFER (sheet 5 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
DC-14	18-Jan-80	CSG80-53	TURB	0.27		
DC-14	18-Jan-80	CSG80-53	ZN	0.02		
DC-15	23-Jan-80	CSG80-54	AL	0.02	<	
DC-15	23-Jan-80	CSG80-54	B	0.02		
DC-15	23-Jan-80	CSG80-54	BA	0.068		
DC-15	23-Jan-80	CSG80-54	C13	-16.2		
DC-15	23-Jan-80	CSG80-54	C14PMC	4.9		
DC-15	23-Jan-80	CSG80-54	CA	8.97		
DC-15	23-Jan-80	CSG80-54	CL	8.1		
DC-15	23-Jan-80	CSG80-54	CO	0.01	<	
DC-15	23-Jan-80	CSG80-54	CR	0.003	<	
DC-15	23-Jan-80	CSG80-54	CU	0.002	<	
DC-15	23-Jan-80	CSG80-54	D	-145		
DC-15	23-Jan-80	CSG80-54	F	1		
DC-15	23-Jan-80	CSG80-54	FE	0.05		
DC-15	23-Jan-80	CSG80-54	FIELD ALK	157.9		
DC-15	23-Jan-80	CSG80-54	FIELD COND	301.9		
DC-15	23-Jan-80	CSG80-54	K	12.6		
DC-15	23-Jan-80	CSG80-54	LI	0.02	<	
DC-15	23-Jan-80	CSG80-54	MG	2.45		
DC-15	23-Jan-80	CSG80-54	MN	0.02	<	
DC-15	23-Jan-80	CSG80-54	MO	0.03	<	
DC-15	23-Jan-80	CSG80-54	NA	58.2		
DC-15	23-Jan-80	CSG80-54	NI	0.02	<	
DC-15	23-Jan-80	CSG80-54	O18	-17.4		
DC-15	23-Jan-80	CSG80-54	P	0.28		
DC-15	23-Jan-80	CSG80-54	PB	0.1	<	
DC-15	23-Jan-80	CSG80-54	SAMP.TEMP	18.1		
DC-15	23-Jan-80	CSG80-54	SI	25.5		

9 2 1 2 6 5 1 2 4 6

CONFINED AQUIFER (sheet 6 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
DC-15	23-Jan-80	CSG80-54	SR	0.051		
DC-15	23-Jan-80	CSG80-54	T	-0.25		
DC-15	23-Jan-80	CSG80-54	TURB	1		
DC-15	23-Jan-80	CSG80-54	ZN	0.02		
299-E26-08	18-May-82	SITE-166	CA	19		
299-E26-08	18-May-82	SITE-166	CHG BAL	-5.626		
299-E26-08	18-May-82	SITE-166	CL	7.9		
299-E26-08	18-May-82	SITE-166	F	0.51		
299-E26-08	18-May-82	SITE-166	FE	0.03	<	
299-E26-08	18-May-82	SITE-166	FIELD ALK	99		
299-E26-08	18-May-82	SITE-166	FIELD COND	360		
299-E26-08	18-May-82	SITE-166	FIELD PH	8.5		
299-E26-08	18-May-82	SITE-166	K	10.4		
299-E26-08	18-May-82	SITE-166	LAB PH	8.4		
299-E26-08	18-May-82	SITE-166	MG	8.2		
299-E26-08	18-May-82	SITE-166	NA	20		
299-E26-08	18-May-82	SITE-166	NO3	8		
299-E26-08	18-May-82	SITE-166	SAMP.TEMP	21.3		
299-E26-08	18-May-82	SITE-166	SI	37		
299-E26-08	18-May-82	SITE-166	SO4	35		
299-E26-08	18-May-82	SITE-166	T	-0.03		
699-49-55B	27-May-82	SITE-183	CA	38		
699-49-55B	27-May-82	SITE-184	CA	38		
699-49-55B	27-May-82	SITE-183	CHG BAL	2.898		
699-49-55B	27-May-82	SITE-184	CHG BAL	6.042		
699-49-55B	27-May-82	SITE-184	FIELD ALK	122		
699-49-55B	27-May-82	SITE-183	FIELD ALK	120		
699-49-55B	27-May-82	SITE-184	FIELD COND	365		
699-49-55B	27-May-82	SITE-183	FIELD COND	375		

9 2 1 2 6 5 5 1 2 4 7

CONFINED AQUIFER (sheet 7 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
699-49-55B	27-May-82	SITE-183	FIELD PH	7.8		
699-49-55B	27-May-82	SITE-184	FIELD PH	7.8		
699-49-55B	27-May-82	SITE-184	K	6.8		
699-49-55B	27-May-82	SITE-183	K	6.9		
699-49-55B	27-May-82	SITE-184	LAB PH	7.6		
699-49-55B	27-May-82	SITE-183	LAB PH	7.6		
699-49-55B	27-May-82	SITE-183	MG	11.9		
699-49-55B	27-May-82	SITE-184	MG	12.2		
699-49-55B	27-May-82	SITE-183	NA	11		
699-49-55B	27-May-82	SITE-184	NA	12		
699-49-55B	27-May-82	SITE-183	NO3	1.5		
699-49-55B	27-May-82	SITE-184	NO3	1.5		
699-49-55B	27-May-82	SITE-184	SAMP.TEMP	18.4		
699-49-55B	27-May-82	SITE-183	SAMP.TEMP	18.1		
699-49-55B	27-May-82	SITE-183	SI	34		
699-49-55B	27-May-82	SITE-184	SI	34		
699-49-55B	27-May-82	SITE-183	SO4	20		
699-49-55B	27-May-82	SITE-184	SO4	21		
699-49-55B	27-May-82	SITE-183	T	0.24		
699-49-55B	27-May-82	SITE-184	T	0.25		
699-50-45	06-Aug-82	SITE-186	BA	0.09		
699-50-45	06-Aug-82	SITE-186	CA	92		
699-50-45	29-May-80	SITE-203	CA	30.02		
699-50-45	06-Aug-82	SITE-186	CHG BAL	33.736		
699-50-45	06-Aug-82	SITE-186	CO	0.012	<	
699-50-45	06-Aug-82	SITE-186	CR	0.01	<	
699-50-45	06-Aug-82	SITE-186	CU	0.001	<	
699-50-45	06-Aug-82	SITE-186	FE	0.04		
699-50-45	06-Aug-82	SITE-186	FIELD ALK	114		

9 2 1 2 6 5 1 2 4 8

CONFINED AQUIFER (sheet 8 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
699-50-45	29-May-80	SITE-203	FIELD COND	301.1		
699-50-45	06-Aug-82	SITE-186	FIELD COND	410		
699-50-45	29-May-80	SITE-203	FIELD PH	7.4		
699-50-45	06-Aug-82	SITE-186	FIELD PH	7.6		
699-50-45	29-May-80	SITE-203	K	5.71		
699-50-45	06-Aug-82	SITE-186	K	6		
699-50-45	06-Aug-82	SITE-186	LAB PH	8.2		
699-50-45	06-Aug-82	SITE-186	MG	15.7		
699-50-45	29-May-80	SITE-203	MG	10.21		
699-50-45	29-May-80	SITE-203	NA	16.39		
699-50-45	06-Aug-82	SITE-186	NA	17		
699-50-45	06-Aug-82	SITE-186	NI	0.006	<	
699-50-45	29-May-80	SITE-203	NO3	0.93		
699-50-45	06-Aug-82	SITE-186	NO3	3.1		
699-50-45	06-Aug-82	SITE-186	PB	0.025	<	
699-50-45	29-May-80	SITE-203	SAMP.TEMP	16.8		
699-50-45	06-Aug-82	SITE-186	SAMP.TEMP	17.6		
699-50-45	06-Aug-82	SITE-186	SI	27		
699-50-45	06-Aug-82	SITE-186	SO4	18		
699-50-45	29-May-80	SITE-203	SO4	20.52		
699-50-45	29-May-80	SITE-203	T	0.16		
699-50-45	06-Aug-82	SITE-186	T	0.36		
699-50-45	06-Aug-82	SITE-186	ZN	0.117		
699-52-46	04-Aug-82	SITE-188	BA	0.087		
699-52-46	06-May-80	SITE-201	CA	32.02		
699-52-46	04-Aug-82	SITE-188	CA	19		
699-52-46	04-Aug-82	SITE-188	CO	0.16	<	
699-52-46	04-Aug-82	SITE-188	CU	0.001	<	
699-52-46	04-Aug-82	SITE-188	FE	0.3		

9 2 1 2 6 3 5 1 2 4 9

CONFINED AQUIFER (sheet 9 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
699-52-46	04-Aug-82	SITE-188	FIELD ALK	86		
699-52-46	06-May-80	SITE-201	FIELD COND	254.9		
699-52-46	04-Aug-82	SITE-188	FIELD COND	320		
699-52-46	06-May-80	SITE-201	FIELD PH	8.9		
699-52-46	04-Aug-82	SITE-188	FIELD PH	8.6		
699-52-46	04-Aug-82	SITE-188	K	9.2		
699-52-46	06-May-80	SITE-201	K	9.31		
699-52-46	04-Aug-82	SITE-188	LAB PH	8.8		
699-52-46	06-May-80	SITE-201	MG	4.23		
699-52-46	04-Aug-82	SITE-188	MG	2.2		
699-52-46	04-Aug-82	SITE-188	NA	21		
699-52-46	06-May-80	SITE-201	NA	20		
699-52-46	04-Aug-82	SITE-188	NI	0.003	<	
699-52-46	04-Aug-82	SITE-188	PB	0.016	<	
699-52-46	06-May-80	SITE-201	SAMP.TEMP	16.5		
699-52-46	04-Aug-82	SITE-188	SAMP.TEMP	17.3		
699-52-46	04-Aug-82	SITE-188	SI	32		
699-52-46	06-May-80	SITE-201	T	-0.06		
699-52-46	04-Aug-82	SITE-188	T	0.57		
699-52-46	04-Aug-82	SITE-188	ZN	0.15		
699-52-48	10-Aug-82	SITE-190	BA	0.064		
699-52-48	08-Apr-80	SITE-199	CA	14.43		
699-52-48	10-Aug-82	SITE-190	CA	6.2		
699-52-48	10-Aug-82	SITE-190	CHG BAL	-12.522		
699-52-48	08-Apr-80	SITE-199	CL	4.99		
699-52-48	10-Aug-82	SITE-190	CL	4		
699-52-48	10-Aug-82	SITE-190	CO	0.008	<	
699-52-48	10-Aug-82	SITE-190	CR	0.007	<	
699-52-48	10-Aug-82	SITE-190	CU	0.001	<	

9 2 1 2 6 5 1 2 5 0

CONFINED AQUIFER (sheet 10 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
699-52-48	08-Apr-80	SITE-199	F	0.71		
699-52-48	10-Aug-82	SITE-190	F	0.64		
699-52-48	10-Aug-82	SITE-190	FE	0.03	<	
699-52-48	10-Aug-82	SITE-190	FIELD ALK	147		
699-52-48	10-Aug-82	SITE-190	FIELD COND	400		
699-52-48	08-Apr-80	SITE-199	FIELD COND	330.7		
699-52-48	10-Aug-82	SITE-190	FIELD PH	8.05		
699-52-48	08-Apr-80	SITE-199	FIELD PH	7.4		
699-52-48	10-Aug-82	SITE-190	K	6.4		
699-52-48	08-Apr-80	SITE-199	K	6.69		
699-52-48	10-Aug-82	SITE-190	LAB PH	8		
699-52-48	10-Aug-82	SITE-190	MG	1.9		
699-52-48	08-Apr-80	SITE-199	MG	3.06		
699-52-48	10-Aug-82	SITE-190	MN	0.005		
699-52-48	08-Apr-80	SITE-199	NA	51.7		
699-52-48	10-Aug-82	SITE-190	NA	50		
699-52-48	10-Aug-82	SITE-190	NI	0.003	<	
699-52-48	10-Aug-82	SITE-190	NO3	1.3		
699-52-48	10-Aug-82	SITE-190	PB	0.018	<	
699-52-48	08-Apr-80	SITE-199	SAMP.TEMP	16.8		
699-52-48	10-Aug-82	SITE-190	SAMP.TEMP	17.9		
699-52-48	10-Aug-82	SITE-190	SI	28		
699-52-48	08-Apr-80	SITE-199	SO4	35.27		
699-52-48	10-Aug-82	SITE-190	SO4	24		
699-52-48	08-Apr-80	SITE-199	T	0.26		
699-52-48	10-Aug-82	SITE-190	T	0.28		
699-52-48	10-Aug-82	SITE-190	ZN	0.088		
699-53-50	14-Jul-82	SITE-191	BA	0.053		
699-53-50	14-Jul-82	SITE-191	CA	30		

9 2 1 2 6 3 5 5 1 2 5 1

CONFINED AQUIFER (sheet 11 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
699-53-50	17-Apr-80	SITE-200	CA	28.98		
699-53-50	14-Jul-82	SITE-191	CHG BAL	-0.907		
699-53-50	14-Jul-82	SITE-191	CL	21		
699-53-50	17-Apr-80	SITE-200	CL	20.99		
699-53-50	14-Jul-82	SITE-191	CO	0.01	<	
699-53-50	14-Jul-82	SITE-191	CU	0.001	<	
699-53-50	14-Jul-82	SITE-191	F	0.6		
699-53-50	17-Apr-80	SITE-200	F	0.42		
699-53-50	14-Jul-82	SITE-191	FE	0.08		
699-53-50	14-Jul-82	SITE-191	FIELD ALK	114		
699-53-50	14-Jul-82	SITE-191	FIELD COND	365		
699-53-50	17-Apr-80	SITE-200	FIELD COND	306.8		
699-53-50	14-Jul-82	SITE-191	FIELD PH	7.65		
699-53-50	17-Apr-80	SITE-200	FIELD PH	7.2		
699-53-50	14-Jul-82	SITE-191	K	7.3		
699-53-50	17-Apr-80	SITE-200	K	7.12		
699-53-50	14-Jul-82	SITE-191	LAB PH	7.6		
699-53-50	14-Jul-82	SITE-191	MG	10.9		
699-53-50	17-Apr-80	SITE-200	MG	8.63		
699-53-50	17-Apr-80	SITE-200	NA	20.39		
699-53-50	14-Jul-82	SITE-191	NA	21		
699-53-50	14-Jul-82	SITE-191	NI	0.014	<	
699-53-50	14-Jul-82	SITE-191	NO3	3.1		
699-53-50	17-Apr-80	SITE-200	NO3	1.05		
699-53-50	14-Jul-82	SITE-191	PB	0.013	<	
699-53-50	17-Apr-80	SITE-200	SAMP.TEMP	16.8		
699-53-50	14-Jul-82	SITE-191	SAMP.TEMP	17.2		
699-53-50	14-Jul-82	SITE-191	SI	33		
699-53-50	17-Apr-80	SITE-200	SO4	18.93		

9 2 1 2 6 5 1 2 5 2

CONFINED AQUIFER (sheet 12 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
699-53-50	14-Jul-82	SITE-191	SO4	29		
699-53-50	17-Apr-80	SITE-200	T	1.79		
699-53-50	14-Jul-82	SITE-191	T	0.45		
699-53-50	14-Jul-82	SITE-191	ZN	0.12		
699-54-57	17-May-82	SITE-192	BA	0.129		
699-54-57	17-May-82	SITE-192	CA	25		
699-54-57	17-May-82	SITE-192	CHG BAL	-12.233		
699-54-57	17-May-82	SITE-192	CL	12.9		
699-54-57	17-May-82	SITE-192	CU	0.001	<	
699-54-57	17-May-82	SITE-192	F	0.53		
699-54-57	17-May-82	SITE-192	FE	0.03	<	
699-54-57	17-May-82	SITE-192	FIELD ALK	117		
699-54-57	17-May-82	SITE-192	FIELD COND	350		
699-54-57	17-May-82	SITE-192	FIELD PH	7.8		
699-54-57	17-May-82	SITE-192	K	7.2		
699-54-57	17-May-82	SITE-192	LAB PH	7.6		
699-54-57	17-May-82	SITE-192	MG	11.6		
699-54-57	17-May-82	SITE-192	NA	2.3		
699-54-57	17-May-82	SITE-192	NI	0.014	<	
699-54-57	17-May-82	SITE-192	NO3	1.9		
699-54-57	17-May-82	SITE-192	PB	0.016	<	
699-54-57	17-May-82	SITE-192	SAMP.TEMP	18.7		
699-54-57	17-May-82	SITE-192	SI	33		
699-54-57	17-May-82	SITE-192	SO4	20		
699-54-57	17-May-82	SITE-192	T	0.02		
699-54-57	17-May-82	SITE-192	ZN	0.226		
699-56-53	03-Jun-82	SITE-196	BA	0.096		
699-56-53	03-Jun-82	SITE-197	BA	0.096		
699-56-53	03-Jun-82	SITE-197	CA	38		

9 2 1 2 6 6 5 1 2 5 3

CONFINED AQUIFER (sheet 13 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
699-56-53	03-Jun-82	SITE-196	CA	38		
699-56-53	03-Jun-82	SITE-196	CHG BAL	8.508		
699-56-53	03-Jun-82	SITE-197	CHG BAL	9.19		
699-56-53	03-Jun-82	SITE-197	CL	27		
699-56-53	03-Jun-82	SITE-196	CL	28		
699-56-53	03-Jun-82	SITE-196	CO	0.012	<	
699-56-53	03-Jun-82	SITE-197	CO	0.012	<	
699-56-53	03-Jun-82	SITE-196	CU	0.001	<	
699-56-53	03-Jun-82	SITE-197	CU	0.001	<	
699-56-53	03-Jun-82	SITE-197	F	0.14		
699-56-53	03-Jun-82	SITE-196	F	0.2		
699-56-53	03-Jun-82	SITE-197	FE	0.03	<	
699-56-53	03-Jun-82	SITE-196	FE	0.03	<	
699-56-53	03-Jun-82	SITE-197	FIELD ALK	129		
699-56-53	03-Jun-82	SITE-196	FIELD ALK	130		
699-56-53	03-Jun-82	SITE-196	FIELD PH	7.75		
699-56-53	03-Jun-82	SITE-197	FIELD PH	7.85		
699-56-53	03-Jun-82	SITE-196	K	6.8		
699-56-53	03-Jun-82	SITE-197	K	6.6		
699-56-53	03-Jun-82	SITE-197	LAB PH	7.6		
699-56-53	03-Jun-82	SITE-196	LAB PH	7.5		
699-56-53	03-Jun-82	SITE-196	MG	13.2		
699-56-53	03-Jun-82	SITE-197	MG	13.5		
699-56-53	03-Jun-82	SITE-197	NA	21		
699-56-53	03-Jun-82	SITE-196	NA	21		
699-56-53	03-Jun-82	SITE-196	NI	0.014	<	
699-56-53	03-Jun-82	SITE-197	NI	0.014	<	
699-56-53	03-Jun-82	SITE-197	NO3	0.62		
699-56-53	03-Jun-82	SITE-196	NO3	0.62		

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CONFINED AQUIFER (sheet 14 of 14)

Well	Date	Sample ID	Constituent	Result	LT	Error
699-56-53	03-Jun-82	SITE-197	PB	0.023	<	
699-56-53	03-Jun-82	SITE-196	PB	0.023	<	
699-56-53	03-Jun-82	SITE-196	SAMP.TEMP	17.4		
699-56-53	03-Jun-82	SITE-197	SAMP.TEMP	18.4		
699-56-53	03-Jun-82	SITE-196	SI	20		
699-56-53	03-Jun-82	SITE-197	SI	19		
699-56-53	03-Jun-82	SITE-197	SO4	2		
699-56-53	03-Jun-82	SITE-196	SO4	1	<	
699-56-53	03-Jun-82	SITE-196	T	0.42		
699-56-53	03-Jun-82	SITE-197	T	-0.02		
699-56-53	03-Jun-82	SITE-196	ZN	0.149		
699-56-53	03-Jun-82	SITE-197	ZN	0.149		

APPENDIX A

A-3 SURFACE WATERS

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SURFACE WATERS (sheet 1 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	01-Aug-84	P84-361	AL	0.065	<	
CR-V-BR	01-Aug-84	P84-330	AL	0.065	<	
CR-V-BR	07-Aug-84	P84-311	AL	0.065	<	
CR-V-BR	07-Aug-84	P84-356	AL	0.065	<	
CR-V-BR	11-Apr-85	P85-207	AL	0.06	<	
CR-V-BR	11-Apr-85	P85-206	AL	0.06	<	
CR-V-BR	26-Jul-85	P85-267	AL	0.06	<	
CR-V-BR	26-Jul-85	P85-266	AL	0.06	<	
CR-V-BR	06-Nov-85	B86-70	AL	0.2	<	
CR-V-BR	06-Nov-85	B86-71	AL	0.2	<	
CR-V-BR	27-Jan-86	B86-109	AL	0.2	<	
CR-V-BR	27-Jan-86	B86-110	AL	0.2	<	
CR-V-BR	20-May-86	B86-238	AL	0.2	<	
CR-V-BR	20-May-86	B86-237	AL	0.2	<	
CR-V-BR	08-Sep-86	B86-328	AL	0.141	<	
CR-V-BR	08-Sep-86	B86-327	AL	0.141	<	
CR-V-BR	14-Nov-86	B87-028	AL	0.141	<	
CR-V-BR	14-Nov-86	B87-029	AL	0.141	<	
CR-V-BR	01-Aug-84	P84-330	B	0.014	<	
CR-V-BR	01-Aug-84	P84-361	B	0.014	<	
CR-V-BR	07-Aug-84	P84-311	B	0.014	<	
CR-V-BR	07-Aug-84	P84-356	B	0.014	<	
CR-V-BR	11-Apr-85	P85-206	B	0.016	<	
CR-V-BR	11-Apr-85	P85-207	B	0.016	<	
CR-V-BR	26-Jul-85	P85-266	B	0.015	<	
CR-V-BR	26-Jul-85	P85-267	B	0.015	<	
CR-V-BR	06-Nov-85	B86-71	B	0.1	<	
CR-V-BR	06-Nov-85	B86-70	B	0.1	<	
CR-V-BR	27-Jan-86	B86-109	B	0.1	<	

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SURFACE WATERS (sheet 2 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	27-Jan-86	B86-110	B	0.1	<	
CR-V-BR	20-May-86	B86-237	B	0.1	<	
CR-V-BR	20-May-86	B86-238	B	0.1	<	
CR-V-BR	08-Sep-86	B86-328	B	0.071	<	
CR-V-BR	08-Sep-86	B86-327	B	0.071	<	
CR-V-BR	14-Nov-86	B87-029	B	0.071	<	
CR-V-BR	14-Nov-86	B87-028	B	0.071	<	
CR-V-BR	01-Aug-84	P84-330	BA	0.028		
CR-V-BR	01-Aug-84	P84-361	BA	0.028		
CR-V-BR	07-Aug-84	P84-311	BA	0.028		
CR-V-BR	07-Aug-84	P84-356	BA	0.03		
CR-V-BR	11-Apr-85	P85-206	BA	0.032		
CR-V-BR	11-Apr-85	P85-207	BA	0.032		
CR-V-BR	26-Jul-85	P85-267	BA	0.023		
CR-V-BR	26-Jul-85	P85-266	BA	0.025		
CR-V-BR	06-Nov-85	B86-70	BA	0.028		
CR-V-BR	06-Nov-85	B86-71	BA	0.028		
CR-V-BR	27-Jan-86	B86-109	BA	0.028		
CR-V-BR	27-Jan-86	B86-110	BA	0.029		
CR-V-BR	20-May-86	B86-238	BA	0.03		
CR-V-BR	20-May-86	B86-237	BA	0.03		
CR-V-BR	08-Sep-86	B86-327	BA	0.026		
CR-V-BR	08-Sep-86	B86-328	BA	0.026		
CR-V-BR	14-Nov-86	B87-028	BA	0.029		
CR-V-BR	14-Nov-86	B87-029	BA	0.028		
CR-V-BR	07-Aug-84	P84-311	C13	-7.5		
CR-V-BR	11-Apr-85	P85-206	C13	-5.9		
CR-V-BR	26-Jul-85	P85-266	C13	-6.2		
CR-V-BR	20-May-86	B86-237	C13	-5.7		

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SURFACE WATERS (sheet 3 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	08-Sep-86	B86-327	C13	-6		
CR-V-BR	14-Nov-86	B87-028	C13	-7.2		
CR-V-BR	07-Aug-84	P84-311	C14PMC	98.6		
CR-V-BR	11-Apr-85	P85-206	C14PMC	90.1		
CR-V-BR	26-Jul-85	P85-266	C14PMC	107.7		
CR-V-BR	20-May-86	B86-237	C14PMC	105.6		
CR-V-BR	08-Sep-86	B86-327	C14PMC	100.7		
CR-V-BR	14-Nov-86	B87-028	C14PMC	105.9		
CR-V-BR	01-Aug-84	P84-361	CA	15.8		
CR-V-BR	01-Aug-84	P84-330	CA	15.9		
CR-V-BR	07-Aug-84	P84-311	CA	15.9		
CR-V-BR	07-Aug-84	P84-356	CA	16		
CR-V-BR	11-Apr-85	P85-206	CA	22.2		
CR-V-BR	11-Apr-85	P85-207	CA	22.2		
CR-V-BR	26-Jul-85	P85-267	CA	16		
CR-V-BR	26-Jul-85	P85-266	CA	17.3		
CR-V-BR	06-Nov-85	B86-71	CA	18.8		
CR-V-BR	06-Nov-85	B86-70	CA	19.2		
CR-V-BR	27-Jan-86	B86-110	CA	19.7		
CR-V-BR	27-Jan-86	B86-109	CA	19.7		
CR-V-BR	20-May-86	B86-238	CA	19.9		
CR-V-BR	20-May-86	B86-237	CA	19.9		
CR-V-BR	08-Sep-86	B86-328	CA	18.697		
CR-V-BR	08-Sep-86	B86-327	CA	18.744		
CR-V-BR	14-Nov-86	B87-028	CA	20.418		
CR-V-BR	14-Nov-86	B87-029	CA	20.455		
CR-V-BR	07-Aug-84	P84-311	CHG BAL	0.674		
CR-V-BR	07-Aug-84	P84-356	CHG BAL	0.875		
CR-V-BR	11-Apr-85	P85-206	CHG BAL	3.391		

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SURFACE WATERS (sheet 4 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	11-Apr-85	P85-207	CHG BAL	3.641		
CR-V-BR	26-Jul-85	P85-266	CHG BAL	0.419		
CR-V-BR	26-Jul-85	P85-267	CHG BAL	-3.267		
CR-V-BR	06-Nov-85	B86-70	CHG BAL	3.226		
CR-V-BR	06-Nov-85	B86-71	CHG BAL	1.739		
CR-V-BR	27-Jan-86	B86-109	CHG BAL	1.184		
CR-V-BR	27-Jan-86	B86-110	CHG BAL	1.165		
CR-V-BR	20-May-86	B86-237	CHG BAL	-0.472		
CR-V-BR	20-May-86	B86-238	CHG BAL	-0.517		
CR-V-BR	08-Sep-86	B86-327	CHG BAL	1.85		
CR-V-BR	08-Sep-86	B86-328	CHG BAL	1.965		
CR-V-BR	14-Nov-86	B87-029	CHG BAL	3.375		
CR-V-BR	14-Nov-86	B87-028	CHG BAL	3.167		
CR-V-BR	01-Aug-84	P84-330	CL	1.6		
CR-V-BR	01-Aug-84	P84-361	CL	1.6		
CR-V-BR	07-Aug-84	P84-311	CL	1.7		
CR-V-BR	07-Aug-84	P84-356	CL	1.7		
CR-V-BR	11-Apr-85	P85-206	CL	1.1		
CR-V-BR	11-Apr-85	P85-207	CL	1.1		
CR-V-BR	26-Jul-85	P85-267	CL	1.01		
CR-V-BR	26-Jul-85	P85-266	CL	1.02		
CR-V-BR	06-Nov-85	B86-70	CL	0.87		
CR-V-BR	06-Nov-85	B86-71	CL	0.93		
CR-V-BR	27-Jan-86	B86-109	CL	1.07		
CR-V-BR	27-Jan-86	B86-110	CL	1.1		
CR-V-BR	20-May-86	B86-237	CL	1.08		
CR-V-BR	20-May-86	B86-238	CL	0.9		
CR-V-BR	08-Sep-86	B86-327	CL	0.99		
CR-V-BR	08-Sep-86	B86-328	CL	0.9		

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SURFACE WATERS (sheet 5 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	14-Nov-86	B87-028	CL	1.05		
CR-V-BR	14-Nov-86	B87-029	CL	1		
CR-V-BR	01-Aug-84	P84-361	CO	0.017	<	
CR-V-BR	01-Aug-84	P84-330	CO	0.017	<	
CR-V-BR	07-Aug-84	P84-311	CO	0.017	<	
CR-V-BR	07-Aug-84	P84-356	CO	0.017	<	
CR-V-BR	11-Apr-85	P85-206	CO	0.017	<	
CR-V-BR	11-Apr-85	P85-207	CO	0.017	<	
CR-V-BR	26-Jul-85	P85-267	CO	0.02	<	
CR-V-BR	26-Jul-85	P85-266	CO	0.02	<	
CR-V-BR	01-Aug-84	P84-330	CR	0.034	<	
CR-V-BR	01-Aug-84	P84-361	CR	0.034	<	
CR-V-BR	07-Aug-84	P84-311	CR	0.034	<	
CR-V-BR	07-Aug-84	P84-356	CR	0.034	<	
CR-V-BR	11-Apr-85	P85-207	CR	0.032	<	
CR-V-BR	11-Apr-85	P85-206	CR	0.032	<	
CR-V-BR	26-Jul-85	P85-266	CR	0.03	<	
CR-V-BR	26-Jul-85	P85-267	CR	0.03	<	
CR-V-BR	01-Aug-84	P84-330	CU	0.005	<	
CR-V-BR	01-Aug-84	P84-361	CU	0.005	<	
CR-V-BR	07-Aug-84	P84-311	CU	0.005	<	
CR-V-BR	07-Aug-84	P84-356	CU	0.005	<	
CR-V-BR	11-Apr-85	P85-206	CU	0.006	<	
CR-V-BR	11-Apr-85	P85-207	CU	0.006	<	
CR-V-BR	26-Jul-85	P85-266	CU	0.006	<	
CR-V-BR	26-Jul-85	P85-267	CU	0.006	<	
CR-V-BR	06-Nov-85	B86-71	CU	0.012	<	
CR-V-BR	06-Nov-85	B86-70	CU	0.012	<	
CR-V-BR	27-Jan-86	B86-109	CU	0.03	<	

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SURFACE WATERS (sheet 6 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	27-Jan-86	B86-110	CU	0.03	<	
CR-V-BR	20-May-86	B86-238	CU	0.03	<	
CR-V-BR	20-May-86	B86-237	CU	0.03	<	
CR-V-BR	08-Sep-86	B86-328	CU	0.021	<	
CR-V-BR	08-Sep-86	B86-327	CU	0.021	<	
CR-V-BR	14-Nov-86	B87-028	CU	0.021	<	
CR-V-BR	14-Nov-86	B87-029	CU	0.021	<	
CR-V-BR	07-Aug-84	P84-311	D	-128		
CR-V-BR	11-Apr-85	P85-206	D	-138		
CR-V-BR	26-Jul-85	P85-266	D	-125		
CR-V-BR	06-Nov-85	B86-71	D	-134		
CR-V-BR	06-Nov-85	B86-70	D	-146		
CR-V-BR	27-Jan-86	B86-109	D	-135		
CR-V-BR	20-May-86	B86-237	D	-130		
CR-V-BR	08-Sep-86	B86-327	D	-131		
CR-V-BR	14-Nov-86	B87-028	D	-129		
CR-V-BR	01-Aug-84	P84-330	F	0.5	<	
CR-V-BR	01-Aug-84	P84-361	F	0.5	<	
CR-V-BR	07-Aug-84	P84-356	F	0.5	<	
CR-V-BR	07-Aug-84	P84-311	F	0.5	<	
CR-V-BR	11-Apr-85	P85-207	F	0.29		
CR-V-BR	11-Apr-85	P85-206	F	0.32		
CR-V-BR	26-Jul-85	P85-267	F	0.2		
CR-V-BR	26-Jul-85	P85-266	F	0.19		
CR-V-BR	06-Nov-85	B86-70	F	0.23		
CR-V-BR	06-Nov-85	B86-71	F	0.25		
CR-V-BR	27-Jan-86	B86-110	F	0.13		
CR-V-BR	27-Jan-86	B86-109	F	0.13		
CR-V-BR	20-May-86	B86-238	F	0.23		

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SURFACE WATERS (sheet 7 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	20-May-86	B86-237	F	0.2		
CR-V-BR	08-Sep-86	B86-328	F	0.12		
CR-V-BR	08-Sep-86	B86-327	F	0.14		
CR-V-BR	14-Nov-86	B87-028	F	0.15		
CR-V-BR	14-Nov-86	B87-029	F	0.13		
CR-V-BR	01-Aug-84	P84-330	FE	0.007	<	
CR-V-BR	01-Aug-84	P84-361	FE	0.015		
CR-V-BR	07-Aug-84	P84-356	FE	0.007	<	
CR-V-BR	07-Aug-84	P84-311	FE	0.008	<	
CR-V-BR	11-Apr-85	P85-206	FE	0.009	<	
CR-V-BR	11-Apr-85	P85-207	FE	0.009	<	
CR-V-BR	26-Jul-85	P85-266	FE	0.009	<	
CR-V-BR	26-Jul-85	P85-267	FE	0.009	<	
CR-V-BR	06-Nov-85	B86-71	FE	0.03	<	
CR-V-BR	06-Nov-85	B86-70	FE	0.03	<	
CR-V-BR	27-Jan-86	B86-110	FE	0.03	<	
CR-V-BR	27-Jan-86	B86-109	FE	0.03	<	
CR-V-BR	20-May-86	B86-238	FE	0.03	<	
CR-V-BR	20-May-86	B86-237	FE	0.03	<	
CR-V-BR	08-Sep-86	B86-327	FE	0.021	<	
CR-V-BR	08-Sep-86	B86-328	FE	0.021	<	
CR-V-BR	14-Nov-86	B87-029	FE	0.021	<	
CR-V-BR	14-Nov-86	B87-028	FE	0.021	<	
CR-V-BR	07-Aug-84	P84-311	FIELD ALK	48		
CR-V-BR	11-Apr-85	P85-206	FIELD ALK	61.5		
CR-V-BR	26-Jul-85	P85-266	FIELD ALK	53		
CR-V-BR	06-Nov-85	B86-70	FIELD ALK	54		
CR-V-BR	27-Jan-86	B86-109	FIELD ALK	58.2		
CR-V-BR	20-May-86	B86-237	FIELD ALK	62		

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SURFACE WATERS (sheet 8 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	08-Sep-86	B86-327	FIELD ALK	56		
CR-V-BR	07-Aug-84	P84-311	FIELD PH	8		
CR-V-BR	11-Apr-85	P85-206	FIELD PH	8.5		
CR-V-BR	26-Jul-85	P85-266	FIELD PH	8.15		
CR-V-BR	06-Nov-85	B86-70	FIELD PH	7.5		
CR-V-BR	27-Jan-86	B86-109	FIELD PH	7.94		
CR-V-BR	20-May-86	B86-237	FIELD PH	8.71		
CR-V-BR	08-Sep-86	B86-327	FIELD PH	8.53		
CR-V-BR	14-Nov-86	B87-028	FIELD PH	7.44		
CR-V-BR	01-Aug-84	P84-330	K	0.72		
CR-V-BR	01-Aug-84	P84-361	K	0.75		
CR-V-BR	07-Aug-84	P84-311	K	0.72		
CR-V-BR	07-Aug-84	P84-356	K	0.69		
CR-V-BR	11-Apr-85	P85-206	K	0.91		
CR-V-BR	11-Apr-85	P85-207	K	0.83		
CR-V-BR	26-Jul-85	P85-266	K	0.42		
CR-V-BR	26-Jul-85	P85-267	K	0.41		
CR-V-BR	06-Nov-85	B86-70	K	0.59	<	
CR-V-BR	06-Nov-85	B86-71	K	0.59	<	
CR-V-BR	27-Jan-86	B86-110	K	0.74		
CR-V-BR	27-Jan-86	B86-109	K	0.742		
CR-V-BR	20-May-86	B86-237	K	0.805		
CR-V-BR	20-May-86	B86-238	K	0.733		
CR-V-BR	08-Sep-86	B86-328	K	0.697		
CR-V-BR	08-Sep-86	B86-327	K	0.686		
CR-V-BR	14-Nov-86	B87-028	K	0.79		
CR-V-BR	14-Nov-86	B87-029	K	0.761		
CR-V-BR	20-May-86	B86-237	LAB ALK	60		
CR-V-BR	07-Aug-84	P84-311	LAB ALK	49		

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SURFACE WATERS (sheet 9 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	11-Apr-85	P85-206	LAB ALK	63		
CR-V-BR	26-Jul-85	P85-266	LAB ALK	53		
CR-V-BR	06-Nov-85	B86-70	LAB ALK	59		
CR-V-BR	27-Jan-86	B86-109	LAB ALK	61.6		
CR-V-BR	08-Sep-86	B86-327	LAB ALK	55		
CR-V-BR	14-Nov-86	B87-028	LAB ALK	58		
CR-V-BR	07-Aug-84	P84-311	LAB COND	117		
CR-V-BR	11-Apr-85	P85-206	LAB COND	152		
CR-V-BR	26-Jul-85	P85-266	LAB COND	123		
CR-V-BR	06-Nov-85	B86-70	LAB COND	128		
CR-V-BR	27-Jan-86	B86-109	LAB COND	143		
CR-V-BR	20-May-86	B86-237	LAB COND	142		
CR-V-BR	08-Sep-86	B86-327	LAB COND	128		
CR-V-BR	14-Nov-86	B87-028	LAB COND	139		
CR-V-BR	07-Aug-84	P84-311	LAB PH	8.29		
CR-V-BR	11-Apr-85	P85-206	LAB PH	8.4		
CR-V-BR	26-Jul-85	P85-266	LAB PH	8.35		
CR-V-BR	06-Nov-85	B86-70	LAB PH	8.04		
CR-V-BR	27-Jan-86	B86-109	LAB PH	7.93		
CR-V-BR	20-May-86	B86-237	LAB PH	8.55		
CR-V-BR	08-Sep-86	B86-327	LAB PH	8.33		
CR-V-BR	14-Nov-86	B87-028	LAB PH	7.85		
CR-V-BR	01-Aug-84	P84-330	LI	0.008	<	
CR-V-BR	01-Aug-84	P84-361	LI	0.008	<	
CR-V-BR	07-Aug-84	P84-356	LI	0.008	<	
CR-V-BR	07-Aug-84	P84-311	LI	0.008	<	
CR-V-BR	11-Apr-85	P85-206	LI	0.008	<	
CR-V-BR	11-Apr-85	P85-207	LI	0.008	<	
CR-V-BR	26-Jul-85	P85-266	LI	0.008	<	

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SURFACE WATERS (sheet 10 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	26-Jul-85	P85-267	LI	0.008	<	
CR-V-BR	06-Nov-85	B86-70	LI	0.016	<	
CR-V-BR	06-Nov-85	B86-71	LI	0.016	<	
CR-V-BR	27-Jan-86	B86-109	LI	0.016	<	
CR-V-BR	27-Jan-86	B86-110	LI	0.016	<	
CR-V-BR	20-May-86	B86-238	LI	0.016	<	
CR-V-BR	20-May-86	B86-237	LI	0.016	<	
CR-V-BR	08-Sep-86	B86-327	LI	0.011	<	
CR-V-BR	08-Sep-86	B86-328	LI	0.011	<	
CR-V-BR	14-Nov-86	B87-029	LI	0.011	<	
CR-V-BR	14-Nov-86	B87-028	LI	0.011	<	
CR-V-BR	01-Aug-84	P84-330	MG	3.82		
CR-V-BR	01-Aug-84	P84-361	MG	3.8		
CR-V-BR	07-Aug-84	P84-356	MG	3.85		
CR-V-BR	07-Aug-84	P84-311	MG	3.83		
CR-V-BR	11-Apr-85	P85-207	MG	5.19		
CR-V-BR	11-Apr-85	P85-206	MG	5.22		
CR-V-BR	26-Jul-85	P85-266	MG	3.98		
CR-V-BR	26-Jul-85	P85-267	MG	3.67		
CR-V-BR	06-Nov-85	B86-70	MG	4.38		
CR-V-BR	06-Nov-85	B86-71	MG	4.29		
CR-V-BR	27-Jan-86	B86-110	MG	4.59		
CR-V-BR	27-Jan-86	B86-109	MG	4.59		
CR-V-BR	20-May-86	B86-238	MG	4.63		
CR-V-BR	20-May-86	B86-237	MG	4.63		
CR-V-BR	08-Sep-86	B86-328	MG	4.353		
CR-V-BR	08-Sep-86	B86-327	MG	4.364		
CR-V-BR	14-Nov-86	B87-028	MG	4.632		
CR-V-BR	14-Nov-86	B87-029	MG	4.626		

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SURFACE WATERS (sheet 11 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	01-Aug-84	P84-361	MN	0.003	<	
CR-V-BR	01-Aug-84	P84-330	MN	0.003	<	
CR-V-BR	07-Aug-84	P84-311	MN	0.003	<	
CR-V-BR	07-Aug-84	P84-356	MN	0.003	<	
CR-V-BR	11-Apr-85	P85-207	MN	0.005	<	
CR-V-BR	11-Apr-85	P85-206	MN	0.005	<	
CR-V-BR	26-Jul-85	P85-267	MN	0.005	<	
CR-V-BR	26-Jul-85	P85-266	MN	0.005	<	
CR-V-BR	06-Nov-85	B86-70	MN	0.01	<	
CR-V-BR	06-Nov-85	B86-71	MN	0.01	<	
CR-V-BR	27-Jan-86	B86-109	MN	0.01	<	
CR-V-BR	27-Jan-86	B86-110	MN	0.01	<	
CR-V-BR	20-May-86	B86-238	MN	0.01	<	
CR-V-BR	20-May-86	B86-237	MN	0.01	<	
CR-V-BR	08-Sep-86	B86-328	MN	0.007	<	
CR-V-BR	08-Sep-86	B86-327	MN	0.007	<	
CR-V-BR	14-Nov-86	B87-028	MN	0.007	<	
CR-V-BR	14-Nov-86	B87-029	MN	0.007	<	
CR-V-BR	01-Aug-84	P84-361	MO	0.038	<	
CR-V-BR	01-Aug-84	P84-330	MO	0.038	<	
CR-V-BR	07-Aug-84	P84-356	MO	0.038	<	
CR-V-BR	07-Aug-84	P84-311	MO	0.038	<	
CR-V-BR	11-Apr-85	P85-207	MO	0.034	<	
CR-V-BR	11-Apr-85	P85-206	MO	0.034	<	
CR-V-BR	26-Jul-85	P85-267	MO	0.03	<	
CR-V-BR	26-Jul-85	P85-266	MO	0.03	<	
CR-V-BR	06-Nov-85	B86-70	MO	0.6	<	
CR-V-BR	06-Nov-85	B86-71	MO	0.6	<	
CR-V-BR	27-Jan-86	B86-110	MO	0.6	<	

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SURFACE WATERS (sheet 12 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	27-Jan-86	B86-109	MO	0.6	<	
CR-V-BR	20-May-86	B86-237	MO	0.6	<	
CR-V-BR	20-May-86	B86-238	MO	0.6	<	
CR-V-BR	08-Sep-86	B86-327	MO	0.424	<	
CR-V-BR	08-Sep-86	B86-328	MO	0.424	<	
CR-V-BR	14-Nov-86	B87-028	MO	0.424	<	
CR-V-BR	14-Nov-86	B87-029	MO	0.424	<	
CR-V-BR	01-Aug-84	P84-330	NA	2.47		
CR-V-BR	01-Aug-84	P84-361	NA	2.43		
CR-V-BR	07-Aug-84	P84-311	NA	2.56		
CR-V-BR	07-Aug-84	P84-356	NA	2.54		
CR-V-BR	11-Apr-85	P85-206	NA	2.43		
CR-V-BR	11-Apr-85	P85-207	NA	2.43		
CR-V-BR	26-Jul-85	P85-267	NA	2.22		
CR-V-BR	26-Jul-85	P85-266	NA	2.26		
CR-V-BR	06-Nov-85	B86-70	NA	2.19		
CR-V-BR	06-Nov-85	B86-71	NA	2.07		
CR-V-BR	27-Jan-86	B86-110	NA	2.25		
CR-V-BR	27-Jan-86	B86-109	NA	2.25		
CR-V-BR	20-May-86	B86-237	NA	2.52		
CR-V-BR	20-May-86	B86-238	NA	2.52		
CR-V-BR	08-Sep-86	B86-327	NA	2.278		
CR-V-BR	08-Sep-86	B86-328	NA	2.278		
CR-V-BR	14-Nov-86	B87-029	NA	2.211		
CR-V-BR	14-Nov-86	B87-028	NA	2.191		
CR-V-BR	01-Aug-84	P84-361	NI	0.017	<	
CR-V-BR	01-Aug-84	P84-330	NI	0.017	<	
CR-V-BR	07-Aug-84	P84-356	NI	0.017	<	
CR-V-BR	07-Aug-84	P84-311	NI	0.017	<	

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SURFACE WATERS (sheet 13 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	11-Apr-85	P85-207	NI	0.03	<	
CR-V-BR	11-Apr-85	P85-206	NI	0.03	<	
CR-V-BR	26-Jul-85	P85-266	NI	0.03	<	
CR-V-BR	26-Jul-85	P85-267	NI	0.03	<	
CR-V-BR	27-Jan-86	B86-109	NO3	0.15		
CR-V-BR	08-Sep-86	B86-327	NO3	0.14		
CR-V-BR	08-Sep-86	B86-328	NO3	0.16		
CR-V-BR	07-Aug-84	P84-311	O18	-16.4		
CR-V-BR	11-Apr-85	P85-206	O18	-17.7		
CR-V-BR	26-Jul-85	P85-266	O18	-16.8		
CR-V-BR	06-Nov-85	B86-71	O18	-17.4		
CR-V-BR	06-Nov-85	B86-70	O18	-17.2		
CR-V-BR	27-Jan-86	B86-109	O18	-17.9		
CR-V-BR	20-May-86	B86-237	O18	-17		
CR-V-BR	08-Sep-86	B86-327	O18	-17.4		
CR-V-BR	14-Nov-86	B87-028	O18	-17		
CR-V-BR	07-Aug-84	P84-311	ORP	160		
CR-V-BR	11-Apr-85	P85-206	ORP	25		
CR-V-BR	26-Jul-85	P85-266	ORP	87		
CR-V-BR	06-Nov-85	B86-70	ORP	125		
CR-V-BR	27-Jan-86	B86-109	ORP	150		
CR-V-BR	20-May-86	B86-237	ORP	165		
CR-V-BR	08-Sep-86	B86-327	ORP	127		
CR-V-BR	14-Nov-86	B87-028	ORP	130		
CR-V-BR	01-Aug-84	P84-361	P	0.54	<	
CR-V-BR	01-Aug-84	P84-330	P	0.54	<	
CR-V-BR	07-Aug-84	P84-311	P	0.54	<	
CR-V-BR	07-Aug-84	P84-356	P	0.54	<	
CR-V-BR	01-Aug-84	P84-330	PB	0.2	<	

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SURFACE WATERS (sheet 14 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	01-Aug-84	P84-361	PB	0.2	<	
CR-V-BR	07-Aug-84	P84-311	PB	0.2	<	
CR-V-BR	07-Aug-84	P84-356	PB	0.2	<	
CR-V-BR	11-Apr-85	P85-206	PB	0.18	<	
CR-V-BR	11-Apr-85	P85-207	PB	0.18	<	
CR-V-BR	26-Jul-85	P85-267	PB	0.2	<	
CR-V-BR	26-Jul-85	P85-266	PB	0.02	<	
CR-V-BR	07-Aug-84	P84-311	S34	6.8		
CR-V-BR	11-Apr-85	P85-206	S34	9		
CR-V-BR	26-Jul-85	P85-266	S34	5.8		
CR-V-BR	20-May-86	B86-237	S34	2.2		
CR-V-BR	07-Aug-84	P84-311	SAMP.TEMP	20.7		
CR-V-BR	11-Apr-85	P85-206	SAMP.TEMP	11		
CR-V-BR	26-Jul-85	P85-266	SAMP.TEMP	20.2		
CR-V-BR	06-Nov-85	B86-70	SAMP.TEMP	11.9		
CR-V-BR	27-Jan-86	B86-109	SAMP.TEMP	11.9		
CR-V-BR	20-May-86	B86-237	SAMP.TEMP	11.7		
CR-V-BR	08-Sep-86	B86-327	SAMP.TEMP	19.8		
CR-V-BR	14-Nov-86	B87-028	SAMP.TEMP	10.7		
CR-V-BR	01-Aug-84	P84-330	SI	2.64		
CR-V-BR	01-Aug-84	P84-361	SI	2.62		
CR-V-BR	07-Aug-84	P84-311	SI	2.75		
CR-V-BR	07-Aug-84	P84-356	SI	2.74		
CR-V-BR	11-Apr-85	P85-207	SI	1.98		
CR-V-BR	11-Apr-85	P85-206	SI	2		
CR-V-BR	26-Jul-85	P85-266	SI	1.89		
CR-V-BR	26-Jul-85	P85-267	SI	1.88		
CR-V-BR	06-Nov-85	B86-71	SI	1.96		
CR-V-BR	06-Nov-85	B86-70	SI	1.96		

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SURFACE WATERS (sheet 15 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	27-Jan-86	B86-109	SI	2.09		
CR-V-BR	27-Jan-86	B86-110	SI	2.08		
CR-V-BR	20-May-86	B86-237	SI	1.8		
CR-V-BR	20-May-86	B86-238	SI	1.8		
CR-V-BR	08-Sep-86	B86-328	SI	1.776		
CR-V-BR	08-Sep-86	B86-327	SI	1.781		
CR-V-BR	14-Nov-86	B87-029	SI	2.278		
CR-V-BR	14-Nov-86	B87-028	SI	2.266		
CR-V-BR	01-Aug-84	P84-361	SO4	8.8		
CR-V-BR	01-Aug-84	P84-330	SO4	8.8		
CR-V-BR	07-Aug-84	P84-311	SO4	9		
CR-V-BR	07-Aug-84	P84-356	SO4	9		
CR-V-BR	11-Apr-85	P85-206	SO4	13.4		
CR-V-BR	11-Apr-85	P85-207	SO4	12.9		
CR-V-BR	26-Jul-85	P85-267	SO4	9.12		
CR-V-BR	26-Jul-85	P85-266	SO4	9.13		
CR-V-BR	06-Nov-85	B86-71	SO4	11		
CR-V-BR	06-Nov-85	B86-70	SO4	10.7		
CR-V-BR	27-Jan-86	B86-110	SO4	11.6		
CR-V-BR	27-Jan-86	B86-109	SO4	11.5		
CR-V-BR	20-May-86	B86-238	SO4	11.3		
CR-V-BR	20-May-86	B86-237	SO4	11.4		
CR-V-BR	08-Sep-86	B86-328	SO4	9.58		
CR-V-BR	08-Sep-86	B86-327	SO4	9.71		
CR-V-BR	14-Nov-86	B87-028	SO4	10.8		
CR-V-BR	14-Nov-86	B87-029	SO4	10.7		
CR-V-BR	01-Aug-84	P84-361	SR	0.075		
CR-V-BR	01-Aug-84	P84-330	SR	0.076		
CR-V-BR	07-Aug-84	P84-311	SR	0.076		

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SURFACE WATERS (sheet 16 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	07-Aug-84	P84-356	SR	0.077		
CR-V-BR	11-Apr-85	P85-206	SR	0.114		
CR-V-BR	11-Apr-85	P85-207	SR	0.114		
CR-V-BR	26-Jul-85	P85-267	SR	0.071		
CR-V-BR	26-Jul-85	P85-266	SR	0.077		
CR-V-BR	06-Nov-85	B86-70	SR	0.092		
CR-V-BR	06-Nov-85	B86-71	SR	0.09		
CR-V-BR	27-Jan-86	B86-110	SR	0.1		
CR-V-BR	27-Jan-86	B86-109	SR	0.096		
CR-V-BR	20-May-86	B86-237	SR	0.086		
CR-V-BR	20-May-86	B86-238	SR	0.087		
CR-V-BR	08-Sep-86	B86-328	SR	0.103		
CR-V-BR	08-Sep-86	B86-327	SR	0.103		
CR-V-BR	14-Nov-86	B87-028	SR	0.095		
CR-V-BR	14-Nov-86	B87-029	SR	0.095		
CR-V-BR	07-Aug-84	P84-311	T	29.7		
CR-V-BR	11-Apr-85	P85-206	T	29.8		
CR-V-BR	26-Jul-85	P85-266	T	25.1		
CR-V-BR	06-Nov-85	B86-70	T	25.9		
CR-V-BR	27-Jan-86	B86-109	T	27.4		
CR-V-BR	20-May-86	B86-237	T	23.6		
CR-V-BR	08-Sep-86	B86-327	T	24		
CR-V-BR	14-Nov-86	B87-028	T	20.2		
CR-V-BR	07-Aug-84	P84-311	TC	14.19		
CR-V-BR	11-Apr-85	P85-206	TC	16.31		
CR-V-BR	26-Jul-85	P85-266	TC	13.94		
CR-V-BR	06-Nov-85	B86-70	TC	15		
CR-V-BR	27-Jan-86	B86-109	TC	115.1		
CR-V-BR	20-May-86	B86-237	TC	15.1		

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SURFACE WATERS (sheet 17 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	08-Sep-86	B86-327	TC	13.7		
CR-V-BR	14-Nov-86	B87-028	TC	15		
CR-V-BR	07-Aug-84	P84-311	TOC	2.03		
CR-V-BR	11-Apr-85	P85-206	TOC	1.55		
CR-V-BR	26-Jul-85	P85-266	TOC	1.77		
CR-V-BR	06-Nov-85	B86-70	TOC	1.56		
CR-V-BR	27-Jan-86	B86-109	TOC	1.15		
CR-V-BR	20-May-86	B86-237	TOC	2.02		
CR-V-BR	08-Sep-86	B86-327	TOC	1.89		
CR-V-BR	14-Nov-86	B87-028	TOC	1.33		
CR-V-BR	07-Aug-84	P84-311	TURB	1.5		
CR-V-BR	11-Apr-85	P85-206	TURB	1.6		
CR-V-BR	26-Jul-85	P85-266	TURB	1.6		
CR-V-BR	06-Nov-85	B86-70	TURB	1.6		
CR-V-BR	27-Jan-86	B86-109	TURB	1.1		
CR-V-BR	20-May-86	B86-237	TURB	3.5		
CR-V-BR	08-Sep-86	B86-327	TURB	2.8		
CR-V-BR	14-Nov-86	B87-028	TURB	0.86		
CR-V-BR	01-Aug-84	P84-361	ZN	0.02	<	
CR-V-BR	01-Aug-84	P84-330	ZN	0.02	<	
CR-V-BR	07-Aug-84	P84-356	ZN	0.02	<	
CR-V-BR	07-Aug-84	P84-311	ZN	0.02	<	
CR-V-BR	11-Apr-85	P85-206	ZN	0.02	<	
CR-V-BR	11-Apr-85	P85-207	ZN	0.02	<	
CR-V-BR	26-Jul-85	P85-267	ZN	0.02	<	
CR-V-BR	26-Jul-85	P85-266	ZN	0.02	<	
CR-V-BR	06-Nov-85	B86-70	ZN	0.04	<	
CR-V-BR	06-Nov-85	B86-71	ZN	0.04	<	
CR-V-BR	27-Jan-86	B86-109	ZN	0.04	<	

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SURFACE WATERS (sheet 18 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
CR-V-BR	27-Jan-86	B86-110	ZN	0.04	<	
CR-V-BR	20-May-86	B86-237	ZN	0.04	<	
CR-V-BR	20-May-86	B86-238	ZN	0.04	<	
CR-V-BR	08-Sep-86	B86-327	ZN	0.028	<	
CR-V-BR	08-Sep-86	B86-328	ZN	0.028	<	
CR-V-BR	14-Nov-86	B87-028	ZN	0.028	<	
CR-V-BR	14-Nov-86	B87-029	ZN	0.028	<	
YR-HR	18-Apr-85	P85-210	AL	0.06	<	
YR-HR	18-Apr-85	P85-211	AL	0.06	<	
YR-HR	26-Jul-85	P85-269	AL	0.1	<	
YR-HR	26-Jul-85	P85-270	AL	0.1	<	
YR-HR	04-Nov-85	B86-68	AL	0.2	<	
YR-HR	04-Nov-85	B86-67	AL	0.2	<	
YR-HR	29-Jan-86	B86-119	AL	0.2	<	
YR-HR	29-Jan-86	B86-118	AL	0.2	<	
YR-HR	15-May-86	B86-231	AL	0.2	<	
YR-HR	15-May-86	B86-232	AL	0.2	<	
YR-HR	09-Sep-86	B86-331	AL	0.141	<	
YR-HR	09-Sep-86	B86-330	AL	0.141	<	
YR-HR	10-Nov-86	B87-025	AL	0.14	<	
YR-HR	10-Nov-86	B87-026	AL	0.14	<	
YR-HR	18-Apr-85	P85-211	B	0.018		
YR-HR	18-Apr-85	P85-210	B	0.016	<	
YR-HR	26-Jul-85	P85-270	B	0.05	<	
YR-HR	26-Jul-85	P85-269	B	0.05	<	
YR-HR	04-Nov-85	B86-67	B	0.1	<	
YR-HR	04-Nov-85	B86-68	B	0.1	<	
YR-HR	29-Jan-86	B86-118	B	0.1	<	
YR-HR	29-Jan-86	B86-119	B	0.1	<	

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SURFACE WATERS (sheet 19 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	15-May-86	B86-231	B	0.1	<	
YR-HR	15-May-86	B86-232	B	0.1	<	
YR-HR	09-Sep-86	B86-330	B	0.071	<	
YR-HR	09-Sep-86	B86-331	B	0.071	<	
YR-HR	10-Nov-86	B87-025	B	0.07	<	
YR-HR	10-Nov-86	B87-026	B	0.07	<	
YR-HR	18-Apr-85	P85-210	BA	0.012		
YR-HR	18-Apr-85	P85-211	BA	0.014		
YR-HR	26-Jul-85	P85-270	BA	0.026		
YR-HR	26-Jul-85	P85-269	BA	0.026		
YR-HR	04-Nov-85	B86-68	BA	0.019		
YR-HR	04-Nov-85	B86-67	BA	0.018		
YR-HR	29-Jan-86	B86-119	BA	0.018		
YR-HR	29-Jan-86	B86-118	BA	0.018		
YR-HR	15-May-86	B86-231	BA	0.022		
YR-HR	15-May-86	B86-232	BA	0.022		
YR-HR	09-Sep-86	B86-330	BA	0.026		
YR-HR	09-Sep-86	B86-331	BA	0.027		
YR-HR	10-Nov-86	B87-025	BA	0.021		
YR-HR	10-Nov-86	B87-026	BA	0.021		
YR-HR	18-Apr-85	P85-210	C13	-9.5		
YR-HR	26-Jul-85	P85-269	C13	-11.5		
YR-HR	15-May-86	B86-231	C13	-10.2		
YR-HR	09-Sep-86	B86-330	C13	-12.4		
YR-HR	10-Nov-86	B87-025	C13	-11.2		
YR-HR	18-Apr-85	P85-210	C14PMC	120		
YR-HR	26-Jul-85	P85-269	C14PMC	115.2		
YR-HR	15-May-86	B86-231	C14PMC	115.8		
YR-HR	09-Sep-86	B86-330	C14PMC	111.7		

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SURFACE WATERS (sheet 20 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	10-Nov-86	B87-025	C14PMC	108.3		
YR-HR	18-Apr-85	P85-210	CA	12.7		
YR-HR	18-Apr-85	P85-211	CA	12.8		
YR-HR	26-Jul-85	P85-269	CA	30.3		
YR-HR	26-Jul-85	P85-270	CA	29.8		
YR-HR	04-Nov-85	B86-68	CA	22.8		
YR-HR	04-Nov-85	B86-67	CA	22.8		
YR-HR	29-Jan-86	B86-118	CA	24.1		
YR-HR	29-Jan-86	B86-119	CA	24		
YR-HR	15-May-86	B86-231	CA	25.8		
YR-HR	15-May-86	B86-232	CA	26		
YR-HR	09-Sep-86	B86-330	CA	30.859		
YR-HR	09-Sep-86	B86-331	CA	31.215		
YR-HR	10-Nov-86	B87-026	CA	30.505		
YR-HR	10-Nov-86	B87-025	CA	30.639		
YR-HR	26-Jul-85	P85-270	CHG BAL	2.095		
YR-HR	26-Jul-85	P85-269	CHG BAL	2.823		
YR-HR	04-Nov-85	B86-68	CHG BAL	1.445		
YR-HR	04-Nov-85	B86-67	CHG BAL	1.901		
YR-HR	29-Jan-86	B86-118	CHG BAL	-0.455		
YR-HR	29-Jan-86	B86-119	CHG BAL	-0.737		
YR-HR	15-May-86	B86-231	CHG BAL	1.809		
YR-HR	15-May-86	B86-232	CHG BAL	1.974		
YR-HR	09-Sep-86	B86-331	CHG BAL	3.368		
YR-HR	09-Sep-86	B86-330	CHG BAL	2.983		
YR-HR	10-Nov-86	B87-025	CHG BAL	2.355		
YR-HR	10-Nov-86	B87-026	CHG BAL	1.86		
YR-HR	18-Apr-85	P85-210	CL	2.2		
YR-HR	18-Apr-85	P85-211	CL	2.2		

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SURFACE WATERS (sheet 21 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	26-Jul-85	P85-269	CL	6.17		
YR-HR	26-Jul-85	P85-270	CL	6.2		
YR-HR	04-Nov-85	B86-67	CL	5.5		
YR-HR	04-Nov-85	B86-68	CL	5.51		
YR-HR	29-Jan-86	B86-119	CL	6.8		
YR-HR	29-Jan-86	B86-118	CL	6.86		
YR-HR	15-May-86	B86-231	CL	5.28		
YR-HR	15-May-86	B86-232	CL	5.31		
YR-HR	09-Sep-86	B86-331	CL	5.89		
YR-HR	09-Sep-86	B86-330	CL	5.9		
YR-HR	10-Nov-86	B87-026	CL	7.65		
YR-HR	10-Nov-86	B87-025	CL	7.45		
YR-HR	18-Apr-85	P85-210	CO	0.017	<	
YR-HR	18-Apr-85	P85-211	CO	0.017	<	
YR-HR	18-Apr-85	P85-210	CR	0.032	<	
YR-HR	18-Apr-85	P85-211	CR	0.032	<	
YR-HR	18-Apr-85	P85-210	CU	0.006	<	
YR-HR	18-Apr-85	P85-211	CU	0.006	<	
YR-HR	26-Jul-85	P85-269	CU	0.006	<	
YR-HR	26-Jul-85	P85-270	CU	0.006	<	
YR-HR	04-Nov-85	B86-68	CU	0.012	<	
YR-HR	04-Nov-85	B86-67	CU	0.012	<	
YR-HR	29-Jan-86	B86-119	CU	0.03	<	
YR-HR	29-Jan-86	B86-118	CU	0.03	<	
YR-HR	15-May-86	B86-231	CU	0.03	<	
YR-HR	15-May-86	B86-232	CU	0.03	<	
YR-HR	09-Sep-86	B86-331	CU	0.021	<	
YR-HR	09-Sep-86	B86-330	CU	0.021	<	
YR-HR	10-Nov-86	B87-025	CU	0.021	<	

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SURFACE WATERS (sheet 22 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	10-Nov-86	B87-026	CU	0.021	<	
YR-HR	18-Apr-85	P85-210	D	-106		
YR-HR	26-Jul-85	P85-269	D	-103		
YR-HR	04-Nov-85	B86-67	D	-105		
YR-HR	29-Jan-86	B86-118	D	-105		
YR-HR	15-May-86	B86-231	D	-105		
YR-HR	09-Sep-86	B86-330	D	-98		
YR-HR	10-Nov-86	B87-025	D	-104		
YR-HR	26-Jul-85	P85-269	F	0.21		
YR-HR	26-Jul-85	P85-270	F	0.21		
YR-HR	04-Nov-85	B86-67	F	0.18		
YR-HR	04-Nov-85	B86-68	F	0.15		
YR-HR	29-Jan-86	B86-119	F	0.2		
YR-HR	29-Jan-86	B86-118	F	0.19		
YR-HR	15-May-86	B86-232	F	0.24		
YR-HR	15-May-86	B86-231	F	0.22		
YR-HR	09-Sep-86	B86-331	F	0.25		
YR-HR	09-Sep-86	B86-330	F	0.25		
YR-HR	10-Nov-86	B87-025	F	0.25		
YR-HR	10-Nov-86	B87-026	F	0.25		
YR-HR	18-Apr-85	P85-211	FE	0.079		
YR-HR	18-Apr-85	P85-210	FE	0.066		
YR-HR	26-Jul-85	P85-269	FE	0.015	<	
YR-HR	26-Jul-85	P85-270	FE	0.015	<	
YR-HR	04-Nov-85	B86-68	FE	0.043		
YR-HR	04-Nov-85	B86-67	FE	0.044		
YR-HR	29-Jan-86	B86-118	FE	0.03	<	
YR-HR	29-Jan-86	B86-119	FE	0.03	<	
YR-HR	15-May-86	B86-231	FE	0.03	<	

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SURFACE WATERS (sheet 23 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	15-May-86	B86-232	FE	0.03	<	
YR-HR	09-Sep-86	B86-331	FE	0.021	<	
YR-HR	09-Sep-86	B86-330	FE	0.021	<	
YR-HR	10-Nov-86	B87-025	FE	0.03		
YR-HR	10-Nov-86	B87-026	FE	0.029		
YR-HR	18-Apr-85	P85-210	FIELD ALK	51		
YR-HR	26-Jul-85	P85-269	FIELD ALK	121		
YR-HR	04-Nov-85	B86-67	FIELD ALK	97		
YR-HR	29-Jan-86	B86-118	FIELD ALK	107		
YR-HR	15-May-86	B86-231	FIELD ALK	105		
YR-HR	09-Sep-86	B86-330	FIELD ALK	122		
YR-HR	18-Apr-85	P85-210	FIELD PH	7.25		
YR-HR	26-Jul-85	P85-269	FIELD PH	8.4		
YR-HR	04-Nov-85	B86-67	FIELD PH	7.85		
YR-HR	29-Jan-86	B86-118	FIELD PH	8.06		
YR-HR	15-May-86	B86-231	FIELD PH	8.78		
YR-HR	09-Sep-86	B86-330	FIELD PH	8.15		
YR-HR	10-Nov-86	B87-025	FIELD PH	7.87		
YR-HR	18-Apr-85	P85-210	K	1.3		
YR-HR	18-Apr-85	P85-211	K	1.41		
YR-HR	26-Jul-85	P85-270	K	2.89		
YR-HR	26-Jul-85	P85-269	K	2.98		
YR-HR	04-Nov-85	B86-68	K	2.27		
YR-HR	04-Nov-85	B86-67	K	2.31		
YR-HR	29-Jan-86	B86-118	K	2.67		
YR-HR	29-Jan-86	B86-119	K	2.66		
YR-HR	15-May-86	B86-232	K	2.84		
YR-HR	15-May-86	B86-231	K	2.8		
YR-HR	09-Sep-86	B86-331	K	2.946		

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SURFACE WATERS (sheet 24 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	09-Sep-86	B86-330	K	2.942		
YR-HR	10-Nov-86	B87-026	K	2.901		
YR-HR	10-Nov-86	B87-025	K	2.983		
YR-HR	18-Apr-85	P85-210	LAB ALK	49		
YR-HR	26-Jul-85	P85-269	LAB ALK	123		
YR-HR	04-Nov-85	B86-67	LAB ALK	98		
YR-HR	29-Jan-86	B86-118	LAB ALK	107		
YR-HR	15-May-86	B86-231	LAB ALK	103		
YR-HR	09-Sep-86	B86-330	LAB ALK	122		
YR-HR	10-Nov-86	B87-025	LAB ALK	126		
YR-HR	18-Apr-85	P85-210	LAB COND	122		
YR-HR	26-Jul-85	P85-269	LAB COND	291		
YR-HR	04-Nov-85	B86-67	LAB COND	216		
YR-HR	29-Jan-86	B86-118	LAB COND	260		
YR-HR	15-May-86	B86-231	LAB COND	248		
YR-HR	09-Sep-86	B86-330	LAB COND	293		
YR-HR	10-Nov-86	B87-025	LAB COND	301		
YR-HR	18-Apr-85	P85-210	LAB PH	7.35		
YR-HR	26-Jul-85	P85-269	LAB PH	8.47		
YR-HR	04-Nov-85	B86-67	LAB PH	7.97		
YR-HR	29-Jan-86	B86-118	LAB PH	8.09		
YR-HR	15-May-86	B86-231	LAB PH	8.65		
YR-HR	09-Sep-86	B86-330	LAB PH	8.23		
YR-HR	10-Nov-86	B87-025	LAB PH	8.2		
YR-HR	18-Apr-85	P85-210	LI	0.008	<	
YR-HR	18-Apr-85	P85-211	LI	0.008	<	
YR-HR	26-Jul-85	P85-269	LI	0.008	<	
YR-HR	26-Jul-85	P85-270	LI	0.008	<	
YR-HR	04-Nov-85	B86-68	LI	0.016	<	

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SURFACE WATERS (sheet 25 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	04-Nov-85	B86-67	LI	0.016	<	
YR-HR	29-Jan-86	B86-119	LI	0.016	<	
YR-HR	29-Jan-86	B86-118	LI	0.016	<	
YR-HR	15-May-86	B86-231	LI	0.016	<	
YR-HR	15-May-86	B86-232	LI	0.016	<	
YR-HR	09-Sep-86	B86-331	LI	0.011	<	
YR-HR	09-Sep-86	B86-330	LI	0.011	<	
YR-HR	10-Nov-86	B87-026	LI	0.011	<	
YR-HR	10-Nov-86	B87-025	LI	0.011	<	
YR-HR	18-Apr-85	P85-211	MG	4.32		
YR-HR	18-Apr-85	P85-210	MG	4.24		
YR-HR	26-Jul-85	P85-270	MG	10.5		
YR-HR	26-Jul-85	P85-269	MG	10.7		
YR-HR	04-Nov-85	B86-67	MG	8.36		
YR-HR	04-Nov-85	B86-68	MG	8.38		
YR-HR	29-Jan-86	B86-118	MG	9.54		
YR-HR	29-Jan-86	B86-119	MG	9.46		
YR-HR	15-May-86	B86-231	MG	9.15		
YR-HR	15-May-86	B86-232	MG	9.2		
YR-HR	09-Sep-86	B86-330	MG	10.851		
YR-HR	09-Sep-86	B86-331	MG	10.961		
YR-HR	10-Nov-86	B87-026	MG	11.208		
YR-HR	10-Nov-86	B87-025	MG	11.285		
YR-HR	18-Apr-85	P85-211	MN	0.012		
YR-HR	18-Apr-85	P85-210	MN	0.012		
YR-HR	26-Jul-85	P85-269	MN	0.017		
YR-HR	26-Jul-85	P85-270	MN	0.017		
YR-HR	04-Nov-85	B86-67	MN	0.016		
YR-HR	04-Nov-85	B86-68	MN	0.016		

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SURFACE WATERS (sheet 26 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	29-Jan-86	B86-118	MN	0.028		
YR-HR	29-Jan-86	B86-119	MN	0.028		
YR-HR	15-May-86	B86-232	MN	0.022		
YR-HR	15-May-86	B86-231	MN	0.023		
YR-HR	09-Sep-86	B86-330	MN	0.015		
YR-HR	09-Sep-86	B86-331	MN	0.015		
YR-HR	10-Nov-86	B87-026	MN	0.009		
YR-HR	10-Nov-86	B87-025	MN	0.008		
YR-HR	18-Apr-85	P85-211	MO	0.034	<	
YR-HR	18-Apr-85	P85-210	MO	0.034	<	
YR-HR	26-Jul-85	P85-269	MO	0.3	<	
YR-HR	26-Jul-85	P85-270	MO	0.3	<	
YR-HR	04-Nov-85	B86-67	MO	0.6	<	
YR-HR	04-Nov-85	B86-68	MO	0.6	<	
YR-HR	29-Jan-86	B86-119	MO	0.6	<	
YR-HR	29-Jan-86	B86-118	MO	0.6	<	
YR-HR	15-May-86	B86-232	MO	0.6	<	
YR-HR	15-May-86	B86-231	MO	0.6	<	
YR-HR	09-Sep-86	B86-331	MO	0.424	<	
YR-HR	09-Sep-86	B86-330	MO	0.424	<	
YR-HR	10-Nov-86	B87-026	MO	0.42	<	
YR-HR	10-Nov-86	B87-025	MO	0.42	<	
YR-HR	18-Apr-85	P85-211	NA	6.14		
YR-HR	18-Apr-85	P85-210	NA	6.18		
YR-HR	26-Jul-85	P85-269	NA	16.3		
YR-HR	26-Jul-85	P85-270	NA	16.3		
YR-HR	04-Nov-85	B86-68	NA	13.5		
YR-HR	04-Nov-85	B86-67	NA	13.4		
YR-HR	29-Jan-86	B86-119	NA	15.5		

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SURFACE WATERS (sheet 27 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	29-Jan-86	B86-118	NA	15.7		
YR-HR	15-May-86	B86-232	NA	13.9		
YR-HR	15-May-86	B86-231	NA	13.9		
YR-HR	09-Sep-86	B86-331	NA	16.604		
YR-HR	09-Sep-86	B86-330	NA	16.573		
YR-HR	10-Nov-86	B87-025	NA	17.994		
YR-HR	10-Nov-86	B87-026	NA	17.802		
YR-HR	18-Apr-85	P85-211	NI	0.03	<	
YR-HR	18-Apr-85	P85-210	NI	0.03	<	
YR-HR	26-Jul-85	P85-270	NO3	1.51		
YR-HR	26-Jul-85	P85-269	NO3	1.56		
YR-HR	04-Nov-85	B86-68	NO3	2.12		
YR-HR	04-Nov-85	B86-67	NO3	0.39		
YR-HR	29-Jan-86	B86-118	NO3	3.97		
YR-HR	29-Jan-86	B86-119	NO3	3.98		
YR-HR	15-May-86	B86-232	NO3	3.16		
YR-HR	15-May-86	B86-231	NO3	3.17		
YR-HR	09-Sep-86	B86-331	NO3	5.46		
YR-HR	09-Sep-86	B86-330	NO3	5.38		
YR-HR	10-Nov-86	B87-025	NO3	4.76		
YR-HR	10-Nov-86	B87-026	NO3	4.7		
YR-HR	18-Apr-85	P85-210	O18	-14.6		
YR-HR	26-Jul-85	P85-269	O18	-13.7		
YR-HR	04-Nov-85	B86-67	O18	-14.1		
YR-HR	29-Jan-86	B86-118	O18	-14.6		
YR-HR	15-May-86	B86-231	O18	-14.3		
YR-HR	09-Sep-86	B86-330	O18	-12.8		
YR-HR	10-Nov-86	B87-025	O18	-13		
YR-HR	18-Apr-85	P85-210	ORP	135		

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SURFACE WATERS (sheet 28 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	26-Jul-85	P85-269	ORP	73		
YR-HR	04-Nov-85	B86-67	ORP	205		
YR-HR	29-Jan-86	B86-118	ORP	162		
YR-HR	15-May-86	B86-231	ORP	170		
YR-HR	09-Sep-86	B86-330	ORP	150		
YR-HR	10-Nov-86	B87-025	ORP	145		
YR-HR	18-Apr-85	P85-211	PB	0.18	<	
YR-HR	18-Apr-85	P85-210	PB	0.18	<	
YR-HR	26-Jul-85	P85-269	S34	3.2		
YR-HR	18-Apr-85	P85-210	SAMP.TEMP	11		
YR-HR	26-Jul-85	P85-269	SAMP.TEMP	25.7		
YR-HR	04-Nov-85	B86-67	SAMP.TEMP	10.2		
YR-HR	29-Jan-86	B86-118	SAMP.TEMP	3.7		
YR-HR	15-May-86	B86-231	SAMP.TEMP	16.8		
YR-HR	09-Sep-86	B86-330	SAMP.TEMP	18.5		
YR-HR	10-Nov-86	B87-025	SAMP.TEMP	5.6		
YR-HR	18-Apr-85	P85-210	SI	9		
YR-HR	18-Apr-85	P85-211	SI	9.03		
YR-HR	26-Jul-85	P85-269	SI	10.7		
YR-HR	26-Jul-85	P85-270	SI	10.6		
YR-HR	04-Nov-85	B86-67	SI	9.91		
YR-HR	04-Nov-85	B86-68	SI	9.92		
YR-HR	29-Jan-86	B86-118	SI	10.6		
YR-HR	29-Jan-86	B86-119	SI	10.5		
YR-HR	15-May-86	B86-231	SI	8.01		
YR-HR	15-May-86	B86-232	SI	8.06		
YR-HR	09-Sep-86	B86-331	SI	11.11		
YR-HR	09-Sep-86	B86-330	SI	11.006		
YR-HR	10-Nov-86	B87-025	SI	11.765		

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SURFACE WATERS (sheet 29 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	10-Nov-86	B87-026	SI	11.702		
YR-HR	18-Apr-85	P85-210	SO4	5.9		
YR-HR	18-Apr-85	P85-211	SO4	6		
YR-HR	26-Jul-85	P85-270	SO4	18		
YR-HR	26-Jul-85	P85-269	SO4	17.9		
YR-HR	04-Nov-85	B86-68	SO4	12.7		
YR-HR	04-Nov-85	B86-67	SO4	12.7		
YR-HR	29-Jan-86	B86-118	SO4	17.1		
YR-HR	29-Jan-86	B86-119	SO4	16.9		
YR-HR	15-May-86	B86-232	SO4	15		
YR-HR	15-May-86	B86-231	SO4	14.8		
YR-HR	09-Sep-86	B86-331	SO4	16.2		
YR-HR	09-Sep-86	B86-330	SO4	16.1		
YR-HR	10-Nov-86	B87-026	SO4	16.7		
YR-HR	10-Nov-86	B87-025	SO4	16.5		
YR-HR	18-Apr-85	P85-211	SR	0.059		
YR-HR	18-Apr-85	P85-210	SR	0.095		
YR-HR	26-Jul-85	P85-269	SR	0.133		
YR-HR	26-Jul-85	P85-270	SR	0.133		
YR-HR	04-Nov-85	B86-68	SR	0.102		
YR-HR	04-Nov-85	B86-67	SR	0.102		
YR-HR	29-Jan-86	B86-118	SR	109		
YR-HR	29-Jan-86	B86-119	SR	0.108		
YR-HR	15-May-86	B86-232	SR	0.113		
YR-HR	15-May-86	B86-231	SR	0.113		
YR-HR	09-Sep-86	B86-331	SR	0.135		
YR-HR	09-Sep-86	B86-330	SR	0.134		
YR-HR	10-Nov-86	B87-025	SR	0.133		
YR-HR	10-Nov-86	B87-026	SR	0.132		

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SURFACE WATERS (sheet 30 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	18-Apr-85	P85-210	T	12.5		
YR-HR	26-Jul-85	P85-269	T	13.5		
YR-HR	04-Nov-85	B86-67	T	12.7		
YR-HR	29-Jan-86	B86-118	T	14		
YR-HR	15-May-86	B86-231	T	13.4		
YR-HR	09-Sep-86	B86-330	T	12.5		
YR-HR	10-Nov-86	B87-025	T	13.8		
YR-HR	18-Apr-85	P85-210	TC	14.94		
YR-HR	26-Jul-85	P85-269	TC	29.51		
YR-HR	04-Nov-85	B86-67	TC	24.7		
YR-HR	29-Jan-86	B86-118	TC	26.3		
YR-HR	15-May-86	B86-231	TC	23.9		
YR-HR	09-Sep-86	B86-330	TC	29.9		
YR-HR	10-Nov-86	B87-025	TC	29.8		
YR-HR	18-Apr-85	P85-210	TOC	3.34		
YR-HR	26-Jul-85	P85-269	TOC	2.47		
YR-HR	04-Nov-85	B86-67	TOC	1.72		
YR-HR	29-Jan-86	B86-118	TOC	1.97		
YR-HR	15-May-86	B86-231	TOC	2.47		
YR-HR	09-Sep-86	B86-330	TOC	2.43		
YR-HR	10-Nov-86	B87-025	TOC	1.7		
YR-HR	18-Apr-85	P85-210	TURB	23.5		
YR-HR	26-Jul-85	P85-269	TURB	22		
YR-HR	29-Jan-86	B86-118	TURB	16.8		
YR-HR	15-May-86	B86-231	TURB	9.2		
YR-HR	09-Sep-86	B86-330	TURB	21		
YR-HR	10-Nov-86	B87-025	TURB	4.3		
YR-HR	18-Apr-85	P85-210	ZN	0.02	<	
YR-HR	18-Apr-85	P85-211	ZN	0.02	<	

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SURFACE WATERS (sheet 31 of 31)

Well	Date	Sample ID	Constituent	Result	LT	Error
YR-HR	26-Jul-85	P85-270	ZN	0.02	<	
YR-HR	26-Jul-85	P85-269	ZN	0.02	<	
YR-HR	04-Nov-85	B86-68	ZN	0.04	<	
YR-HR	04-Nov-85	B86-67	ZN	0.04	<	
YR-HR	29-Jan-86	B86-118	ZN	0.04	<	
YR-HR	29-Jan-86	B86-119	ZN	0.04	<	
YR-HR	15-May-86	B86-232	ZN	0.04	<	
YR-HR	15-May-86	B86-231	ZN	0.04	<	
YR-HR	09-Sep-86	B86-330	ZN	0.028	<	
YR-HR	09-Sep-86	B86-331	ZN	0.028	<	
YR-HR	10-Nov-86	B87-025	ZN	0.028	<	
YR-HR	10-Nov-86	B87-026	ZN	0.028	<	

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APPENDIX A

A-4 SPRING WATERS

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SPRING WATERS (sheet 1 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-BENNETT	20-Sep-85	P85-362	AL	0.2	<	
SP-BENNETT	20-Sep-85	P85-363	AL	0.2	<	
SP-BENNETT	04-Apr-86	B86-190	AL	0.2	<	
SP-BENNETT	04-Apr-86	B86-191	AL	0.2	<	
SP-BENNETT	22-Jul-86	B86-288	AL	0.141	<	
SP-BENNETT	22-Jul-86	B86-289	AL	0.141	<	
SP-BENNETT	17-Oct-86	B87-007	AL	0.141	<	
SP-BENNETT	17-Oct-86	B87-008	AL	0.141	<	
SP-BENNETT	20-Sep-85	P85-363	B	0.1	<	
SP-BENNETT	20-Sep-85	P85-362	B	0.1	<	
SP-BENNETT	04-Apr-86	B86-191	B	0.1	<	
SP-BENNETT	04-Apr-86	B86-190	B	0.1	<	
SP-BENNETT	22-Jul-86	B86-289	B	0.071	<	
SP-BENNETT	22-Jul-86	B86-288	B	0.071	<	
SP-BENNETT	17-Oct-86	B87-007	B	0.071	<	
SP-BENNETT	17-Oct-86	B87-008	B	0.071	<	
SP-BENNETT	20-Sep-85	P85-363	BA	0.011		
SP-BENNETT	20-Sep-85	P85-362	BA	0.011		
SP-BENNETT	04-Apr-86	B86-190	BA	0.008		
SP-BENNETT	04-Apr-86	B86-191	BA	0.007		
SP-BENNETT	22-Jul-86	B86-289	BA	0.012		
SP-BENNETT	22-Jul-86	B86-288	BA	0.012		
SP-BENNETT	17-Oct-86	B87-008	BA	0.009		
SP-BENNETT	17-Oct-86	B87-007	BA	0.008		
SP-BENNETT	20-Sep-85	P85-362	C13	-11.5		
SP-BENNETT	04-Apr-86	B86-190	C13	-11.4		
SP-BENNETT	22-Jul-86	B86-288	C13	-11		
SP-BENNETT	17-Oct-86	B87-007	C13	-11.2		
SP-BENNETT	20-Sep-85	P85-362	C14PMC	70.8		

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SPRING WATERS (sheet 2 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-BENNETT	04-Apr-86	B86-190	C14PMC	75.1		
SP-BENNETT	22-Jul-86	B86-288	C14PMC	72.6		
SP-BENNETT	17-Oct-86	B87-007	C14PMC	73.6		
SP-BENNETT	20-Sep-85	P85-362	CA	29		
SP-BENNETT	20-Sep-85	P85-363	CA	29.1		
SP-BENNETT	04-Apr-86	B86-191	CA	28.5		
SP-BENNETT	04-Apr-86	B86-190	CA	28.7		
SP-BENNETT	22-Jul-86	B86-289	CA	29.329		
SP-BENNETT	22-Jul-86	B86-288	CA	29.713		
SP-BENNETT	17-Oct-86	B87-007	CA	27.808		
SP-BENNETT	17-Oct-86	B87-008	CA	27.99		
SP-BENNETT	20-Sep-85	P85-362	CHG BAL	1.782		
SP-BENNETT	20-Sep-85	P85-363	CHG BAL	1.821		
SP-BENNETT	04-Apr-86	B86-191	CHG BAL	0.587		
SP-BENNETT	04-Apr-86	B86-190	CHG BAL	0.58		
SP-BENNETT	22-Jul-86	B86-289	CHG BAL	1.495		
SP-BENNETT	22-Jul-86	B86-288	CHG BAL	2.318		
SP-BENNETT	17-Oct-86	B87-008	CHG BAL	0.622		
SP-BENNETT	17-Oct-86	B87-007	CHG BAL	-0.01		
SP-BENNETT	20-Sep-85	P85-363	CL	11.1		
SP-BENNETT	20-Sep-85	P85-362	CL	11		
SP-BENNETT	04-Apr-86	B86-190	CL	11.6		
SP-BENNETT	04-Apr-86	B86-191	CL	11.7		
SP-BENNETT	22-Jul-86	B86-288	CL	11.3		
SP-BENNETT	22-Jul-86	B86-289	CL	11.3		
SP-BENNETT	17-Oct-86	B87-008	CL	11.8		
SP-BENNETT	17-Oct-86	B87-007	CL	12.1		
SP-BENNETT	20-Sep-85	P85-363	CU	0.012	<	
SP-BENNETT	20-Sep-85	P85-362	CU	0.012	<	

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SPRING WATERS (sheet 3 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-BENNETT	04-Apr-86	B86-190	CU	0.03	<	
SP-BENNETT	04-Apr-86	B86-191	CU	0.03	<	
SP-BENNETT	22-Jul-86	B86-289	CU	0.021	<	
SP-BENNETT	22-Jul-86	B86-288	CU	0.021	<	
SP-BENNETT	17-Oct-86	B87-008	CU	0.021	<	
SP-BENNETT	17-Oct-86	B87-007	CU	0.021	<	
SP-BENNETT	20-Sep-85	P85-362	D	-124		
SP-BENNETT	04-Apr-86	B86-190	D	-122		
SP-BENNETT	22-Jul-86	B86-288	D	-123		
SP-BENNETT	17-Oct-86	B87-007	D	-120		
SP-BENNETT	20-Sep-85	P85-362	F	0.29		
SP-BENNETT	20-Sep-85	P85-363	F	0.29		
SP-BENNETT	04-Apr-86	B86-190	F	0.31		
SP-BENNETT	04-Apr-86	B86-191	F	0.31		
SP-BENNETT	22-Jul-86	B86-289	F	0.35		
SP-BENNETT	22-Jul-86	B86-288	F	0.33		
SP-BENNETT	17-Oct-86	B87-007	F	0.33		
SP-BENNETT	17-Oct-86	B87-008	F	0.27		
SP-BENNETT	20-Sep-85	P85-362	FE	0.03	<	
SP-BENNETT	20-Sep-85	P85-363	FE	0.03	<	
SP-BENNETT	04-Apr-86	B86-190	FE	0.03	<	
SP-BENNETT	04-Apr-86	B86-191	FE	0.03	<	
SP-BENNETT	22-Jul-86	B86-289	FE	0.021	<	
SP-BENNETT	22-Jul-86	B86-288	FE	0.021	<	
SP-BENNETT	17-Oct-86	B87-008	FE	0.021	<	
SP-BENNETT	17-Oct-86	B87-007	FE	0.021	<	
SP-BENNETT	20-Sep-85	P85-362	FIELD ALK	91		
SP-BENNETT	04-Apr-86	B86-190	FIELD ALK	90		
SP-BENNETT	22-Jul-86	B86-288	FIELD ALK	92		

9 2 1 2 6 5 1 2 9 3

SPRING WATERS (sheet 4 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-BENNETT	17-Oct-86	B87-007	FIELD ALK	89		
SP-BENNETT	20-Sep-85	P85-362	FIELD PH	7.5		
SP-BENNETT	04-Apr-86	B86-190	FIELD PH	7.63		
SP-BENNETT	22-Jul-86	B86-288	FIELD PH	7.62		
SP-BENNETT	17-Oct-86	B87-007	FIELD PH	7.49		
SP-BENNETT	20-Sep-85	P85-363	K	2.76		
SP-BENNETT	20-Sep-85	P85-362	K	2.74		
SP-BENNETT	04-Apr-86	B86-191	K	2.36		
SP-BENNETT	04-Apr-86	B86-190	K	2.38		
SP-BENNETT	22-Jul-86	B86-289	K	2.359		
SP-BENNETT	22-Jul-86	B86-288	K	2.346		
SP-BENNETT	17-Oct-86	B87-007	K	2.192		
SP-BENNETT	17-Oct-86	B87-008	K	2.241		
SP-BENNETT	20-Sep-85	P85-362	LAB ALK	92		
SP-BENNETT	04-Apr-86	B86-190	LAB ALK	91		
SP-BENNETT	22-Jul-86	B86-288	LAB ALK	89		
SP-BENNETT	17-Oct-86	B87-007	LAB ALK	88		
SP-BENNETT	20-Sep-85	P85-362	LAB COND	263		
SP-BENNETT	04-Apr-86	B86-190	LAB COND	260		
SP-BENNETT	22-Jul-86	B86-288	LAB COND	263		
SP-BENNETT	17-Oct-86	B87-007	LAB COND	265		
SP-BENNETT	20-Sep-85	P85-362	LAB PH	7.63		
SP-BENNETT	04-Apr-86	B86-190	LAB PH	7.79		
SP-BENNETT	22-Jul-86	B86-288	LAB PH	7.69		
SP-BENNETT	17-Oct-86	B87-007	LAB PH	7.84		
SP-BENNETT	20-Sep-85	P85-363	LI	0.016	<	
SP-BENNETT	20-Sep-85	P85-362	LI	0.016	<	
SP-BENNETT	04-Apr-86	B86-190	LI	0.016	<	
SP-BENNETT	04-Apr-86	B86-191	LI	0.016	<	

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SPRING WATERS (sheet 5 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-BENNETT	22-Jul-86	B86-289	LI	0.011	<	
SP-BENNETT	22-Jul-86	B86-288	LI	0.011	<	
SP-BENNETT	17-Oct-86	B87-007	LI	0.011	<	
SP-BENNETT	17-Oct-86	B87-008	LI	0.011	<	
SP-BENNETT	20-Sep-85	P85-363	MG	10.1		
SP-BENNETT	20-Sep-85	P85-362	MG	10.1		
SP-BENNETT	04-Apr-86	B86-190	MG	9.89		
SP-BENNETT	04-Apr-86	B86-191	MG	9.85		
SP-BENNETT	22-Jul-86	B86-288	MG	10.172		
SP-BENNETT	22-Jul-86	B86-289	MG	10.025		
SP-BENNETT	17-Oct-86	B87-008	MG	9.846		
SP-BENNETT	17-Oct-86	B87-007	MG	9.811		
SP-BENNETT	20-Sep-85	P85-362	MN	0.01	<	
SP-BENNETT	20-Sep-85	P85-363	MN	0.01	<	
SP-BENNETT	04-Apr-86	B86-190	MN	0.01	<	
SP-BENNETT	04-Apr-86	B86-191	MN	0.01	<	
SP-BENNETT	22-Jul-86	B86-289	MN	0.007	<	
SP-BENNETT	22-Jul-86	B86-288	MN	0.007	<	
SP-BENNETT	17-Oct-86	B87-007	MN	0.007	<	
SP-BENNETT	17-Oct-86	B87-008	MN	0.007	<	
SP-BENNETT	20-Sep-85	P85-363	MO	0.6	<	
SP-BENNETT	20-Sep-85	P85-362	MO	0.6	<	
SP-BENNETT	04-Apr-86	B86-191	MO	0.6	<	
SP-BENNETT	04-Apr-86	B86-190	MO	0.6	<	
SP-BENNETT	22-Jul-86	B86-289	MO	0.424	<	
SP-BENNETT	22-Jul-86	B86-288	MO	0.424	<	
SP-BENNETT	17-Oct-86	B87-008	MO	0.424	<	
SP-BENNETT	17-Oct-86	B87-007	MO	0.424	<	
SP-BENNETT	20-Sep-85	P85-362	NA	9.13		

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SPRING WATERS (sheet 6 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-BENNETT	20-Sep-85	P85-363	NA	9.17		
SP-BENNETT	04-Apr-86	B86-191	NA	9.24		
SP-BENNETT	04-Apr-86	B86-190	NA	9.08		
SP-BENNETT	22-Jul-86	B86-289	NA	9.224		
SP-BENNETT	22-Jul-86	B86-288	NA	9.408		
SP-BENNETT	17-Oct-86	B87-007	NA	9.004		
SP-BENNETT	17-Oct-86	B87-008	NA	9.041		
SP-BENNETT	20-Sep-85	P85-363	NO3	13.4		
SP-BENNETT	20-Sep-85	P85-362	NO3	13.4		
SP-BENNETT	04-Apr-86	B86-190	NO3	13.3		
SP-BENNETT	04-Apr-86	B86-191	NO3	13.2		
SP-BENNETT	22-Jul-86	B86-288	NO3	12.2		
SP-BENNETT	22-Jul-86	B86-289	NO3	12.4		
SP-BENNETT	17-Oct-86	B87-008	NO3	12.5		
SP-BENNETT	17-Oct-86	B87-007	NO3	12.8		
SP-BENNETT	20-Sep-85	P85-362	O18	-16		
SP-BENNETT	04-Apr-86	B86-190	O18	-16.4		
SP-BENNETT	22-Jul-86	B86-288	O18	-15.5		
SP-BENNETT	17-Oct-86	B87-007	O18	-15.4		
SP-BENNETT	20-Sep-85	P85-362	ORP	180		
SP-BENNETT	04-Apr-86	B86-190	ORP	90		
SP-BENNETT	22-Jul-86	B86-288	ORP	145		
SP-BENNETT	17-Oct-86	B87-007	ORP	167		
SP-BENNETT	20-Sep-85	P85-362	S34	2.8		
SP-BENNETT	04-Apr-86	B86-190	S34	3.4		
SP-BENNETT	22-Jul-86	B86-288	S34	4.2		
SP-BENNETT	20-Sep-85	P85-362	SAMP.TEMP	12.2		
SP-BENNETT	04-Apr-86	B86-190	SAMP.TEMP	12.2		
SP-BENNETT	22-Jul-86	B86-288	SAMP.TEMP	12.5		

9 2 1 2 6 3 5 1 2 9 6

SPRING WATERS (sheet 7 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-BENNETT	17-Oct-86	B87-007	SAMP.TEMP	12		
SP-BENNETT	20-Sep-85	P85-362	SI	23.6		
SP-BENNETT	20-Sep-85	P85-363	SI	23.6		
SP-BENNETT	04-Apr-86	B86-190	SI	22.6		
SP-BENNETT	04-Apr-86	B86-191	SI	22.6		
SP-BENNETT	22-Jul-86	B86-289	SI	22.428		
SP-BENNETT	22-Jul-86	B86-288	SI	22.769		
SP-BENNETT	17-Oct-86	B87-007	SI	22.425		
SP-BENNETT	17-Oct-86	B87-008	SI	22.521		
SP-BENNETT	20-Sep-85	P85-362	SO4	13.8		
SP-BENNETT	20-Sep-85	P85-363	SO4	13.9		
SP-BENNETT	04-Apr-86	B86-191	SO4	14.6		
SP-BENNETT	04-Apr-86	B86-190	SO4	15		
SP-BENNETT	22-Jul-86	B86-289	SO4	14		
SP-BENNETT	22-Jul-86	B86-288	SO4	13.9		
SP-BENNETT	17-Oct-86	B87-007	SO4	14.3		
SP-BENNETT	17-Oct-86	B87-008	SO4	14.2		
SP-BENNETT	20-Sep-85	P85-363	SR	0.108		
SP-BENNETT	20-Sep-85	P85-362	SR	0.108		
SP-BENNETT	04-Apr-86	B86-190	SR	0.109		
SP-BENNETT	04-Apr-86	B86-191	SR	0.109		
SP-BENNETT	22-Jul-86	B86-288	SR	0.11		
SP-BENNETT	22-Jul-86	B86-289	SR	0.108		
SP-BENNETT	17-Oct-86	B87-007	SR	0.106		
SP-BENNETT	17-Oct-86	B87-008	SR	0.106		
SP-BENNETT	20-Sep-85	P85-362	T	0.54		
SP-BENNETT	04-Apr-86	B86-190	T	0.25		
SP-BENNETT	22-Jul-86	B86-288	T	0.47		
SP-BENNETT	17-Oct-86	B87-007	T	0.3		

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SPRING WATERS (sheet 8 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-BENNETT	20-Sep-85	P85-362	TC	22.3		
SP-BENNETT	04-Apr-86	B86-190	TC	21.4		
SP-BENNETT	22-Jul-86	B86-288	TC	22.25		
SP-BENNETT	17-Oct-86	B87-007	TC	21.9		
SP-BENNETT	20-Sep-85	P85-362	TOC	0.63		
SP-BENNETT	04-Apr-86	B86-190	TOC	0.699		
SP-BENNETT	22-Jul-86	B86-288	TOC	0.6		
SP-BENNETT	17-Oct-86	B87-007	TOC	0.68		
SP-BENNETT	20-Sep-85	P85-362	TURB	0.3		
SP-BENNETT	04-Apr-86	B86-190	TURB	0.3		
SP-BENNETT	22-Jul-86	B86-288	TURB	2		
SP-BENNETT	17-Oct-86	B87-007	TURB	3.5		
SP-BENNETT	20-Sep-85	P85-362	ZN	0.04	<	
SP-BENNETT	20-Sep-85	P85-363	ZN	0.04	<	
SP-BENNETT	04-Apr-86	B86-191	ZN	0.04	<	
SP-BENNETT	04-Apr-86	B86-190	ZN	0.04	<	
SP-BENNETT	22-Jul-86	B86-288	ZN	0.028	<	
SP-BENNETT	22-Jul-86	B86-289	ZN	0.028	<	
SP-BENNETT	17-Oct-86	B87-007	ZN	0.028	<	
SP-BENNETT	17-Oct-86	B87-008	ZN	0.028	<	
SP-OBSERVTRY	18-Sep-85	P85-359	AL	0.1	<	
SP-OBSERVTRY	18-Sep-85	P85-360	AL	0.1	<	
SP-OBSERVTRY	01-Apr-86	B86-178	AL	0.2	<	
SP-OBSERVTRY	01-Apr-86	B86-179	AL	0.2	<	
SP-OBSERVTRY	24-Jul-86	B86-291	AL	0.141	<	
SP-OBSERVTRY	24-Jul-86	B86-292	AL	0.141	<	
SP-OBSERVTRY	20-Oct-86	B87-010	AL	0.141	<	
SP-OBSERVTRY	20-Oct-86	B87-011	AL	0.141	<	
SP-OBSERVTRY	18-Sep-85	P85-360	B	0.05	<	

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SPRING WATERS (sheet 9 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-OBSERVTRY	18-Sep-85	P85-359	B	0.05	<	
SP-OBSERVTRY	01-Apr-86	B86-179	B	0.1	<	
SP-OBSERVTRY	01-Apr-86	B86-178	B	0.1	<	
SP-OBSERVTRY	24-Jul-86	B86-292	B	0.071	<	
SP-OBSERVTRY	24-Jul-86	B86-291	B	0.071	<	
SP-OBSERVTRY	20-Oct-86	B87-010	B	0.071	<	
SP-OBSERVTRY	20-Oct-86	B87-011	B	0.071	<	
SP-OBSERVTRY	18-Sep-85	P85-360	BA	0.003		
SP-OBSERVTRY	18-Sep-85	P85-359	BA	0.003		
SP-OBSERVTRY	01-Apr-86	B86-178	BA	0.003	<	
SP-OBSERVTRY	01-Apr-86	B86-179	BA	0.003	<	
SP-OBSERVTRY	24-Jul-86	B86-292	BA	0.006	<	
SP-OBSERVTRY	24-Jul-86	B86-291	BA	0.006	<	
SP-OBSERVTRY	20-Oct-86	B87-011	BA	0.006		
SP-OBSERVTRY	20-Oct-86	B87-010	BA	0.006	<	
SP-OBSERVTRY	18-Sep-85	P85-359	C13	-11.9		
SP-OBSERVTRY	01-Apr-86	B86-178	C13	-13.3		
SP-OBSERVTRY	24-Jul-86	B86-291	C13	-11.7		
SP-OBSERVTRY	20-Oct-86	B87-010	C13	-11.6		
SP-OBSERVTRY	18-Sep-85	P85-359	C14PMC	105.5		
SP-OBSERVTRY	01-Apr-86	B86-178	C14PMC	103.8		
SP-OBSERVTRY	24-Jul-86	B86-291	C14PMC	104.6		
SP-OBSERVTRY	20-Oct-86	B87-010	C14PMC	102		
SP-OBSERVTRY	18-Sep-85	P85-359	CA	21.1		
SP-OBSERVTRY	18-Sep-85	P85-360	CA	21.5		
SP-OBSERVTRY	01-Apr-86	B86-179	CA	22.5		
SP-OBSERVTRY	01-Apr-86	B86-178	CA	22.7		
SP-OBSERVTRY	24-Jul-86	B86-292	CA	21.852		
SP-OBSERVTRY	24-Jul-86	B86-291	CA	21.56		

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SPRING WATERS (sheet 10 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-OBSERVTRY	20-Oct-86	B87-010	CA	21.973		
SP-OBSERVTRY	20-Oct-86	B87-011	CA	21.855		
SP-OBSERVTRY	18-Sep-85	P85-359	CHG BAL	0.769		
SP-OBSERVTRY	18-Sep-85	P85-360	CHG BAL	1.762		
SP-OBSERVTRY	01-Apr-86	B86-179	CHG BAL	1.211		
SP-OBSERVTRY	01-Apr-86	B86-178	CHG BAL	1.626		
SP-OBSERVTRY	24-Jul-86	B86-292	CHG BAL	1.422		
SP-OBSERVTRY	24-Jul-86	B86-291	CHG BAL	0.909		
SP-OBSERVTRY	20-Oct-86	B87-011	CHG BAL	1.436		
SP-OBSERVTRY	20-Oct-86	B87-010	CHG BAL	1.558		
SP-OBSERVTRY	18-Sep-85	P85-360	CL	3.03		
SP-OBSERVTRY	18-Sep-85	P85-359	CL	3.02		
SP-OBSERVTRY	01-Apr-86	B86-178	CL	3.26		
SP-OBSERVTRY	01-Apr-86	B86-179	CL	3.23		
SP-OBSERVTRY	24-Jul-86	B86-291	CL	2.86		
SP-OBSERVTRY	24-Jul-86	B86-292	CL	2.85		
SP-OBSERVTRY	20-Oct-86	B87-011	CL	2.95		
SP-OBSERVTRY	20-Oct-86	B87-010	CL	2.98		
SP-OBSERVTRY	18-Sep-85	P85-360	CU	0.006	<	
SP-OBSERVTRY	18-Sep-85	P85-359	CU	0.006	<	
SP-OBSERVTRY	01-Apr-86	B86-178	CU	0.03	<	
SP-OBSERVTRY	01-Apr-86	B86-179	CU	0.03	<	
SP-OBSERVTRY	24-Jul-86	B86-292	CU	0.021	<	
SP-OBSERVTRY	24-Jul-86	B86-291	CU	0.021	<	
SP-OBSERVTRY	20-Oct-86	B87-011	CU	0.021	<	
SP-OBSERVTRY	20-Oct-86	B87-010	CU	0.021	<	
SP-OBSERVTRY	18-Sep-85	P85-359	D	-117		
SP-OBSERVTRY	01-Apr-86	B86-178	D	-115		
SP-OBSERVTRY	24-Jul-86	B86-291	D	-117		

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SPRING WATERS (sheet 11 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-OBSERVTRY	20-Oct-86	B87-010	D	-113		
SP-OBSERVTRY	18-Sep-85	P85-359	F	0.19		
SP-OBSERVTRY	18-Sep-85	P85-360	F	0.21		
SP-OBSERVTRY	01-Apr-86	B86-178	F	0.2		
SP-OBSERVTRY	01-Apr-86	B86-179	F	0.19		
SP-OBSERVTRY	24-Jul-86	B86-292	F	0.26		
SP-OBSERVTRY	24-Jul-86	B86-291	F	0.24		
SP-OBSERVTRY	20-Oct-86	B87-010	F	0.17		
SP-OBSERVTRY	20-Oct-86	B87-011	F	0.21		
SP-OBSERVTRY	18-Sep-85	P85-359	FE	0.015	<	
SP-OBSERVTRY	18-Sep-85	P85-360	FE	0.015	<	
SP-OBSERVTRY	01-Apr-86	B86-178	FE	0.03	<	
SP-OBSERVTRY	01-Apr-86	B86-179	FE	0.03	<	
SP-OBSERVTRY	24-Jul-86	B86-292	FE	0.021	<	
SP-OBSERVTRY	24-Jul-86	B86-291	FE	0.021	<	
SP-OBSERVTRY	20-Oct-86	B87-011	FE	0.021	<	
SP-OBSERVTRY	20-Oct-86	B87-010	FE	0.021	<	
SP-OBSERVTRY	18-Sep-85	P85-359	FIELD ALK	91		
SP-OBSERVTRY	01-Apr-86	B86-178	FIELD ALK	93		
SP-OBSERVTRY	24-Jul-86	B86-291	FIELD ALK	91		
SP-OBSERVTRY	20-Oct-86	B87-010	FIELD ALK	90		
SP-OBSERVTRY	18-Sep-85	P85-359	FIELD PH	7.55		
SP-OBSERVTRY	01-Apr-86	B86-178	FIELD PH	7.81		
SP-OBSERVTRY	24-Jul-86	B86-291	FIELD PH	7.78		
SP-OBSERVTRY	20-Oct-86	B87-010	FIELD PH	7.76		
SP-OBSERVTRY	18-Sep-85	P85-360	K	1.48		
SP-OBSERVTRY	18-Sep-85	P85-359	K	1.58		
SP-OBSERVTRY	01-Apr-86	B86-179	K	1.6		
SP-OBSERVTRY	01-Apr-86	B86-178	K	1.7		

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SPRING WATERS (sheet 12 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-OBSERVTRY	24-Jul-86	B86-292	K	1.737		
SP-OBSERVTRY	24-Jul-86	B86-291	K	1.683		
SP-OBSERVTRY	20-Oct-86	B87-010	K	1.969		
SP-OBSERVTRY	20-Oct-86	B87-011	K	1.895		
SP-OBSERVTRY	18-Sep-85	P85-359	LAB ALK	93		
SP-OBSERVTRY	01-Apr-86	B86-178	LAB ALK	94		
SP-OBSERVTRY	24-Jul-86	B86-291	LAB ALK	88		
SP-OBSERVTRY	20-Oct-86	B87-010	LAB ALK	89		
SP-OBSERVTRY	18-Sep-85	P85-359	LAB COND	217		
SP-OBSERVTRY	01-Apr-86	B86-178	LAB COND	219		
SP-OBSERVTRY	24-Jul-86	B86-291	LAB COND	212		
SP-OBSERVTRY	20-Oct-86	B87-010	LAB COND	219		
SP-OBSERVTRY	18-Sep-85	P85-359	LAB PH	7.67		
SP-OBSERVTRY	01-Apr-86	B86-178	LAB PH	7.97		
SP-OBSERVTRY	24-Jul-86	B86-291	LAB PH	7.78		
SP-OBSERVTRY	20-Oct-86	B87-010	LAB PH	7.98		
SP-OBSERVTRY	18-Sep-85	P85-360	LI	0.008	<	
SP-OBSERVTRY	18-Sep-85	P85-359	LI	0.008	<	
SP-OBSERVTRY	01-Apr-86	B86-178	LI	0.016	<	
SP-OBSERVTRY	01-Apr-86	B86-179	LI	0.016	<	
SP-OBSERVTRY	24-Jul-86	B86-292	LI	0.011	<	
SP-OBSERVTRY	24-Jul-86	B86-291	LI	0.011	<	
SP-OBSERVTRY	20-Oct-86	B87-010	LI	0.011	<	
SP-OBSERVTRY	20-Oct-86	B87-011	LI	0.011	<	
SP-OBSERVTRY	18-Sep-85	P85-360	MG	10.6		
SP-OBSERVTRY	18-Sep-85	P85-359	MG	10.4		
SP-OBSERVTRY	01-Apr-86	B86-178	MG	10.9		
SP-OBSERVTRY	01-Apr-86	B86-179	MG	10.8		
SP-OBSERVTRY	24-Jul-86	B86-291	MG	10.339		

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SPRING WATERS (sheet 13 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-OBSERVTRY	24-Jul-86	B86-292	MG	10.403		
SP-OBSERVTRY	20-Oct-86	B87-011	MG	10.49		
SP-OBSERVTRY	20-Oct-86	B87-010	MG	10.48		
SP-OBSERVTRY	18-Sep-85	P85-359	MN	0.004	<	
SP-OBSERVTRY	18-Sep-85	P85-360	MN	0.004	<	
SP-OBSERVTRY	01-Apr-86	B86-178	MN	0.01	<	
SP-OBSERVTRY	01-Apr-86	B86-179	MN	0.01	<	
SP-OBSERVTRY	24-Jul-86	B86-292	MN	0.007	<	
SP-OBSERVTRY	24-Jul-86	B86-291	MN	0.007	<	
SP-OBSERVTRY	20-Oct-86	B87-010	MN	0.007	<	
SP-OBSERVTRY	20-Oct-86	B87-011	MN	0.007	<	
SP-OBSERVTRY	18-Sep-85	P85-360	MO	0.3	<	
SP-OBSERVTRY	18-Sep-85	P85-359	MO	0.3	<	
SP-OBSERVTRY	01-Apr-86	B86-179	MO	0.6	<	
SP-OBSERVTRY	01-Apr-86	B86-178	MO	0.6	<	
SP-OBSERVTRY	24-Jul-86	B86-292	MO	0.424	<	
SP-OBSERVTRY	24-Jul-86	B86-291	MO	0.424	<	
SP-OBSERVTRY	20-Oct-86	B87-011	MO	0.424	<	
SP-OBSERVTRY	20-Oct-86	B87-010	MO	0.424	<	
SP-OBSERVTRY	18-Sep-85	P85-359	NA	7.1		
SP-OBSERVTRY	18-Sep-85	P85-360	NA	7.2		
SP-OBSERVTRY	01-Apr-86	B86-179	NA	7.36		
SP-OBSERVTRY	01-Apr-86	B86-178	NA	7.42		
SP-OBSERVTRY	24-Jul-86	B86-292	NA	7.161		
SP-OBSERVTRY	24-Jul-86	B86-291	NA	7.196		
SP-OBSERVTRY	20-Oct-86	B87-010	NA	6.943		
SP-OBSERVTRY	20-Oct-86	B87-011	NA	6.995		
SP-OBSERVTRY	18-Sep-85	P85-360	NO3	4.13		
SP-OBSERVTRY	18-Sep-85	P85-359	NO3	4.51		

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SPRING WATERS (sheet 14 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-OBSERVTRY	01-Apr-86	B86-178	NO3	6.61		
SP-OBSERVTRY	01-Apr-86	B86-179	NO3	6.48		
SP-OBSERVTRY	24-Jul-86	B86-291	NO3	6.65		
SP-OBSERVTRY	24-Jul-86	B86-292	NO3	6.5		
SP-OBSERVTRY	20-Oct-86	B87-011	NO3	7.55		
SP-OBSERVTRY	20-Oct-86	B87-010	NO3	7.57		
SP-OBSERVTRY	18-Sep-85	P85-359	O18	-14.7		
SP-OBSERVTRY	01-Apr-86	B86-178	O18	-14.8		
SP-OBSERVTRY	24-Jul-86	B86-291	O18	-14.7		
SP-OBSERVTRY	20-Oct-86	B87-010	O18	-14.5		
SP-OBSERVTRY	18-Sep-85	P85-359	ORP	195		
SP-OBSERVTRY	01-Apr-86	B86-178	ORP	120		
SP-OBSERVTRY	24-Jul-86	B86-291	ORP	200		
SP-OBSERVTRY	20-Oct-86	B87-010	ORP	175		
SP-OBSERVTRY	18-Sep-85	P85-359	S34	4.1		
SP-OBSERVTRY	01-Apr-86	B86-178	S34	3.4		
SP-OBSERVTRY	24-Jul-86	B86-291	S34	4.6		
SP-OBSERVTRY	18-Sep-85	P85-359	SAMP.TEMP	10.1		
SP-OBSERVTRY	01-Apr-86	B86-178	SAMP.TEMP	9.9		
SP-OBSERVTRY	24-Jul-86	B86-291	SAMP.TEMP	10.1		
SP-OBSERVTRY	20-Oct-86	B87-010	SAMP.TEMP	10.4		
SP-OBSERVTRY	18-Sep-85	P85-359	SI	17.9		
SP-OBSERVTRY	18-Sep-85	P85-360	SI	17.9		
SP-OBSERVTRY	01-Apr-86	B86-178	SI	17		
SP-OBSERVTRY	01-Apr-86	B86-179	SI	16.9		
SP-OBSERVTRY	24-Jul-86	B86-292	SI	16.855		
SP-OBSERVTRY	24-Jul-86	B86-291	SI	16.764		
SP-OBSERVTRY	20-Oct-86	B87-010	SI	17.092		
SP-OBSERVTRY	20-Oct-86	B87-011	SI	17.112		

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SPRING WATERS (sheet 15 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-OBSERVTRY	18-Sep-85	P85-359	SO4	11.3		
SP-OBSERVTRY	18-Sep-85	P85-360	SO4	11.2		
SP-OBSERVTRY	01-Apr-86	B86-179	SO4	12		
SP-OBSERVTRY	01-Apr-86	B86-178	SO4	12		
SP-OBSERVTRY	24-Jul-86	B86-292	SO4	10.5		
SP-OBSERVTRY	24-Jul-86	B86-291	SO4	10.6		
SP-OBSERVTRY	20-Oct-86	B87-010	SO4	10.8		
SP-OBSERVTRY	20-Oct-86	B87-011	SO4	10.8		
SP-OBSERVTRY	18-Sep-85	P85-360	SR	0.06		
SP-OBSERVTRY	18-Sep-85	P85-359	SR	0.058		
SP-OBSERVTRY	01-Apr-86	B86-178	SR	0.064		
SP-OBSERVTRY	01-Apr-86	B86-179	SR	0.064		
SP-OBSERVTRY	24-Jul-86	B86-291	SR	0.059		
SP-OBSERVTRY	24-Jul-86	B86-292	SR	0.059		
SP-OBSERVTRY	20-Oct-86	B87-010	SR	0.06		
SP-OBSERVTRY	20-Oct-86	B87-011	SR	0.06		
SP-OBSERVTRY	18-Sep-85	P85-359	T	4.74		
SP-OBSERVTRY	01-Apr-86	B86-178	T	4.48		
SP-OBSERVTRY	24-Jul-86	B86-291	T	5.72		
SP-OBSERVTRY	20-Oct-86	B87-010	T	5.03		
SP-OBSERVTRY	18-Sep-85	P85-359	TC	22.8		
SP-OBSERVTRY	01-Apr-86	B86-178	TC	22.3		
SP-OBSERVTRY	24-Jul-86	B86-291	TC	22.1		
SP-OBSERVTRY	20-Oct-86	B87-010	TC	21.9		
SP-OBSERVTRY	18-Sep-85	P85-359	TOC	0.89		
SP-OBSERVTRY	01-Apr-86	B86-178	TOC	1.63		
SP-OBSERVTRY	24-Jul-86	B86-291	TOC	0.73		
SP-OBSERVTRY	20-Oct-86	B87-010	TOC	0.73		
SP-OBSERVTRY	18-Sep-85	P85-359	TURB	0.32		

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SPRING WATERS (sheet 16 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-OBSERVTRY	01-Apr-86	B86-178	TURB	3.2		
SP-OBSERVTRY	24-Jul-86	B86-291	TURB	1.3		
SP-OBSERVTRY	20-Oct-86	B87-010	TURB	7.2		
SP-OBSERVTRY	18-Sep-85	P85-359	ZN	0.02	<	
SP-OBSERVTRY	18-Sep-85	P85-360	ZN	0.02	<	
SP-OBSERVTRY	01-Apr-86	B86-179	ZN	0.04	<	
SP-OBSERVTRY	01-Apr-86	B86-178	ZN	0.04	<	
SP-OBSERVTRY	24-Jul-86	B86-291	ZN	0.028	<	
SP-OBSERVTRY	24-Jul-86	B86-292	ZN	0.028	<	
SP-OBSERVTRY	20-Oct-86	B87-010	ZN	0.028	<	
SP-OBSERVTRY	20-Oct-86	B87-011	ZN	0.028	<	
SP-UP-SNIVEL	08-Apr-86	B86-193	AL	0.2	<	
SP-UP-SNIVEL	08-Apr-86	B86-194	AL	0.2	<	
SP-UP-SNIVEL	22-Jul-86	B86-285	AL	0.141	<	
SP-UP-SNIVEL	22-Jul-86	B86-286	AL	0.141	<	
SP-UP-SNIVEL	16-Oct-86	B87-004	AL	0.014	<	
SP-UP-SNIVEL	16-Oct-86	B87-005	AL	0.141	<	
SP-UP-SNIVEL	08-Apr-86	B86-193	B	0.1	<	
SP-UP-SNIVEL	08-Apr-86	B86-194	B	0.1	<	
SP-UP-SNIVEL	22-Jul-86	B86-285	B	0.071	<	
SP-UP-SNIVEL	22-Jul-86	B86-286	B	0.071	<	
SP-UP-SNIVEL	16-Oct-86	B87-004	B	0.071	<	
SP-UP-SNIVEL	16-Oct-86	B87-005	B	0.071	<	
SP-UP-SNIVEL	08-Apr-86	B86-194	BA	0.003	<	
SP-UP-SNIVEL	08-Apr-86	B86-193	BA	0.003	<	
SP-UP-SNIVEL	22-Jul-86	B86-285	BA	0.006	<	
SP-UP-SNIVEL	22-Jul-86	B86-286	BA	0.006		
SP-UP-SNIVEL	16-Oct-86	B87-005	BA	0.006	<	
SP-UP-SNIVEL	16-Oct-86	B87-004	BA	0.006	<	

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SPRING WATERS (sheet 17 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UP-SNIVEL	08-Apr-86	B86-193	C13	-10.9		
SP-UP-SNIVEL	22-Jul-86	B86-285	C13	-11		
SP-UP-SNIVEL	16-Oct-86	B87-004	C13	-10.7		
SP-UP-SNIVEL	08-Apr-86	B86-193	C14PMC	62.4		
SP-UP-SNIVEL	22-Jul-86	B86-285	C14PMC	69.2		
SP-UP-SNIVEL	16-Oct-86	B87-004	C14PMC	73.5		
SP-UP-SNIVEL	08-Apr-86	B86-194	CA	21.3		
SP-UP-SNIVEL	08-Apr-86	B86-193	CA	21.5		
SP-UP-SNIVEL	22-Jul-86	B86-285	CA	22.207		
SP-UP-SNIVEL	22-Jul-86	B86-286	CA	22.452		
SP-UP-SNIVEL	16-Oct-86	B87-005	CA	21.241		
SP-UP-SNIVEL	16-Oct-86	B87-004	CA	21.038		
SP-UP-SNIVEL	08-Apr-86	B86-193	CHG BAL	0.514		
SP-UP-SNIVEL	08-Apr-86	B86-194	CHG BAL	0.051		
SP-UP-SNIVEL	08-Apr-86	B86-194	CHG BAL	2.366		
SP-UP-SNIVEL	22-Jul-86	B86-285	CHG BAL	2.366		
SP-UP-SNIVEL	22-Jul-86	B86-286	CHG BAL	2.885		
SP-UP-SNIVEL	22-Jul-86	B86-286	CHG BAL	0.751		
SP-UP-SNIVEL	16-Oct-86	B87-004	CHG BAL	0.751		
SP-UP-SNIVEL	16-Oct-86	B87-005	CHG BAL	1.257		
SP-UP-SNIVEL	08-Apr-86	B86-194	CL	6.11		
SP-UP-SNIVEL	08-Apr-86	B86-194	CL	6.04		
SP-UP-SNIVEL	08-Apr-86	B86-193	CL	6.05		
SP-UP-SNIVEL	22-Jul-86	B86-286	CL	5.97		
SP-UP-SNIVEL	22-Jul-86	B86-285	CL	6.04		
SP-UP-SNIVEL	22-Jul-86	B86-286	CL	5.97		
SP-UP-SNIVEL	16-Oct-86	B87-004	CL	6.21		
SP-UP-SNIVEL	16-Oct-86	B87-005	CL	6.2		
SP-UP-SNIVEL	08-Apr-86	B86-194	CU	0.03	<	

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SPRING WATERS (sheet 18 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UP-SNIVEL	08-Apr-86	B86-193	CU	0.03	<	
SP-UP-SNIVEL	22-Jul-86	B86-286	CU	0.021	<	
SP-UP-SNIVEL	22-Jul-86	B86-285	CU	0.021	<	
SP-UP-SNIVEL	16-Oct-86	B87-004	CU	0.021	<	
SP-UP-SNIVEL	16-Oct-86	B87-005	CU	0.021	<	
SP-UP-SNIVEL	08-Apr-86	B86-193	D	-130		
SP-UP-SNIVEL	22-Jul-86	B86-285	D	-129		
SP-UP-SNIVEL	16-Oct-86	B87-004	D	-119		
SP-UP-SNIVEL	08-Apr-86	B86-194	F	0.34		
SP-UP-SNIVEL	08-Apr-86	B86-193	F	0.31		
SP-UP-SNIVEL	08-Apr-86	B86-194	F	0.31		
SP-UP-SNIVEL	22-Jul-86	B86-285	F	0.34		
SP-UP-SNIVEL	22-Jul-86	B86-286	F	0.33		
SP-UP-SNIVEL	22-Jul-86	B86-286	F	0.33		
SP-UP-SNIVEL	16-Oct-86	B87-004	F	0.28		
SP-UP-SNIVEL	16-Oct-86	B87-005	F	0.3		
SP-UP-SNIVEL	08-Apr-86	B86-193	FE	0.03	<	
SP-UP-SNIVEL	08-Apr-86	B86-194	FE	0.03	<	
SP-UP-SNIVEL	22-Jul-86	B86-286	FE	0.021	<	
SP-UP-SNIVEL	22-Jul-86	B86-285	FE	0.021	<	
SP-UP-SNIVEL	16-Oct-86	B87-004	FE	0.021	<	
SP-UP-SNIVEL	16-Oct-86	B87-005	FE	0.021	<	
SP-UP-SNIVEL	08-Apr-86	B86-193	FIELD ALK	77		
SP-UP-SNIVEL	22-Jul-86	B86-285	FIELD ALK	77		
SP-UP-SNIVEL	16-Oct-86	B87-004	FIELD ALK	75		
SP-UP-SNIVEL	08-Apr-86	B86-193	FIELD PH	7.72		
SP-UP-SNIVEL	22-Jul-86	B86-285	FIELD PH	7.79		
SP-UP-SNIVEL	16-Oct-86	B87-004	FIELD PH	7.33		
SP-UP-SNIVEL	08-Apr-86	B86-193	K	2.18		

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SPRING WATERS (sheet 19 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UP-SNIVEL	08-Apr-86	B86-194	K	2.12		
SP-UP-SNIVEL	22-Jul-86	B86-285	K	2.236		
SP-UP-SNIVEL	22-Jul-86	B86-286	K	2.305		
SP-UP-SNIVEL	16-Oct-86	B87-005	K	2.088		
SP-UP-SNIVEL	16-Oct-86	B87-004	K	2.094		
SP-UP-SNIVEL	08-Apr-86	B86-193	LAB ALK	76		
SP-UP-SNIVEL	22-Jul-86	B86-285	LAB ALK	77		
SP-UP-SNIVEL	16-Oct-86	B87-004	LAB ALK	78		
SP-UP-SNIVEL	08-Apr-86	B86-193	LAB COND	205		
SP-UP-SNIVEL	22-Jul-86	B86-285	LAB COND	210		
SP-UP-SNIVEL	16-Oct-86	B87-004	LAB COND	211		
SP-UP-SNIVEL	08-Apr-86	B86-193	LAB PH	7.86		
SP-UP-SNIVEL	22-Jul-86	B86-285	LAB PH	7.82		
SP-UP-SNIVEL	16-Oct-86	B87-004	LAB PH	7.77		
SP-UP-SNIVEL	08-Apr-86	B86-193	LI	0.016	<	
SP-UP-SNIVEL	08-Apr-86	B86-194	LI	0.016	<	
SP-UP-SNIVEL	22-Jul-86	B86-286	LI	0.011	<	
SP-UP-SNIVEL	22-Jul-86	B86-285	LI	0.011	<	
SP-UP-SNIVEL	16-Oct-86	B87-005	LI	0.011	<	
SP-UP-SNIVEL	16-Oct-86	B87-004	LI	0.011	<	
SP-UP-SNIVEL	08-Apr-86	B86-193	MG	8.08		
SP-UP-SNIVEL	08-Apr-86	B86-194	MG	8.03		
SP-UP-SNIVEL	22-Jul-86	B86-285	MG	8.339		
SP-UP-SNIVEL	22-Jul-86	B86-286	MG	8.413		
SP-UP-SNIVEL	16-Oct-86	B87-004	MG	8.094		
SP-UP-SNIVEL	16-Oct-86	B87-005	MG	8.119		
SP-UP-SNIVEL	08-Apr-86	B86-193	MN	0.01	<	
SP-UP-SNIVEL	08-Apr-86	B86-194	MN	0.01	<	
SP-UP-SNIVEL	22-Jul-86	B86-285	MN	0.007	<	

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SPRING WATERS (sheet 20 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UP-SNIVEL	22-Jul-86	B86-286	MN	0.007	<	
SP-UP-SNIVEL	16-Oct-86	B87-005	MN	0.007	<	
SP-UP-SNIVEL	16-Oct-86	B87-004	MN	0.007	<	
SP-UP-SNIVEL	08-Apr-86	B86-194	MO	0.6	<	
SP-UP-SNIVEL	08-Apr-86	B86-193	MO	0.6	<	
SP-UP-SNIVEL	22-Jul-86	B86-285	MO	0.424	<	
SP-UP-SNIVEL	22-Jul-86	B86-286	MO	0.424	<	
SP-UP-SNIVEL	16-Oct-86	B87-004	MO	0.424	<	
SP-UP-SNIVEL	16-Oct-86	B87-005	MO	0.424	<	
SP-UP-SNIVEL	08-Apr-86	B86-193	NA	8.08		
SP-UP-SNIVEL	08-Apr-86	B86-194	NA	8.05		
SP-UP-SNIVEL	22-Jul-86	B86-285	NA	8.289		
SP-UP-SNIVEL	22-Jul-86	B86-286	NA	8.354		
SP-UP-SNIVEL	16-Oct-86	B87-005	NA	8.152		
SP-UP-SNIVEL	16-Oct-86	B87-004	NA	8.25		
SP-UP-SNIVEL	08-Apr-86	B86-193	NO3	8.92		
SP-UP-SNIVEL	08-Apr-86	B86-194	NO3	8.28		
SP-UP-SNIVEL	08-Apr-86	B86-194	NO3	8.99		
SP-UP-SNIVEL	22-Jul-86	B86-286	NO3	8.5		
SP-UP-SNIVEL	22-Jul-86	B86-286	NO3	8.93		
SP-UP-SNIVEL	22-Jul-86	B86-285	NO3	8.28		
SP-UP-SNIVEL	16-Oct-86	B87-005	NO3	8.82		
SP-UP-SNIVEL	16-Oct-86	B87-004	NO3	8.93		
SP-UP-SNIVEL	08-Apr-86	B86-193	O18	-17		
SP-UP-SNIVEL	22-Jul-86	B86-285	O18	-16.8		
SP-UP-SNIVEL	16-Oct-86	B87-004	O18	-15.9		
SP-UP-SNIVEL	08-Apr-86	B86-193	ORP	110		
SP-UP-SNIVEL	22-Jul-86	B86-285	ORP	180		
SP-UP-SNIVEL	16-Oct-86	B87-004	ORP	175		

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SPRING WATERS (sheet 21 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UP-SNIVEL	22-Jul-86	B86-285	S34	4.1		
SP-UP-SNIVEL	08-Apr-86	B86-193	SAMP.TEMP	12.8		
SP-UP-SNIVEL	22-Jul-86	B86-285	SAMP.TEMP	12.8		
SP-UP-SNIVEL	16-Oct-86	B87-004	SAMP.TEMP	12.8		
SP-UP-SNIVEL	08-Apr-86	B86-193	SI	20.3		
SP-UP-SNIVEL	08-Apr-86	B86-194	SI	20.1		
SP-UP-SNIVEL	22-Jul-86	B86-286	SI	20.496		
SP-UP-SNIVEL	22-Jul-86	B86-285	SI	20.301		
SP-UP-SNIVEL	16-Oct-86	B87-005	SI	20.256		
SP-UP-SNIVEL	16-Oct-86	B87-004	SI	20.211		
SP-UP-SNIVEL	08-Apr-86	B86-194	SO4	12.1		
SP-UP-SNIVEL	08-Apr-86	B86-194	SO4	11.9		
SP-UP-SNIVEL	08-Apr-86	B86-193	SO4	12.1		
SP-UP-SNIVEL	22-Jul-86	B86-285	SO4	11.9		
SP-UP-SNIVEL	22-Jul-86	B86-286	SO4	11.84		
SP-UP-SNIVEL	22-Jul-86	B86-286	SO4	12.6		
SP-UP-SNIVEL	16-Oct-86	B87-005	SO4	12		
SP-UP-SNIVEL	16-Oct-86	B87-004	SO4	12.6		
SP-UP-SNIVEL	08-Apr-86	B86-194	SR	0.09		
SP-UP-SNIVEL	08-Apr-86	B86-193	SR	0.092		
SP-UP-SNIVEL	22-Jul-86	B86-285	SR	0.091		
SP-UP-SNIVEL	22-Jul-86	B86-286	SR	0.092		
SP-UP-SNIVEL	16-Oct-86	B87-005	SR	0.089		
SP-UP-SNIVEL	16-Oct-86	B87-004	SR	0.09		
SP-UP-SNIVEL	08-Apr-86	B86-193	T	0.67		
SP-UP-SNIVEL	22-Jul-86	B86-285	T	1.06		
SP-UP-SNIVEL	16-Oct-86	B87-004	T	0.91		
SP-UP-SNIVEL	08-Apr-86	B86-193	TC	18.1		
SP-UP-SNIVEL	22-Jul-86	B86-285	TC	18.87		

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SPRING WATERS (sheet 22 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UP-SNIVEL	16-Oct-86	B87-004	TC	18.6		
SP-UP-SNIVEL	08-Apr-86	B86-193	TOC	0.56		
SP-UP-SNIVEL	22-Jul-86	B86-285	TOC	0.46		
SP-UP-SNIVEL	16-Oct-86	B87-004	TOC	0.61		
SP-UP-SNIVEL	08-Apr-86	B86-193	TURB	0.27		
SP-UP-SNIVEL	22-Jul-86	B86-285	TURB	0.5		
SP-UP-SNIVEL	16-Oct-86	B87-004	TURB	0.45		
SP-UP-SNIVEL	08-Apr-86	B86-194	ZN	0.04	<	
SP-UP-SNIVEL	08-Apr-86	B86-193	ZN	0.04	<	
SP-UP-SNIVEL	22-Jul-86	B86-285	ZN	0.028	<	
SP-UP-SNIVEL	22-Jul-86	B86-286	ZN	0.028	<	
SP-UP-SNIVEL	16-Oct-86	B87-004	ZN	0.028	<	
SP-UP-SNIVEL	16-Oct-86	B87-005	ZN	0.028	<	
SP-UR2-07	29-Aug-85	P85-343	AL	0.1	<	
SP-UR2-07	29-Aug-85	P85-344	AL	0.1	<	
SP-UR2-07	17-Mar-86	B86-159	AL	0.2	<	
SP-UR2-07	17-Mar-86	B86-160	AL	0.2	<	
SP-UR2-07	13-Jun-86	B86-256	AL	0.202	<	
SP-UR2-07	13-Jun-86	B86-255	AL	0.202	<	
SP-UR2-07	19-Sep-86	B86-346	AL	0.141	<	
SP-UR2-07	19-Sep-86	B86-345	AL	0.141	<	
SP-UR2-07	29-Aug-85	P85-344	B	0.05	<	
SP-UR2-07	29-Aug-85	P85-343	B	0.05	<	
SP-UR2-07	17-Mar-86	B86-160	B	0.1	<	
SP-UR2-07	17-Mar-86	B86-159	B	0.1	<	
SP-UR2-07	13-Jun-86	B86-256	B	0.101	<	
SP-UR2-07	13-Jun-86	B86-255	B	0.101	<	
SP-UR2-07	19-Sep-86	B86-346	B	0.071	<	
SP-UR2-07	19-Sep-86	B86-345	B	0.071	<	

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SPRING WATERS (sheet 23 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR2-07	29-Aug-85	P85-344	BA	0.019		
SP-UR2-07	29-Aug-85	P85-343	BA	0.02		
SP-UR2-07	17-Mar-86	B86-160	BA	0.019		
SP-UR2-07	17-Mar-86	B86-159	BA	0.018		
SP-UR2-07	13-Jun-86	B86-255	BA	0.025		
SP-UR2-07	13-Jun-86	B86-256	BA	0.025		
SP-UR2-07	19-Sep-86	B86-345	BA	0.018		
SP-UR2-07	19-Sep-86	B86-346	BA	0.018		
SP-UR2-07	17-Mar-86	B86-159	C13	-15		
SP-UR2-07	13-Jun-86	B86-255	C13	-17.6		
SP-UR2-07	19-Sep-86	B86-345	C13	-16.5		
SP-UR2-07	17-Mar-86	B86-159	C14PMC	100.9		
SP-UR2-07	13-Jun-86	B86-255	C14PMC	106.6		
SP-UR2-07	19-Sep-86	B86-345	C14PMC	101.9		
SP-UR2-07	29-Aug-85	P85-344	CA	26.8		
SP-UR2-07	29-Aug-85	P85-343	CA	27.1		
SP-UR2-07	17-Mar-86	B86-159	CA	28.7		
SP-UR2-07	17-Mar-86	B86-160	CA	28.8		
SP-UR2-07	13-Jun-86	B86-255	CA	29.2		
SP-UR2-07	13-Jun-86	B86-256	CA	28.7		
SP-UR2-07	19-Sep-86	B86-345	CA	27.666		
SP-UR2-07	19-Sep-86	B86-346	CA	27.365		
SP-UR2-07	29-Aug-85	P85-344	CHG BAL	1.554		
SP-UR2-07	29-Aug-85	P85-343	CHG BAL	1.741		
SP-UR2-07	17-Mar-86	B86-159	CHG BAL	0.168		
SP-UR2-07	17-Mar-86	B86-160	CHG BAL	0.576		
SP-UR2-07	13-Jun-86	B86-255	CHG BAL	2.014		
SP-UR2-07	13-Jun-86	B86-256	CHG BAL	1.328		
SP-UR2-07	19-Sep-86	B86-345	CHG BAL	1.299		

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SPRING WATERS (sheet 24 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR2-07	19-Sep-86	B86-346	CHG BAL	0.96		
SP-UR2-07	29-Aug-85	P85-344	CL	2.4		
SP-UR2-07	29-Aug-85	P85-343	CL	2.49		
SP-UR2-07	17-Mar-86	B86-160	CL	4.62		
SP-UR2-07	17-Mar-86	B86-159	CL	4.72		
SP-UR2-07	13-Jun-86	B86-256	CL	1.91		
SP-UR2-07	13-Jun-86	B86-255	CL	1.95		
SP-UR2-07	19-Sep-86	B86-346	CL	3.61		
SP-UR2-07	19-Sep-86	B86-345	CL	3.65		
SP-UR2-07	29-Aug-85	P85-343	CU	0.006	<	
SP-UR2-07	29-Aug-85	P85-344	CU	0.006	<	
SP-UR2-07	17-Mar-86	B86-160	CU	0.03	<	
SP-UR2-07	17-Mar-86	B86-159	CU	0.03	<	
SP-UR2-07	13-Jun-86	B86-255	CU	0.03	<	
SP-UR2-07	13-Jun-86	B86-256	CU	0.03	<	
SP-UR2-07	19-Sep-86	B86-345	CU	0.021	<	
SP-UR2-07	19-Sep-86	B86-346	CU	0.021	<	
SP-UR2-07	29-Aug-85	P85-343	D	-116		
SP-UR2-07	17-Mar-86	B86-159	D	-127		
SP-UR2-07	13-Jun-86	B86-255	D	-122		
SP-UR2-07	19-Sep-86	B86-345	D	-118		
SP-UR2-07	29-Aug-85	P85-343	F	0.41		
SP-UR2-07	29-Aug-85	P85-344	F	0.4		
SP-UR2-07	17-Mar-86	B86-160	F	0.36		
SP-UR2-07	17-Mar-86	B86-159	F	0.36		
SP-UR2-07	13-Jun-86	B86-256	F	0.39		
SP-UR2-07	13-Jun-86	B86-255	F	0.42		
SP-UR2-07	19-Sep-86	B86-345	F	0.42		
SP-UR2-07	19-Sep-86	B86-346	F	0.39		

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SPRING WATERS (sheet 25 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR2-07	29-Aug-85	P85-343	FE	0.015	<	
SP-UR2-07	29-Aug-85	P85-344	FE	0.015	<	
SP-UR2-07	17-Mar-86	B86-159	FE	0.03	<	
SP-UR2-07	17-Mar-86	B86-160	FE	0.03	<	
SP-UR2-07	13-Jun-86	B86-256	FE	0.03	<	
SP-UR2-07	13-Jun-86	B86-255	FE	0.03	<	
SP-UR2-07	19-Sep-86	B86-345	FE	0.021	<	
SP-UR2-07	19-Sep-86	B86-346	FE	0.021	<	
SP-UR2-07	29-Aug-85	P85-343	FIELD ALK	111		
SP-UR2-07	17-Mar-86	B86-159	FIELD ALK	109		
SP-UR2-07	13-Jun-86	B86-255	FIELD ALK	117		
SP-UR2-07	19-Sep-86	B86-345	FIELD ALK	110		
SP-UR2-07	29-Aug-85	P85-343	FIELD PH	6.7		
SP-UR2-07	17-Mar-86	B86-159	FIELD PH	6.89		
SP-UR2-07	13-Jun-86	B86-255	FIELD PH	6.69		
SP-UR2-07	19-Sep-86	B86-345	FIELD PH	6.38		
SP-UR2-07	29-Aug-85	P85-344	K	1.69		
SP-UR2-07	29-Aug-85	P85-343	K	1.7		
SP-UR2-07	17-Mar-86	B86-160	K	1.53		
SP-UR2-07	17-Mar-86	B86-159	K	1.53		
SP-UR2-07	13-Jun-86	B86-255	K	1.95		
SP-UR2-07	13-Jun-86	B86-256	K	1.92		
SP-UR2-07	19-Sep-86	B86-345	K	1.792		
SP-UR2-07	19-Sep-86	B86-346	K	1.752		
SP-UR2-07	29-Aug-85	P85-343	LAB ALK	111		
SP-UR2-07	17-Mar-86	B86-159	LAB ALK	108		
SP-UR2-07	13-Jun-86	B86-255	LAB ALK	115		
SP-UR2-07	19-Sep-86	B86-345	LAB ALK	110		
SP-UR2-07	29-Aug-85	P85-343	LAB COND	238		

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SPRING WATERS (sheet 26 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR2-07	17-Mar-86	B86-159	LAB COND	252		
SP-UR2-07	13-Jun-86	B86-255	LAB COND	243		
SP-UR2-07	19-Sep-86	B86-345	LAB COND	244		
SP-UR2-07	29-Aug-85	P85-343	LAB PH	6.72		
SP-UR2-07	17-Mar-86	B86-159	LAB PH	6.97		
SP-UR2-07	13-Jun-86	B86-255	LAB PH	6.66		
SP-UR2-07	19-Sep-86	B86-345	LAB PH	7.03		
SP-UR2-07	29-Aug-85	P85-344	LI	0.008	<	
SP-UR2-07	29-Aug-85	P85-343	LI	0.008	<	
SP-UR2-07	17-Mar-86	B86-159	LI	0.016	<	
SP-UR2-07	17-Mar-86	B86-160	LI	0.016	<	
SP-UR2-07	13-Jun-86	B86-256	LI	0.016	<	
SP-UR2-07	13-Jun-86	B86-255	LI	0.016	<	
SP-UR2-07	19-Sep-86	B86-345	LI	0.011	<	
SP-UR2-07	19-Sep-86	B86-346	LI	0.011	<	
SP-UR2-07	29-Aug-85	P85-343	MG	9.67		
SP-UR2-07	29-Aug-85	P85-344	MG	9.62		
SP-UR2-07	17-Mar-86	B86-159	MG	9.83		
SP-UR2-07	17-Mar-86	B86-160	MG	9.88		
SP-UR2-07	13-Jun-86	B86-256	MG	9.74		
SP-UR2-07	13-Jun-86	B86-255	MG	9.88		
SP-UR2-07	19-Sep-86	B86-345	MG	9.504		
SP-UR2-07	19-Sep-86	B86-346	MG	9.445		
SP-UR2-07	29-Aug-85	P85-344	MN	0.004	<	
SP-UR2-07	29-Aug-85	P85-343	MN	0.004	<	
SP-UR2-07	17-Mar-86	B86-160	MN	0.01	<	
SP-UR2-07	17-Mar-86	B86-159	MN	0.01	<	
SP-UR2-07	13-Jun-86	B86-255	MN	0.01	<	
SP-UR2-07	13-Jun-86	B86-256	MN	0.01	<	

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SPRING WATERS (sheet 27 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR2-07	19-Sep-86	B86-345	MN	0.007	<	
SP-UR2-07	19-Sep-86	B86-346	MN	0.007	<	
SP-UR2-07	29-Aug-85	P85-343	MO	0.03	<	
SP-UR2-07	29-Aug-85	P85-344	MO	0.03	<	
SP-UR2-07	17-Mar-86	B86-160	MO	0.6	<	
SP-UR2-07	17-Mar-86	B86-159	MO	0.6	<	
SP-UR2-07	13-Jun-86	B86-256	MO	0.606	<	
SP-UR2-07	13-Jun-86	B86-255	MO	0.606	<	
SP-UR2-07	19-Sep-86	B86-345	MO	0.424	<	
SP-UR2-07	19-Sep-86	B86-346	MO	0.424	<	
SP-UR2-07	29-Aug-85	P85-343	NA	8.89		
SP-UR2-07	29-Aug-85	P85-344	NA	8.93		
SP-UR2-07	17-Mar-86	B86-159	NA	8.92		
SP-UR2-07	17-Mar-86	B86-160	NA	8.99		
SP-UR2-07	13-Jun-86	B86-255	NA	9.07		
SP-UR2-07	13-Jun-86	B86-256	NA	8.97		
SP-UR2-07	19-Sep-86	B86-345	NA	9.343		
SP-UR2-07	19-Sep-86	B86-346	NA	9.318		
SP-UR2-07	29-Aug-85	P85-344	NO3	1.33		
SP-UR2-07	29-Aug-85	P85-343	NO3	1.49		
SP-UR2-07	17-Mar-86	B86-159	NO3	5.16		
SP-UR2-07	17-Mar-86	B86-160	NO3	5		
SP-UR2-07	13-Jun-86	B86-255	NO3	1.46		
SP-UR2-07	13-Jun-86	B86-256	NO3	1.43		
SP-UR2-07	19-Sep-86	B86-345	NO3	3		
SP-UR2-07	19-Sep-86	B86-346	NO3	2.83		
SP-UR2-07	29-Aug-85	P85-343	O18	-15.8		
SP-UR2-07	17-Mar-86	B86-159	O18	-15.9		
SP-UR2-07	13-Jun-86	B86-255	O18	-15.8		

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SPRING WATERS (sheet 28 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR2-07	19-Sep-86	B86-345	O18	-15.8		
SP-UR2-07	29-Aug-85	P85-343	ORP	195		
SP-UR2-07	17-Mar-86	B86-159	ORP	135		
SP-UR2-07	13-Jun-86	B86-255	ORP	195		
SP-UR2-07	19-Sep-86	B86-345	ORP	220		
SP-UR2-07	17-Mar-86	B86-159	S34	3.2		
SP-UR2-07	13-Jun-86	B86-255	S34	5.5		
SP-UR2-07	29-Aug-85	P85-343	SAMP.TEMP	15		
SP-UR2-07	13-Jun-86	B86-255	SAMP.TEMP	13.1		
SP-UR2-07	19-Sep-86	B86-345	SAMP.TEMP	14.9		
SP-UR2-07	29-Aug-85	P85-343	SI	24.2		
SP-UR2-07	29-Aug-85	P85-344	SI	24.2		
SP-UR2-07	17-Mar-86	B86-159	SI	19.3		
SP-UR2-07	17-Mar-86	B86-160	SI	19.4		
SP-UR2-07	13-Jun-86	B86-255	SI	21.7		
SP-UR2-07	13-Jun-86	B86-256	SI	21.4		
SP-UR2-07	19-Sep-86	B86-345	SI	22.479		
SP-UR2-07	19-Sep-86	B86-346	SI	22.332		
SP-UR2-07	29-Aug-85	P85-344	SO4	7.29		
SP-UR2-07	29-Aug-85	P85-343	SO4	7.39		
SP-UR2-07	17-Mar-86	B86-160	SO4	11.5		
SP-UR2-07	17-Mar-86	B86-159	SO4	11.7		
SP-UR2-07	13-Jun-86	B86-256	SO4	7.93		
SP-UR2-07	13-Jun-86	B86-255	SO4	7.99		
SP-UR2-07	19-Sep-86	B86-345	SO4	8.36		
SP-UR2-07	19-Sep-86	B86-346	SO4	8.42		
SP-UR2-07	29-Aug-85	P85-344	SR	0.086		
SP-UR2-07	29-Aug-85	P85-343	SR	0.086		
SP-UR2-07	17-Mar-86	B86-159	SR	0.091		

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SPRING WATERS (sheet 29 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR2-07	17-Mar-86	B86-160	SR	0.091		
SP-UR2-07	13-Jun-86	B86-256	SR	0.094		
SP-UR2-07	13-Jun-86	B86-255	SR	0.095		
SP-UR2-07	19-Sep-86	B86-346	SR	0.091		
SP-UR2-07	19-Sep-86	B86-345	SR	0.091		
SP-UR2-07	29-Aug-85	P85-343	T	2.58		
SP-UR2-07	17-Mar-86	B86-159	T	1.97		
SP-UR2-07	13-Jun-86	B86-255	T	2.6		
SP-UR2-07	19-Sep-86	B86-345	T	2.89		
SP-UR2-07	29-Aug-85	P85-343	TC	33.8		
SP-UR2-07	17-Mar-86	B86-159	TC	31.9		
SP-UR2-07	13-Jun-86	B86-255	TC	35.9		
SP-UR2-07	19-Sep-86	B86-345	TC	32.9		
SP-UR2-07	29-Aug-85	P85-343	TOC	1.27		
SP-UR2-07	17-Mar-86	B86-159	TOC	1.64		
SP-UR2-07	13-Jun-86	B86-255	TOC	1.2		
SP-UR2-07	19-Sep-86	B86-345	TOC	1.08		
SP-UR2-07	29-Aug-85	P85-343	TURB	0.3		
SP-UR2-07	17-Mar-86	B86-159	TURB	0.27		
SP-UR2-07	13-Jun-86	B86-255	TURB	1		
SP-UR2-07	19-Sep-86	B86-345	TURB	0.35		
SP-UR2-07	29-Aug-85	P85-344	ZN	0.02	<	
SP-UR2-07	29-Aug-85	P85-343	ZN	0.02	<	
SP-UR2-07	17-Mar-86	B86-159	ZN	0.04	<	
SP-UR2-07	17-Mar-86	B86-160	ZN	0.04	<	
SP-UR2-07	13-Jun-86	B86-255	ZN	0.04	<	
SP-UR2-07	13-Jun-86	B86-256	ZN	0.04	<	
SP-UR2-07	19-Sep-86	B86-345	ZN	0.028	<	
SP-UR2-07	19-Sep-86	B86-346	ZN	0.028	<	

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SPRING WATERS (sheet 30 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR6-20	29-Aug-85	P85-347	AL	0.1	<	
SP-UR6-20	29-Aug-85	P85-346	AL	0.1	<	
SP-UR6-20	17-Mar-86	B86-163	AL	0.2	<	
SP-UR6-20	17-Mar-86	B86-162	AL	0.2	<	
SP-UR6-20	13-Jun-86	B86-259	AL	0.202	<	
SP-UR6-20	13-Jun-86	B86-258	AL	0.202	<	
SP-UR6-20	19-Sep-86	B86-349	AL	0.141	<	
SP-UR6-20	19-Sep-86	B86-348	AL	0.141	<	
SP-UR6-20	29-Aug-85	P85-347	B	0.05	<	
SP-UR6-20	29-Aug-85	P85-346	B	0.05	<	
SP-UR6-20	17-Mar-86	B86-162	B	0.1	<	
SP-UR6-20	17-Mar-86	B86-163	B	0.1	<	
SP-UR6-20	13-Jun-86	B86-258	B	0.101	<	
SP-UR6-20	13-Jun-86	B86-259	B	0.101	<	
SP-UR6-20	19-Sep-86	B86-348	B	0.071	<	
SP-UR6-20	19-Sep-86	B86-349	B	0.071	<	
SP-UR6-20	29-Aug-85	P85-347	BA	0.011		
SP-UR6-20	29-Aug-85	P85-346	BA	0.011		
SP-UR6-20	17-Mar-86	B86-163	BA	0.01		
SP-UR6-20	17-Mar-86	B86-162	BA	0.01		
SP-UR6-20	13-Jun-86	B86-258	BA	0.018		
SP-UR6-20	13-Jun-86	B86-259	BA	0.018		
SP-UR6-20	19-Sep-86	B86-348	BA	0.009		
SP-UR6-20	19-Sep-86	B86-349	BA	0.01		
SP-UR6-20	17-Mar-86	B86-162	C13	-15.5		
SP-UR6-20	13-Jun-86	B86-258	C13	-17.9		
SP-UR6-20	19-Sep-86	B86-348	C13	-16		
SP-UR6-20	17-Mar-86	B86-162	C14PMC	102		
SP-UR6-20	13-Jun-86	B86-258	C14PMC	104.2		

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SPRING WATERS (sheet 31 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR6-20	19-Sep-86	B86-348	C14PMC	98.6		
SP-UR6-20	29-Aug-85	P85-347	CA	24.2		
SP-UR6-20	29-Aug-85	P85-346	CA	24.1		
SP-UR6-20	17-Mar-86	B86-163	CA	24.9		
SP-UR6-20	17-Mar-86	B86-162	CA	24.9		
SP-UR6-20	13-Jun-86	B86-259	CA	24.9		
SP-UR6-20	13-Jun-86	B86-258	CA	25.1		
SP-UR6-20	19-Sep-86	B86-348	CA	23.677		
SP-UR6-20	19-Sep-86	B86-349	CA	23.841		
SP-UR6-20	29-Aug-85	P85-346	CHG BAL	0.23		
SP-UR6-20	29-Aug-85	P85-347	CHG BAL	0.348		
SP-UR6-20	17-Mar-86	B86-162	CHG BAL	-0.07		
SP-UR6-20	17-Mar-86	B86-163	CHG BAL	0.012		
SP-UR6-20	13-Jun-86	B86-259	CHG BAL	1.527		
SP-UR6-20	13-Jun-86	B86-258	CHG BAL	1.777		
SP-UR6-20	19-Sep-86	B86-349	CHG BAL	1.087		
SP-UR6-20	19-Sep-86	B86-348	CHG BAL	0.762		
SP-UR6-20	29-Aug-85	P85-346	CL	4.47		
SP-UR6-20	29-Aug-85	P85-347	CL	4.52		
SP-UR6-20	17-Mar-86	B86-162	CL	6.64		
SP-UR6-20	17-Mar-86	B86-163	CL	6.48		
SP-UR6-20	13-Jun-86	B86-258	CL	3.43		
SP-UR6-20	13-Jun-86	B86-259	CL	3.43		
SP-UR6-20	19-Sep-86	B86-348	CL	5.94		
SP-UR6-20	29-Aug-85	P85-346	CU	0.006	<	
SP-UR6-20	29-Aug-85	P85-347	CU	0.006	<	
SP-UR6-20	17-Mar-86	B86-163	CU	0.03	<	
SP-UR6-20	17-Mar-86	B86-162	CU	0.03	<	
SP-UR6-20	13-Jun-86	B86-259	CU	0.03	<	

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SPRING WATERS (sheet 32 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR6-20	13-Jun-86	B86-258	CU	0.03	<	
SP-UR6-20	19-Sep-86	B86-349	CU	0.021	<	
SP-UR6-20	19-Sep-86	B86-348	CU	0.021	<	
SP-UR6-20	29-Aug-85	P85-346	D	-118		
SP-UR6-20	17-Mar-86	B86-162	D	-124		
SP-UR6-20	13-Jun-86	B86-258	D	-124		
SP-UR6-20	19-Sep-86	B86-348	D	-119		
SP-UR6-20	29-Aug-85	P85-347	F	0.43		
SP-UR6-20	29-Aug-85	P85-346	F	0.45		
SP-UR6-20	17-Mar-86	B86-163	F	0.43		
SP-UR6-20	17-Mar-86	B86-162	F	0.45		
SP-UR6-20	13-Jun-86	B86-258	F	0.46		
SP-UR6-20	13-Jun-86	B86-259	F	0.43		
SP-UR6-20	19-Sep-86	B86-348	F	0.49		
SP-UR6-20	29-Aug-85	P85-346	FE	0.015	<	
SP-UR6-20	29-Aug-85	P85-347	FE	0.015	<	
SP-UR6-20	17-Mar-86	B86-163	FE	0.03	<	
SP-UR6-20	17-Mar-86	B86-162	FE	0.03	<	
SP-UR6-20	13-Jun-86	B86-259	FE	0.03	<	
SP-UR6-20	13-Jun-86	B86-258	FE	0.03	<	
SP-UR6-20	19-Sep-86	B86-349	FE	0.021	<	
SP-UR6-20	19-Sep-86	B86-348	FE	0.021	<	
SP-UR6-20	29-Aug-85	P85-346	FIELD ALK	104		
SP-UR6-20	17-Mar-86	B86-162	FIELD ALK	97		
SP-UR6-20	13-Jun-86	B86-258	FIELD ALK	105		
SP-UR6-20	19-Sep-86	B86-348	FIELD ALK	95		
SP-UR6-20	29-Aug-85	P85-346	FIELD PH	6.7		
SP-UR6-20	17-Mar-86	B86-162	FIELD PH	6.95		
SP-UR6-20	13-Jun-86	B86-258	FIELD PH	6.68		

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SPRING WATERS (sheet 33 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR6-20	19-Sep-86	B86-348	FIELD PH	6.23		
SP-UR6-20	29-Aug-85	P85-346	K	1.11		
SP-UR6-20	29-Aug-85	P85-347	K	1.09		
SP-UR6-20	17-Mar-86	B86-163	K	1.27		
SP-UR6-20	17-Mar-86	B86-162	K	1.28		
SP-UR6-20	13-Jun-86	B86-259	K	1.51		
SP-UR6-20	13-Jun-86	B86-258	K	1.49		
SP-UR6-20	19-Sep-86	B86-349	K	1.219		
SP-UR6-20	19-Sep-86	B86-348	K	1.232		
SP-UR6-20	29-Aug-85	P85-346	LAB ALK	100		
SP-UR6-20	17-Mar-86	B86-162	LAB ALK	95		
SP-UR6-20	13-Jun-86	B86-258	LAB ALK	104		
SP-UR6-20	19-Sep-86	B86-348	LAB ALK	98		
SP-UR6-20	29-Aug-85	P85-346	LAB COND	232		
SP-UR6-20	17-Mar-86	B86-162	LAB COND	239		
SP-UR6-20	13-Jun-86	B86-258	LAB COND	230		
SP-UR6-20	19-Sep-86	B86-348	LAB COND	236		
SP-UR6-20	29-Aug-85	P85-346	LAB PH	6.84		
SP-UR6-20	17-Mar-86	B86-162	LAB PH	7.02		
SP-UR6-20	13-Jun-86	B86-258	LAB PH	6.76		
SP-UR6-20	19-Sep-86	B86-348	LAB PH	7		
SP-UR6-20	29-Aug-85	P85-347	LI	0.008	<	
SP-UR6-20	29-Aug-85	P85-346	LI	0.008	<	
SP-UR6-20	17-Mar-86	B86-162	LI	0.016	<	
SP-UR6-20	17-Mar-86	B86-163	LI	0.016	<	
SP-UR6-20	13-Jun-86	B86-258	LI	0.016	<	
SP-UR6-20	13-Jun-86	B86-259	LI	0.016	<	
SP-UR6-20	19-Sep-86	B86-348	LI	0.011	<	
SP-UR6-20	19-Sep-86	B86-349	LI	0.011	<	

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SPRING WATERS (sheet 34 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR6-20	29-Aug-85	P85-347	MG	9.89		
SP-UR6-20	29-Aug-85	P85-346	MG	9.85		
SP-UR6-20	17-Mar-86	B86-162	MG	9.84		
SP-UR6-20	17-Mar-86	B86-163	MG	9.82		
SP-UR6-20	13-Jun-86	B86-259	MG	9.87		
SP-UR6-20	13-Jun-86	B86-258	MG	9.91		
SP-UR6-20	19-Sep-86	B86-348	MG	9.55		
SP-UR6-20	19-Sep-86	B86-349	MG	9.601		
SP-UR6-20	29-Aug-85	P85-347	MN	0.004	<	
SP-UR6-20	29-Aug-85	P85-346	MN	0.004	<	
SP-UR6-20	17-Mar-86	B86-162	MN	0.01	<	
SP-UR6-20	17-Mar-86	B86-163	MN	0.01	<	
SP-UR6-20	13-Jun-86	B86-258	MN	0.01	<	
SP-UR6-20	13-Jun-86	B86-259	MN	0.01	<	
SP-UR6-20	19-Sep-86	B86-348	MN	0.007	<	
SP-UR6-20	19-Sep-86	B86-349	MN	0.007	<	
SP-UR6-20	29-Aug-85	P85-347	MO	0.3	<	
SP-UR6-20	29-Aug-85	P85-346	MO	0.3	<	
SP-UR6-20	17-Mar-86	B86-162	MO	0.6	<	
SP-UR6-20	17-Mar-86	B86-163	MO	0.6	<	
SP-UR6-20	13-Jun-86	B86-259	MO	0.606	<	
SP-UR6-20	13-Jun-86	B86-258	MO	0.606	<	
SP-UR6-20	19-Sep-86	B86-348	MO	0.424	<	
SP-UR6-20	19-Sep-86	B86-349	MO	0.424	<	
SP-UR6-20	29-Aug-85	P85-347	NA	9.92		
SP-UR6-20	29-Aug-85	P85-346	NA	9.86		
SP-UR6-20	17-Mar-86	B86-163	NA	10		
SP-UR6-20	17-Mar-86	B86-162	NA	10		
SP-UR6-20	13-Jun-86	B86-259	NA	9.77		

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SPRING WATERS (sheet 35 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR6-20	13-Jun-86	B86-258	NA	9.8		
SP-UR6-20	19-Sep-86	B86-348	NA	10.019		
SP-UR6-20	19-Sep-86	B86-349	NA	10.02		
SP-UR6-20	17-Mar-86	B86-162	NO3	5.78		
SP-UR6-20	17-Mar-86	B86-163	NO3	5.75		
SP-UR6-20	13-Jun-86	B86-259	NO3	0.78		
SP-UR6-20	13-Jun-86	B86-258	NO3	0.77		
SP-UR6-20	19-Sep-86	B86-349	NO3	3.81		
SP-UR6-20	19-Sep-86	B86-348	NO3	3.76		
SP-UR6-20	29-Aug-85	P85-346	O18	-15.6		
SP-UR6-20	17-Mar-86	B86-162	O18	-16		
SP-UR6-20	13-Jun-86	B86-258	O18	-15.4		
SP-UR6-20	19-Sep-86	B86-348	O18	-14.8		
SP-UR6-20	29-Aug-85	P85-346	ORP	180		
SP-UR6-20	17-Mar-86	B86-162	ORP	140		
SP-UR6-20	13-Jun-86	B86-258	ORP	188		
SP-UR6-20	19-Sep-86	B86-348	ORP	190		
SP-UR6-20	17-Mar-86	B86-162	S34	4.4		
SP-UR6-20	13-Jun-86	B86-258	S34	5.8		
SP-UR6-20	29-Aug-85	P85-346	SAMP.TEMP	17.5		
SP-UR6-20	17-Mar-86	B86-162	SAMP.TEMP	7.8		
SP-UR6-20	13-Jun-86	B86-258	SAMP.TEMP	12.9		
SP-UR6-20	19-Sep-86	B86-348	SAMP.TEMP	14.4		
SP-UR6-20	29-Aug-85	P85-347	SI	27.4		
SP-UR6-20	29-Aug-85	P85-346	SI	27.3		
SP-UR6-20	17-Mar-86	B86-163	SI	21		
SP-UR6-20	17-Mar-86	B86-162	SI	21.1		
SP-UR6-20	13-Jun-86	B86-258	SI	23.5		
SP-UR6-20	13-Jun-86	B86-259	SI	23.4		

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SPRING WATERS (sheet 36 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR6-20	19-Sep-86	B86-349	SI	24.233		
SP-UR6-20	19-Sep-86	B86-348	SI	24.144		
SP-UR6-20	29-Aug-85	P85-346	SO4	11		
SP-UR6-20	29-Aug-85	P85-347	SO4	11.2		
SP-UR6-20	17-Mar-86	B86-162	SO4	13.4		
SP-UR6-20	17-Mar-86	B86-163	SO4	13.4		
SP-UR6-20	13-Jun-86	B86-259	SO4	10.1		
SP-UR6-20	13-Jun-86	B86-258	SO4	10.1		
SP-UR6-20	19-Sep-86	B86-349	SO4	11.6		
SP-UR6-20	19-Sep-86	B86-348	SO4	11.7		
SP-UR6-20	29-Aug-85	P85-347	SR	0.081		
SP-UR6-20	29-Aug-85	P85-346	SR	0.08		
SP-UR6-20	17-Mar-86	B86-162	SR	0.084		
SP-UR6-20	17-Mar-86	B86-163	SR	0.084		
SP-UR6-20	13-Jun-86	B86-259	SR	0.087		
SP-UR6-20	13-Jun-86	B86-258	SR	0.087		
SP-UR6-20	19-Sep-86	B86-349	SR	0.082		
SP-UR6-20	19-Sep-86	B86-348	SR	0.082		
SP-UR6-20	29-Aug-85	P85-346	T	1.01		
SP-UR6-20	17-Mar-86	B86-162	T	1.68		
SP-UR6-20	13-Jun-86	B86-258	T	2.32		
SP-UR6-20	19-Sep-86	B86-348	T	1.36		
SP-UR6-20	29-Aug-85	P85-346	TC	30.2		
SP-UR6-20	17-Mar-86	B86-162	TC	28.8		
SP-UR6-20	13-Jun-86	B86-258	TC	32		
SP-UR6-20	19-Sep-86	B86-348	TC	28.2		
SP-UR6-20	29-Aug-85	P85-346	TOC	0.98		
SP-UR6-20	17-Mar-86	B86-162	TOC	2.37		
SP-UR6-20	13-Jun-86	B86-258	TOC	1.15		

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SPRING WATERS (sheet 37 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR6-20	19-Sep-86	B86-348	TOC	0.99		
SP-UR6-20	29-Aug-85	P85-346	TURB	0.3		
SP-UR6-20	17-Mar-86	B86-162	TURB	0.22		
SP-UR6-20	13-Jun-86	B86-258	TURB	0.5		
SP-UR6-20	19-Sep-86	B86-348	TURB	0.51		
SP-UR6-20	29-Aug-85	P85-347	ZN	0.02	<	
SP-UR6-20	29-Aug-85	P85-346	ZN	0.02	<	
SP-UR6-20	17-Mar-86	B86-162	ZN	0.04	<	
SP-UR6-20	17-Mar-86	B86-163	ZN	0.04	<	
SP-UR6-20	13-Jun-86	B86-259	ZN	0.04	<	
SP-UR6-20	13-Jun-86	B86-258	ZN	0.04	<	
SP-UR6-20	19-Sep-86	B86-348	ZN	0.028	<	
SP-UR6-20	19-Sep-86	B86-349	ZN	0.028	<	
SP-UR7-22	29-Aug-85	P85-349	AL	0.1	<	
SP-UR7-22	29-Aug-85	P85-350	AL	0.1	<	
SP-UR7-22	13-Mar-86	B86-153	AL	0.2	<	
SP-UR7-22	13-Mar-86	B86-154	AL	0.2	<	
SP-UR7-22	11-Jun-86	B86-252	AL	0.202	<	
SP-UR7-22	11-Jun-86	B86-253	AL	0.202	<	
SP-UR7-22	18-Sep-86	B86-343	AL	0.141	<	
SP-UR7-22	18-Sep-86	B86-342	AL	0.141	<	
SP-UR7-22	29-Aug-85	P85-350	B	0.05	<	
SP-UR7-22	29-Aug-85	P85-349	B	0.05	<	
SP-UR7-22	13-Mar-86	B86-154	B	0.1	<	
SP-UR7-22	13-Mar-86	B86-153	B	0.1	<	
SP-UR7-22	11-Jun-86	B86-252	B	0.101	<	
SP-UR7-22	11-Jun-86	B86-253	B	0.101	<	
SP-UR7-22	18-Sep-86	B86-343	B	0.071	<	
SP-UR7-22	18-Sep-86	B86-342	B	0.071	<	

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SPRING WATERS (sheet 38 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR7-22	29-Aug-85	P85-350	BA	0.006		
SP-UR7-22	29-Aug-85	P85-349	BA	0.006		
SP-UR7-22	13-Mar-86	B86-153	BA	0.013		
SP-UR7-22	13-Mar-86	B86-154	BA	0.015		
SP-UR7-22	11-Jun-86	B86-253	BA	0.013		
SP-UR7-22	11-Jun-86	B86-252	BA	0.013		
SP-UR7-22	18-Sep-86	B86-343	BA	0.006	<	
SP-UR7-22	18-Sep-86	B86-342	BA	0.006	<	
SP-UR7-22	13-Mar-86	B86-153	C13	-13.8		
SP-UR7-22	11-Jun-86	B86-252	C13	-15.3		
SP-UR7-22	18-Sep-86	B86-342	C13	-14.3		
SP-UR7-22	13-Mar-86	B86-153	C14PMC	108.5		
SP-UR7-22	11-Jun-86	B86-252	C14PMC	92.8		
SP-UR7-22	18-Sep-86	B86-342	C14PMC	86.5		
SP-UR7-22	29-Aug-85	P85-349	CA	17.3		
SP-UR7-22	29-Aug-85	P85-350	CA	17.3		
SP-UR7-22	13-Mar-86	B86-154	CA	19.9		
SP-UR7-22	13-Mar-86	B86-153	CA	19.8		
SP-UR7-22	11-Jun-86	B86-252	CA	18.2		
SP-UR7-22	11-Jun-86	B86-253	CA	18.2		
SP-UR7-22	11-Jun-86	B86-252	CA	18.2		
SP-UR7-22	18-Sep-86	B86-343	CA	17.13		
SP-UR7-22	18-Sep-86	B86-342	CA	17.114		
SP-UR7-22	29-Aug-85	P85-349	CHG BAL	0.836		
SP-UR7-22	29-Aug-85	P85-350	CHG BAL	0.654		
SP-UR7-22	13-Mar-86	B86-153	CHG BAL	-0.796		
SP-UR7-22	13-Mar-86	B86-154	CHG BAL	-0.676		
SP-UR7-22	11-Jun-86	B86-252	CHG BAL	1.044		
SP-UR7-22	11-Jun-86	B86-253	CHG BAL	1.062		

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SPRING WATERS (sheet 39 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR7-22	18-Sep-86	B86-342	CHG BAL	0.872		
SP-UR7-22	18-Sep-86	B86-343	CHG BAL	0.852		
SP-UR7-22	29-Aug-85	P85-349	CL	3.54		
SP-UR7-22	29-Aug-85	P85-350	CL	3.49		
SP-UR7-22	13-Mar-86	B86-154	CL	7.1		
SP-UR7-22	13-Mar-86	B86-153	CL	7.03		
SP-UR7-22	11-Jun-86	B86-253	CL	3.74		
SP-UR7-22	11-Jun-86	B86-252	CL	3.75		
SP-UR7-22	18-Sep-86	B86-343	CL	3.76		
SP-UR7-22	18-Sep-86	B86-342	CL	3.77		
SP-UR7-22	29-Aug-85	P85-349	CU	0.006	<	
SP-UR7-22	29-Aug-85	P85-350	CU	0.006	<	
SP-UR7-22	13-Mar-86	B86-153	CU	0.03	<	
SP-UR7-22	13-Mar-86	B86-154	CU	0.03	<	
SP-UR7-22	11-Jun-86	B86-253	CU	0.03	<	
SP-UR7-22	11-Jun-86	B86-252	CU	0.03	<	
SP-UR7-22	18-Sep-86	B86-342	CU	0.021	<	
SP-UR7-22	18-Sep-86	B86-343	CU	0.021	<	
SP-UR7-22	29-Aug-85	P85-349	D	-106		
SP-UR7-22	13-Mar-86	B86-153	D	-116		
SP-UR7-22	11-Jun-86	B86-252	D	-112		
SP-UR7-22	18-Sep-86	B86-342	D	-110		
SP-UR7-22	29-Aug-85	P85-349	F	0.47		
SP-UR7-22	29-Aug-85	P85-350	F	0.47		
SP-UR7-22	13-Mar-86	B86-154	F	0.52		
SP-UR7-22	13-Mar-86	B86-153	F	0.52		
SP-UR7-22	11-Jun-86	B86-252	F	0.48		
SP-UR7-22	11-Jun-86	B86-253	F	0.47		
SP-UR7-22	18-Sep-86	B86-343	F	0.5		

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SPRING WATERS (sheet 40 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR7-22	18-Sep-86	B86-342	F	0.49		
SP-UR7-22	29-Aug-85	P85-350	FE	0.015	<	
SP-UR7-22	29-Aug-85	P85-349	FE	0.015	<	
SP-UR7-22	13-Mar-86	B86-153	FE	0.03	<	
SP-UR7-22	13-Mar-86	B86-154	FE	0.03	<	
SP-UR7-22	11-Jun-86	B86-253	FE	0.03	<	
SP-UR7-22	11-Jun-86	B86-252	FE	0.03	<	
SP-UR7-22	18-Sep-86	B86-343	FE	0.021	<	
SP-UR7-22	18-Sep-86	B86-342	FE	0.021	<	
SP-UR7-22	29-Aug-85	P85-349	FIELD ALK	92		
SP-UR7-22	13-Mar-86	B86-153	FIELD ALK	93		
SP-UR7-22	11-Jun-86	B86-252	FIELD ALK	94		
SP-UR7-22	18-Sep-86	B86-342	FIELD ALK	89		
SP-UR7-22	29-Aug-85	P85-349	FIELD PH	7.25		
SP-UR7-22	13-Mar-86	B86-153	FIELD PH	7.18		
SP-UR7-22	11-Jun-86	B86-252	FIELD PH	7.19		
SP-UR7-22	18-Sep-86	B86-342	FIELD PH	6.72		
SP-UR7-22	29-Aug-85	P85-349	K	2.37		
SP-UR7-22	29-Aug-85	P85-350	K	2.32		
SP-UR7-22	13-Mar-86	B86-154	K	1.94		
SP-UR7-22	13-Mar-86	B86-153	K	1.83		
SP-UR7-22	11-Jun-86	B86-253	K	2.29		
SP-UR7-22	11-Jun-86	B86-252	K	2.28		
SP-UR7-22	11-Jun-86	B86-252	K	2.28		
SP-UR7-22	18-Sep-86	B86-342	K	2.181		
SP-UR7-22	18-Sep-86	B86-343	K	2.169		
SP-UR7-22	29-Aug-85	P85-349	LAB ALK	90		
SP-UR7-22	13-Mar-86	B86-153	LAB ALK	92		
SP-UR7-22	11-Jun-86	B86-252	LAB ALK	93		

9 2 1 2 6 5 5 1 3 3 0

SPRING WATERS (sheet 41 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR7-22	18-Sep-86	B86-342	LAB ALK	89		
SP-UR7-22	29-Aug-85	P85-349	LAB COND	229		
SP-UR7-22	13-Mar-86	B86-153	LAB COND	258		
SP-UR7-22	11-Jun-86	B86-252	LAB COND	237		
SP-UR7-22	18-Sep-86	B86-342	LAB COND	232		
SP-UR7-22	29-Aug-85	P85-349	LAB PH	7.19		
SP-UR7-22	13-Mar-86	B86-153	LAB PH	7.31		
SP-UR7-22	11-Jun-86	B86-252	LAB PH	7.1		
SP-UR7-22	18-Sep-86	B86-342	LAB PH	7.36		
SP-UR7-22	29-Aug-85	P85-350	LI	0.008	<	
SP-UR7-22	29-Aug-85	P85-349	LI	0.008	<	
SP-UR7-22	13-Mar-86	B86-154	LI	0.016	<	
SP-UR7-22	13-Mar-86	B86-153	LI	0.016	<	
SP-UR7-22	11-Jun-86	B86-253	LI	0.016	<	
SP-UR7-22	11-Jun-86	B86-252	LI	0.016	<	
SP-UR7-22	18-Sep-86	B86-342	LI	0.011	<	
SP-UR7-22	18-Sep-86	B86-343	LI	0.011	<	
SP-UR7-22	29-Aug-85	P85-350	MG	12.3		
SP-UR7-22	29-Aug-85	P85-349	MG	12.3		
SP-UR7-22	13-Mar-86	B86-153	MG	12.1		
SP-UR7-22	13-Mar-86	B86-154	MG	12.2		
SP-UR7-22	11-Jun-86	B86-252	MG	12.3		
SP-UR7-22	11-Jun-86	B86-252	MG	12.3		
SP-UR7-22	11-Jun-86	B86-253	MG	12.3		
SP-UR7-22	18-Sep-86	B86-342	MG	11.975		
SP-UR7-22	18-Sep-86	B86-343	MG	11.965		
SP-UR7-22	29-Aug-85	P85-350	MN	0.004	<	
SP-UR7-22	29-Aug-85	P85-349	MN	0.004	<	
SP-UR7-22	13-Mar-86	B86-154	MN	0.01	<	

9 2 1 2 6 5 1 3 3 1

SPRING WATERS (sheet 42 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR7-22	13-Mar-86	B86-153	MN	0.01	<	
SP-UR7-22	11-Jun-86	B86-252	MN	0.01	<	
SP-UR7-22	11-Jun-86	B86-253	MN	0.01	<	
SP-UR7-22	18-Sep-86	B86-342	MN	0.007	<	
SP-UR7-22	18-Sep-86	B86-343	MN	0.007	<	
SP-UR7-22	29-Aug-85	P85-350	MO	0.3	<	
SP-UR7-22	29-Aug-85	P85-349	MO	0.3	<	
SP-UR7-22	13-Mar-86	B86-154	MO	0.6	<	
SP-UR7-22	13-Mar-86	B86-153	MO	0.6	<	
SP-UR7-22	11-Jun-86	B86-253	MO	0.606	<	
SP-UR7-22	11-Jun-86	B86-252	MO	0.606	<	
SP-UR7-22	18-Sep-86	B86-342	MO	0.424	<	
SP-UR7-22	18-Sep-86	B86-343	MO	0.424	<	
SP-UR7-22	29-Aug-85	P85-350	NA	11.1		
SP-UR7-22	29-Aug-85	P85-349	NA	11.2		
SP-UR7-22	13-Mar-86	B86-153	NA	14.6		
SP-UR7-22	13-Mar-86	B86-154	NA	14.5		
SP-UR7-22	11-Jun-86	B86-253	NA	11.9		
SP-UR7-22	11-Jun-86	B86-252	NA	11.9		
SP-UR7-22	11-Jun-86	B86-252	NA	11.9		
SP-UR7-22	18-Sep-86	B86-343	NA	11.623		
SP-UR7-22	18-Sep-86	B86-342	NA	11.674		
SP-UR7-22	29-Aug-85	P85-350	NO3	5.29		
SP-UR7-22	29-Aug-85	P85-349	NO3	4.88		
SP-UR7-22	13-Mar-86	B86-154	NO3	8.2		
SP-UR7-22	13-Mar-86	B86-153	NO3	8.12		
SP-UR7-22	11-Jun-86	B86-253	NO3	5.06		
SP-UR7-22	11-Jun-86	B86-252	NO3	5.05		
SP-UR7-22	18-Sep-86	B86-342	NO3	5.76		

9 2 1 2 6 3 5 1 3 3 2

SPRING WATERS (sheet 43 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR7-22	18-Sep-86	B86-343	NO3	5.78		
SP-UR7-22	29-Aug-85	P85-349	O18	-14.1		
SP-UR7-22	13-Mar-86	B86-153	O18	-14.6		
SP-UR7-22	11-Jun-86	B86-252	O18	-13.8		
SP-UR7-22	18-Sep-86	B86-342	O18	-14.1		
SP-UR7-22	29-Aug-85	P85-349	ORP	185		
SP-UR7-22	13-Mar-86	B86-153	ORP	175		
SP-UR7-22	13-Mar-86	B86-153	S34	5		
SP-UR7-22	11-Jun-86	B86-252	S34	5.2		
SP-UR7-22	29-Aug-85	P85-349	SAMP.TEMP	14.5		
SP-UR7-22	13-Mar-86	B86-153	SAMP.TEMP	9		
SP-UR7-22	11-Jun-86	B86-252	SAMP.TEMP	11.8		
SP-UR7-22	18-Sep-86	B86-342	SAMP.TEMP	13.2		
SP-UR7-22	29-Aug-85	P85-349	SI	23		
SP-UR7-22	29-Aug-85	P85-350	SI	23.1		
SP-UR7-22	13-Mar-86	B86-154	SI	21.3		
SP-UR7-22	13-Mar-86	B86-153	SI	20.9		
SP-UR7-22	11-Jun-86	B86-252	SI	20.9		
SP-UR7-22	18-Sep-86	B86-342	SI	21.593		
SP-UR7-22	18-Sep-86	B86-343	SI	21.555		
SP-UR7-22	29-Aug-85	P85-349	SO4	16.3		
SP-UR7-22	29-Aug-85	P85-350	SO4	16.2		
SP-UR7-22	13-Mar-86	B86-154	SO4	23.7		
SP-UR7-22	13-Mar-86	B86-153	SO4	23.6		
SP-UR7-22	11-Jun-86	B86-253	SO4	16.9		
SP-UR7-22	11-Jun-86	B86-252	SO4	16.9		
SP-UR7-22	18-Sep-86	B86-343	SO4	17		
SP-UR7-22	18-Sep-86	B86-342	SO4	17.1		
SP-UR7-22	29-Aug-85	P85-349	SR	0.04		

9 2 1 2 6 5 1 3 3 3

SPRING WATERS (sheet 44 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR7-22	29-Aug-85	P85-350	SR	0.04		
SP-UR7-22	13-Mar-86	B86-153	SR	0.056		
SP-UR7-22	13-Mar-86	B86-154	SR	0.056		
SP-UR7-22	11-Jun-86	B86-253	SR	0.046		
SP-UR7-22	11-Jun-86	B86-252	SR	0.046		
SP-UR7-22	18-Sep-86	B86-342	SR	0.041		
SP-UR7-22	18-Sep-86	B86-343	SR	0.041		
SP-UR7-22	29-Aug-85	P85-349	T	1.39		
SP-UR7-22	13-Mar-86	B86-153	T	5.85		
SP-UR7-22	11-Jun-86	B86-252	T	2.99		
SP-UR7-22	18-Sep-86	B86-342	T	1.55		
SP-UR7-22	29-Aug-85	P85-349	TC	23.8		
SP-UR7-22	13-Mar-86	B86-153	TC	25.2		
SP-UR7-22	11-Jun-86	B86-252	TC	24.6		
SP-UR7-22	18-Sep-86	B86-342	TC	23.1		
SP-UR7-22	29-Aug-85	P85-349	TOC	1.05		
SP-UR7-22	13-Mar-86	B86-153	TOC	2.3		
SP-UR7-22	11-Jun-86	B86-252	TOC	0.97		
SP-UR7-22	18-Sep-86	B86-342	TOC	0.76		
SP-UR7-22	29-Aug-85	P85-349	TURB	0.3		
SP-UR7-22	11-Jun-86	B86-252	TURB	0.7		
SP-UR7-22	18-Sep-86	B86-342	TURB	0.67		
SP-UR7-22	29-Aug-85	P85-349	ZN	0.02	<	
SP-UR7-22	29-Aug-85	P85-350	ZN	0.02	<	
SP-UR7-22	13-Mar-86	B86-154	ZN	0.04	<	
SP-UR7-22	13-Mar-86	B86-153	ZN	0.04	<	
SP-UR7-22	11-Jun-86	B86-253	ZN	0.04	<	
SP-UR7-22	11-Jun-86	B86-252	ZN	0.04	<	
SP-UR7-22	18-Sep-86	B86-342	ZN	0.028	<	

9 2 1 2 6 3 5 1 3 3 4

SPRING WATERS (sheet 45 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-UR7-22	18-Sep-86	B86-343	ZN	0.028	<	
SP-WARM	18-Jul-84	P84-358	AL	0.07	<	
SP-WARM	18-Jul-84	P84-371	AL	0.07	<	
SP-WARM	18-Jul-84	P84-358	B	0.034		
SP-WARM	18-Jul-84	P84-371	B	0.032		
SP-WARM	18-Jul-84	P84-358	BA	0.004		
SP-WARM	18-Jul-84	P84-371	BA	0.004		
SP-WARM	18-Jul-84	P84-358	CA	25.6		
SP-WARM	18-Jul-84	P84-371	CA	25.7		
SP-WARM	18-Jul-84	P84-358	CHG BAL	0.938		
SP-WARM	18-Jul-84	P84-371	CHG BAL	1.22		
SP-WARM	18-Jul-84	P84-371	CL	8.5		
SP-WARM	18-Jul-84	P84-358	CL	8.4		
SP-WARM	18-Jul-84	P84-358	CO	0.015	<	
SP-WARM	18-Jul-84	P84-371	CO	0.015	<	
SP-WARM	18-Jul-84	P84-371	CR	0.036	<	
SP-WARM	18-Jul-84	P84-358	CR	0.036	<	
SP-WARM	18-Jul-84	P84-358	CU	0.006	<	
SP-WARM	18-Jul-84	P84-371	CU	0.006	<	
SP-WARM	18-Jul-84	P84-358	D	-127		
SP-WARM	18-Jul-84	P84-358	F	0.7		
SP-WARM	18-Jul-84	P84-371	F	0.5		
SP-WARM	18-Jul-84	P84-358	FE	0.026		
SP-WARM	18-Jul-84	P84-371	FE	0.034		
SP-WARM	18-Jul-84	P84-358	FIELD ALK	134		
SP-WARM	18-Jul-84	P84-358	FIELD PH	7.95		
SP-WARM	18-Jul-84	P84-371	K	6.2		
SP-WARM	18-Jul-84	P84-358	K	6.2		
SP-WARM	18-Jul-84	P84-358	LAB ALK	133		

9 2 1 2 6 5 1 3 3 5

SPRING WATERS (sheet 46 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-WARM	18-Jul-84	P84-358	LAB COND	308		
SP-WARM	18-Jul-84	P84-358	LAB PH	7.6		
SP-WARM	18-Jul-84	P84-371	LI	0.006	<	
SP-WARM	18-Jul-84	P84-358	LI	0.006	<	
SP-WARM	18-Jul-84	P84-358	MG	11.2		
SP-WARM	18-Jul-84	P84-371	MG	11.3		
SP-WARM	18-Jul-84	P84-371	MN	0.004		
SP-WARM	18-Jul-84	P84-358	MN	0.004		
SP-WARM	18-Jul-84	P84-358	MO	0.02	<	
SP-WARM	18-Jul-84	P84-371	MO	0.02	<	
SP-WARM	18-Jul-84	P84-358	NA	22.9		
SP-WARM	18-Jul-84	P84-371	NA	22.9		
SP-WARM	18-Jul-84	P84-358	NI	0.026	<	
SP-WARM	18-Jul-84	P84-371	NI	0.026	<	
SP-WARM	18-Jul-84	P84-358	O18	-15.7		
SP-WARM	18-Jul-84	P84-358	ORP	165		
SP-WARM	18-Jul-84	P84-371	P	0.34	<	
SP-WARM	18-Jul-84	P84-358	P	0.34	<	
SP-WARM	18-Jul-84	P84-358	PB	0.15	<	
SP-WARM	18-Jul-84	P84-371	PB	0.15	<	
SP-WARM	18-Jul-84	P84-358	SAMP.TEMP	22.5		
SP-WARM	18-Jul-84	P84-358	SI	28.3		
SP-WARM	18-Jul-84	P84-371	SI	28.4		
SP-WARM	18-Jul-84	P84-358	SO4	16.2		
SP-WARM	18-Jul-84	P84-371	SO4	16.3		
SP-WARM	18-Jul-84	P84-371	SR	0.08		
SP-WARM	18-Jul-84	P84-358	SR	0.08		
SP-WARM	18-Jul-84	P84-358	T	0.12		
SP-WARM	18-Jul-84	P84-358	TC	31.58		

9 2 1 2 6 5 5 1 3 3 6

SPRING WATERS (sheet 47 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-WARM	18-Jul-84	P84-358	TOC	0.79		
SP-WARM	18-Jul-84	P84-358	ZN	0.15	<	
SP-WARM	18-Jul-84	P84-371	ZN	0.15	<	
SP-YR3-04	27-Aug-85	P85-333	AL	0.06	<	
SP-YR3-04	27-Aug-85	P85-334	AL	0.06	<	
SP-YR3-04	13-Mar-86	B86-151	AL	0.2	<	
SP-YR3-04	13-Mar-86	B86-150	AL	0.2	<	
SP-YR3-04	09-Jun-86	B86-243	AL	0.202	<	
SP-YR3-04	09-Jun-86	B86-244	AL	0.202	<	
SP-YR3-04	15-Sep-86	B86-334	AL	0.141	<	
SP-YR3-04	15-Sep-86	B86-333	AL	0.141	<	
SP-YR3-04	27-Aug-85	P85-334	B	0.016	<	
SP-YR3-04	27-Aug-85	P85-333	B	0.016	<	
SP-YR3-04	13-Mar-86	B86-150	B	0.1	<	
SP-YR3-04	13-Mar-86	B86-151	B	0.1	<	
SP-YR3-04	09-Jun-86	B86-243	B	0.101	<	
SP-YR3-04	09-Jun-86	B86-244	B	0.101	<	
SP-YR3-04	15-Sep-86	B86-334	B	0.071	<	
SP-YR3-04	15-Sep-86	B86-333	B	0.071	<	
SP-YR3-04	27-Aug-85	P85-334	BA	0.008		
SP-YR3-04	27-Aug-85	P85-333	BA	0.008		
SP-YR3-04	13-Mar-86	B86-150	BA	0.007		
SP-YR3-04	13-Mar-86	B86-151	BA	0.007		
SP-YR3-04	09-Jun-86	B86-243	BA	0.009		
SP-YR3-04	09-Jun-86	B86-244	BA	0.009		
SP-YR3-04	15-Sep-86	B86-334	BA	0.006	<	
SP-YR3-04	15-Sep-86	B86-333	BA	0.006	<	
SP-YR3-04	13-Mar-86	B86-150	C13	-14.7		
SP-YR3-04	09-Jun-86	B86-243	C13	-15.3		

9 2 1 2 6 5 1 3 3 7

SPRING WATERS (sheet 48 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR3-04	15-Sep-86	B86-333	C13	-15.7		
SP-YR3-04	13-Mar-86	B86-150	C14PMC	110.3		
SP-YR3-04	09-Jun-86	B86-243	C14PMC	105.2		
SP-YR3-04	15-Sep-86	B86-333	C14PMC	105		
SP-YR3-04	27-Aug-85	P85-334	CA	20.3		
SP-YR3-04	27-Aug-85	P85-333	CA	20.4		
SP-YR3-04	13-Mar-86	B86-150	CA	23		
SP-YR3-04	13-Mar-86	B86-151	CA	23.1		
SP-YR3-04	09-Jun-86	B86-243	CA	21.9		
SP-YR3-04	09-Jun-86	B86-244	CA	22.1		
SP-YR3-04	15-Sep-86	B86-334	CA	21.061		
SP-YR3-04	15-Sep-86	B86-333	CA	21.158		
SP-YR3-04	27-Aug-85	P85-333	CHG BAL	0.312		
SP-YR3-04	27-Aug-85	P85-334	CHG BAL	-0.021		
SP-YR3-04	13-Mar-86	B86-151	CHG BAL	-0.022		
SP-YR3-04	13-Mar-86	B86-150	CHG BAL	-0.039		
SP-YR3-04	09-Jun-86	B86-243	CHG BAL	1.22		
SP-YR3-04	09-Jun-86	B86-244	CHG BAL	1.414		
SP-YR3-04	15-Sep-86	B86-333	CHG BAL	0.228		
SP-YR3-04	15-Sep-86	B86-334	CHG BAL	0.257		
SP-YR3-04	27-Aug-85	P85-333	CL	4.63		
SP-YR3-04	27-Aug-85	P85-334	CL	4.63		
SP-YR3-04	13-Mar-86	B86-150	CL	7.07		
SP-YR3-04	13-Mar-86	B86-151	CL	7.08		
SP-YR3-04	09-Jun-86	B86-243	CL	4.68		
SP-YR3-04	09-Jun-86	B86-244	CL	4.69		
SP-YR3-04	15-Sep-86	B86-334	CL	4.49		
SP-YR3-04	15-Sep-86	B86-333	CL	4.48		
SP-YR3-04	27-Aug-85	P85-334	CO	0.017	<	

9 2 1 2 6 5 5 1 3 3 8

SPRING WATERS (sheet 49 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR3-04	27-Aug-85	P85-333	CO	0.017	<	
SP-YR3-04	27-Aug-85	P85-333	CR	0.032	<	
SP-YR3-04	27-Aug-85	P85-334	CR	0.032	<	
SP-YR3-04	27-Aug-85	P85-333	CU	0.006	<	
SP-YR3-04	27-Aug-85	P85-334	CU	0.006	<	
SP-YR3-04	13-Mar-86	B86-151	CU	0.03	<	
SP-YR3-04	13-Mar-86	B86-150	CU	0.03	<	
SP-YR3-04	09-Jun-86	B86-244	CU	0.03	<	
SP-YR3-04	09-Jun-86	B86-243	CU	0.03	<	
SP-YR3-04	15-Sep-86	B86-334	CU	0.021	<	
SP-YR3-04	15-Sep-86	B86-333	CU	0.021	<	
SP-YR3-04	27-Aug-85	P85-333	D	-117		
SP-YR3-04	13-Mar-86	B86-150	D	-117		
SP-YR3-04	09-Jun-86	B86-243	D	-119		
SP-YR3-04	15-Sep-86	B86-333	D	-115		
SP-YR3-04	27-Aug-85	P85-334	F	0.36		
SP-YR3-04	27-Aug-85	P85-333	F	0.36		
SP-YR3-04	13-Mar-86	B86-151	F	0.37		
SP-YR3-04	13-Mar-86	B86-150	F	0.39		
SP-YR3-04	09-Jun-86	B86-243	F	0.36		
SP-YR3-04	09-Jun-86	B86-244	F	0.35		
SP-YR3-04	15-Sep-86	B86-334	F	0.36		
SP-YR3-04	15-Sep-86	B86-333	F	0.36		
SP-YR3-04	27-Aug-85	P85-333	FE	0.009	<	
SP-YR3-04	27-Aug-85	P85-334	FE	0.009	<	
SP-YR3-04	13-Mar-86	B86-150	FE	0.03	<	
SP-YR3-04	13-Mar-86	B86-151	FE	0.03	<	
SP-YR3-04	09-Jun-86	B86-243	FE	0.03	<	
SP-YR3-04	09-Jun-86	B86-244	FE	0.03	<	

9 2 1 2 6 5 1 3 3 9

SPRING WATERS (sheet 50 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR3-04	15-Sep-86	B86-334	FE	0.0211	<	
SP-YR3-04	15-Sep-86	B86-333	FE	0.021	<	
SP-YR3-04	27-Aug-85	P85-333	FIELD ALK	103		
SP-YR3-04	13-Mar-86	B86-150	FIELD ALK	109		
SP-YR3-04	09-Jun-86	B86-243	FIELD ALK	106		
SP-YR3-04	15-Sep-86	B86-333	FIELD ALK	108		
SP-YR3-04	27-Aug-85	P85-333	FIELD PH	6.8		
SP-YR3-04	13-Mar-86	B86-150	FIELD PH	6.94		
SP-YR3-04	09-Jun-86	B86-243	FIELD PH	6.85		
SP-YR3-04	15-Sep-86	B86-333	FIELD PH	6.76		
SP-YR3-04	27-Aug-85	P85-333	K	2.58		
SP-YR3-04	27-Aug-85	P85-334	K	2.55		
SP-YR3-04	13-Mar-86	B86-151	K	2.29		
SP-YR3-04	13-Mar-86	B86-150	K	2.36		
SP-YR3-04	09-Jun-86	B86-244	K	2.58		
SP-YR3-04	09-Jun-86	B86-243	K	2.53		
SP-YR3-04	15-Sep-86	B86-333	K	2.305		
SP-YR3-04	15-Sep-86	B86-334	K	2.293		
SP-YR3-04	27-Aug-85	P85-333	LAB ALK	102		
SP-YR3-04	13-Mar-86	B86-150	LAB ALK	109		
SP-YR3-04	09-Jun-86	B86-243	LAB ALK	103		
SP-YR3-04	15-Sep-86	B86-333	LAB ALK	105		
SP-YR3-04	27-Aug-85	P85-333	LAB COND	236		
SP-YR3-04	13-Mar-86	B86-150	LAB COND	262		
SP-YR3-04	09-Jun-86	B86-243	LAB COND	244		
SP-YR3-04	15-Sep-86	B86-333	LAB COND	235		
SP-YR3-04	27-Aug-85	P85-333	LAB PH	6.8		
SP-YR3-04	13-Mar-86	B86-150	LAB PH	7.03		
SP-YR3-04	09-Jun-86	B86-243	LAB PH	6.81		

9 2 1 2 6 5 5 1 3 4 0

SPRING WATERS (sheet 51 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR3-04	15-Sep-86	B86-333	LAB PH	6.8		
SP-YR3-04	27-Aug-85	P85-334	LI	0.008	<	
SP-YR3-04	27-Aug-85	P85-333	LI	0.008	<	
SP-YR3-04	13-Mar-86	B86-150	LI	0.016	<	
SP-YR3-04	13-Mar-86	B86-151	LI	0.016	<	
SP-YR3-04	09-Jun-86	B86-243	LI	0.016	<	
SP-YR3-04	09-Jun-86	B86-244	LI	0.016	<	
SP-YR3-04	15-Sep-86	B86-333	LI	0.011	<	
SP-YR3-04	15-Sep-86	B86-334	LI	0.011	<	
SP-YR3-04	27-Aug-85	P85-334	MG	12.7		
SP-YR3-04	27-Aug-85	P85-333	MG	12.7		
SP-YR3-04	13-Mar-86	B86-150	MG	14.2		
SP-YR3-04	13-Mar-86	B86-151	MG	14.2		
SP-YR3-04	09-Jun-86	B86-243	MG	13.8		
SP-YR3-04	09-Jun-86	B86-244	MG	13.8		
SP-YR3-04	15-Sep-86	B86-333	MG	13.542		
SP-YR3-04	15-Sep-86	B86-334	MG	13.51		
SP-YR3-04	27-Aug-85	P85-334	MN	0.005	<	
SP-YR3-04	27-Aug-85	P85-333	MN	0.005	<	
SP-YR3-04	13-Mar-86	B86-150	MN	0.01	<	
SP-YR3-04	13-Mar-86	B86-151	MN	0.01	<	
SP-YR3-04	09-Jun-86	B86-244	MN	0.01	<	
SP-YR3-04	09-Jun-86	B86-243	MN	0.01	<	
SP-YR3-04	15-Sep-86	B86-333	MN	0.007	<	
SP-YR3-04	15-Sep-86	B86-334	MN	0.007	<	
SP-YR3-04	27-Aug-85	P85-334	MO	0.034	<	
SP-YR3-04	27-Aug-85	P85-333	MO	0.034	<	
SP-YR3-04	13-Mar-86	B86-151	MO	0.6	<	
SP-YR3-04	13-Mar-86	B86-150	MO	0.6	<	

9 2 1 2 6 5 1 3 4 1

SPRING WATERS (sheet 52 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR3-04	09-Jun-86	B86-243	MO	0.606	<	
SP-YR3-04	09-Jun-86	B86-244	MO	0.606	<	
SP-YR3-04	15-Sep-86	B86-334	MO	0.424	<	
SP-YR3-04	15-Sep-86	B86-333	MO	0.424	<	
SP-YR3-04	27-Aug-85	P85-334	NA	8.42		
SP-YR3-04	27-Aug-85	P85-333	NA	8.44		
SP-YR3-04	13-Mar-86	B86-150	NA	8.53		
SP-YR3-04	13-Mar-86	B86-151	NA	8.53		
SP-YR3-04	09-Jun-86	B86-244	NA	8.18		
SP-YR3-04	09-Jun-86	B86-243	NA	8.2		
SP-YR3-04	15-Sep-86	B86-334	NA	8.657		
SP-YR3-04	15-Sep-86	B86-333	NA	8.629		
SP-YR3-04	27-Aug-85	P85-333	NI	0.03	<	
SP-YR3-04	27-Aug-85	P85-334	NI	0.03	<	
SP-YR3-04	27-Aug-85	P85-334	NO3	1.91		
SP-YR3-04	27-Aug-85	P85-333	NO3	1.55		
SP-YR3-04	13-Mar-86	B86-150	NO3	3.46		
SP-YR3-04	13-Mar-86	B86-151	NO3	3.52		
SP-YR3-04	09-Jun-86	B86-244	NO3	2.87		
SP-YR3-04	09-Jun-86	B86-243	NO3	2.85		
SP-YR3-04	15-Sep-86	B86-334	NO3	1.91		
SP-YR3-04	15-Sep-86	B86-333	NO3	1.91		
SP-YR3-04	27-Aug-85	P85-333	O18	-14.9		
SP-YR3-04	13-Mar-86	B86-150	O18	-14.5		
SP-YR3-04	09-Jun-86	B86-243	O18	-14.5		
SP-YR3-04	15-Sep-86	B86-333	O18	-15		
SP-YR3-04	27-Aug-85	P85-333	ORP	160		
SP-YR3-04	13-Mar-86	B86-150	ORP	162		
SP-YR3-04	09-Jun-86	B86-243	ORP	135		

9 2 1 2 6 3 5 1 3 4 2

SPRING WATERS (sheet 53 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR3-04	15-Sep-86	B86-333	ORP	230		
SP-YR3-04	27-Aug-85	P85-333	PB	0.18	<	
SP-YR3-04	27-Aug-85	P85-334	PB	0.18	<	
SP-YR3-04	13-Mar-86	B86-150	S34	-1.8		
SP-YR3-04	09-Jun-86	B86-243	S34	4.9		
SP-YR3-04	27-Aug-85	P85-333	SAMP.TEMP	12.5		
SP-YR3-04	13-Mar-86	B86-150	SAMP.TEMP	8		
SP-YR3-04	09-Jun-86	B86-243	SAMP.TEMP	10.8		
SP-YR3-04	15-Sep-86	B86-333	SAMP.TEMP	12.8		
SP-YR3-04	27-Aug-85	P85-334	SI	20.5		
SP-YR3-04	27-Aug-85	P85-333	SI	20.7		
SP-YR3-04	13-Mar-86	B86-150	SI	18.9		
SP-YR3-04	13-Mar-86	B86-151	SI	18.9		
SP-YR3-04	09-Jun-86	B86-243	SI	19.2		
SP-YR3-04	09-Jun-86	B86-244	SI	19.3		
SP-YR3-04	15-Sep-86	B86-333	SI	20.526		
SP-YR3-04	15-Sep-86	B86-334	SI	20.485		
SP-YR3-04	27-Aug-85	P85-334	SO4	12		
SP-YR3-04	27-Aug-85	P85-333	SO4	11.8		
SP-YR3-04	13-Mar-86	B86-150	SO4	14.1		
SP-YR3-04	13-Mar-86	B86-151	SO4	14.2		
SP-YR3-04	09-Jun-86	B86-243	SO4	12.9		
SP-YR3-04	09-Jun-86	B86-244	SO4	12.9		
SP-YR3-04	15-Sep-86	B86-333	SO4	12.3		
SP-YR3-04	15-Sep-86	B86-334	SO4	11.9		
SP-YR3-04	27-Aug-85	P85-334	SR	0.047		
SP-YR3-04	27-Aug-85	P85-333	SR	0.046		
SP-YR3-04	13-Mar-86	B86-151	SR	0.054		
SP-YR3-04	13-Mar-86	B86-150	SR	0.054		

9 2 1 2 6 1 3 4 3

SPRING WATERS (sheet 54 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR3-04	09-Jun-86	B86-244	SR	0.052		
SP-YR3-04	09-Jun-86	B86-243	SR	0.051		
SP-YR3-04	15-Sep-86	B86-333	SR	0.049		
SP-YR3-04	15-Sep-86	B86-334	SR	0.049		
SP-YR3-04	27-Aug-85	P85-333	T	0.45		
SP-YR3-04	13-Mar-86	B86-150	T	0.89		
SP-YR3-04	09-Jun-86	B86-243	T	1.05		
SP-YR3-04	15-Sep-86	B86-333	T	0.39		
SP-YR3-04	27-Aug-85	P85-333	TC	31		
SP-YR3-04	13-Mar-86	B86-150	TC	31.4		
SP-YR3-04	09-Jun-86	B86-243	TC	31		
SP-YR3-04	15-Sep-86	B86-333	TC	33.4		
SP-YR3-04	27-Aug-85	P85-333	TOC	0.66		
SP-YR3-04	13-Mar-86	B86-150	TOC	1.33		
SP-YR3-04	09-Jun-86	B86-243	TOC	1.43		
SP-YR3-04	15-Sep-86	B86-333	TOC	1.48		
SP-YR3-04	27-Aug-85	P85-333	TURB	0.7		
SP-YR3-04	13-Mar-86	B86-150	TURB	0.38		
SP-YR3-04	09-Jun-86	B86-243	TURB	1		
SP-YR3-04	15-Sep-86	B86-333	TURB	0.75		
SP-YR3-04	27-Aug-85	P85-334	ZN	0.02	<	
SP-YR3-04	27-Aug-85	P85-333	ZN	0.02	<	
SP-YR3-04	13-Mar-86	B86-151	ZN	0.04	<	
SP-YR3-04	13-Mar-86	B86-150	ZN	0.04	<	
SP-YR3-04	09-Jun-86	B86-243	ZN	0.04	<	
SP-YR3-04	09-Jun-86	B86-244	ZN	0.04	<	
SP-YR3-04	15-Sep-86	B86-333	ZN	0.028	<	
SP-YR3-04	15-Sep-86	B86-334	ZN	0.028	<	
SP-YR5-08	27-Aug-85	P85-336	018	-16		

9 2 1 2 6 3 5 1 3 4 4

SPRING WATERS (sheet 55 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR5-08	27-Aug-85	P85-337	AL	0.06	<	
SP-YR5-08	27-Aug-85	P85-336	AL	0.06	<	
SP-YR5-08	19-Mar-86	B86-148	AL	0.2	<	
SP-YR5-08	19-Mar-86	B86-147	AL	0.2	<	
SP-YR5-08	09-Jun-86	B86-247	AL	0.202	<	
SP-YR5-08	09-Jun-86	B86-246	AL	0.202	<	
SP-YR5-08	15-Sep-86	B86-337	AL	0.141	<	
SP-YR5-08	15-Sep-86	B86-336	AL	0.141	<	
SP-YR5-08	27-Aug-85	P85-337	B	0.016	<	
SP-YR5-08	27-Aug-85	P85-336	B	0.016	<	
SP-YR5-08	19-Mar-86	B86-148	B	0.1	<	
SP-YR5-08	19-Mar-86	B86-147	B	0.1	<	
SP-YR5-08	09-Jun-86	B86-247	B	0.101	<	
SP-YR5-08	09-Jun-86	B86-246	B	0.101	<	
SP-YR5-08	15-Sep-86	B86-337	B	0.071	<	
SP-YR5-08	15-Sep-86	B86-336	B	0.071	<	
SP-YR5-08	27-Aug-85	P85-336	BA	0.008		
SP-YR5-08	27-Aug-85	P85-337	BA	0.008		
SP-YR5-08	19-Mar-86	B86-148	BA	0.01		
SP-YR5-08	19-Mar-86	B86-147	BA	0.009		
SP-YR5-08	09-Jun-86	B86-247	BA	0.009		
SP-YR5-08	09-Jun-86	B86-246	BA	0.009		
SP-YR5-08	15-Sep-86	B86-337	BA	0.006	<	
SP-YR5-08	15-Sep-86	B86-336	BA	0.006	<	
SP-YR5-08	19-Mar-86	B86-147	C13	-14.5		
SP-YR5-08	09-Jun-86	B86-246	C13	-16.1		
SP-YR5-08	15-Sep-86	B86-336	C13	-15.6		
SP-YR5-08	19-Mar-86	B86-147	C14PMC	116.4		
SP-YR5-08	09-Jun-86	B86-246	C14PMC	115.5		

92126 5 1 3 4 5

SPRING WATERS (sheet 56 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR5-08	15-Sep-86	B86-336	C14PMC	114.1		
SP-YR5-08	27-Aug-85	P85-336	CA	20.2		
SP-YR5-08	27-Aug-85	P85-337	CA	20.3		
SP-YR5-08	19-Mar-86	B86-147	CA	33.5		
SP-YR5-08	19-Mar-86	B86-148	CA	33.6		
SP-YR5-08	09-Jun-86	B86-246	CA	22.2		
SP-YR5-08	09-Jun-86	B86-247	CA	21.9		
SP-YR5-08	15-Sep-86	B86-336	CA	21.19		
SP-YR5-08	15-Sep-86	B86-337	CA	20.831		
SP-YR5-08	27-Aug-85	P85-336	CHG BAL	0.348		
SP-YR5-08	27-Aug-85	P85-337	CHG BAL	0.184		
SP-YR5-08	19-Mar-86	B86-148	CHG BAL	1.469		
SP-YR5-08	19-Mar-86	B86-147	CHG BAL	1.479		
SP-YR5-08	09-Jun-86	B86-247	CHG BAL	0.983		
SP-YR5-08	09-Jun-86	B86-246	CHG BAL	1.507		
SP-YR5-08	15-Sep-86	B86-336	CHG BAL	0.75		
SP-YR5-08	15-Sep-86	B86-337	CHG BAL	0.017		
SP-YR5-08	27-Aug-85	P85-337	CL	5.62		
SP-YR5-08	27-Aug-85	P85-336	CL	5.55		
SP-YR5-08	19-Mar-86	B86-147	CL	16.9		
SP-YR5-08	19-Mar-86	B86-148	CL	16.9		
SP-YR5-08	09-Jun-86	B86-247	CL	6.44		
SP-YR5-08	09-Jun-86	B86-246	CL	6.47		
SP-YR5-08	15-Sep-86	B86-336	CL	5.49		
SP-YR5-08	15-Sep-86	B86-337	CL	5.54		
SP-YR5-08	27-Aug-85	P85-336	CO	0.017	<	
SP-YR5-08	27-Aug-85	P85-337	CO	0.017	<	
SP-YR5-08	27-Aug-85	P85-337	CR	0.032	<	
SP-YR5-08	27-Aug-85	P85-336	CR	0.032	<	

9 2 1 2 6 5 5 1 3 4 6

SPRING WATERS (sheet 57 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR5-08	27-Aug-85	P85-337	CU	0.006	<	
SP-YR5-08	27-Aug-85	P85-336	CU	0.006	<	
SP-YR5-08	19-Mar-86	B86-147	CU	0.03	<	
SP-YR5-08	19-Mar-86	B86-148	CU	0.03	<	
SP-YR5-08	09-Jun-86	B86-247	CU	0.03	<	
SP-YR5-08	09-Jun-86	B86-246	CU	0.03	<	
SP-YR5-08	15-Sep-86	B86-336	CU	0.021	<	
SP-YR5-08	15-Sep-86	B86-337	CU	0.021	<	
SP-YR5-08	27-Aug-85	P85-336	D	-124		
SP-YR5-08	19-Mar-86	B86-147	D	-124		
SP-YR5-08	09-Jun-86	B86-246	D	-127		
SP-YR5-08	15-Sep-86	B86-336	D	-122		
SP-YR5-08	27-Aug-85	P85-337	F	0.38		
SP-YR5-08	27-Aug-85	P85-336	F	0.38		
SP-YR5-08	19-Mar-86	B86-148	F	0.36		
SP-YR5-08	19-Mar-86	B86-147	F	0.37		
SP-YR5-08	09-Jun-86	B86-246	F	0.38		
SP-YR5-08	09-Jun-86	B86-247	F	0.37		
SP-YR5-08	15-Sep-86	B86-336	F	0.36		
SP-YR5-08	15-Sep-86	B86-337	F	0.37		
SP-YR5-08	27-Aug-85	P85-336	FE	0.009	<	
SP-YR5-08	27-Aug-85	P85-337	FE	0.009	<	
SP-YR5-08	19-Mar-86	B86-148	FE	0.03	<	
SP-YR5-08	19-Mar-86	B86-147	FE	0.03	<	
SP-YR5-08	09-Jun-86	B86-246	FE	0.03	<	
SP-YR5-08	09-Jun-86	B86-247	FE	0.03	<	
SP-YR5-08	15-Sep-86	B86-337	FE	0.021	<	
SP-YR5-08	15-Sep-86	B86-336	FE	0.021	<	
SP-YR5-08	27-Aug-85	P85-336	FIELD ALK	95		

9 2 1 2 6 5 1 3 4 7

SPRING WATERS (sheet 58 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR5-08	19-Mar-86	B86-147	FIELD ALK	96		
SP-YR5-08	09-Jun-86	B86-246	FIELD ALK	95		
SP-YR5-08	15-Sep-86	B86-336	FIELD ALK	98		
SP-YR5-08	27-Aug-85	P85-336	FIELD PH	6.65		
SP-YR5-08	19-Mar-86	B86-147	FIELD PH	6.83		
SP-YR5-08	09-Jun-86	B86-246	FIELD PH	6.78		
SP-YR5-08	15-Sep-86	B86-336	FIELD PH	6.61		
SP-YR5-08	27-Aug-85	P85-336	K	2.58		
SP-YR5-08	27-Aug-85	P85-337	K	2.55		
SP-YR5-08	19-Mar-86	B86-148	K	2.72		
SP-YR5-08	19-Mar-86	B86-147	K	2.69		
SP-YR5-08	09-Jun-86	B86-247	K	2.33		
SP-YR5-08	09-Jun-86	B86-246	K	2.43		
SP-YR5-08	15-Sep-86	B86-336	K	2.23		
SP-YR5-08	15-Sep-86	B86-337	K	2.147		
SP-YR5-08	27-Aug-85	P85-336	LAB ALK	94		
SP-YR5-08	19-Mar-86	B86-147	LAB ALK	97		
SP-YR5-08	09-Jun-86	B86-246	LAB ALK	92		
SP-YR5-08	15-Sep-86	B86-336	LAB ALK	96		
SP-YR5-08	27-Aug-85	P85-336	LAB COND	219		
SP-YR5-08	19-Mar-86	B86-147	LAB COND	352		
SP-YR5-08	09-Jun-86	B86-246	LAB COND	230		
SP-YR5-08	15-Sep-86	B86-336	LAB COND	227		
SP-YR5-08	27-Aug-85	P85-336	LAB PH	6.62		
SP-YR5-08	19-Mar-86	B86-147	LAB PH	6.9		
SP-YR5-08	09-Jun-86	B86-246	LAB PH	6.61		
SP-YR5-08	15-Sep-86	B86-336	LAB PH	6.8		
SP-YR5-08	27-Aug-85	P85-336	LI	0.008	<	
SP-YR5-08	27-Aug-85	P85-337	LI	0.008	<	

9 2 1 2 6 5 5 1 3 4 8

SPRING WATERS (sheet 59 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR5-08	19-Mar-86	B86-148	LI	0.016	<	
SP-YR5-08	19-Mar-86	B86-147	LI	0.016	<	
SP-YR5-08	09-Jun-86	B86-247	LI	0.016	<	
SP-YR5-08	09-Jun-86	B86-246	LI	0.016	<	
SP-YR5-08	15-Sep-86	B86-337	LI	0.011	<	
SP-YR5-08	15-Sep-86	B86-336	LI	0.011	<	
SP-YR5-08	27-Aug-85	P85-337	MG	9.2		
SP-YR5-08	27-Aug-85	P85-336	MG	9.18		
SP-YR5-08	19-Mar-86	B86-148	MG	15.4		
SP-YR5-08	19-Mar-86	B86-147	MG	15.4		
SP-YR5-08	09-Jun-86	B86-246	MG	10.2		
SP-YR5-08	09-Jun-86	B86-247	MG	10.1		
SP-YR5-08	15-Sep-86	B86-337	MG	9.722		
SP-YR5-08	15-Sep-86	B86-336	MG	9.872		
SP-YR5-08	27-Aug-85	P85-337	MN	0.005	<	
SP-YR5-08	27-Aug-85	P85-336	MN	0.005	<	
SP-YR5-08	19-Mar-86	B86-148	MN	0.01	<	
SP-YR5-08	19-Mar-86	B86-147	MN	0.01	<	
SP-YR5-08	09-Jun-86	B86-246	MN	0.01	<	
SP-YR5-08	09-Jun-86	B86-247	MN	0.01	<	
SP-YR5-08	15-Sep-86	B86-337	MN	0.007	<	
SP-YR5-08	15-Sep-86	B86-336	MN	0.007	<	
SP-YR5-08	27-Aug-85	P85-337	MO	0.034	<	
SP-YR5-08	27-Aug-85	P85-336	MO	0.034	<	
SP-YR5-08	19-Mar-86	B86-147	MO	0.6	<	
SP-YR5-08	19-Mar-86	B86-148	MO	0.6	<	
SP-YR5-08	09-Jun-86	B86-246	MO	0.606	<	
SP-YR5-08	09-Jun-86	B86-247	MO	0.606	<	
SP-YR5-08	15-Sep-86	B86-336	MO	0.424	<	

SPRING WATERS (sheet 60 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR5-08	15-Sep-86	B86-337	MO	0.424	<	
SP-YR5-08	27-Aug-85	P85-337	NA	10.7		
SP-YR5-08	27-Aug-85	P85-336	NA	10.9		
SP-YR5-08	19-Mar-86	B86-147	NA	12.6		
SP-YR5-08	19-Mar-86	B86-148	NA	12.4		
SP-YR5-08	09-Jun-86	B86-247	NA	10.5		
SP-YR5-08	09-Jun-86	B86-246	NA	10.6		
SP-YR5-08	15-Sep-86	B86-337	NA	11		
SP-YR5-08	15-Sep-86	B86-336	NA	11.064		
SP-YR5-08	27-Aug-85	P85-337	NI	0.03	<	
SP-YR5-08	27-Aug-85	P85-336	NI	0.03	<	
SP-YR5-08	19-Mar-86	B86-147	NO3	39.8		
SP-YR5-08	19-Mar-86	B86-148	NO3	39.7		
SP-YR5-08	09-Jun-86	B86-246	NO3	4.04		
SP-YR5-08	09-Jun-86	B86-247	NO3	3.99		
SP-YR5-08	15-Sep-86	B86-336	NO3	0.82		
SP-YR5-08	15-Sep-86	B86-337	NO3	0.82		
SP-YR5-08	19-Mar-86	B86-147	O18	-15.9		
SP-YR5-08	09-Jun-86	B86-246	O18	-16.6		
SP-YR5-08	15-Sep-86	B86-336	O18	-15.8		
SP-YR5-08	27-Aug-85	P85-336	ORP	250		
SP-YR5-08	19-Mar-86	B86-147	ORP	190		
SP-YR5-08	09-Jun-86	B86-246	ORP	170		
SP-YR5-08	15-Sep-86	B86-336	ORP	195		
SP-YR5-08	27-Aug-85	P85-336	PB	0.18	<	
SP-YR5-08	27-Aug-85	P85-337	PB	0.18	<	
SP-YR5-08	19-Mar-86	B86-147	S34	4		
SP-YR5-08	09-Jun-86	B86-246	S34	6.1		
SP-YR5-08	27-Aug-85	P85-336	SAMP.TEMP	13.5		

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SPRING WATERS (sheet 61 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR5-08	19-Mar-86	B86-147	SAMP.TEMP	5.5		
SP-YR5-08	09-Jun-86	B86-246	SAMP.TEMP	9.8		
SP-YR5-08	15-Sep-86	B86-336	SAMP.TEMP	11.8		
SP-YR5-08	27-Aug-85	P85-337	SI	23.5		
SP-YR5-08	27-Aug-85	P85-336	SI	23.1		
SP-YR5-08	19-Mar-86	B86-147	SI	20		
SP-YR5-08	19-Mar-86	B86-148	SI	19.8		
SP-YR5-08	09-Jun-86	B86-246	SI	21.2		
SP-YR5-08	09-Jun-86	B86-247	SI	21		
SP-YR5-08	15-Sep-86	B86-336	SI	22.765		
SP-YR5-08	15-Sep-86	B86-337	SI	22.472		
SP-YR5-08	27-Aug-85	P85-336	SO4	10.12		
SP-YR5-08	27-Aug-85	P85-337	SO4	10.25		
SP-YR5-08	19-Mar-86	B86-147	SO4	18.9		
SP-YR5-08	19-Mar-86	B86-148	SO4	18.9		
SP-YR5-08	09-Jun-86	B86-247	SO4	10.9		
SP-YR5-08	09-Jun-86	B86-246	SO4	11		
SP-YR5-08	15-Sep-86	B86-336	SO4	10.8		
SP-YR5-08	15-Sep-86	B86-337	SO4	10.7		
SP-YR5-08	27-Aug-85	P85-336	SR	0.074		
SP-YR5-08	27-Aug-85	P85-337	SR	0.066		
SP-YR5-08	19-Mar-86	B86-148	SR	0.12		
SP-YR5-08	19-Mar-86	B86-147	SR	0.12		
SP-YR5-08	09-Jun-86	B86-246	SR	0.08		
SP-YR5-08	09-Jun-86	B86-247	SR	0.079		
SP-YR5-08	15-Sep-86	B86-336	SR	0.077		
SP-YR5-08	15-Sep-86	B86-337	SR	0.076		
SP-YR5-08	27-Aug-85	P85-336	T	0.49		
SP-YR5-08	19-Mar-86	B86-147	T	2.07		

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SPRING WATERS (sheet 62 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR5-08	09-Jun-86	B86-246	T	0.94		
SP-YR5-08	15-Sep-86	B86-336	T	0.38		
SP-YR5-08	27-Aug-85	P85-336	TC	27		
SP-YR5-08	19-Mar-86	B86-147	TC	32.3		
SP-YR5-08	09-Jun-86	B86-246	TC	29.6		
SP-YR5-08	15-Sep-86	B86-336	TC	30.4		
SP-YR5-08	27-Aug-85	P85-336	TOC	1.15		
SP-YR5-08	19-Mar-86	B86-147	TOC	4.38		
SP-YR5-08	09-Jun-86	B86-246	TOC	1.41		
SP-YR5-08	15-Sep-86	B86-336	TOC	1.14		
SP-YR5-08	27-Aug-85	P85-336	TURB	0.3		
SP-YR5-08	19-Mar-86	B86-147	TURB	0.85		
SP-YR5-08	09-Jun-86	B86-246	TURB	1.3		
SP-YR5-08	15-Sep-86	B86-336	TURB	0.83		
SP-YR5-08	27-Aug-85	P85-337	ZN	0.02	<	
SP-YR5-08	27-Aug-85	P85-336	ZN	0.02	<	
SP-YR5-08	19-Mar-86	B86-148	ZN	0.04	<	
SP-YR5-08	19-Mar-86	B86-147	ZN	0.04	<	
SP-YR5-08	09-Jun-86	B86-247	ZN	0.04	<	
SP-YR5-08	09-Jun-86	B86-246	ZN	0.04	<	
SP-YR5-08	15-Sep-86	B86-336	ZN	0.028	<	
SP-YR5-08	15-Sep-86	B86-337	ZN	0.028	<	
SP-YR7-14	27-Aug-85	P85-339	AL	0.06	<	
SP-YR7-14	27-Aug-85	P85-340	AL	0.06	<	
SP-YR7-14	19-Mar-86	B86-157	AL	0.2	<	
SP-YR7-14	19-Mar-86	B86-156	AL	0.2	<	
SP-YR7-14	11-Jun-86	B86-250	AL	0.202	<	
SP-YR7-14	11-Jun-86	B86-249	AL	0.202	<	
SP-YR7-14	17-Sep-86	B86-339	AL	0.141	<	

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SPRING WATERS (sheet 63 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR7-14	17-Sep-86	B86-340	AL	0.141	<	
SP-YR7-14	27-Aug-85	P85-340	B	0.016	<	
SP-YR7-14	27-Aug-85	P85-339	B	0.016	<	
SP-YR7-14	19-Mar-86	B86-156	B	0.1	<	
SP-YR7-14	19-Mar-86	B86-157	B	0.1	<	
SP-YR7-14	11-Jun-86	B86-249	B	0.101	<	
SP-YR7-14	11-Jun-86	B86-250	B	0.101	<	
SP-YR7-14	17-Sep-86	B86-339	B	0.071	<	
SP-YR7-14	17-Sep-86	B86-340	B	0.071	<	
SP-YR7-14	27-Aug-85	P85-340	BA	0.008		
SP-YR7-14	27-Aug-85	P85-339	BA	0.008		
SP-YR7-14	19-Mar-86	B86-156	BA	0.006		
SP-YR7-14	19-Mar-86	B86-157	BA	0.006		
SP-YR7-14	11-Jun-86	B86-250	BA	0.009		
SP-YR7-14	11-Jun-86	B86-249	BA	0.008		
SP-YR7-14	17-Sep-86	B86-339	BA	0.006	<	
SP-YR7-14	17-Sep-86	B86-340	BA	0.008		
SP-YR7-14	19-Mar-86	B86-156	C13	-14.5		
SP-YR7-14	11-Jun-86	B86-249	C13	-15.5		
SP-YR7-14	17-Sep-86	B86-339	C13	-16.2		
SP-YR7-14	19-Mar-86	B86-156	C14PMC	115		
SP-YR7-14	11-Jun-86	B86-249	C14PMC	116.2		
SP-YR7-14	17-Sep-86	B86-339	C14PMC	114.5		
SP-YR7-14	27-Aug-85	P85-340	CA	16.7		
SP-YR7-14	27-Aug-85	P85-339	CA	16.8		
SP-YR7-14	19-Mar-86	B86-157	CA	14.6		
SP-YR7-14	19-Mar-86	B86-156	CA	14.5		
SP-YR7-14	11-Jun-86	B86-249	CA	17		
SP-YR7-14	11-Jun-86	B86-250	CA	16.8		

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SPRING WATERS (sheet 64 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR7-14	17-Sep-86	B86-340	CA	16.977		
SP-YR7-14	17-Sep-86	B86-339	CA	17.081		
SP-YR7-14	27-Aug-85	P85-339	CHG BAL	0.151		
SP-YR7-14	27-Aug-85	P85-340	CHG BAL	0.244		
SP-YR7-14	19-Mar-86	B86-157	CHG BAL	0.239		
SP-YR7-14	19-Mar-86	B86-156	CHG BAL	-0.143		
SP-YR7-14	11-Jun-86	B86-250	CHG BAL	0.639		
SP-YR7-14	11-Jun-86	B86-249	CHG BAL	0.97		
SP-YR7-14	17-Sep-86	B86-340	CHG BAL	0.014		
SP-YR7-14	17-Sep-86	B86-339	CHG BAL	0.171		
SP-YR7-14	27-Aug-85	P85-339	CL	7.47		
SP-YR7-14	27-Aug-85	P85-340	CL	7.4		
SP-YR7-14	19-Mar-86	B86-156	CL	6.61		
SP-YR7-14	19-Mar-86	B86-157	CL	6.62		
SP-YR7-14	11-Jun-86	B86-249	CL	6.23		
SP-YR7-14	11-Jun-86	B86-250	CL	6.2		
SP-YR7-14	17-Sep-86	B86-340	CL	7.68		
SP-YR7-14	17-Sep-86	B86-339	CL	7.63		
SP-YR7-14	27-Aug-85	P85-339	CO	0.017	<	
SP-YR7-14	27-Aug-85	P85-340	CO	0.017	<	
SP-YR7-14	27-Aug-85	P85-340	CR	0.032	<	
SP-YR7-14	27-Aug-85	P85-339	CR	0.032	<	
SP-YR7-14	27-Aug-85	P85-340	CU	0.006	<	
SP-YR7-14	27-Aug-85	P85-339	CU	0.006	<	
SP-YR7-14	19-Mar-86	B86-157	CU	0.03	<	
SP-YR7-14	19-Mar-86	B86-156	CU	0.03	<	
SP-YR7-14	11-Jun-86	B86-250	CU	0.03	<	
SP-YR7-14	11-Jun-86	B86-249	CU	0.03	<	
SP-YR7-14	17-Sep-86	B86-339	CU	0.021	<	

9 2 1 2 6 5 1 3 5 4

SPRING WATERS (sheet 65 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR7-14	17-Sep-86	B86-340	CU	0.021	<	
SP-YR7-14	27-Aug-85	P85-339	D	-126		
SP-YR7-14	19-Mar-86	B86-156	D	-124		
SP-YR7-14	11-Jun-86	B86-249	D	-127		
SP-YR7-14	17-Sep-86	B86-339	D	-119		
SP-YR7-14	27-Aug-85	P85-340	F	0.2		
SP-YR7-14	27-Aug-85	P85-339	F	0.2		
SP-YR7-14	19-Mar-86	B86-157	F	0.2		
SP-YR7-14	19-Mar-86	B86-156	F	0.2		
SP-YR7-14	11-Jun-86	B86-249	F	0.21		
SP-YR7-14	11-Jun-86	B86-250	F	0.2		
SP-YR7-14	17-Sep-86	B86-340	F	0.19		
SP-YR7-14	17-Sep-86	B86-339	F	0.18		
SP-YR7-14	27-Aug-85	P85-340	FE	0.009	<	
SP-YR7-14	27-Aug-85	P85-339	FE	0.009	<	
SP-YR7-14	19-Mar-86	B86-156	FE	0.03	<	
SP-YR7-14	19-Mar-86	B86-157	FE	0.03	<	
SP-YR7-14	11-Jun-86	B86-249	FE	0.03	<	
SP-YR7-14	11-Jun-86	B86-250	FE	0.03	<	
SP-YR7-14	17-Sep-86	B86-339	FE	0.021	<	
SP-YR7-14	17-Sep-86	B86-340	FE	0.021	<	
SP-YR7-14	27-Aug-85	P85-339	FIELD ALK	66		
SP-YR7-14	19-Mar-86	B86-156	FIELD ALK	54		
SP-YR7-14	11-Jun-86	B86-249	FIELD ALK	66		
SP-YR7-14	17-Sep-86	B86-339	FIELD ALK	67		
SP-YR7-14	27-Aug-85	P85-339	FIELD PH	6.65		
SP-YR7-14	19-Mar-86	B86-156	FIELD PH	6.87		
SP-YR7-14	11-Jun-86	B86-249	FIELD PH	6.76		
SP-YR7-14	17-Sep-86	B86-339	FIELD PH	6.21		

9 2 1 2 6 5 1 3 5 5

SPRING WATERS (sheet 66 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR7-14	27-Aug-85	P85-340	K	2.2		
SP-YR7-14	27-Aug-85	P85-339	K	2.26		
SP-YR7-14	19-Mar-86	B86-156	K	1.77		
SP-YR7-14	19-Mar-86	B86-157	K	1.78		
SP-YR7-14	11-Jun-86	B86-250	K	1.98		
SP-YR7-14	11-Jun-86	B86-249	K	2		
SP-YR7-14	17-Sep-86	B86-339	K	1.95		
SP-YR7-14	17-Sep-86	B86-340	K	1.912		
SP-YR7-14	27-Aug-85	P85-339	LAB ALK	63		
SP-YR7-14	19-Mar-86	B86-156	LAB ALK	53		
SP-YR7-14	11-Jun-86	B86-249	LAB ALK	63		
SP-YR7-14	17-Sep-86	B86-339	LAB ALK	64		
SP-YR7-14	27-Aug-85	P85-339	LAB COND	177		
SP-YR7-14	19-Mar-86	B86-156	LAB COND	158		
SP-YR7-14	11-Jun-86	B86-249	LAB COND	175		
SP-YR7-14	17-Sep-86	B86-339	LAB COND	179		
SP-YR7-14	27-Aug-85	P85-339	LAB PH	6.65		
SP-YR7-14	19-Mar-86	B86-156	LAB PH	6.89		
SP-YR7-14	11-Jun-86	B86-249	LAB PH	6.61		
SP-YR7-14	17-Sep-86	B86-339	LAB PH	6.82		
SP-YR7-14	27-Aug-85	P85-339	LI	0.008	<	
SP-YR7-14	27-Aug-85	P85-340	LI	0.008	<	
SP-YR7-14	19-Mar-86	B86-157	LI	0.016	<	
SP-YR7-14	19-Mar-86	B86-156	LI	0.016	<	
SP-YR7-14	11-Jun-86	B86-249	LI	0.016	<	
SP-YR7-14	11-Jun-86	B86-250	LI	0.016	<	
SP-YR7-14	17-Sep-86	B86-339	LI	0.011	<	
SP-YR7-14	17-Sep-86	B86-340	LI	0.011	<	
SP-YR7-14	27-Aug-85	P85-340	MG	6.86		

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SPRING WATERS (sheet 67 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR7-14	27-Aug-85	P85-339	MG	6.9		
SP-YR7-14	19-Mar-86	B86-157	MG	6.09		
SP-YR7-14	19-Mar-86	B86-156	MG	6.05		
SP-YR7-14	11-Jun-86	B86-249	MG	7.12		
SP-YR7-14	11-Jun-86	B86-250	MG	7.04		
SP-YR7-14	17-Sep-86	B86-339	MG	7.217		
SP-YR7-14	17-Sep-86	B86-340	MG	7.192		
SP-YR7-14	27-Aug-85	P85-340	MN	0.005	<	
SP-YR7-14	27-Aug-85	P85-339	MN	0.005	<	
SP-YR7-14	19-Mar-86	B86-156	MN	0.01	<	
SP-YR7-14	19-Mar-86	B86-157	MN	0.01	<	
SP-YR7-14	11-Jun-86	B86-250	MN	0.01	<	
SP-YR7-14	11-Jun-86	B86-249	MN	0.01	<	
SP-YR7-14	17-Sep-86	B86-340	MN	0.007	<	
SP-YR7-14	17-Sep-86	B86-339	MN	0.007	<	
SP-YR7-14	27-Aug-85	P85-340	MO	0.034	<	
SP-YR7-14	27-Aug-85	P85-339	MO	0.034	<	
SP-YR7-14	19-Mar-86	B86-157	MO	0.6	<	
SP-YR7-14	19-Mar-86	B86-156	MO	0.6	<	
SP-YR7-14	11-Jun-86	B86-250	MO	0.606	<	
SP-YR7-14	11-Jun-86	B86-249	MO	0.606	<	
SP-YR7-14	17-Sep-86	B86-340	MO	0.424	<	
SP-YR7-14	17-Sep-86	B86-339	MO	0.424	<	
SP-YR7-14	27-Aug-85	P85-340	NA	7.86		
SP-YR7-14	27-Aug-85	P85-339	NA	7.9		
SP-YR7-14	19-Mar-86	B86-157	NA	7.28		
SP-YR7-14	19-Mar-86	B86-156	NA	7.18		
SP-YR7-14	11-Jun-86	B86-249	NA	7.55		
SP-YR7-14	11-Jun-86	B86-250	NA	7.56		

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SPRING WATERS (sheet 68 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR7-14	17-Sep-86	B86-339	NA	7.897		
SP-YR7-14	17-Sep-86	B86-340	NA	7.898		
SP-YR7-14	27-Aug-85	P85-339	NI	0.03	<	
SP-YR7-14	27-Aug-85	P85-340	NI	0.03	<	
SP-YR7-14	27-Aug-85	P85-339	NO3	0.8		
SP-YR7-14	19-Mar-86	B86-157	NO3	3.92		
SP-YR7-14	19-Mar-86	B86-156	NO3	3.89		
SP-YR7-14	11-Jun-86	B86-249	NO3	2.4		
SP-YR7-14	11-Jun-86	B86-250	NO3	2.33		
SP-YR7-14	17-Sep-86	B86-340	NO3	1.14		
SP-YR7-14	17-Sep-86	B86-339	NO3	1.15		
SP-YR7-14	27-Aug-85	P85-339	O18	-16		
SP-YR7-14	19-Mar-86	B86-156	O18	-16.3		
SP-YR7-14	11-Jun-86	B86-249	O18	-16.1		
SP-YR7-14	17-Sep-86	B86-339	O18	-15.8		
SP-YR7-14	27-Aug-85	P85-339	ORP	245		
SP-YR7-14	19-Mar-86	B86-156	ORP	165		
SP-YR7-14	17-Sep-86	B86-339	ORP	210		
SP-YR7-14	27-Aug-85	P85-339	PB	0.18	<	
SP-YR7-14	27-Aug-85	P85-340	PB	0.18	<	
SP-YR7-14	19-Mar-86	B86-156	S34	4.8		
SP-YR7-14	11-Jun-86	B86-249	S34	5.6		
SP-YR7-14	27-Aug-85	P85-339	SAMP.TEMP	11.8		
SP-YR7-14	19-Mar-86	B86-156	SAMP.TEMP	7.6		
SP-YR7-14	11-Jun-86	B86-249	SAMP.TEMP	9.5		
SP-YR7-14	17-Sep-86	B86-339	SAMP.TEMP	11.3		
SP-YR7-14	27-Aug-85	P85-339	SI	18		
SP-YR7-14	27-Aug-85	P85-340	SI	18		
SP-YR7-14	19-Mar-86	B86-157	SI	15.6		

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SPRING WATERS (sheet 69 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR7-14	19-Mar-86	B86-156	SI	15.4		
SP-YR7-14	11-Jun-86	B86-250	SI	16.6		
SP-YR7-14	11-Jun-86	B86-249	SI	16.8		
SP-YR7-14	17-Sep-86	B86-339	SI	18.062		
SP-YR7-14	17-Sep-86	B86-340	SI	17.982		
SP-YR7-14	27-Aug-85	P85-339	SO4	11.9		
SP-YR7-14	27-Aug-85	P85-340	SO4	11.9		
SP-YR7-14	19-Mar-86	B86-156	SO4	11.7		
SP-YR7-14	19-Mar-86	B86-157	SO4	11.7		
SP-YR7-14	11-Jun-86	B86-249	SO4	11.2		
SP-YR7-14	11-Jun-86	B86-250	SO4	11.1		
SP-YR7-14	17-Sep-86	B86-339	SO4	12		
SP-YR7-14	17-Sep-86	B86-340	SO4	11.8		
SP-YR7-14	27-Aug-85	P85-340	SR	0.067		
SP-YR7-14	27-Aug-85	P85-339	SR	0.067		
SP-YR7-14	19-Mar-86	B86-156	SR	0.059		
SP-YR7-14	19-Mar-86	B86-157	SR	0.059		
SP-YR7-14	11-Jun-86	B86-250	SR	0.07		
SP-YR7-14	11-Jun-86	B86-249	SR	0.07		
SP-YR7-14	17-Sep-86	B86-339	SR	0.07		
SP-YR7-14	17-Sep-86	B86-340	SR	0.07		
SP-YR7-14	27-Aug-85	P85-339	T	10.7		
SP-YR7-14	19-Mar-86	B86-156	T	13.21		
SP-YR7-14	11-Jun-86	B86-249	T	11.7		
SP-YR7-14	17-Sep-86	B86-339	T	9.93		
SP-YR7-14	27-Aug-85	P85-339	TC	22		
SP-YR7-14	19-Mar-86	B86-156	TC	17.6		
SP-YR7-14	11-Jun-86	B86-249	TC	21.7		
SP-YR7-14	17-Sep-86	B86-339	TC	21.3		

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SPRING WATERS (sheet 70 of 70)

Well	Date	Sample ID	Constituent	Result	LT	Error
SP-YR7-14	27-Aug-85	P85-339	TOC	1.09		
SP-YR7-14	19-Mar-86	B86-156	TOC	1.94		
SP-YR7-14	11-Jun-86	B86-249	TOC	1.17		
SP-YR7-14	17-Sep-86	B86-339	TOC	1.56		
SP-YR7-14	27-Aug-85	P85-339	TURB	0.4		
SP-YR7-14	19-Mar-86	B86-156	TURB	0.78		
SP-YR7-14	11-Jun-86	B86-249	TURB	0.85		
SP-YR7-14	17-Sep-86	B86-339	TURB	0.45		
SP-YR7-14	27-Aug-85	P85-339	ZN	0.02	<	
SP-YR7-14	27-Aug-85	P85-340	ZN	0.02	<	
SP-YR7-14	19-Mar-86	B86-157	ZN	0.04	<	
SP-YR7-14	19-Mar-86	B86-156	ZN	0.04	<	
SP-YR7-14	11-Jun-86	B86-250	ZN	0.04	<	
SP-YR7-14	11-Jun-86	B86-249	ZN	0.04	<	
SP-YR7-14	17-Sep-86	B86-339	ZN	0.028	<	
SP-YR7-14	17-Sep-86	B86-340	ZN	0.028	<	

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APPENDIX B

STATISTICAL METHODS, RESULTS, AND APPLICATIONS

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APPENDIX B

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1.0 STATISTICAL METHODS, RESULTS, AND APPLICATIONS

This appendix describes the statistical methods used to evaluate selected Hanford Site groundwater data described in Chapter 4.0, Section 4.1 of this report. Detailed results of the statistical analyses are provided in Tables 1 and 2. Possible application of the provisional groundwater background values in Tables 1 and 2 are discussed in Section 1.2.

1.1 METHODS

The primary objective of the statistical analyses for each naturally occurring constituent in Hanford Site groundwater is to determine a reasonable upper limit (for pH, both the upper and lower limits) as a provisional threshold level based on the existing data. This leads to the concept of a tolerance interval. Statistical tolerance intervals are used to estimate these provisional threshold levels because the tolerance intervals contain a specified proportion, P% (coverage), of the entire sampled populations (of naturally occurring constituents) with a specified degree of confidence [$100(1 - \alpha)\%$].

Tolerance interval techniques are sensitive to the assumption that the data are drawn from a normal population. The statistical tests used for evaluating whether or not the data follow a specified distribution are called 'goodness-of-fit' tests. One recommended test is the Lilliefors test for normality of data (EPA 1989a). Procedures to perform the Lilliefors test can be found in published documents (Conover 1980). The hypothesis of normality is rejected at a 5 percent level of significance (α = 5%) if the computed value of the Lilliefors test statistic (D_{max}) is larger than the critical value ($W_{0.95}$) for the particular sample size (n = number of observations). If the proportions of less than detection limit values are more than 50 percent, the Lilliefors test is not performed. Statistical software (STATGRAPHICS*, Version 4.2) was used to calculate the summary statistics (Table 1) and values of D_{max} (STSC 1989). Results of the Lilliefors test are presented in Table 2.

If a normal distribution is a reasonable approximation of the background concentrations, a parametric tolerance interval of the following form is calculated:

$$\bar{x} \pm K*S \text{ (two-sided) or } \bar{x} + K*S \text{ (one-sided)}$$

where $\bar{x}$ denotes the average; S denotes the standard deviation; and K is a normal tolerance factor that depends on sample size (n), coverage (P%), and confidence level $100(1 - \alpha)\%$. A coverage of 95 percent and confidence level

*Statgraphics is a registered trademark of Statistical Graphics Corporation.

of 95 percent (95/95) are recommended (EPA 1989a). Values of K are provided in Natrella (1966).

If background concentrations do not follow a normal distribution, if there is insufficient data, or if the proportions of less than detection limit values are more than 50 percent, a nonparametric (distribution-free) tolerance interval is constructed (Conover 1980). Two-sided nonparametric tolerance limits are just the largest and smallest datum of the observed data. An upper one-sided nonparametric tolerance limit is the largest observation. The number of observations determine the coverage (P%) and the probability level $(1 - \alpha)$ associated with that proportion.

The resulting threshold value for each constituent also is shown in Table 2. In most cases, a one-sided distribution-free upper tolerance limit is calculated. Because the endpoints of distribution-free tolerance intervals are restricted to the observed order statistics (i.e., the largest and/or smallest data), it is generally not possible to obtain an interval with precisely the desired associated confidence level. Furthermore, with small sample sizes, it is not always possible to obtain a distribution-free interval with a high degree of certainty. For a one-sided 95/95 nonparametric tolerance interval, the number of samples required is 59 (calculation is provided). More observations from the population would be needed to increase the coverage and/or level of confidence. These considerations are factors that bear on the acquisition of new data and the size of the sample population (number of wells and/or samples) required to reduce uncertainty.

Solution for the following equation gives the required minimum sample size n for a one-sided nonparametric tolerance limit (Hahn and Meeker 1991):

$$n = \log(\alpha)/\log(P)$$

where log denotes the common logarithms of α and P, which were defined previously.

For example, if one desires that the largest observation to exceed with 95 percent confidence (i.e., $\alpha = 5\%$), at least 95 percent (i.e., $P = 95\%$) of the sampled population, the needed sample size is calculated as:

$$n = \log(0.05)/\log(0.95)$$

$$= -1.3010/-0.0223$$

$$= 58.4 \text{ (which is rounded upward to 59)}$$

Table 3 gives the smallest sample size needed to have $100(1 - \alpha)\%$ confidence that the maximum observation in the sample will exceed at least 100 P% of the population for various values of $(1 - \alpha)$ and P. The required sample size is discussed further in relation to additional data needs in Chapter 5.0.

1.2 APPLICATIONS AND LIMITATIONS

Application of the provisional background data presented in this report could include statistical treatments involving the background means as well as the threshold values. However, an understanding of the limitations and associated caveats is needed to avoid possible misuse of the provisional background data. Accordingly, possible applications and limitations are discussed briefly in the following sections.

1.2.1 Use of Background Data

The threshold values (Table 2) are intended primarily for [provisional] use in estimating Hanford Site-wide background levels, based on existing data, for those constituents occurring naturally in Hanford Site groundwater. As described previously, these provisional threshold values, for each constituent of concern, established a reasonable upper limit for the background samples. Determining when threshold levels or natural background-based standards have been exceeded for either CERCLA cleanup or RCRA corrective action programs requires appropriate statistical tests designed for this purpose. This determination can be accomplished using compliance monitoring tests as specified in WAC-173-340-720(8c,d). However, because of the limited data used in estimating these values, there is a strong likelihood that the observed maximum (threshold value) might underestimate the population maximum especially when the data are skewed to the right (positive skewness). For this reason, more data are needed to provide better estimates of these threshold levels. Additionally, it might be necessary to differentiate between a 'high' and 'low' background concentration group for a few constituents (as discussed in Chapter 5.0).

1.2.2 Groundwater Quality Standards

Recently promulgated standards for protection of groundwater in the state of Washington include provisions for a special case when the natural groundwater quality for a contaminant exceeds the standard (WAC 173-200, Table 1). In these cases, the enforcement limit for the contaminant becomes the 'natural level'. For the Hanford Site, 'natural level' is taken to be either the provisional background threshold values such as those listed in Table 2 or subsequent updates. Two constituents of regulatory interest were identified in the present study that fall under the provisions of subparagraph 3b(i) of WAC 173-200-50 (i.e., iron and manganese, and the 'high' population groups (Table 2). Additional characterization data are needed to more adequately document the occurrence of this condition in upper confined and suprabasalt aquifers beneath the Hanford Site.

1.2.3 Limitations

For reasons previously discussed (i.e., older-type wells and incomplete spatial coverage), the background values presented in Tables 1 and 2 are provisional. Therefore, caution should be used in the application of the

provisional data for any of the previous purposes. The uncertainty in the data can be reduced by appropriate resampling, well remediation, and/or new data collection (new wells). The primary use of the data and evaluation presented in this report should be to delineate the target background population and to establish the natural variation in constituent concentrations for the uppermost confined and suprabasalt aquifers. The provisional data can be used as described previously but with the understanding that additional background characterization data could result in changes.

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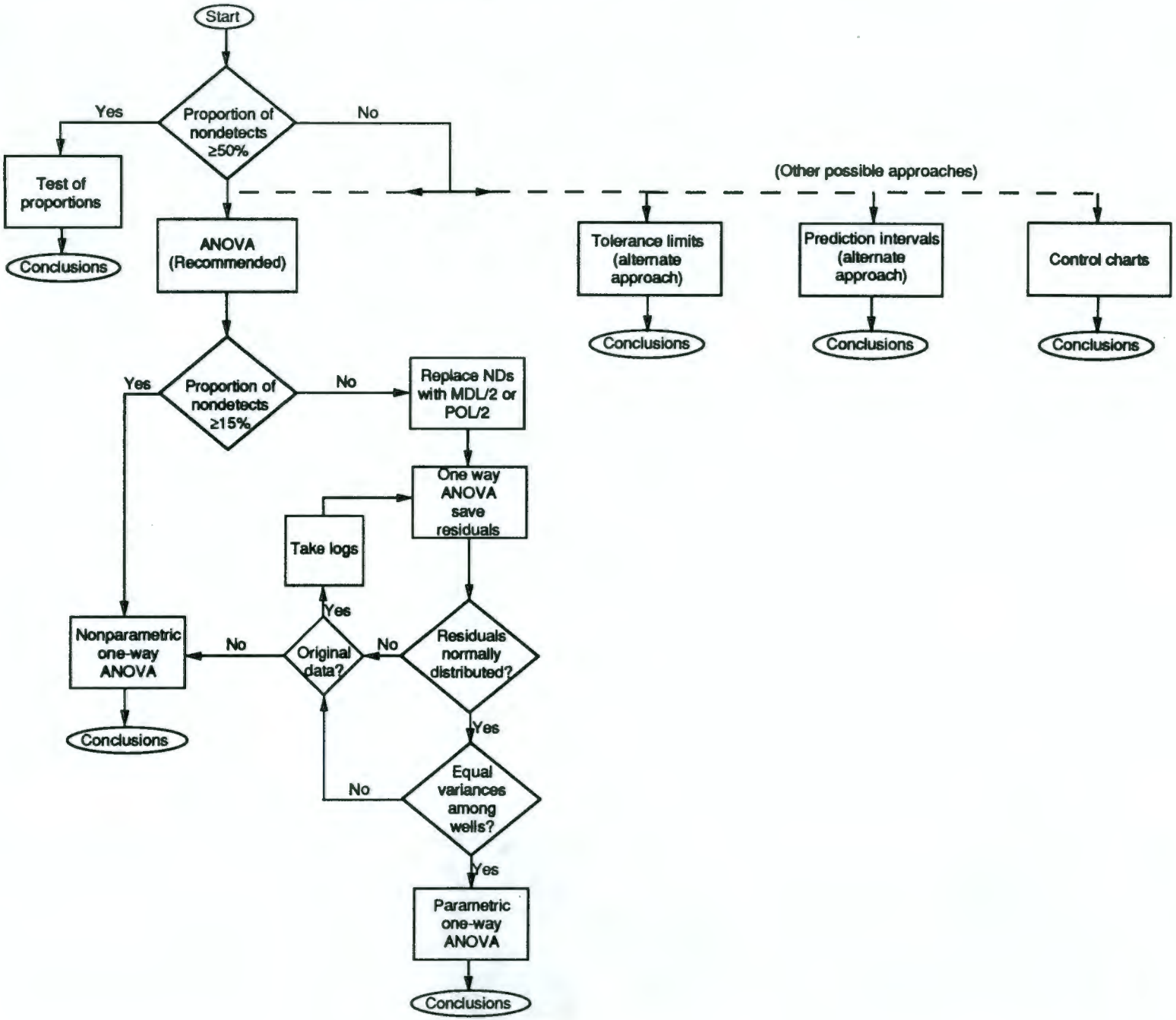

Figure 1. Background Well to Compliance Well Comparisons.

Table 1. Summary Statistics for Selected Constituents in Hanford Groundwater[a]. (sheet 1 of 11)

Description	Aluminum	Ammonium	Arsenic	Barium	Beryllium
Guideline Limit	50	N.A.	50	1,000	N.A.
Detection Limit	200	50	5	10	5
Sample Size (n)	50	18	14	53	16
Greater Than (GT)	0	3	4	50	0
Less Than (LT)	50	15	10	3	16
Average ($\bar{x}$)	<200	<50	<5	40.93	<5
Std Dev (s)	N.C.	N.C.	N.C.	20.08	N.C.
Minimum	<200	<50	<5	3	<5
Maximum	<200	120	10	68.5	<5
Lower Quartile Q_1	<200	<50	<5	22	<5
Median Q_2	<200	<50	<5	48	<5
Upper Quartile Q_3	<200	<50	<5	54.5	<5
Interquartile Range ($Q_3 - Q_1$)	N.C.	N.C.	N.C.	32.5	N.C.

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Table 1. Summary Statistics for Selected Constituents in Hanford Groundwater[a]. (sheet 2 of 11)

Description	Bismuth	Boron	Cadmium	Calcium	Chloride (Low)
Guideline Limit	N.A.	N.A.	10	N.A.	250,000
Detection Limit	5	100	10	50	500
Sample Size (n)	4	35	16	53	53
Greater Than (GT)	0	0	0	53	53
Less Than (LT)	4	35	16	0	0
Average ($\bar{x}$)	<5	<100	<10	38,542.3	5,031.89
Std Dev (s)	N.C.	N.C.	N.C.	11,023.2	1,773.77
Minimum	<5	<100	<10	22,700	1,850
Maximum	<5	<100	<10	63,600	8,690
Lower Quartile Q_1	<5	<100	<10	29,450	3,625
Median Q_2	<5	<100	<10	34,500	4,655
Upper Quartile Q_3	<5	<100	<10	45,300	6,390
Interquartile Range ($Q_3 - Q_1$)	N.C.	N.C.	N.C.	15,850	2,765

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Table 1. Summary Statistics for Selected Constituents in Hanford Groundwater[a]. (sheet 3 of 11)

Description	Chloride (High)	Chromium	Copper	Fluoride (LDL)	Fluoride* (LDL)
Guideline Limit	250,000	50	1,000	4,000	4,000
Detection Limit	500	30	30	50	50
Sample Size (n)	14	8	50	48	47
Greater Than (GT)	14	0	0	48	47
Less Than (LT)	0	8	50	0	0
Average ($\bar{x}$)	23,296.4	<30	<30	455.71	436.89
Std Dev (s)	2,462.68	N.C.	N.C.	183.94	131.18
Minimum	20,500	<30	<30	200	200
Maximum	28,500	<30	<30	1340	775
Lower Quartile Q_1	21,900	<30	<30	367.5	365
Median Q_2	22,450	<30	<30	412.5	410
Upper Quartile Q_3	24,100	<30	<30	492.5	490
Interquartile Range (Q_3 - Q_1)	2,200	N.C.	N.C.	125	125

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Table 1. Summary Statistics for Selected Constituents in Hanford Groundwater[a]. (sheet 4 of 11)

Description	Iron (Low)	Iron (Mid)	Iron (High)	Lead	Magnesium
Guideline Limit	300	300	300	50	N.A.
Detection Limit	50	50	50	5	50
Sample Size (n)	34	7	12	15	53
Greater Than (GT)	2	7	12	0	53
Less Than (LT)	32	0	0	15	0
Average ($\bar{x}$)	<50	114.93	493.71	<5	11,189.7
Std Dev (s)	N.C.	51.91	118.43	N.C.	2,577.92
Minimum	<50	37.5	247.5	<5	5,830
Maximum	86	180	692.5	<5	16,500
Lower Quartile Q_1	<50	83.5	444	<5	9,790
Median Q_2	<50	118	473.5	<5	10,850
Upper Quartile Q_3	<50	179	559.8	<5	12,450
Interquartile Range (Q_3 - Q_1)	N.C.	95.5	115.8	N.C.	2,660

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Table 1. Summary Statistics for Selected Constituents in Hanford Groundwater[a]. (sheet 5 of 11)

Description	Manganese (Low)	Manganese (High)	Mercury	Nickel	Nitrate
Guideline Limit	50	50	2	N.A.	45,000
Detection Limit	20	20	0.1	30	500
Sample Size (n)	33	20	14	23	78
Greater Than (GT)	1	20	0	0	78
Less Than (LT)	32	0	14	23	0
Average ($\bar{x}$)	<20	118.38	<0.1	<30	5,169.81
Std Dev (s)	N.C.	17.49	N.C.	N.C.	3,575.92
Minimum	<20	100.5	<0.1	<30	210
Maximum	24.5	163.5	<0.1	<30	12,400
Lower Quartile Q_1	<20	106.5	<0.1	<30	2,860
Median Q_2	<20	110.3	<0.1	<30	3,555
Upper Quartile Q_3	<20	128.3	<0.1	<30	7,480
Interquartile Range ($Q_3 - Q_1$)	N.C.	21.8	N.C.	N.C.	4,620

9 2 1 2 6 5 1 3 7 2

Table 1. Summary Statistics for Selected Constituents in Hanford Groundwater[a] (sheet 6 of 11)

Description	Potassium	Selenium	Silicon	Sodium	Strontium
Guideline Limit	N.A.	10	N.A.	N.A.	N.A.
Detection Limit	100	5	50	200	10
Sample Size (n)	53	14	35	53	43
Greater Than (GT)	53	0	35	53	43
Less Than (LT)	0	14	0	0	0
Average ($\bar{x}$)	4,993.42	<5	18,152	15,774.1	164.2
Std Dev (s)	1,453.08	N.C.	4,974.19	6,783.87	47.41
Minimum	2,215	<5	11,700	6,465	103
Maximum	7,810	<5	26,500	33,500	255.5
Lower Quartile Q_1	4,110	<5	12,905	11,638.5	112
Median Q_2	4,860	<5	19,813	13,298	162.5
Upper Quartile Q_3	5,790	<5	22,200	18,400	192
Interquartile Range ($Q_3 - Q_1$)	1,680	N.C.	9,295	6,761.5	80

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Table 1. Summary Statistics for Selected Constituents in Hanford Groundwater[a]. (sheet 7 of 11)

Description	Sulfate	Uranium[b]	Vanadium	Zinc (Low)	Zinc (High)
Guideline Limit	250,000	24	N.A.	5,000	5,000
Detection Limit	500	0.5	5	50	50
Sample Size (n)	67	10	18	36	17
Greater Than (GT)	67	10	12	36	17
Less Than (LT)	0	0	6	0	0
Average ($\bar{x}$)	30,605.1	1.74	9.17	<50	246.5
Std Dev (s)	22,611	1.15	3.63	N.C.	165.1
Minimum	12,300	0.53	<5	<50	58
Maximum	90,500	3.43	15	<50	564
Lower Quartile Q_1	16,100	0.79	<5	<50	74
Median Q_2	19,950	1.16	9	<50	231
Upper Quartile Q_3	33,500	2.93	12	<50	392.5
Interquartile Range (Q_3 - Q_1)	17,400	2.14	7	N.C.	318.5

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Table 1. Summary Statistics for Selected Constituents in Hanford Groundwater[a]. (sheet 8 of 11)

Description	Field Alkalinity	Lab Alkalinity	Field pH	Lab pH	TOC[#]
Guideline Limit	N.A.	N.A.	8.5	8.5	N.A.
Detection Limit	20	20	0.1	0.01	1,000
Sample Size (n)	31	52	57	52	63
Greater Than (GT)	31	52	57	52	42
Less Than (LT)	0	0	0	0	21
Average ($\bar{x}$)	137,758	133,717	7.57	7.75	551.92
Std Dev (s)	33,656.3	29,399.1	0.285	0.213	449.58
Minimum	91,000	89,300	7.0	7.19	130
Maximum	215,000	210,000	8.2	8.10	2,610
Lower Quartile Q_1	117,000	116,000	7.35	7.66	290
Median Q_2	136,000	129,000	7.6	7.78	390
Upper Quartile Q_3	149,000	148,000	7.73	7.9	630
Interquartile Range ($Q_3 - Q_1$)	32,000	32,000	0.38	0.24	340

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Table 1. Summary Statistics for Selected Constituents in Hanford Groundwater[a]. (sheet 9 of 11)

Description	TOC[#*]	Field Conductivity[c]	Lab Conductivity[c]	TOX,LDL	TOX,LDL[*]
Guideline Limit	N.A.	N.A.	N.A.	N.A.	N.A.
Detection Limit	1,000	1	1	20	20
Sample Size (n)	62	22	36	15	14
Greater Than (GT)	41	22	36	3	2
Less Than (LT)	21	0	0	12	12
Average ($\bar{x}$)	518.73	344.27	331.5	<20	<20
Std Dev (s)	367.26	82.91	93.08	N.C.	N.C.
Minimum	130	197	206	<20	<20
Maximum	1610	492	530	60.8	37.6
Lower Quartile Q_1	290	289	264.5	<20	<20
Median Q_2	390	351	331.5	<20	<20
Upper Quartile Q_3	620	400	374	<20	<20
Interquartile Range ($Q_3 - Q_1$)	330	111	109.5	N.C.	N.C.

Table 1. Summary Statistics for Selected Constituents in Hanford Groundwater[a]. (sheet 10 of 11)

Description	Total Carbon	Gross Alpha[b]	Gross Alpha[b*]	Gross Beta[b]	Gross Beta[b*]
Guideline Limit	N.A.	15	15	50	50
Detection Limit	2,000	N.A.	N.A.	N.A.	N.A.
Sample Size (n)	48	37	36	46	44
Greater Than (GT)	48	32	31	44	42
Less Than (LT)	0	5	5	2	2
Average ($\bar{x}$)	31,772.3	4.17	2.53	8.24	7.14
Std Dev (s)	7,021.67	10.05	1.51	5.84	2.61
Minimum	20,900	0.25	0.25	1.66	1.66
Maximum	50,100	63	7.83	35.5	12.8
Lower Quartile Q_1	27,580	1.54	1.49	5.5	5.49
Median Q_2	31,300	2.52	2.45	7	6.87
Upper Quartile Q_3	34,385	3.54	3.53	9.03	8.88
Interquartile Range (Q_3 - Q_1)	6,805	2	2.04	3.53	3.39

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Table 1. Summary Statistics for Selected Constituents in Hanford Groundwater[a]. (sheet 11 of 11)

Description	Radium[b]				
Guideline Limit	4				
Detection Limit	N.A.				
Sample Size (n)	10				
Greater Than (GT)	2				
Less Than (LT)	8				
Average ($\bar{x}$)	N.D.				
Std Dev (s)	N.C.				
Minimum	N.D.				
Maximum	0.23				
Lower Quartile Q_1	N.D.				
Median Q_2	N.D.				
Upper Quartile Q_3	N.D.				
Interquartile Range (Q_3 - Q_1)	N.C.				

[a]Units in parts per billion unless otherwise noted.
[b]Units in picocuries per liter.
[c]Units in micromho per centimeter.
#Indicates compound was analyzed for but not detected. Reported values in the data base were analytical laboratory's actual measured concentrations.
<Indicates compound was analyzed for but not detected. Reported value after the "<" sign is the detection limit.
*Outlier observation(s) are removed.
N.A. = not available (or not applicable). N.C. = not calculated.

Table 2. Summary of Provisional Threshold Values.
(sheet 1 of 5)

Constituent (Concentration)	Lilliefors Test		Provisional Threshold Values
	D_{max}	Critical Value*	
Aluminum (ppb)	N.C.[d]	N.C.[d]	<200
Ammonium (ppb)	N.C.[d]	N.C.[d]	120[b]
Arsenic (ppb)	N.C.[d]	N.C.[d]	10[b]
Barium (ppb)	0.212 s.	0.122	68.5[b]
Beryllium (ppb)	N.C.[d]	N.C.[d]	<5
Bismuth (ppb)	N.C.[d]	N.C.[d]	<5
Boron (ppb)	N.C.[d]	N.C.[d]	<100
Cadmium (ppb)	N.C.[d]	N.C.[d]	<10
Calcium (ppb)	0.212 s.	0.122	63,600[b]
Chloride, Low (ppb)	0.126 s.	0.122	8,690[b]
Chloride, High (ppb)	0.239 s.	0.227	28,500[b]
Chromium (ppb)	N.C.[d]	N.C.[d]	<30

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Table 2. Summary of Provisional Threshold Values.
(sheet 2 of 5)

Constituent (Concentration)	Lilliefors Test		Provisional Threshold Values
	D_{max}	Critical Value*	
Copper (ppb)	N.C.[d]	N.C.[d]	<30
Fluoride, LDL (ppb)	0.186 s.	0.128	1,340[b]
Fluoride, LDL[c] (ppb)	0.135[c] s.	0.129	775[bc]
Iron, Low (ppb)	N.C.[d]	N.C.[d]	86[b]
Iron, Mid (ppb)	0.177 n.s.	0.300	291[a]
Iron, High (ppb)	0.229 n.s.	0.242	818[a]
Lead (ppb)	N.C.[d]	N.C.[d]	<5
Magnesium (ppb)	0.114 n.s.	0.122	16,480[a]
Manganese, Low (ppb)	N.C.[d]	N.C.[d]	24.5[b]
Manganese, High (ppb)	0.249 s.	0.190	163.5[b]
Mercury (ppb)	N.C.[d]	N.C.[d]	<0.1
Nickel (ppb)	N.C.[d]	N.C.[d]	<30

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Table 2. Summary of Provisional Threshold Values.
(sheet 3 of 5)

Constituent (Concentration)	Lilliefors Test		Provisional Threshold Values
	D_{max}	Critical Value*	
Nitrate (ppb)	0.207 s.	0.100	12,400[b]
Phosphate[f] (ppb)	N.A.	N.A.	<1,000[f]
Potassium (ppb)	0.112 n.s.	0.122	7,975[a]
Selenium (ppb)	N.C.[d]	N.C.[d]	<5
Silver[e] (ppb)	N.A.	N.A.	<10[e]
Silicon (ppb)	0.186 s.	0.150	26,500[b]
Sodium (ppb)	0.189 s.	0.122	33,500[b]
Strontium (ppb)	0.120 n.s.	0.135	264.1[a]
Sulfate (ppb)	0.277 s.	0.108	90,500[b]
Uranium (pCi/l)	0.263 s.	0.258	3.43[b]
Vanadium (ppb)	0.208 s.	0.200	15[b]
Zinc, Low (ppb)	N.C.[d]	N.C.[d]	<50

9 2 1 2 6 5 1 3 8 1

Table 2. Summary of Provisional Threshold Values.
(sheet 4 of 5)

Constituent (Concentration)	Lilliefors Test		Provisional Threshold Values
	D_{max}	Critical Value*	
Zinc, High (ppb)	0.205 n.s.	0.206	673[a]
Field Alkalinity (ppb)	0.175 s.	0.159	215,000[b]
Lab Alkalinity (ppb)	0.146 s.	0.123	210,000[b]
Field pH	0.069 n.s.	0.117	[6.90, 8.24][a]
Lab pH	0.109 n.s.	0.123	[7.25, 8.25][a]
TOC (ppb)	0.224 s.	0.112	2,610[b]
TOC[c] (ppb)	0.219[c] s.	0.113	1,610[b]
Field Conductivity (umho/cm)	0.103 n.s.	0.183	539[a]
Lab Conductivity (umho/cm)	0.256 s.	0.148	530[b]

9 2 1 2 6 1 3 3 2

Table 2. Summary of Provisional Threshold Values.
(sheet 5 of 5)

Constituent (Concentration)	Lilliefors Test		Provisional Threshold Values
	D_{max}	Critical Value*	
TOX, LDL	N.C.[d]	N.C.[d]	60.8[b]
TOX, LDL[c]	N.C.[d]	N.C.[d]	37.6[b]
Total Carbon (ppb)	0.166 s.	0.128	50,100[b]
Gross Alpha (pCi/l)	0.430 s.	0.146	63[b]
Gross Alpha[c] (pCi/l)	0.101[c] n.s.	0.148	5.79[ac]
Gross Beta (pCi/l)	0.225 s.	0.131	35.5[b]
Gross Beta[c] (pCi/l)	0.068[c] n.s.	0.134	12.62[ac]
Radium (pCi/l)	N.C.[d]	N.C.[d]	0.23[b]

[a]Based on normal distribution.
[b]Based on non-parametric tolerance interval, maximum value reported.
[c]Potential outlier observation(s) were removed.
[d]Proportion of non-detects is greater than 50%.
[e]From WHC (1990), based on ICP/MS (inductively coupled plasma/mass spectroscopy) data.
[f]From springs data (Early et al. 1986)
*Form Conover (1980), level of significance, $\alpha = 0.05$.
<Indicates compound was analyzed for but not detected. Reported value after the "<" sign is the detection limit.
n.s. = not significant at 5%. s. = significant at 5%.
N.C. = not calculated. N.A. = not applicable.

9 2 1 2 6 5 1 3 8 3

Table 3. Required Sample Size for One-Sided Non-Parametric Tolerance Limits.

$1 - \alpha$	P = 0.80	P = 0.85	P = 0.90	P = 0.95	P = 0.99
0.75	7	9	14	28	138
0.80	8	10	16	32	161
0.90	11	15	22	45	230
0.95	14	19	29	59	299
0.99	21	29	44	90	459

9 2 1 2 6 0 1 3 8 4

APPENDIX C

STATISTICAL PLOTS

9 2 1 2 6 5 1 3 8 5

APPENDIX C

STATISTICAL PLOTS

The following figures are arranged as follows. There are three plots, per each constituent, consisting of:

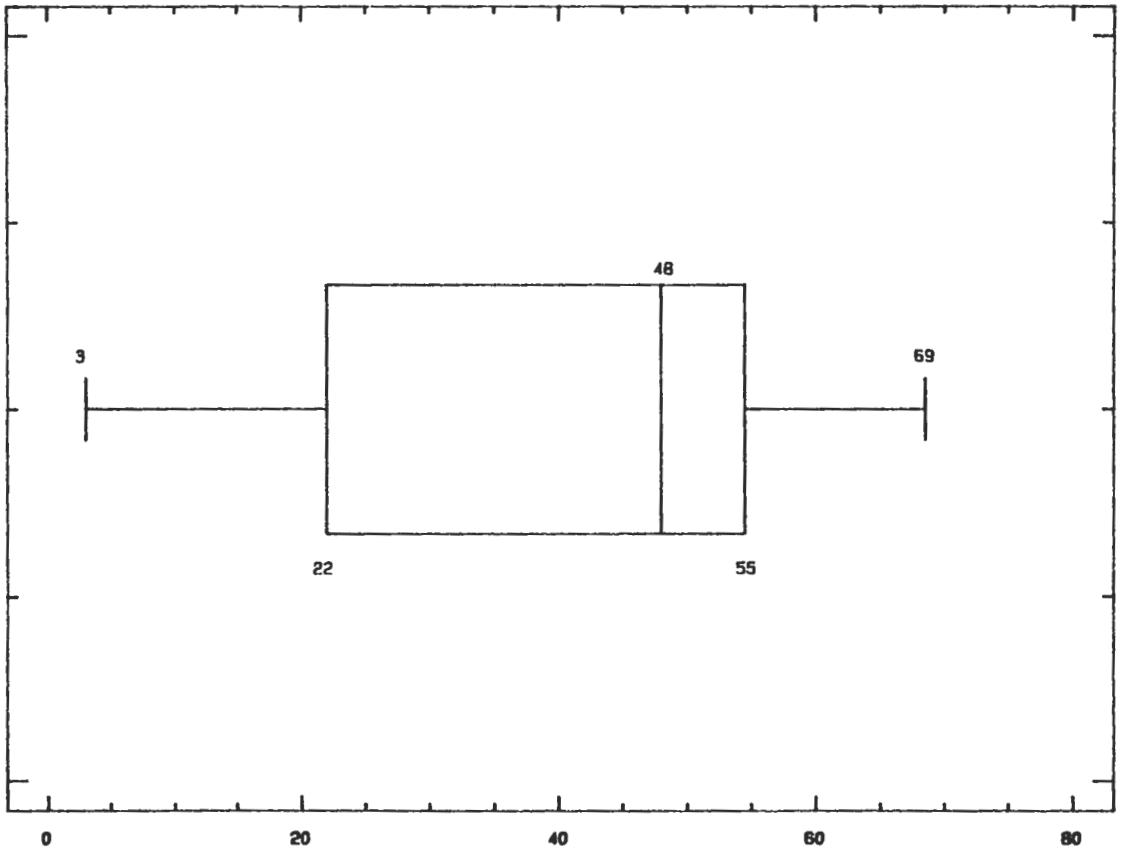
(1) Box-and Whisker Plot

(2) Normal Probability Plot

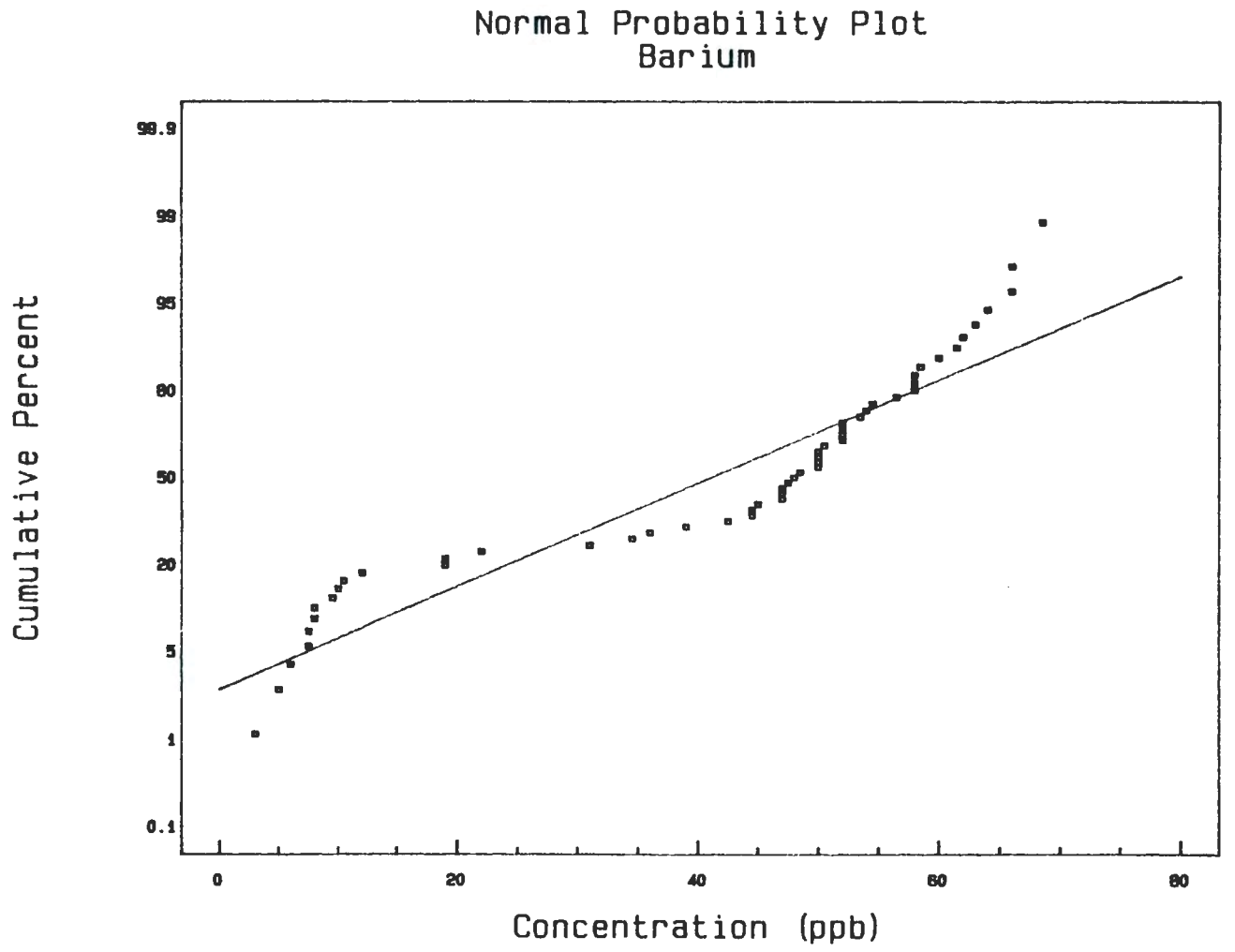
(3) Histogram (with fitted normal distribution)

No plots are provided when more than 50 percent of the data values (for a particular constituent) are nondetects.

Est. Background Levels in Hanford GW
Barium

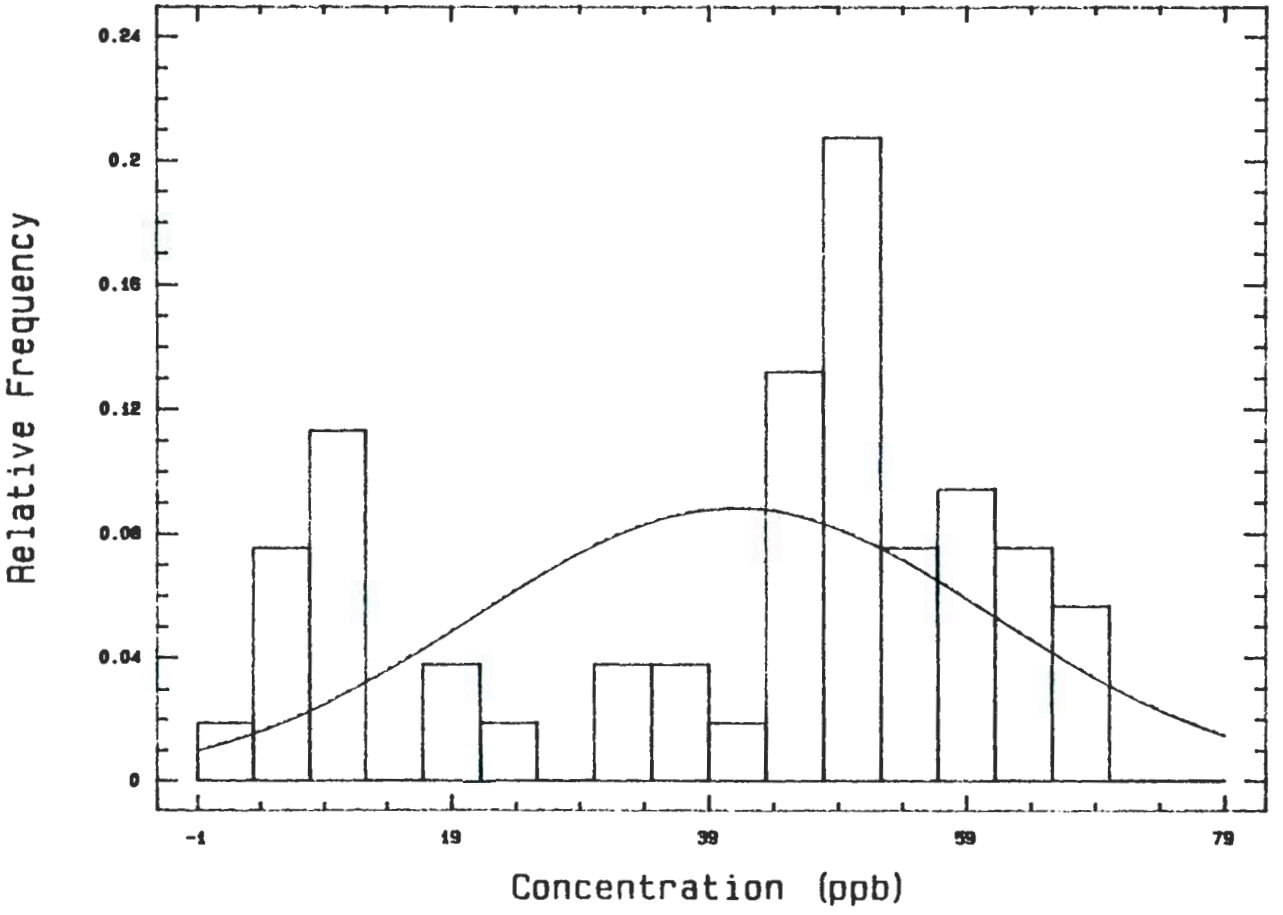


Concentration (ppb)

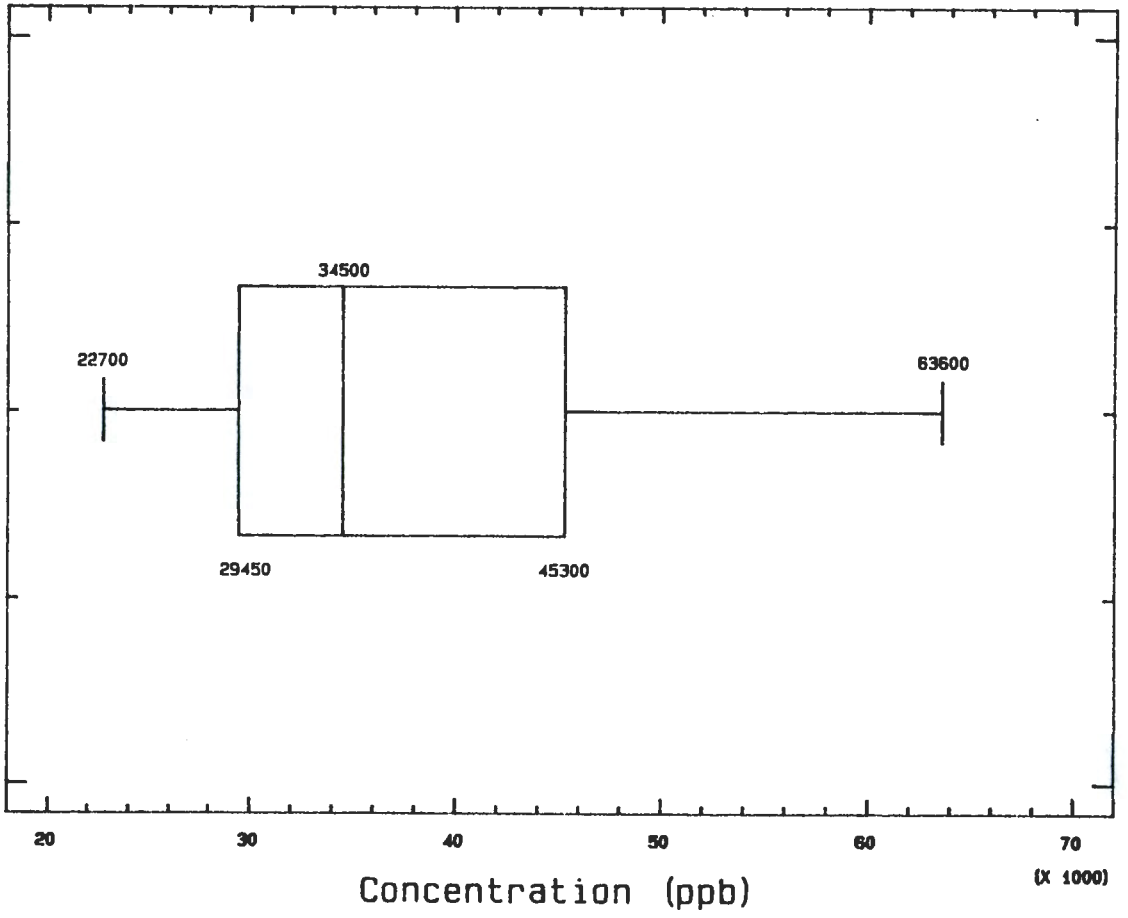

Normal Probability Plot
Barium
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
20
40
60
80
Concentration (ppb)

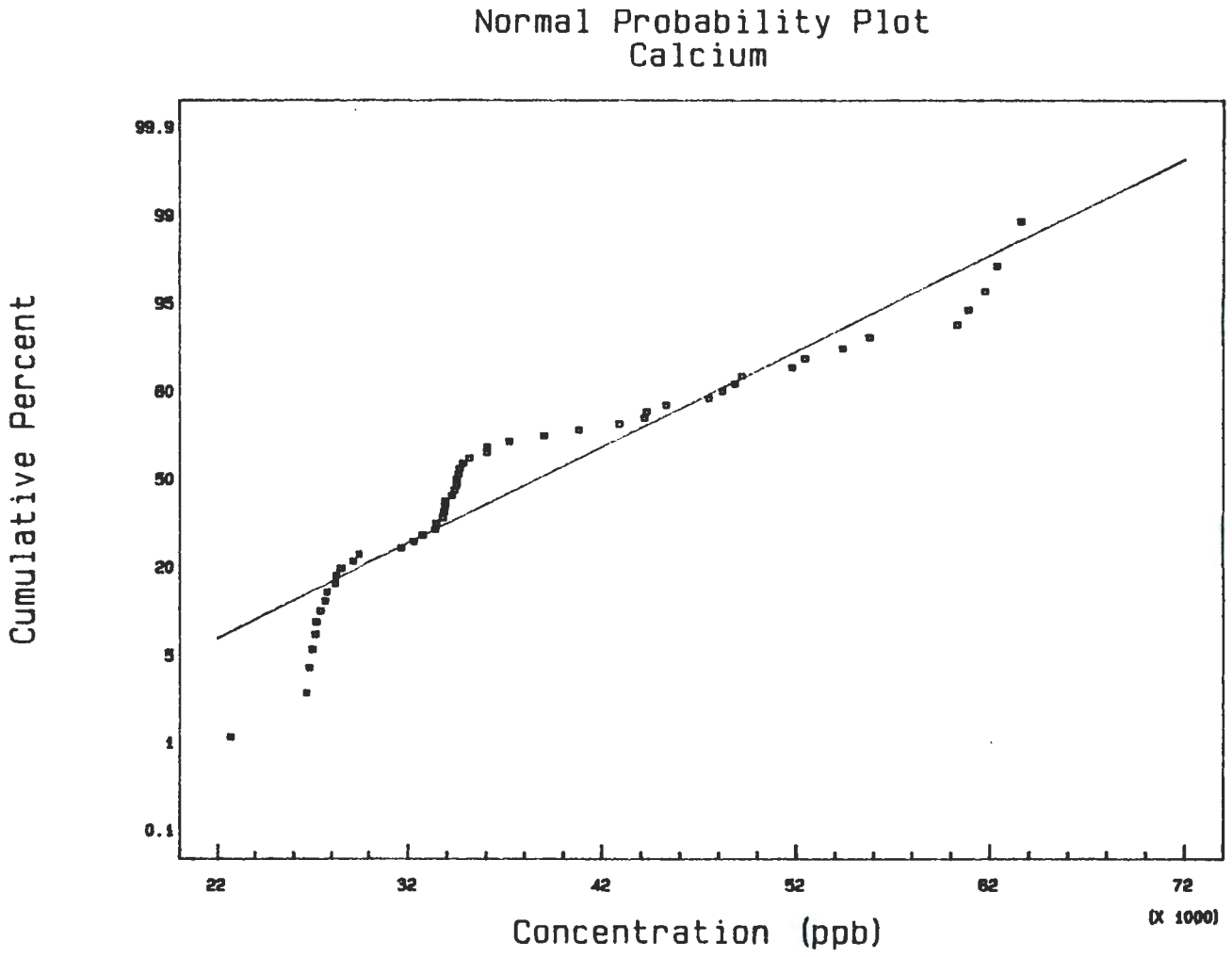
9 2 1 2 6 5 1 3 8 9

Histogram - Barium Concentration

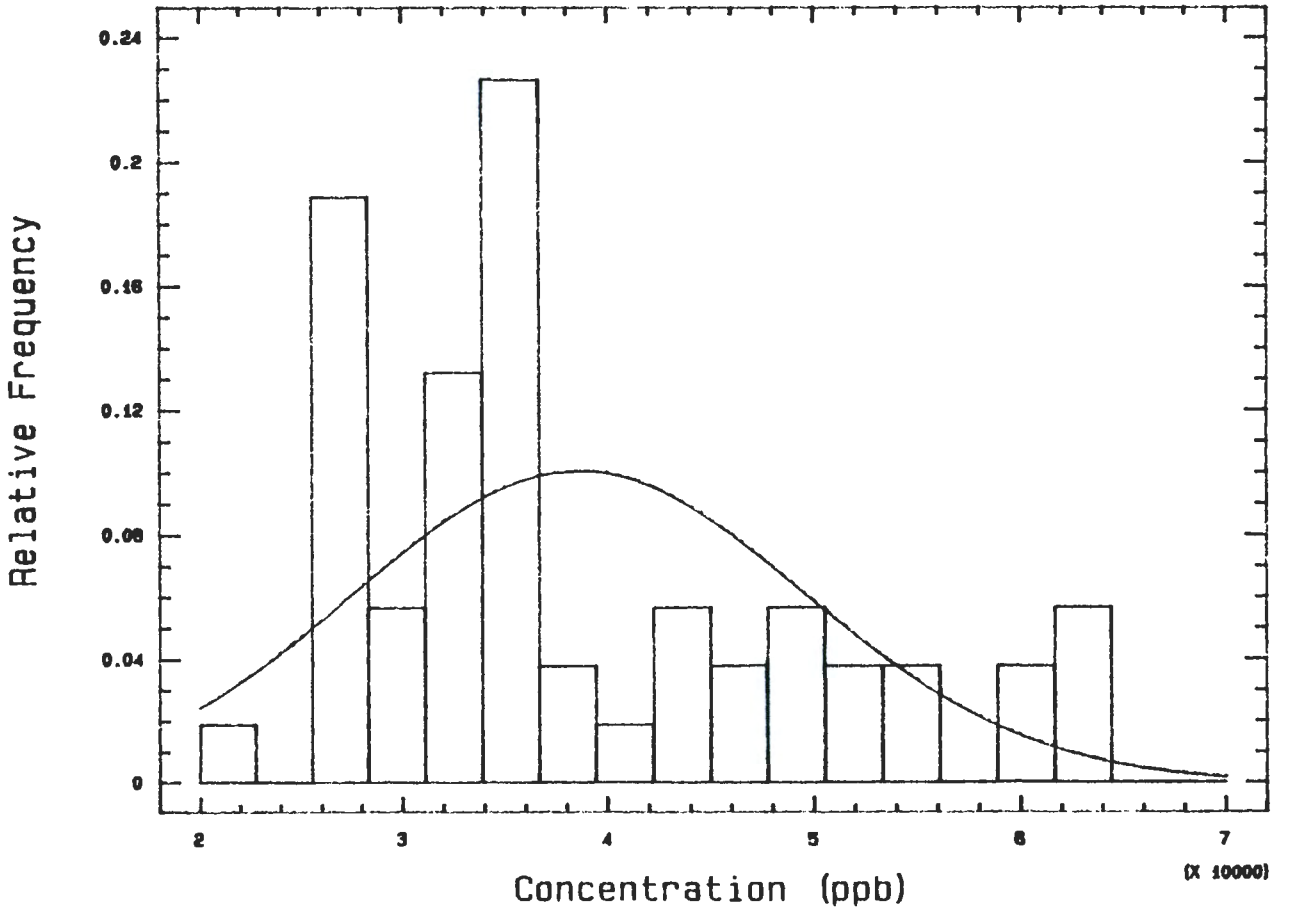


Est. Background Levels in Hanford GW
Calcium

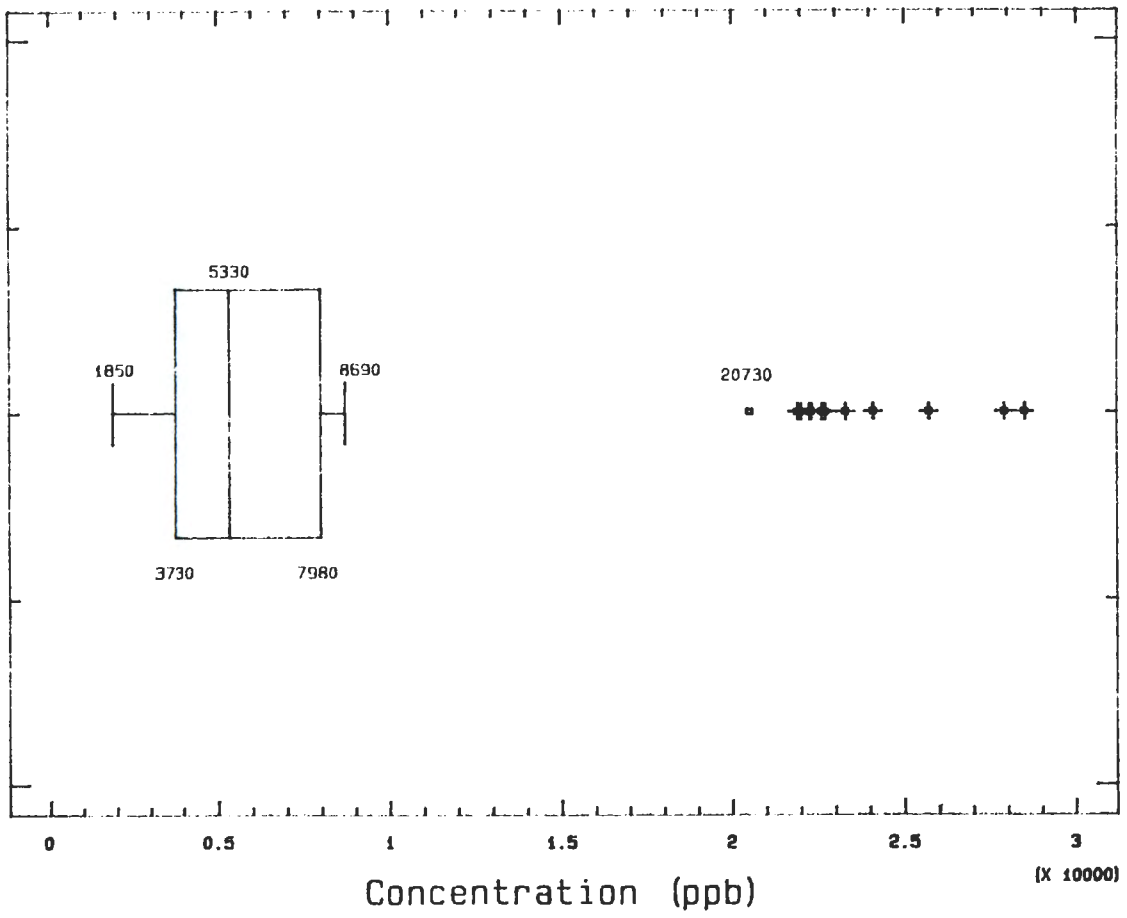


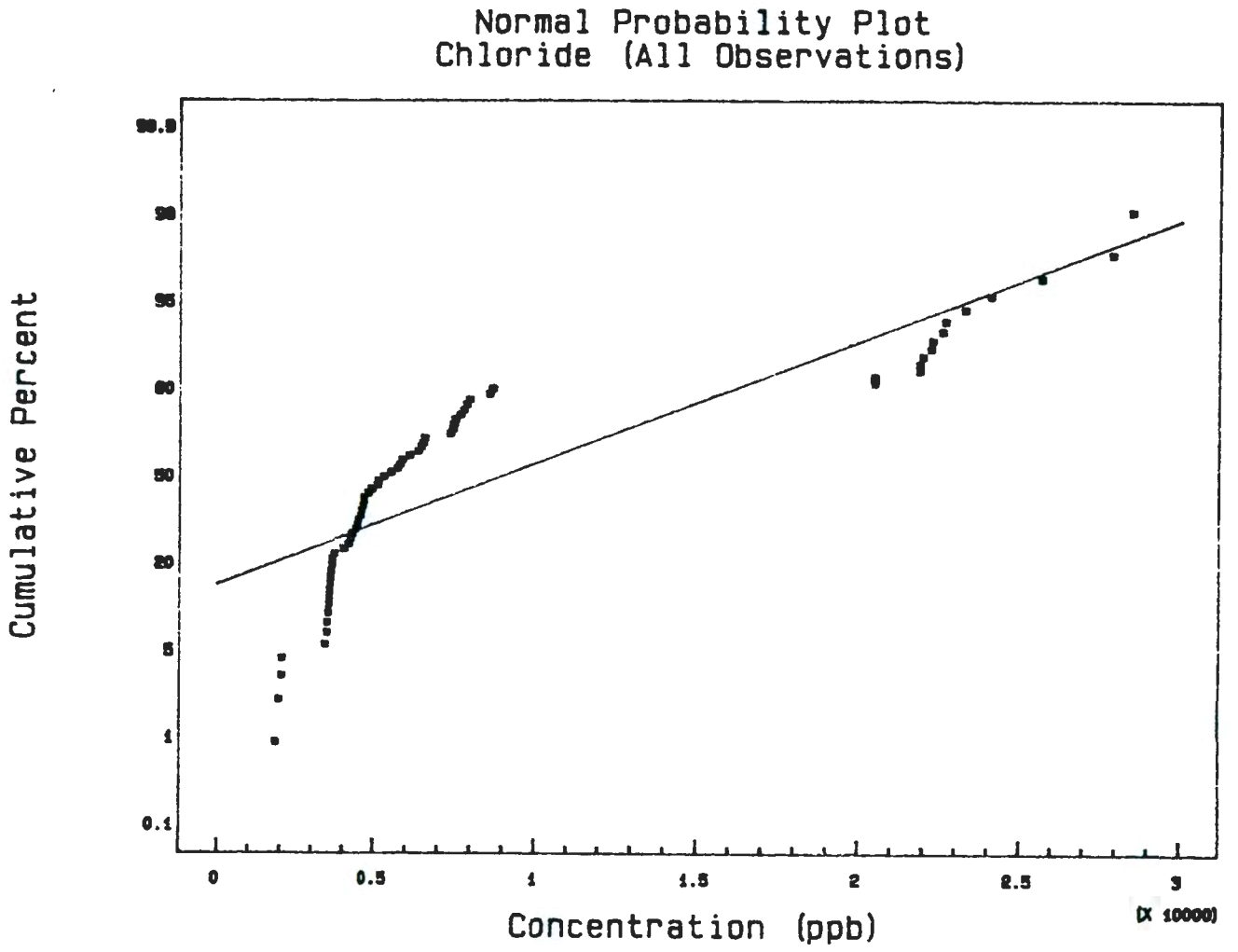

Normal Probability Plot
Calcium
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
22
32
42
52
62
72
(X 1000)
Concentration (ppb)

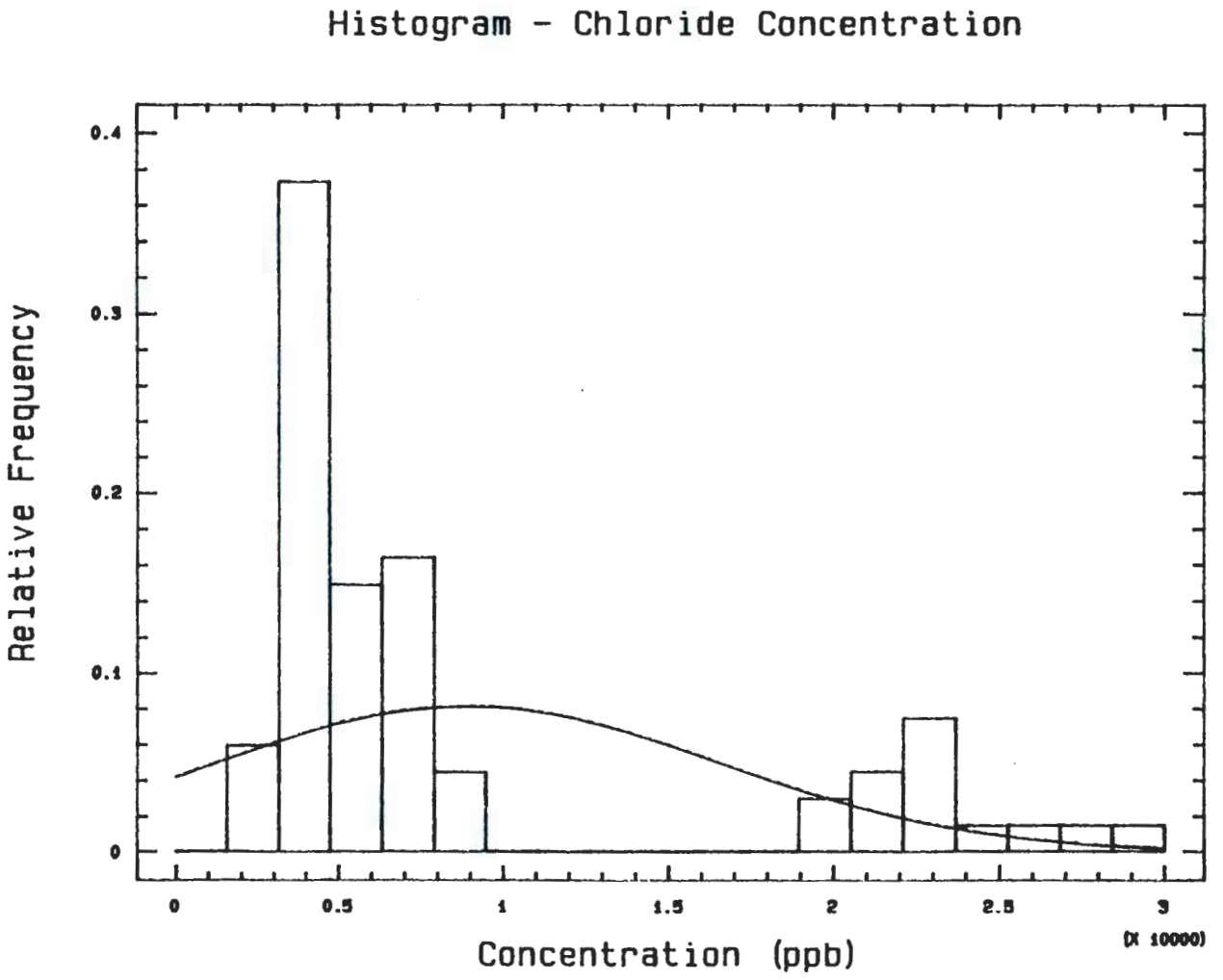
Histogram - Calcium Concentration



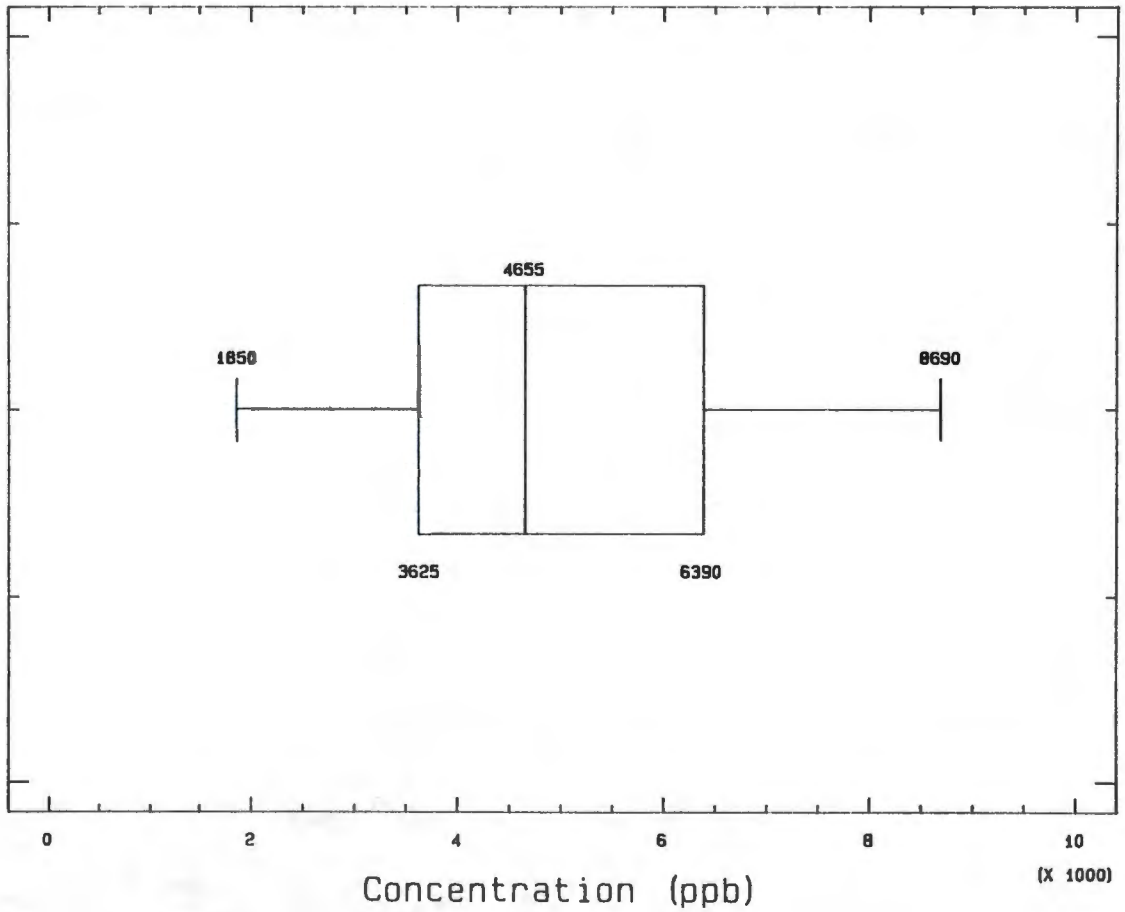
Est. Background Levels in Hanford GW
Chloride

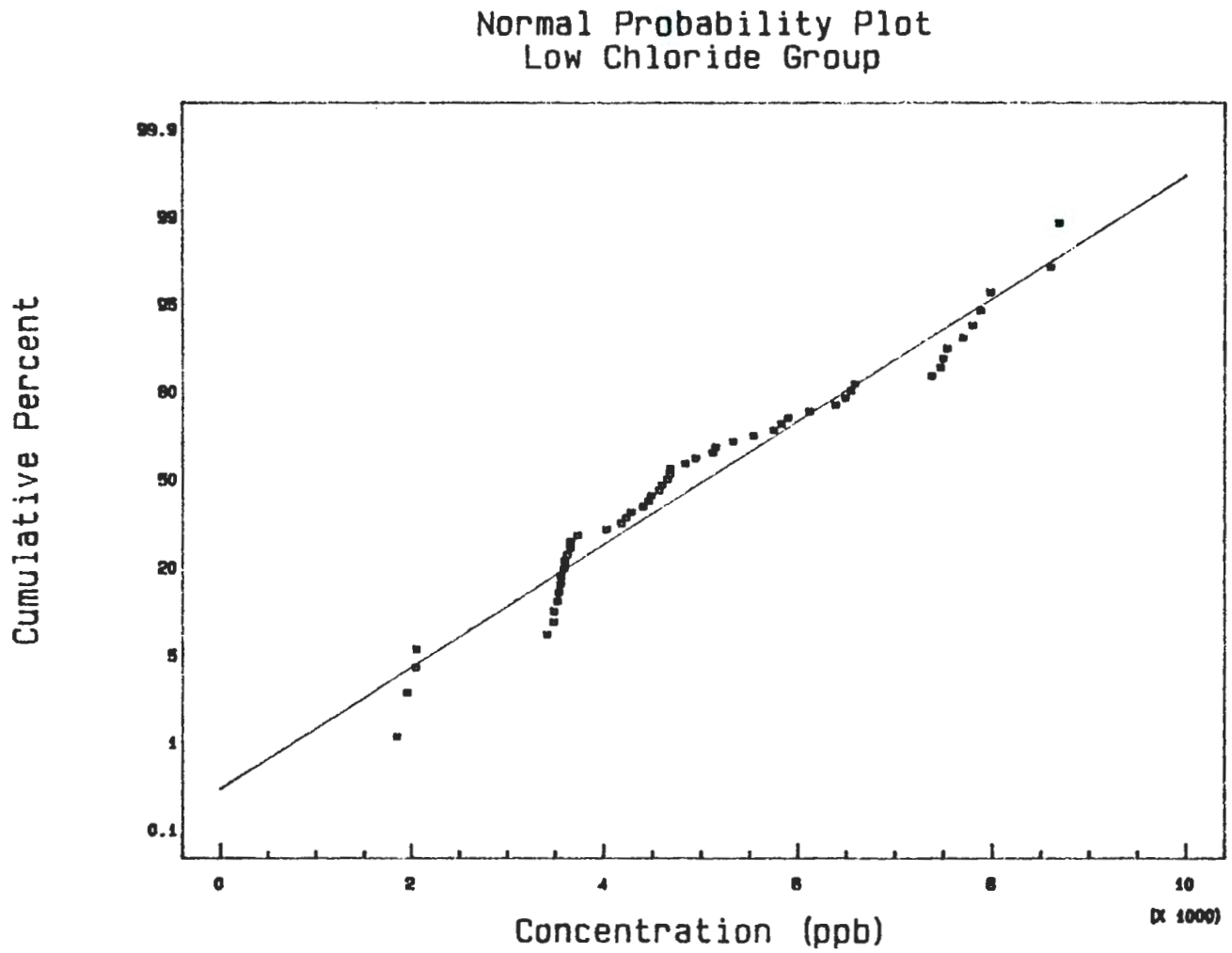



Normal Probability Plot
Chloride (All Observations)
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
0.5
1
1.5
2
2.5
3
(X 10000)
Concentration (ppb)

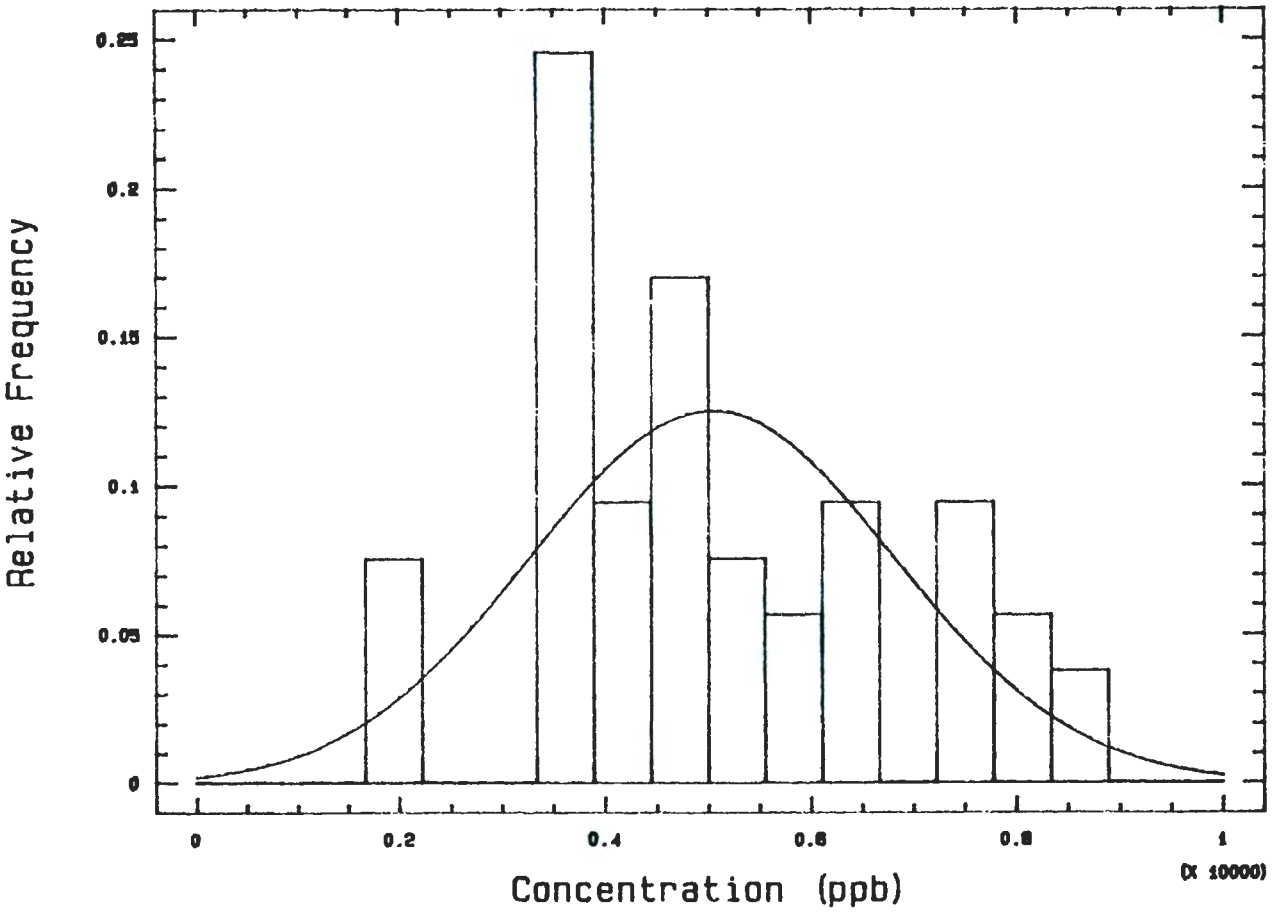

Histogram - Chloride Concentration
Relative Frequency
0.4
0.3
0.2
0.1
0
0
0.5
1
1.5
2
2.5
3
(X 10000)
Concentration (ppb)

Est. Background Levels in Hanford GW
Low Chloride Group

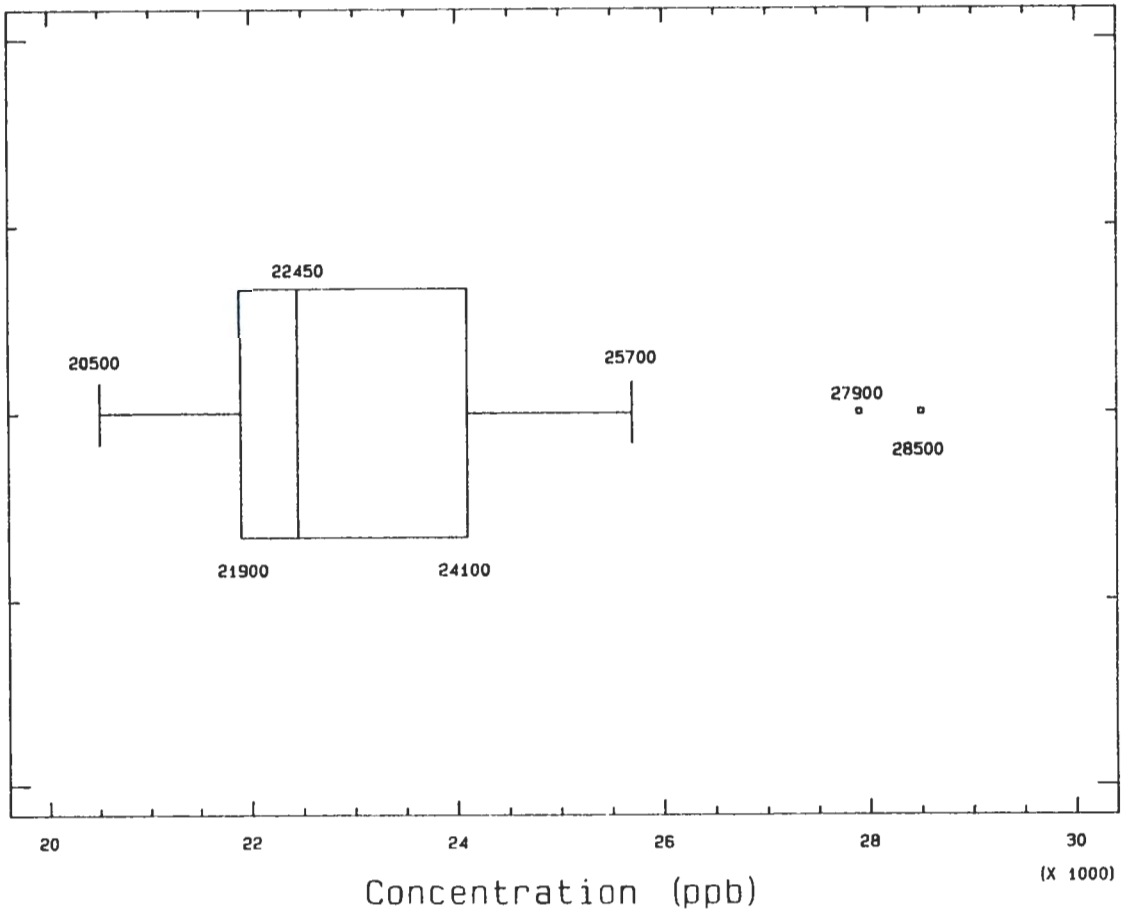


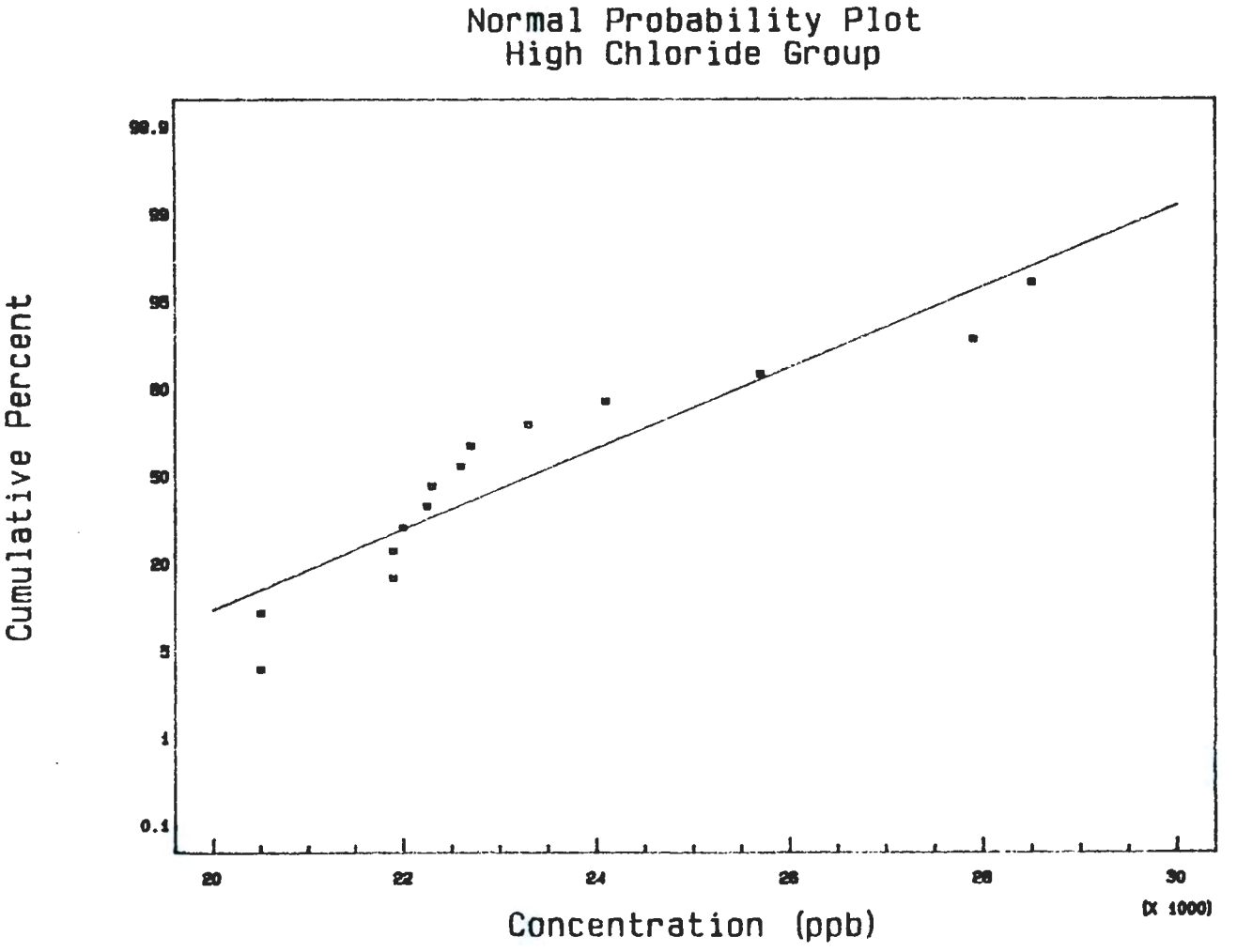

Normal Probability Plot
Low Chloride Group
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
2
4
6
8
10
(X 1000)
Concentration (ppb)

Histogram - Low Chloride Group



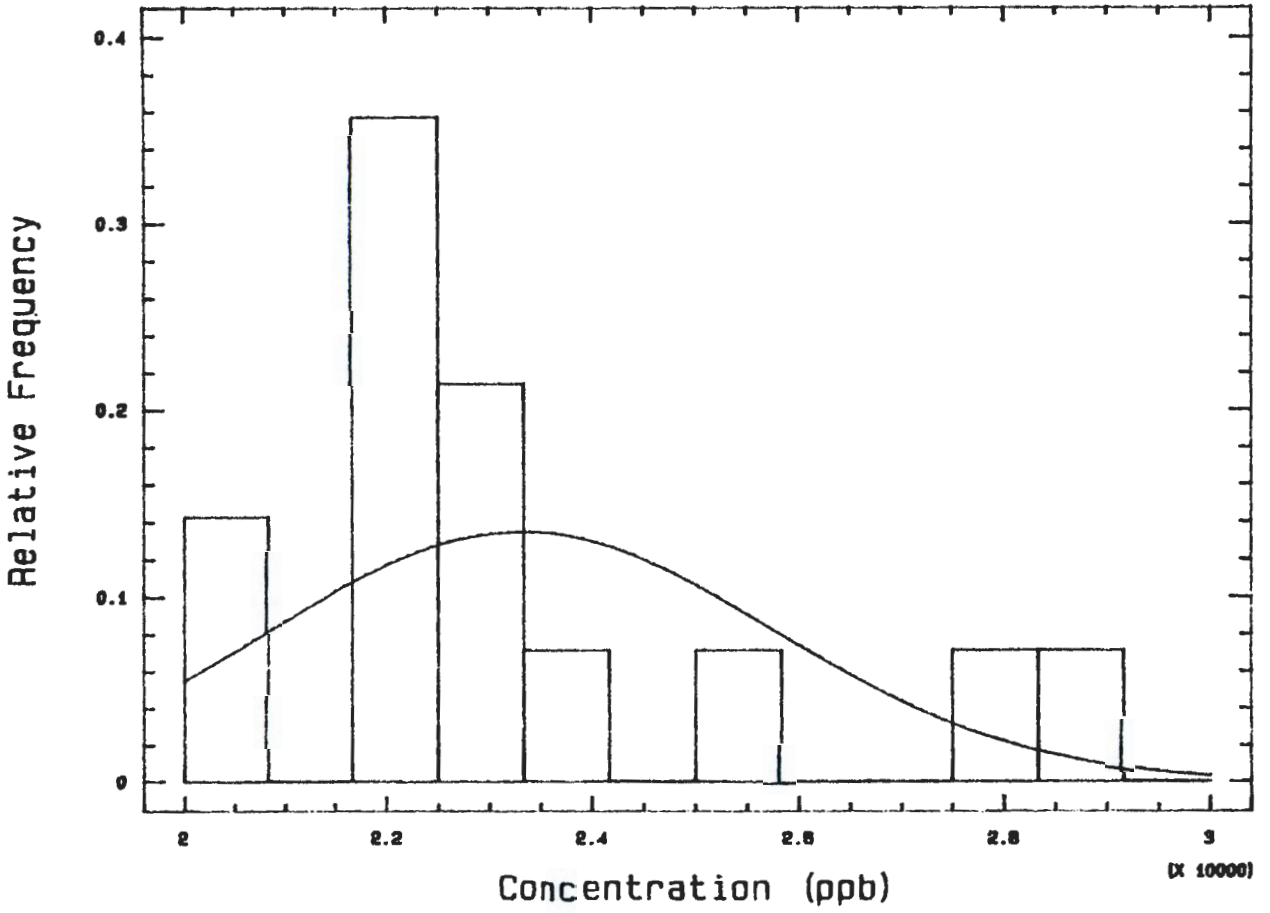
Est. Background Levels in Hanford GW
High Chloride Group



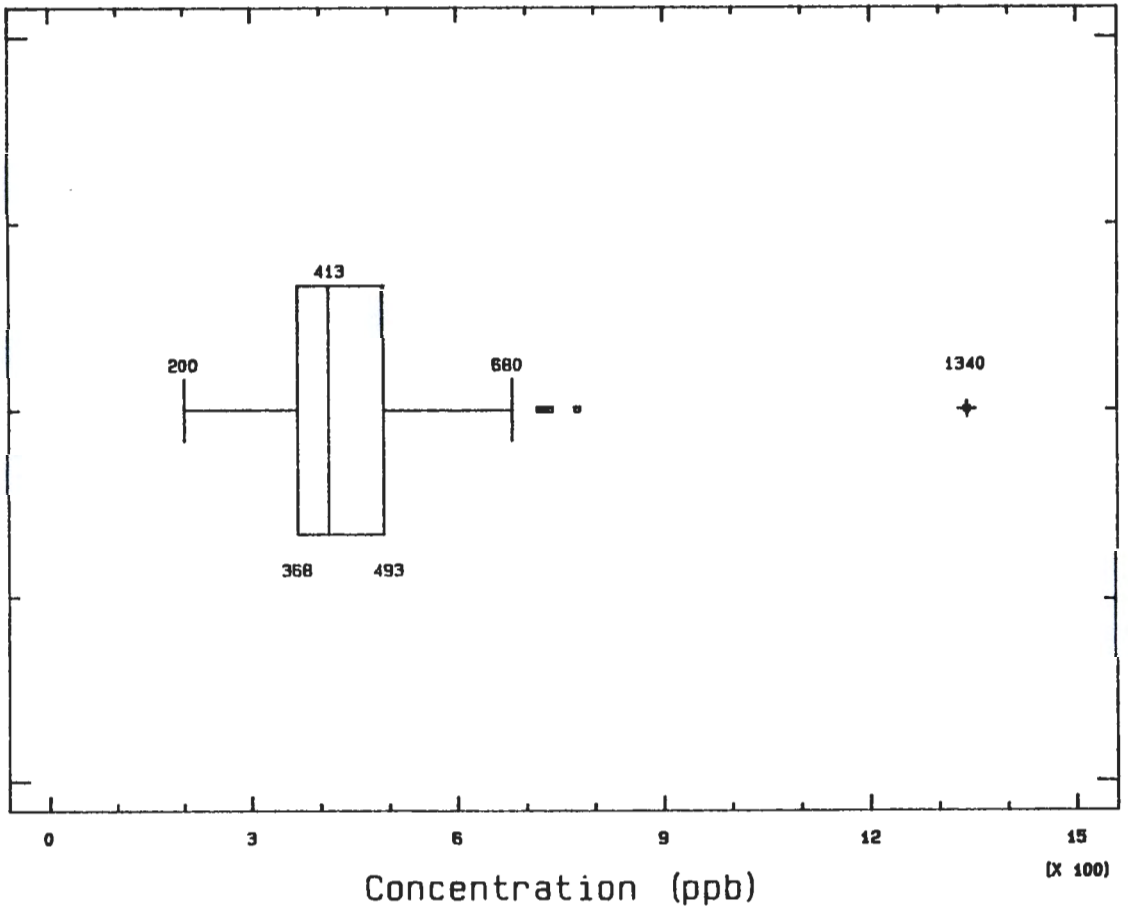

Normal Probability Plot
High Chloride Group
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
20
22
24
26
28
30
(X 1000)
Concentration (ppb)

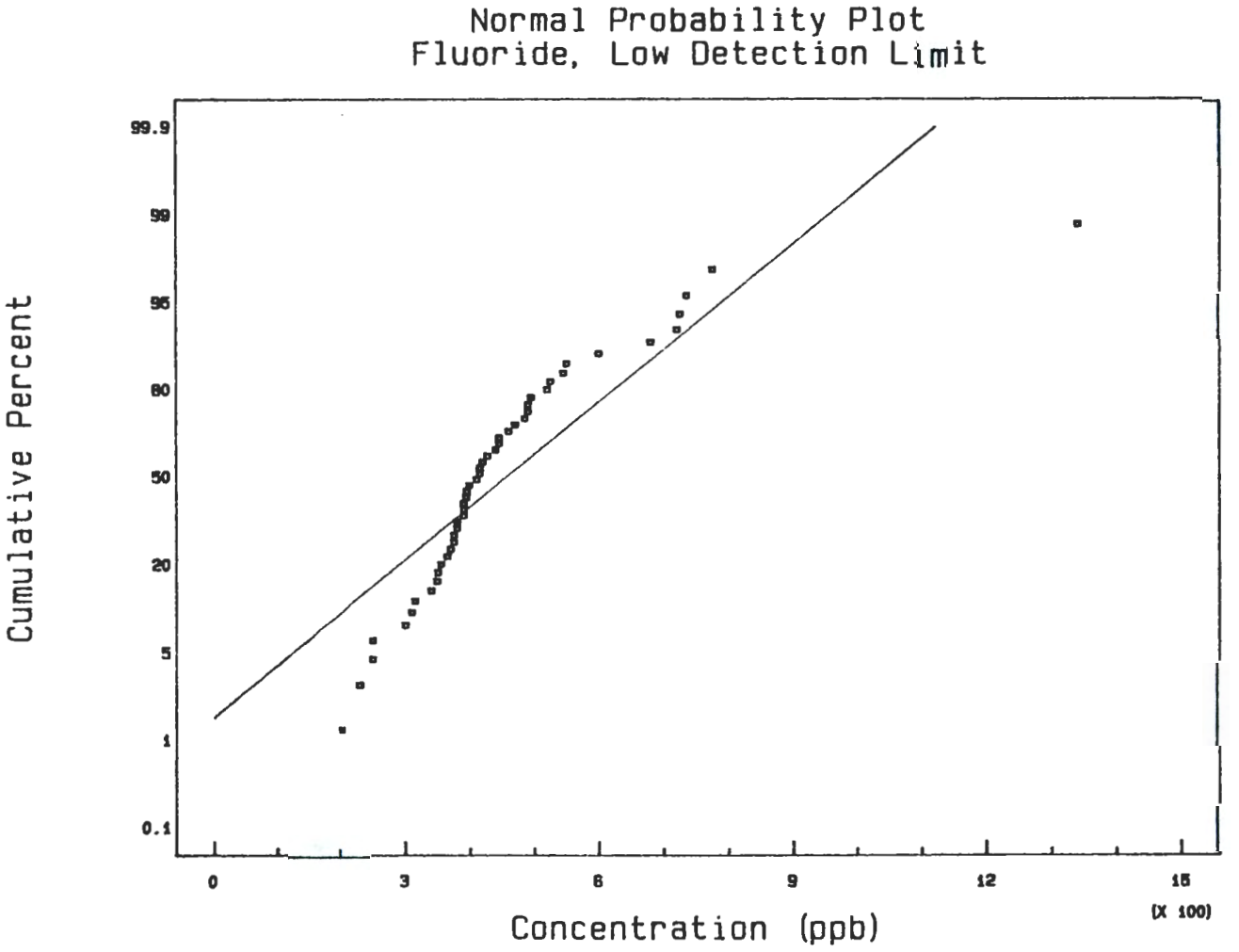
9 2 1 2 6 5 1 4 0 1

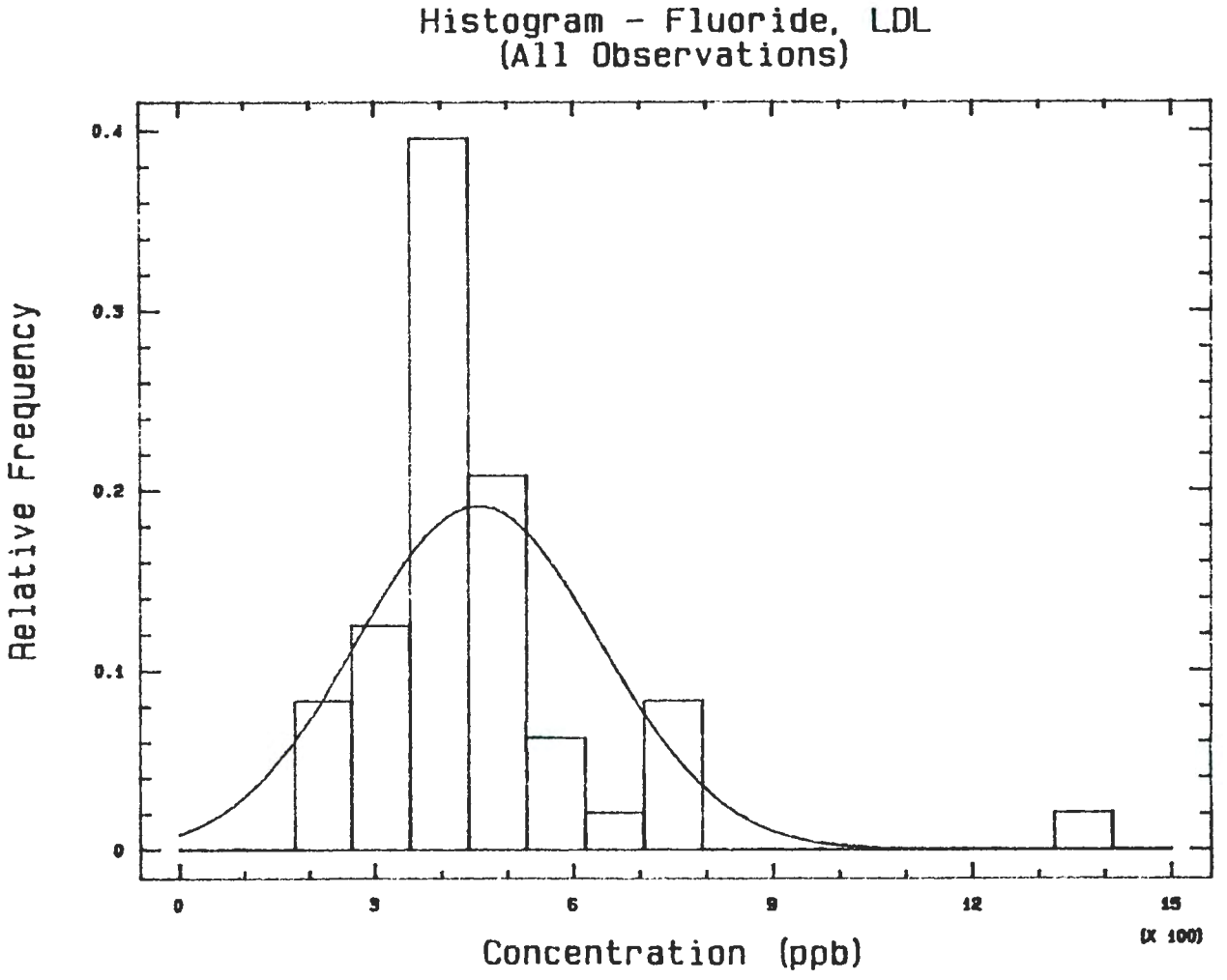
Histogram - High Chloride Group



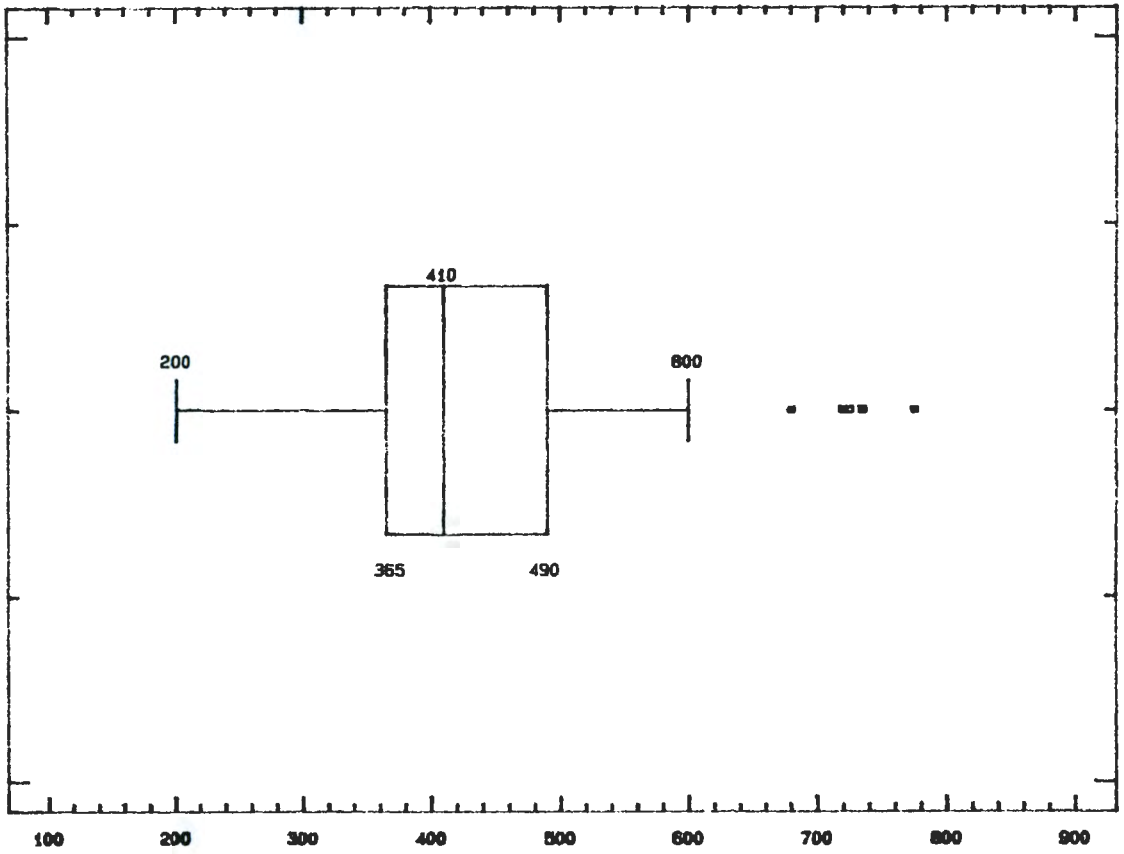
Est. Background Levels in Hanford GW
Fluoride, Low Detection Limit




Normal Probability Plot
Fluoride, Low Detection Limit
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
3
6
9
12
15
(X 100)
Concentration (ppb)

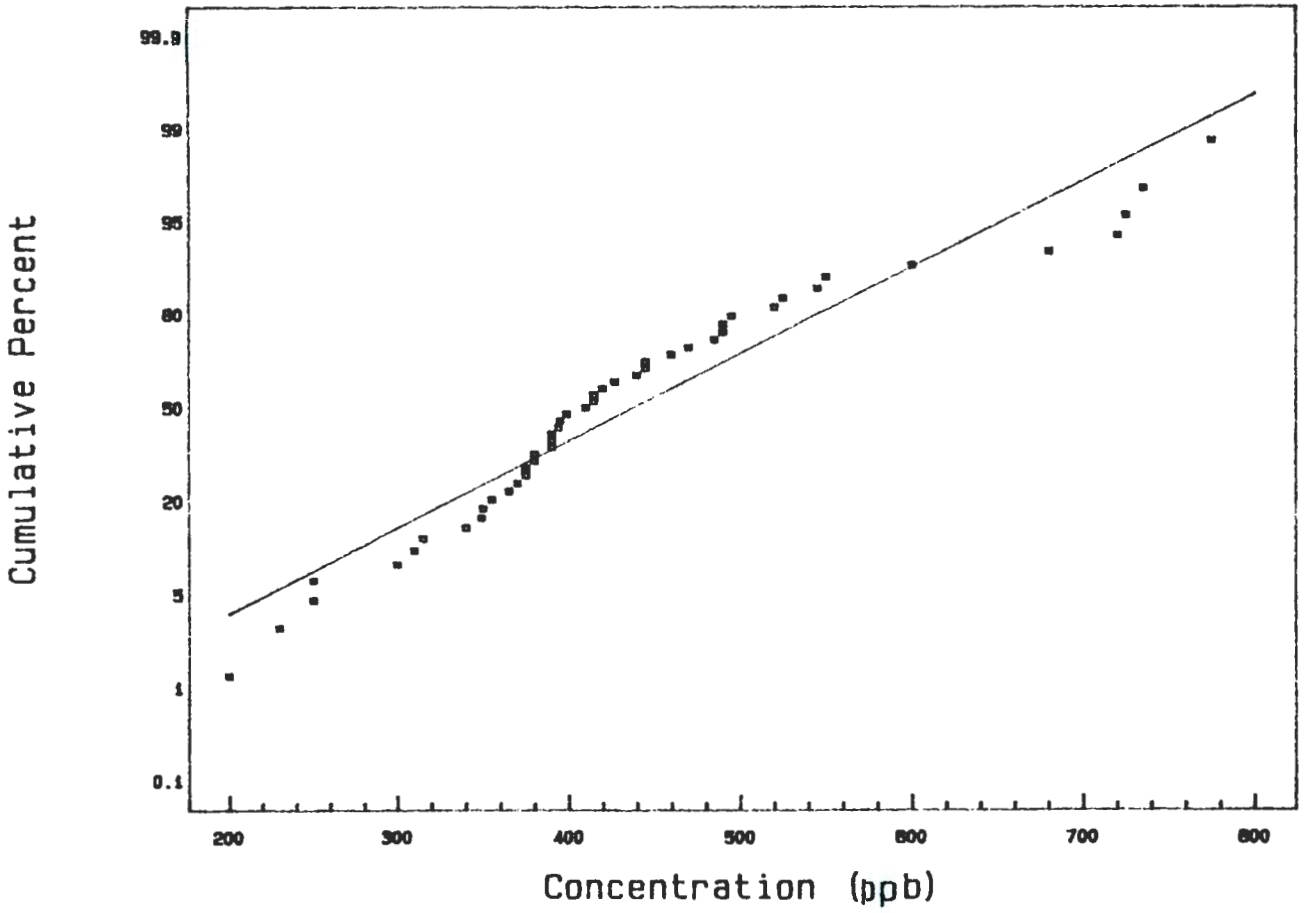

Histogram - Fluoride, LDL
(All Observations)
Relative Frequency
0.4
0.3
0.2
0.1
0
0
3
6
9
12
15
(X 100)
Concentration (ppb)

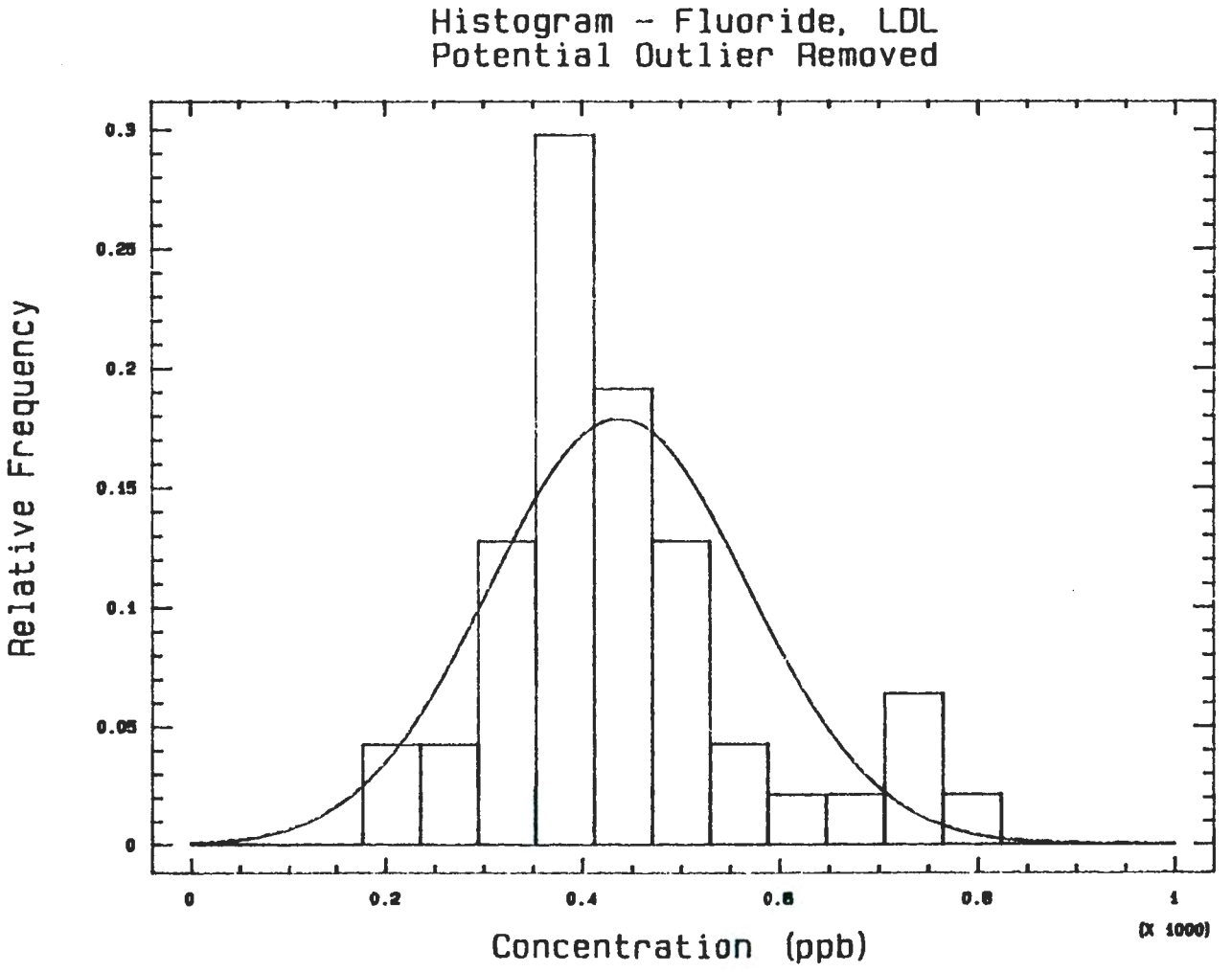
Est. Background Levels in Hanford GW
Fluoride, LDL (Removed Potential Outlier)



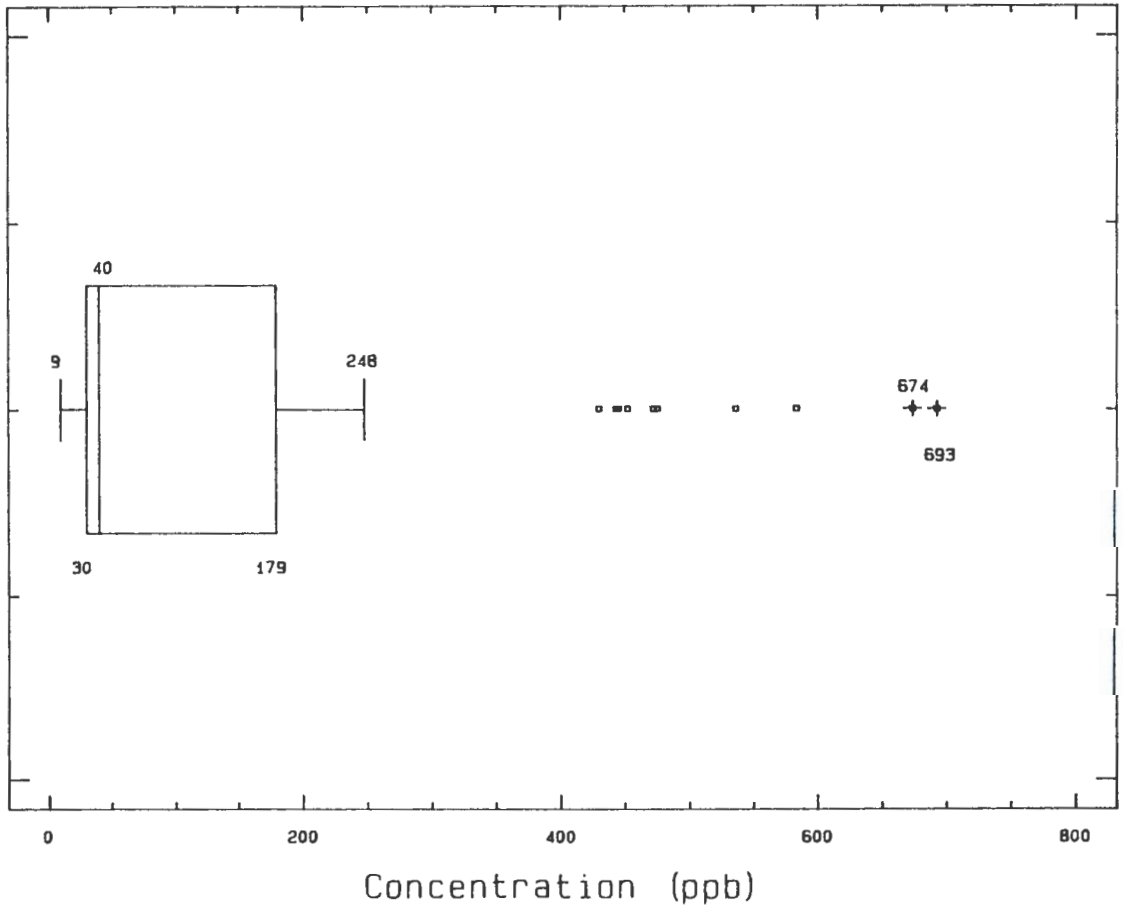
Concentration (ppb)

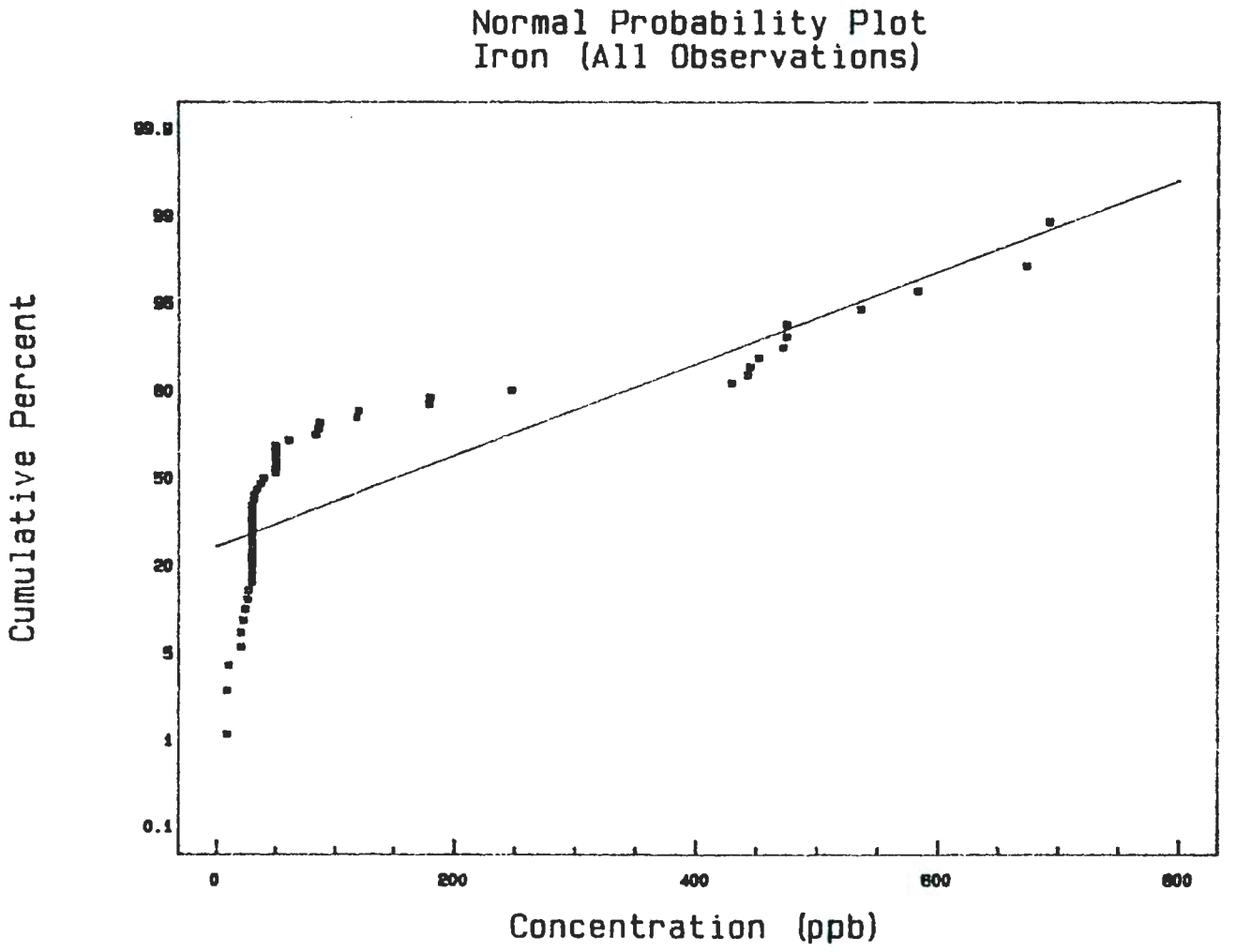
Normal Probability Plot
Fluoride, LDL (Delete Outlier)



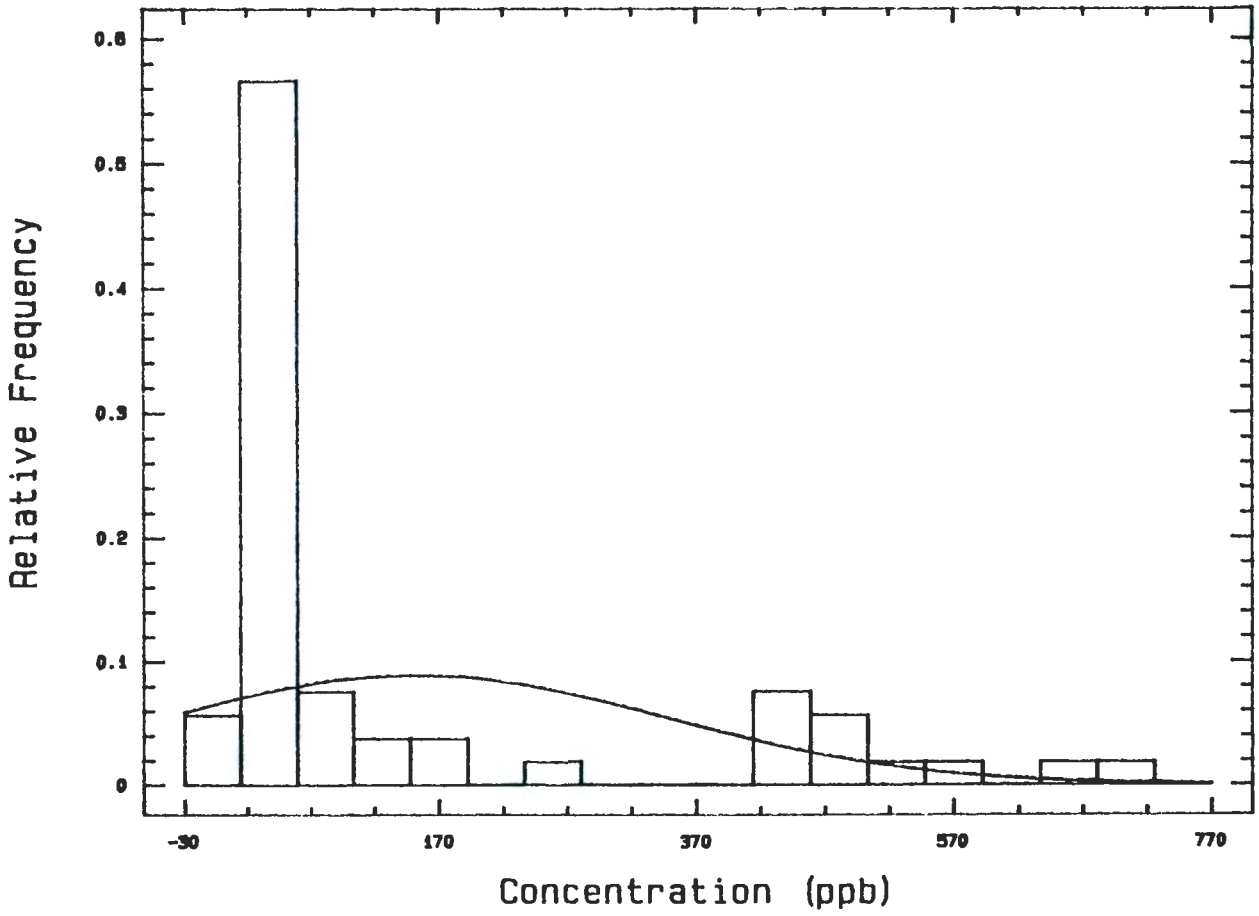

Histogram - Fluoride, LDL
Potential Outlier Removed
Relative Frequency
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.2
0.4
0.6
0.8
1
(X 1000)
Concentration (ppb)

Est. Background Levels in Hanford GW
Iron

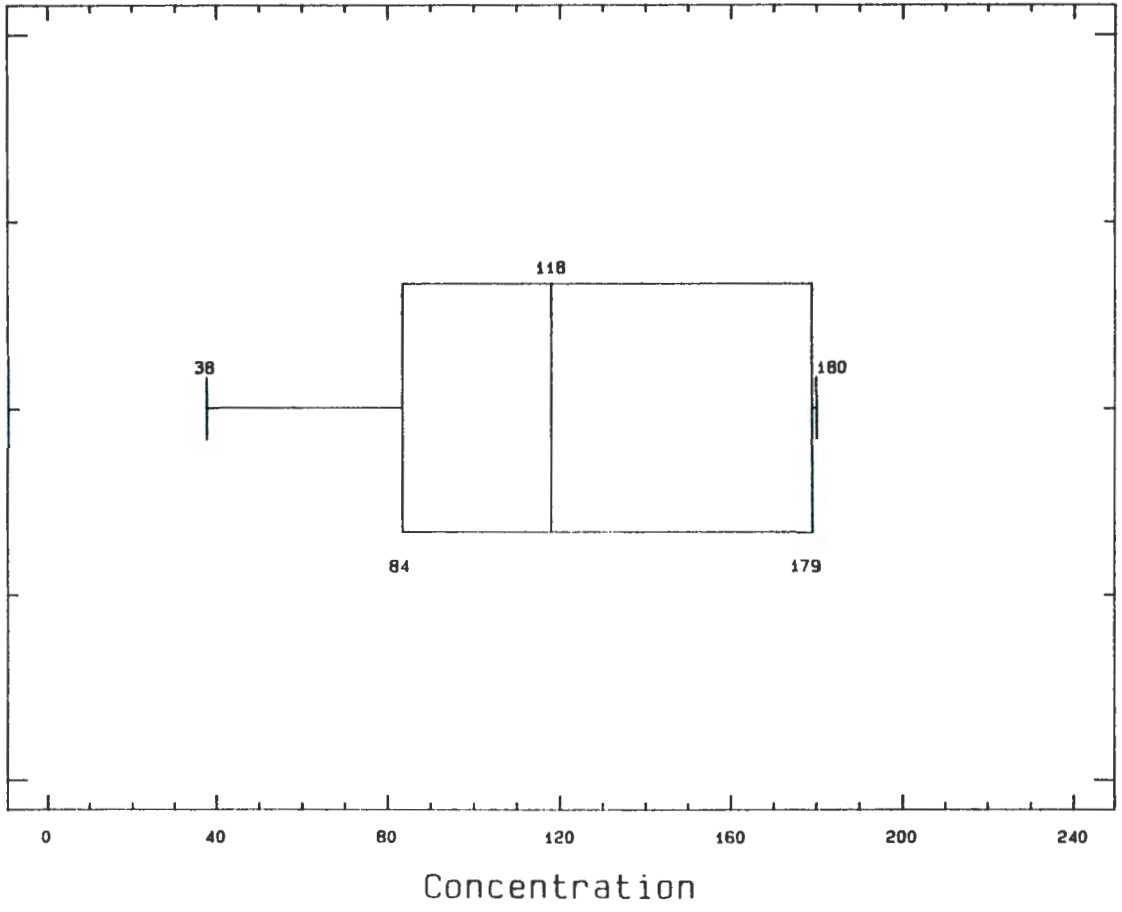


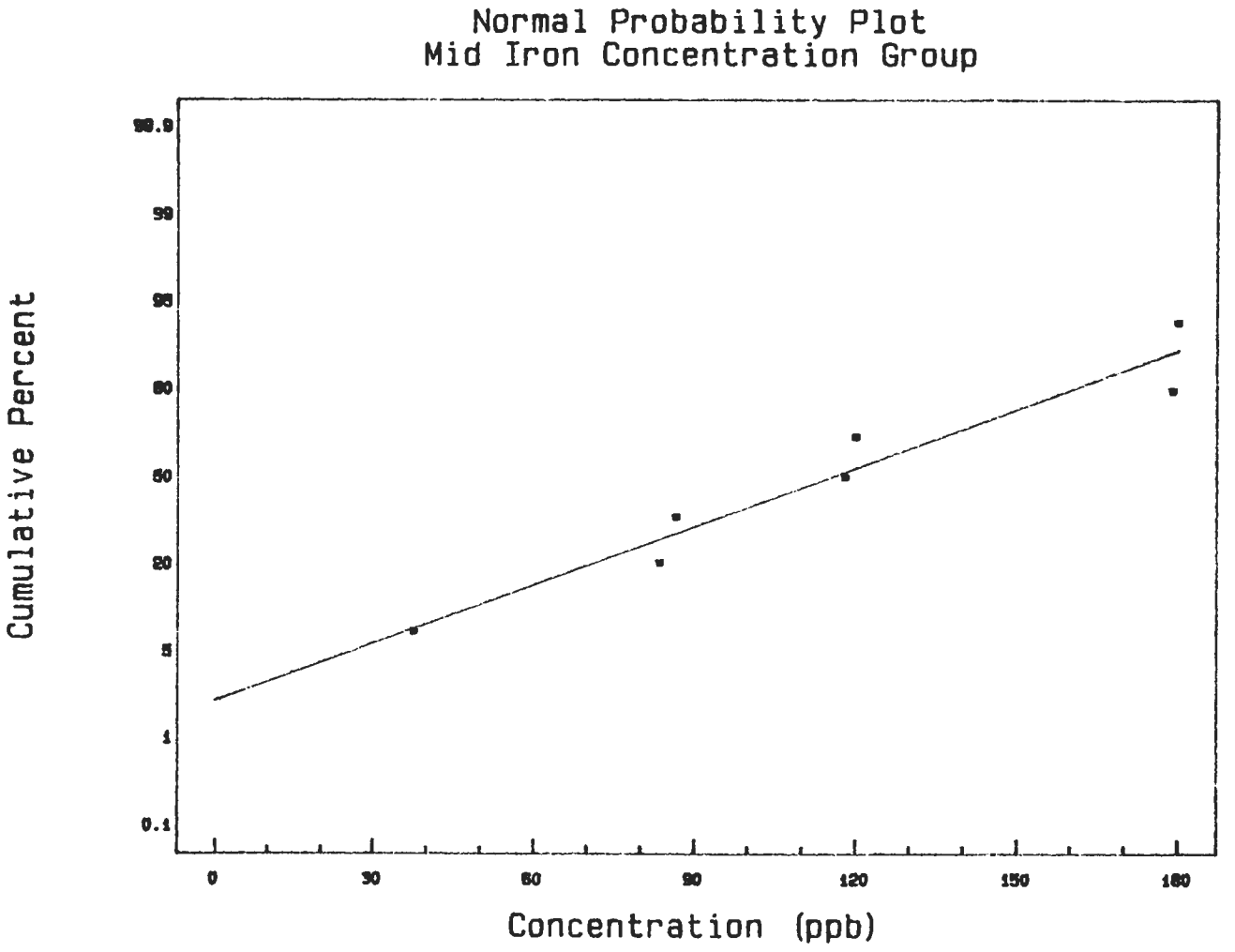

Normal Probability Plot
Iron (All Observations)
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
200
400
600
800
Concentration (ppb)

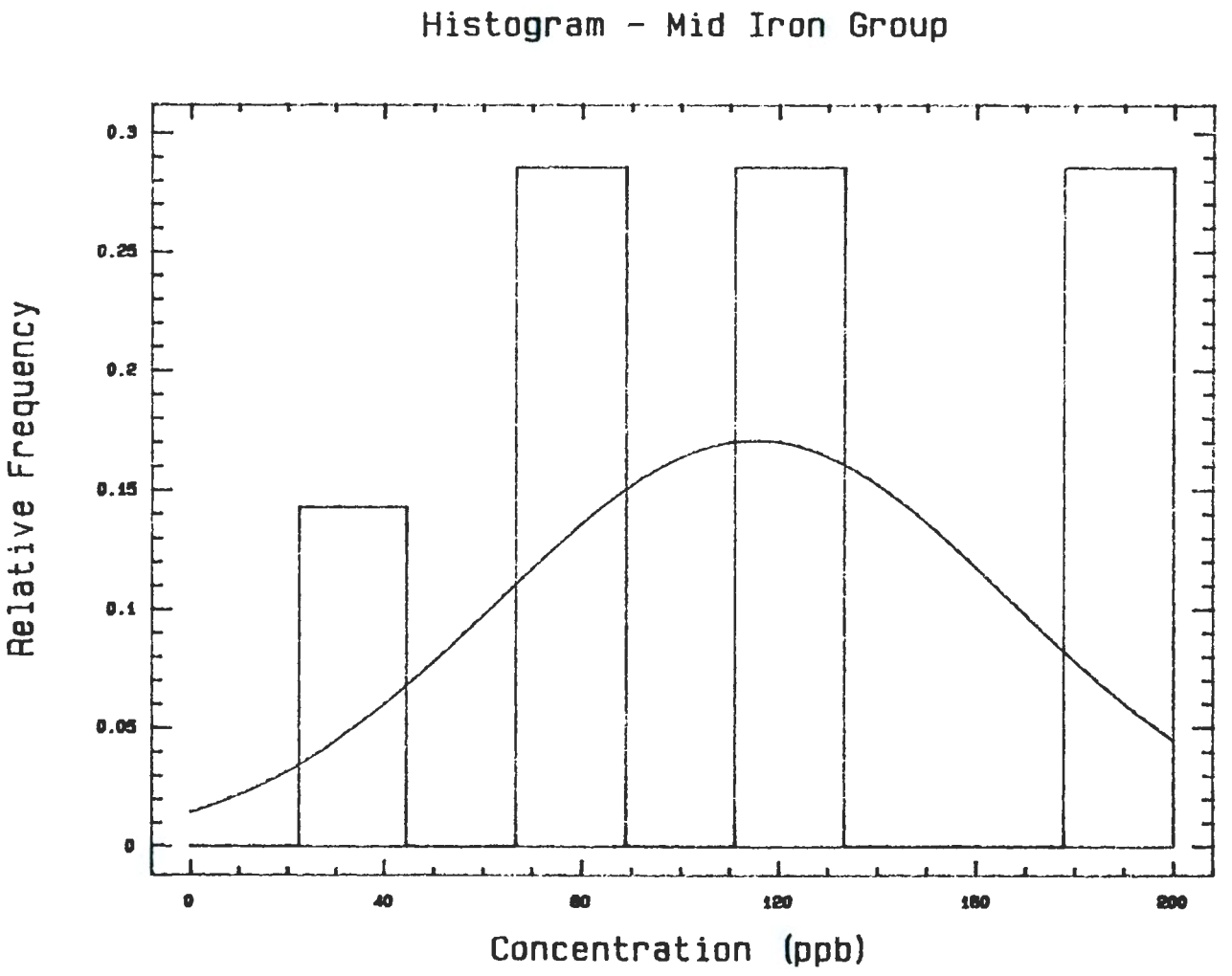
Histogram - Iron Concentration



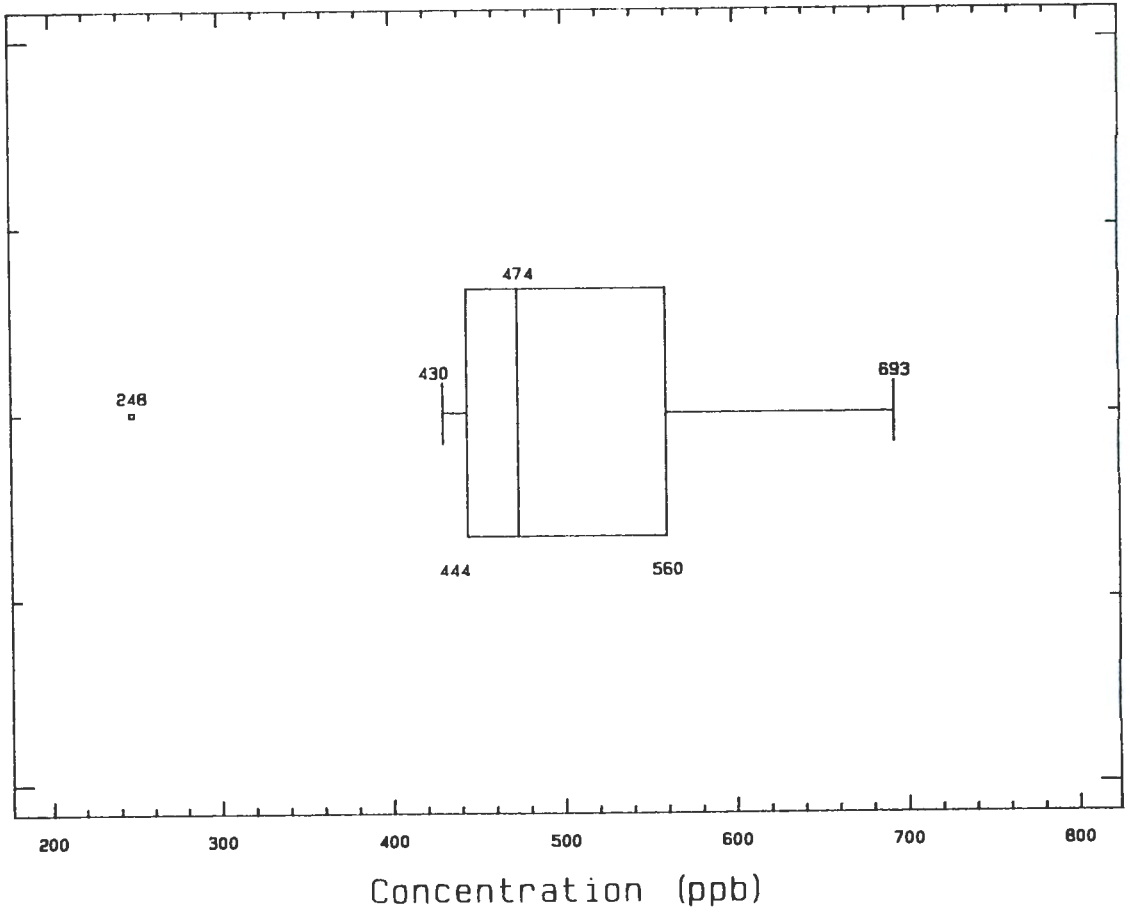
Est. Background Levels in Hanford GW
Mid-Iron Concentration Group



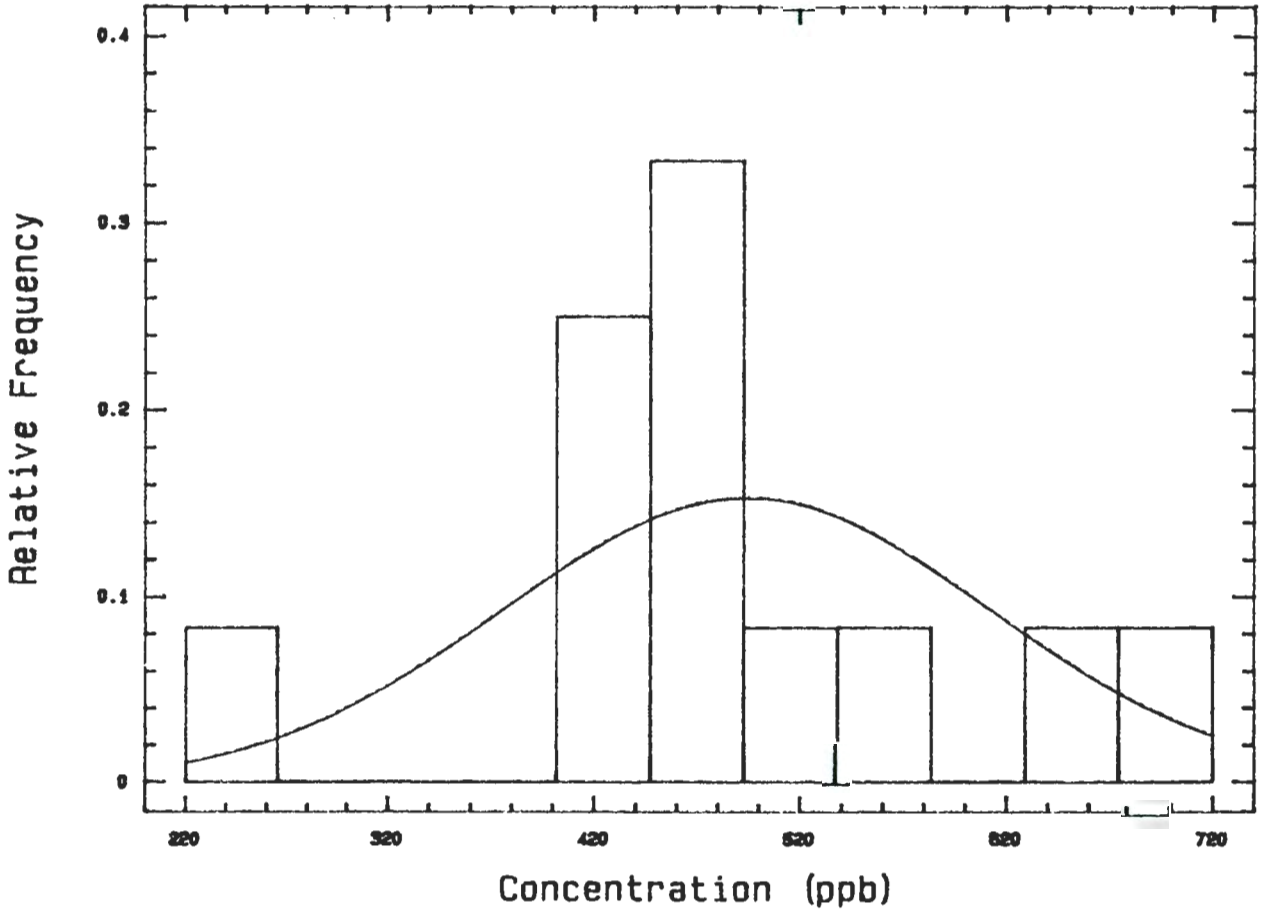

Normal Probability Plot
Mid Iron Concentration Group
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
30
60
90
120
150
180
Concentration (ppb)

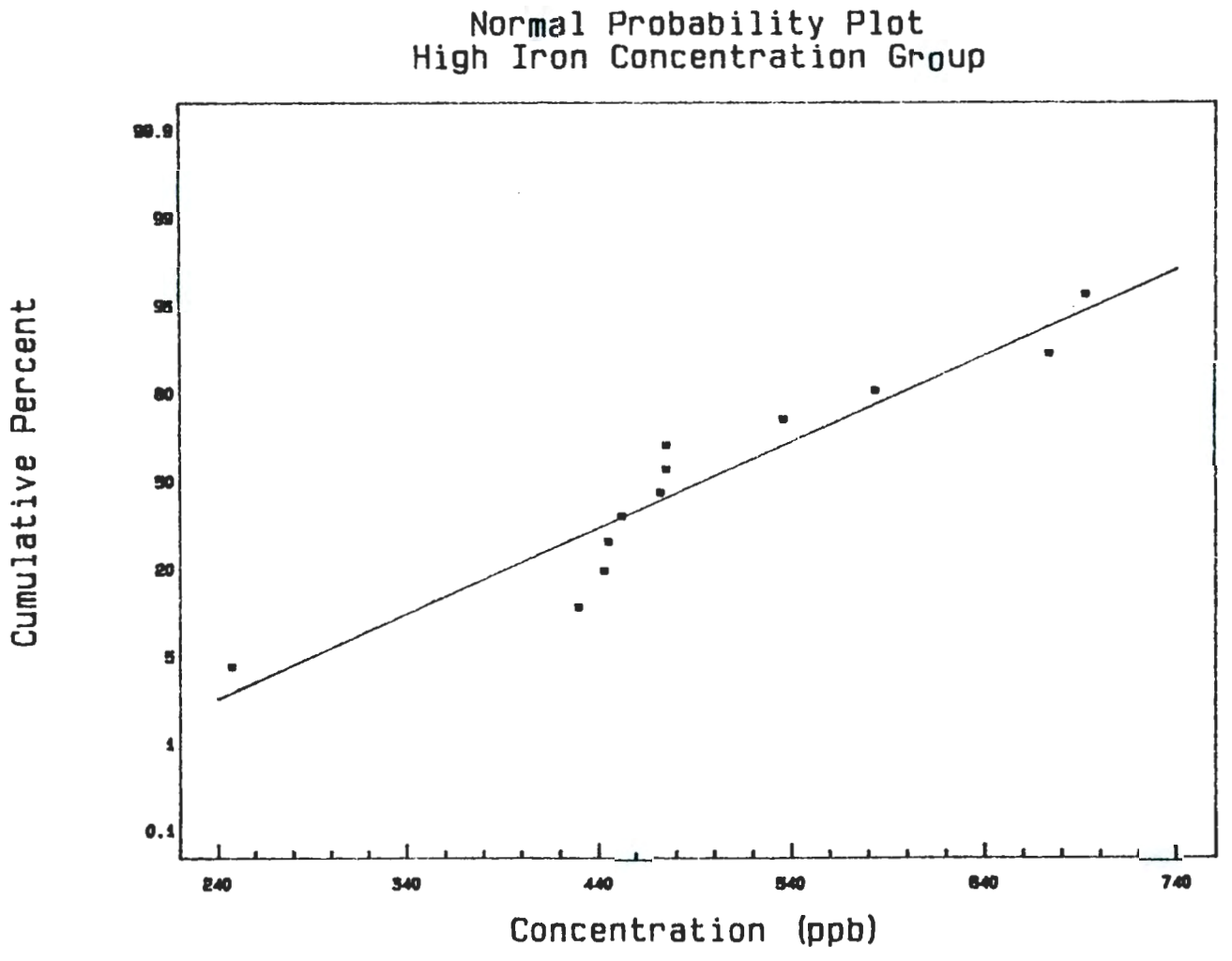

Histogram - Mid Iron Group
Relative Frequency
0.3
0.25
0.2
0.15
0.1
0.05
0
0
40
80
120
160
200
Concentration (ppb)

Est. Background Levels in Hanford GW
High-Iron Concentration Group

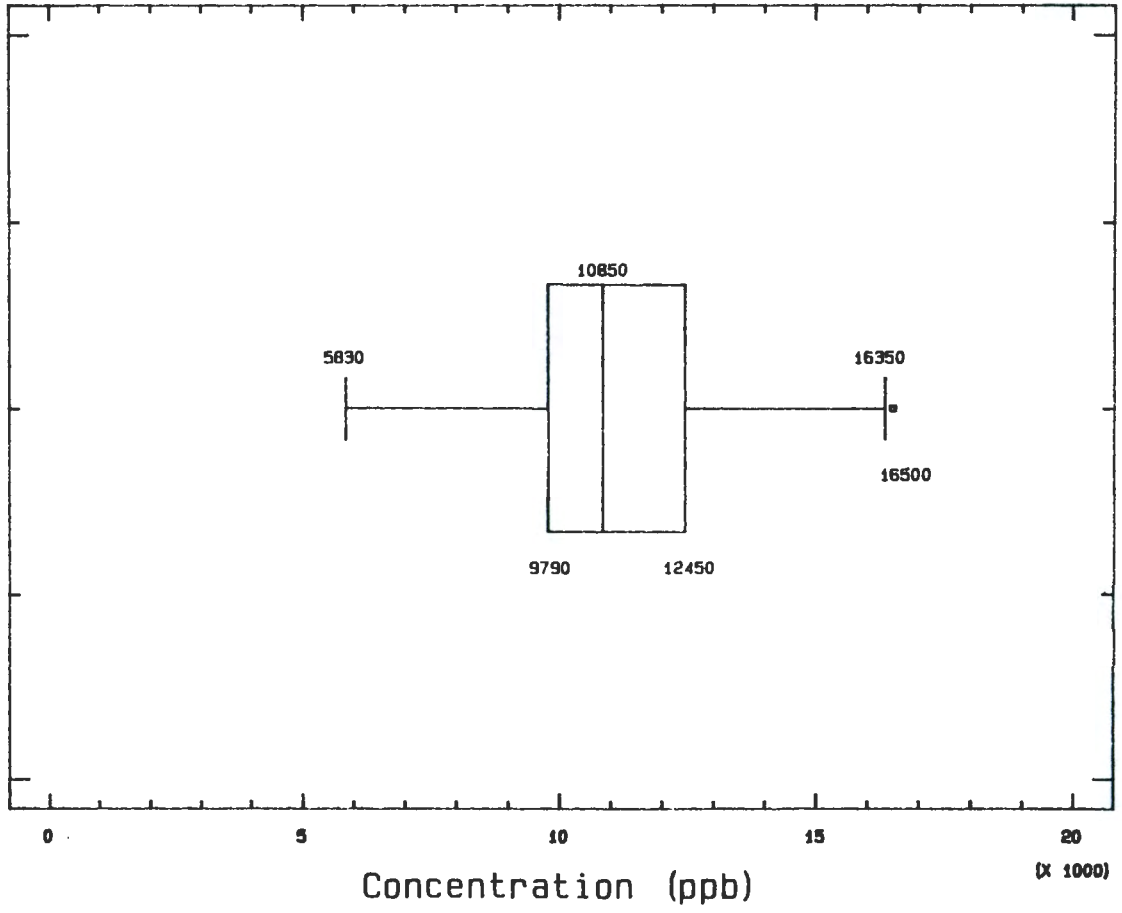


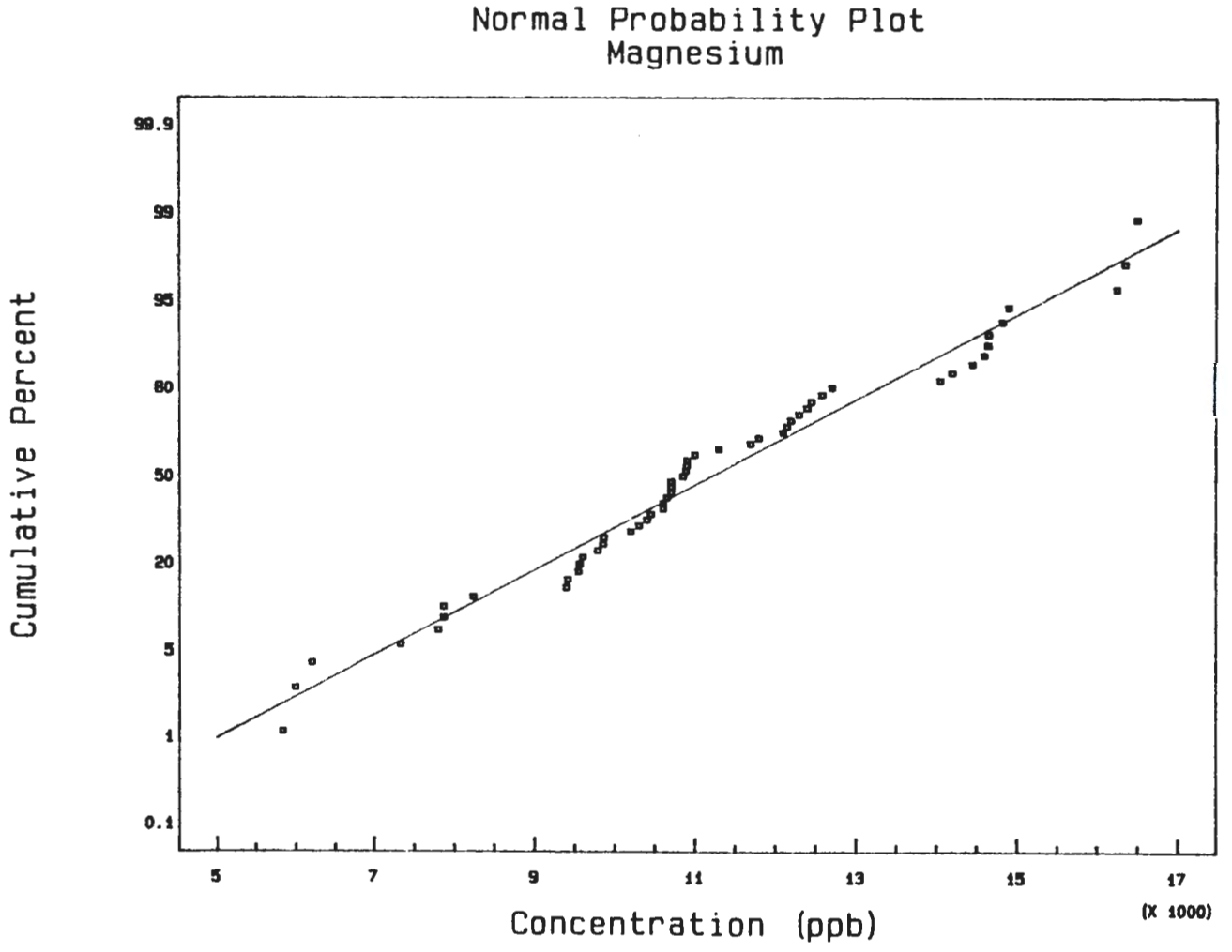
Histogram - High Iron Group



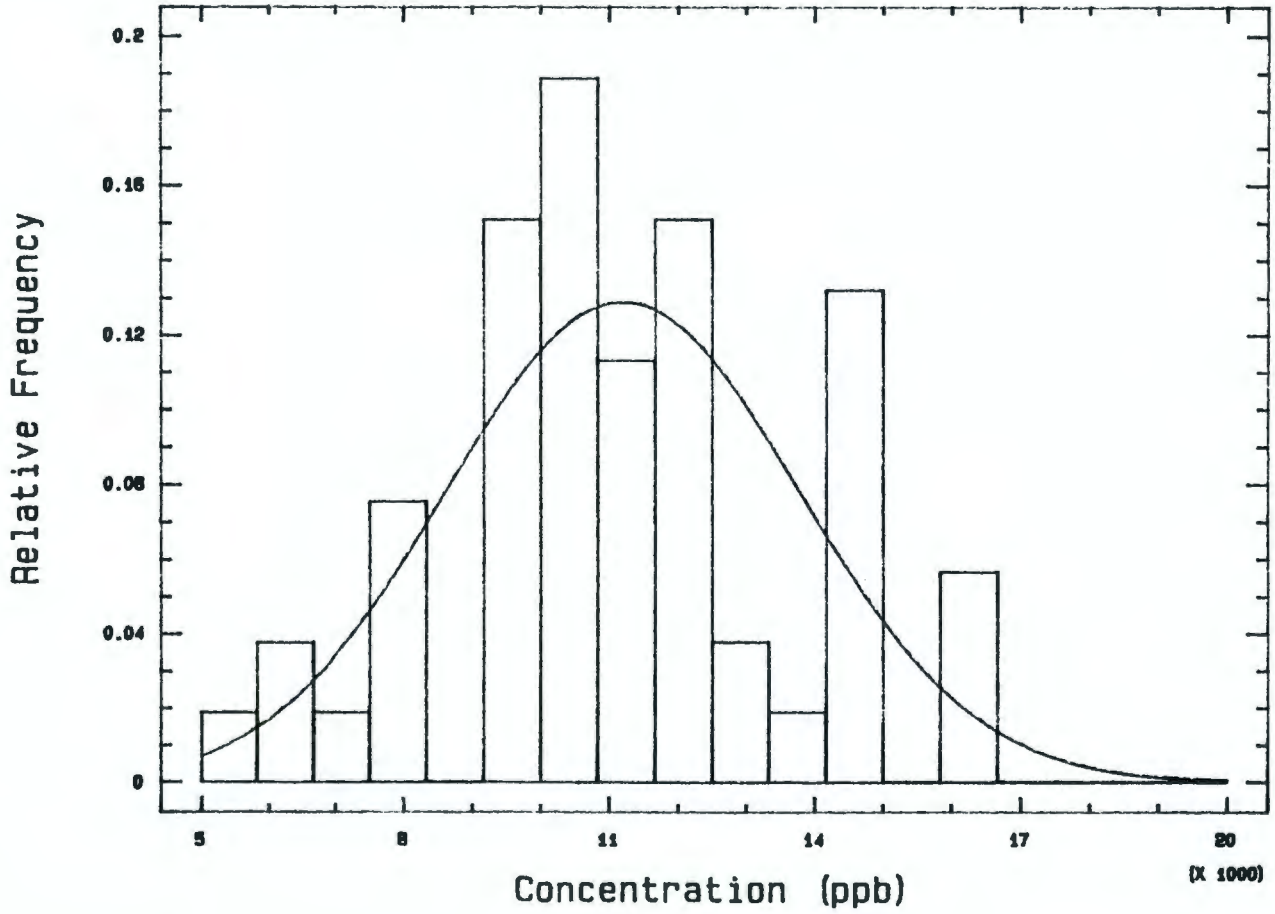

Normal Probability Plot
High Iron Concentration Group
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
240
340
440
540
640
740
Concentration (ppb)

Est. Background Levels in Hanford GW
Magnesium

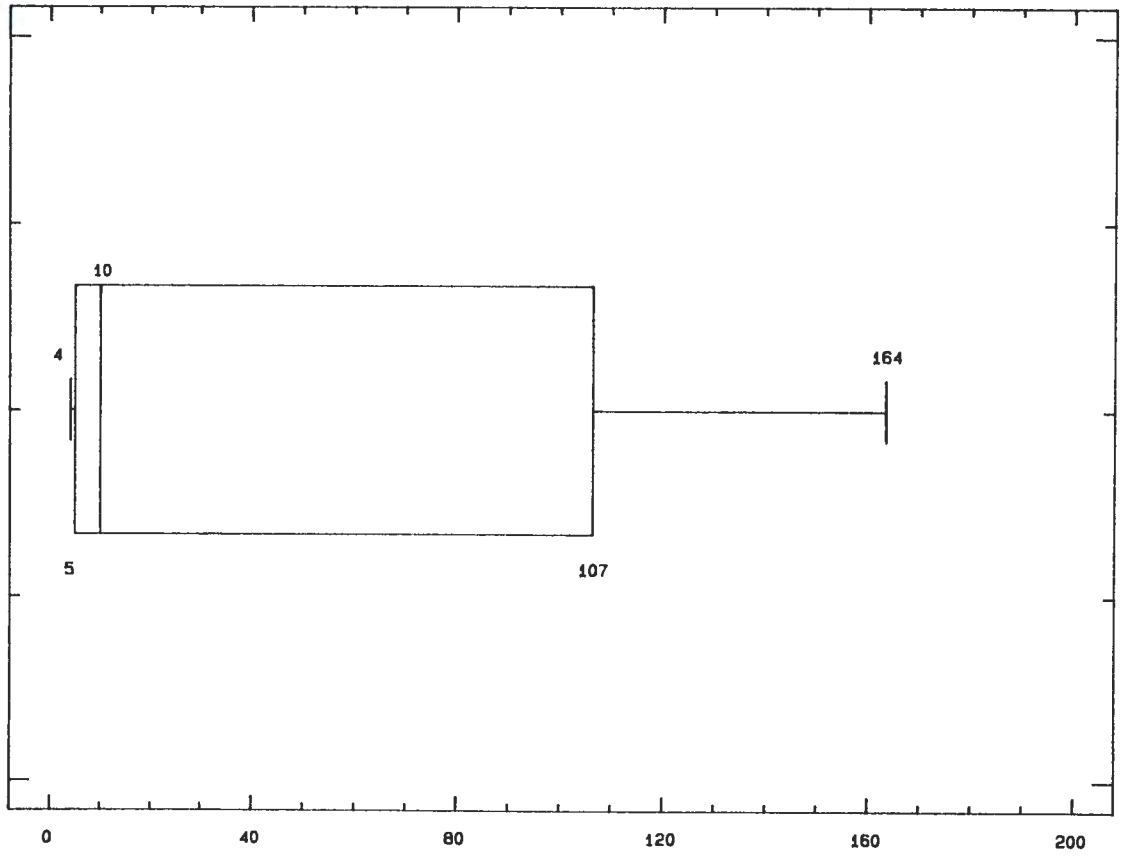



Normal Probability Plot
Magnesium
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
5
7
9
11
13
15
17
(X 1000)
Concentration (ppb)

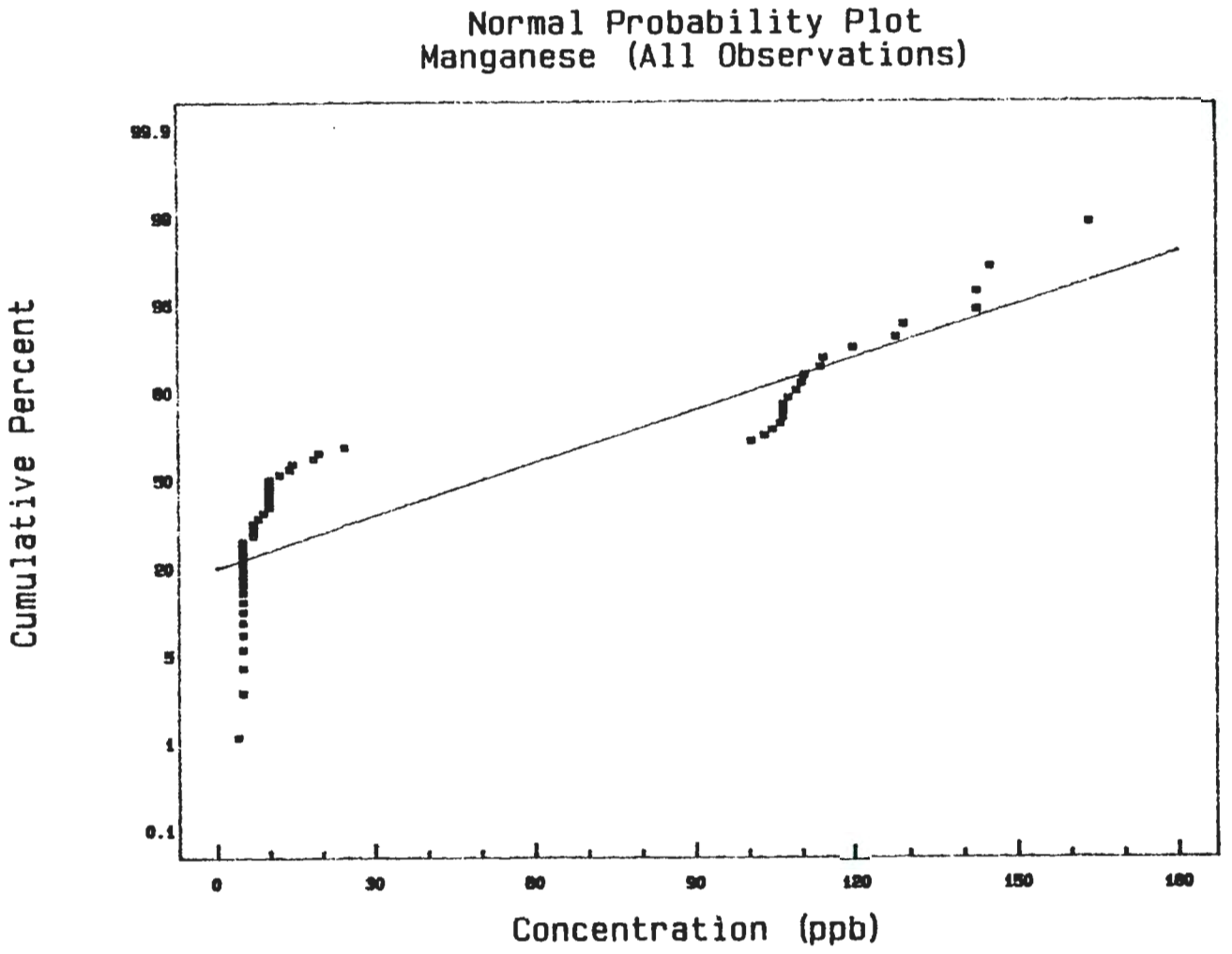
Histogram - Magnesium Concentration



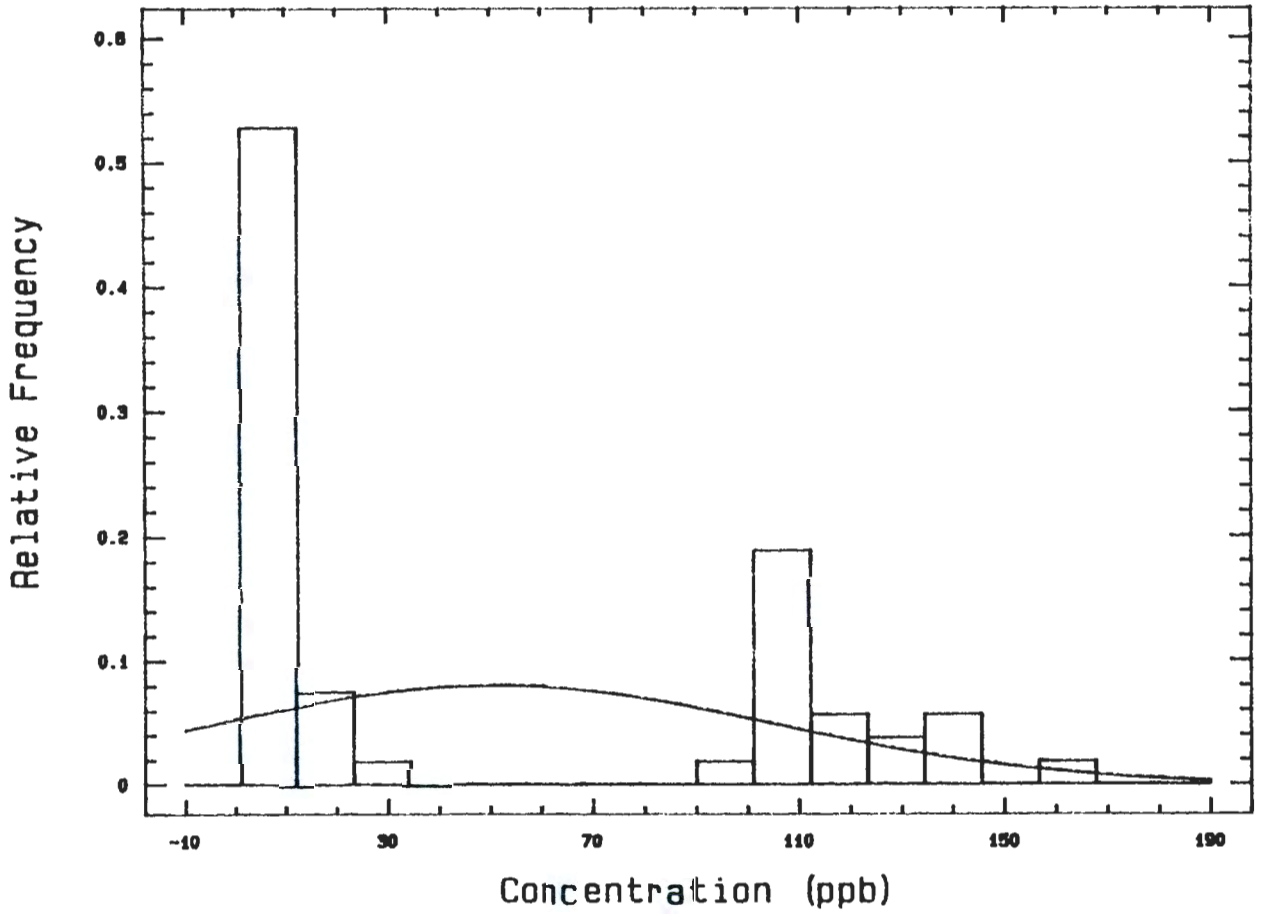
Est. Background Levels in Hanford GW
Manganese



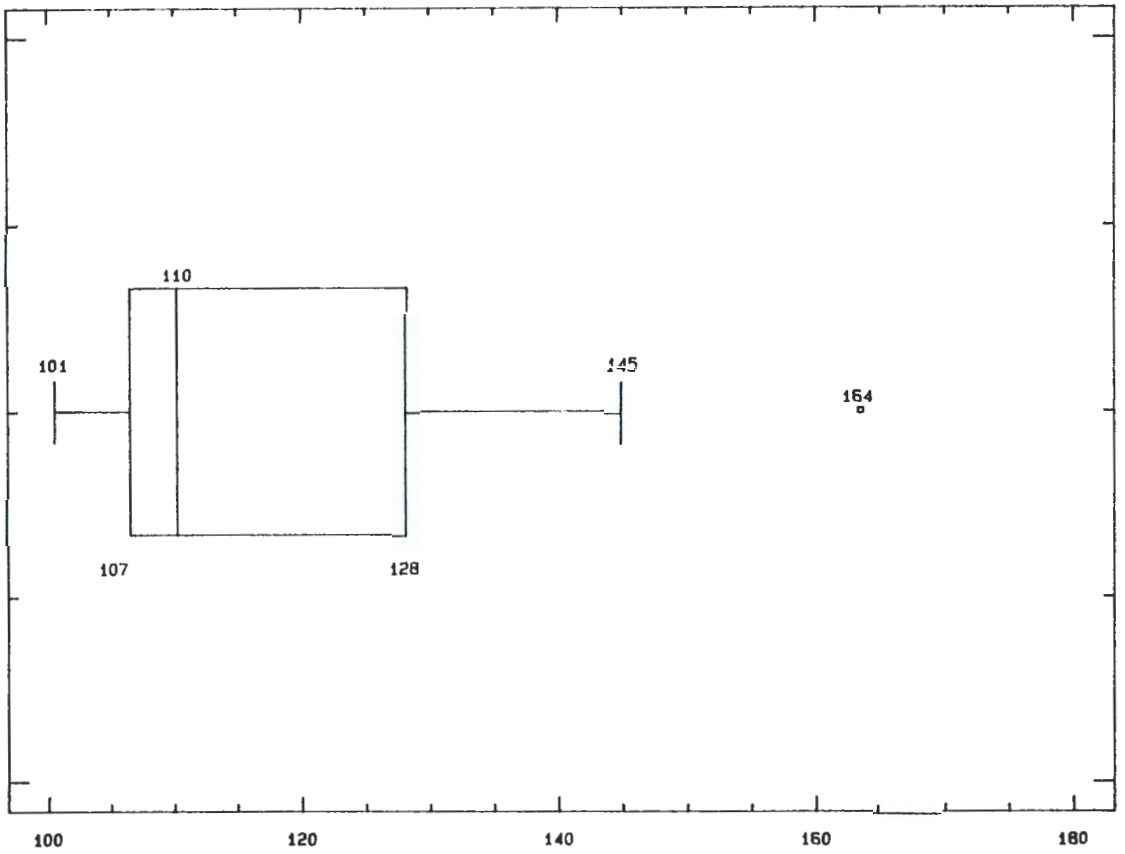
Concentration (ppb)


Normal Probability Plot
Manganese (All Observations)
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
30
60
90
120
150
180
Concentration (ppb)

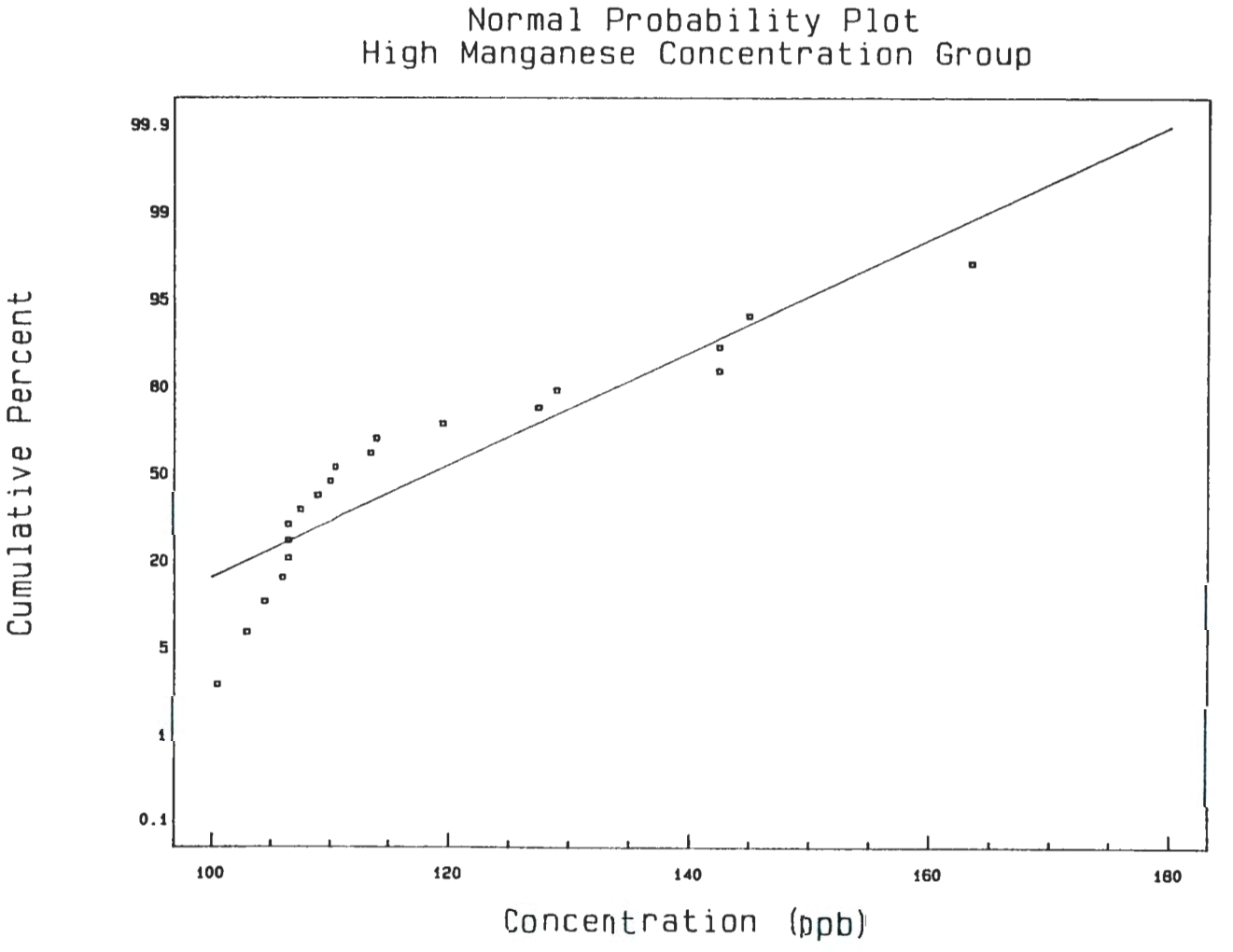
Histogram - Manganese Concentration



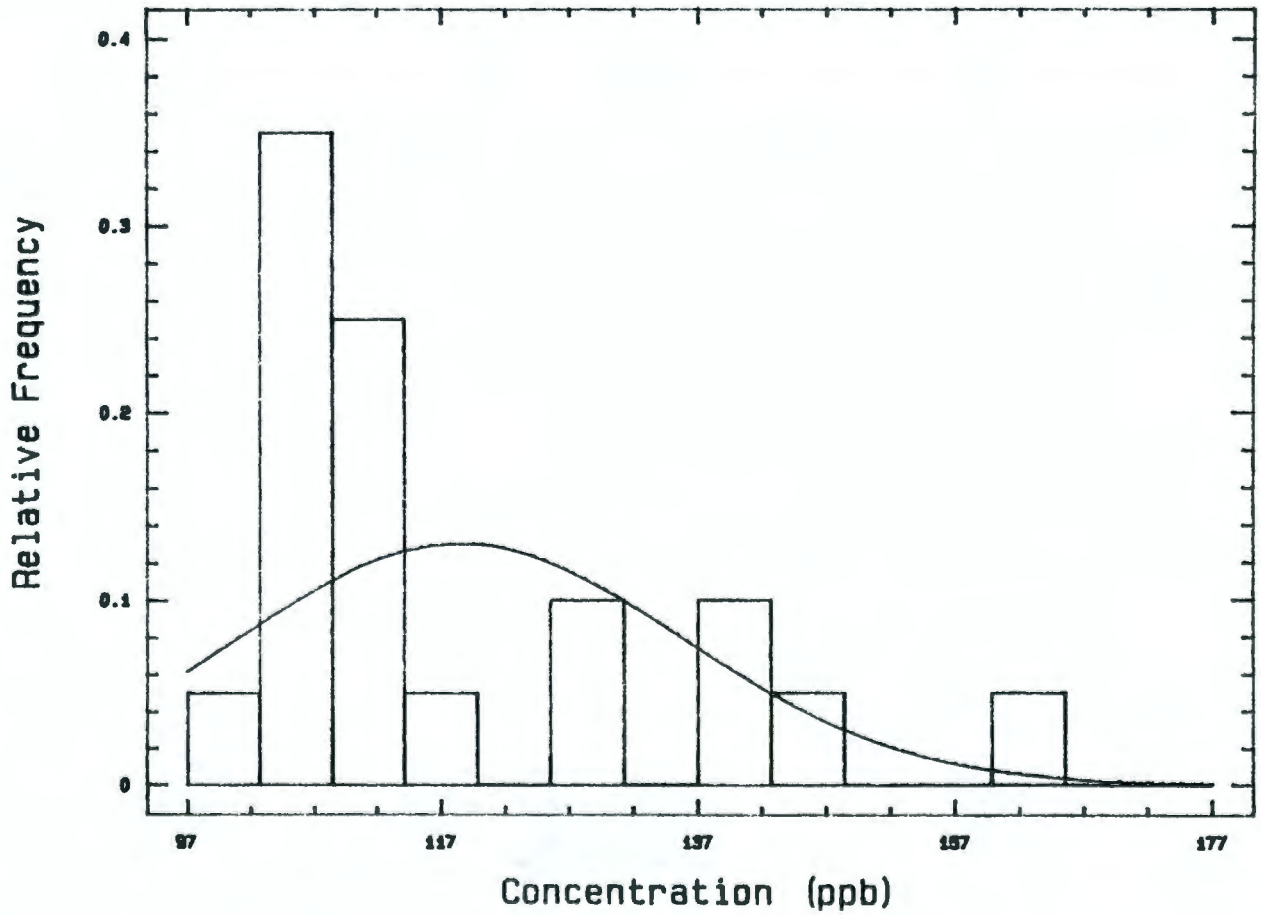
Est. Background Levels in Hanford GW
High Manganese Concentration Group



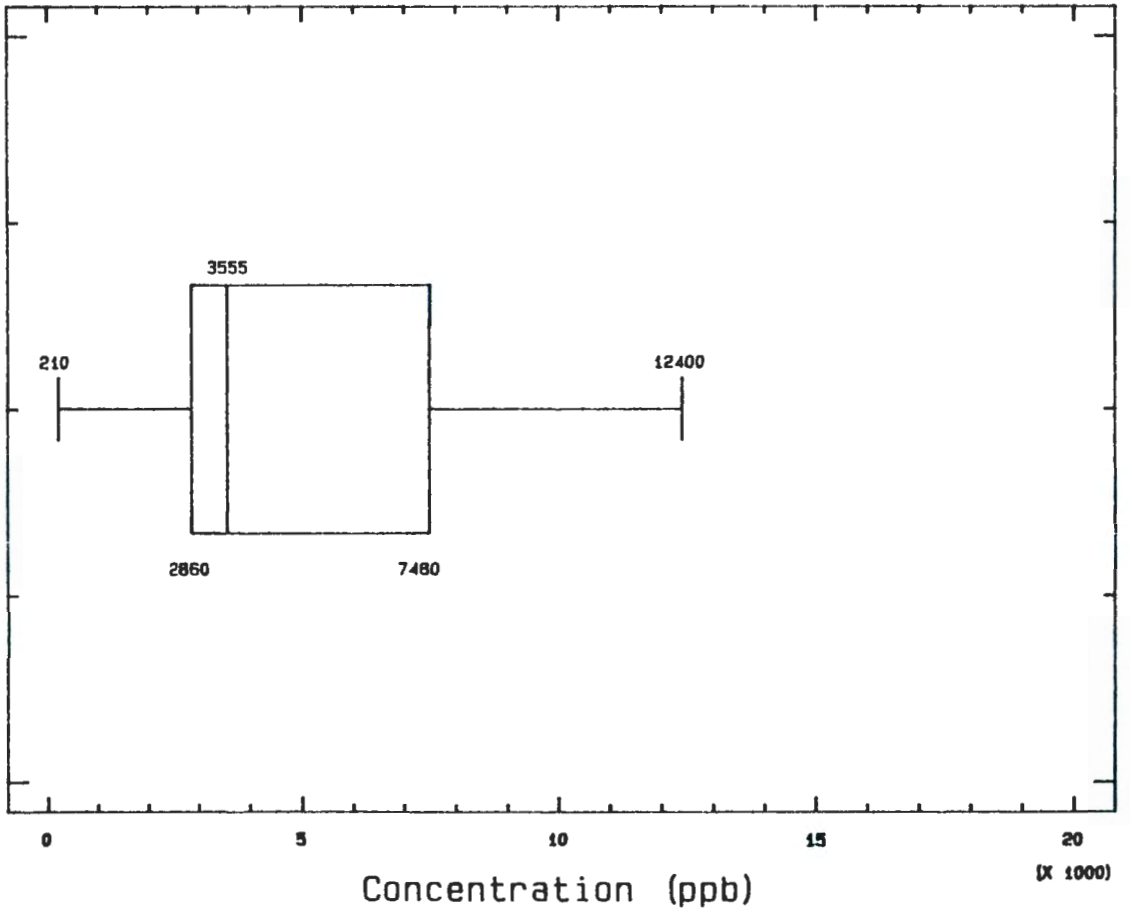
Concentration (ppb)

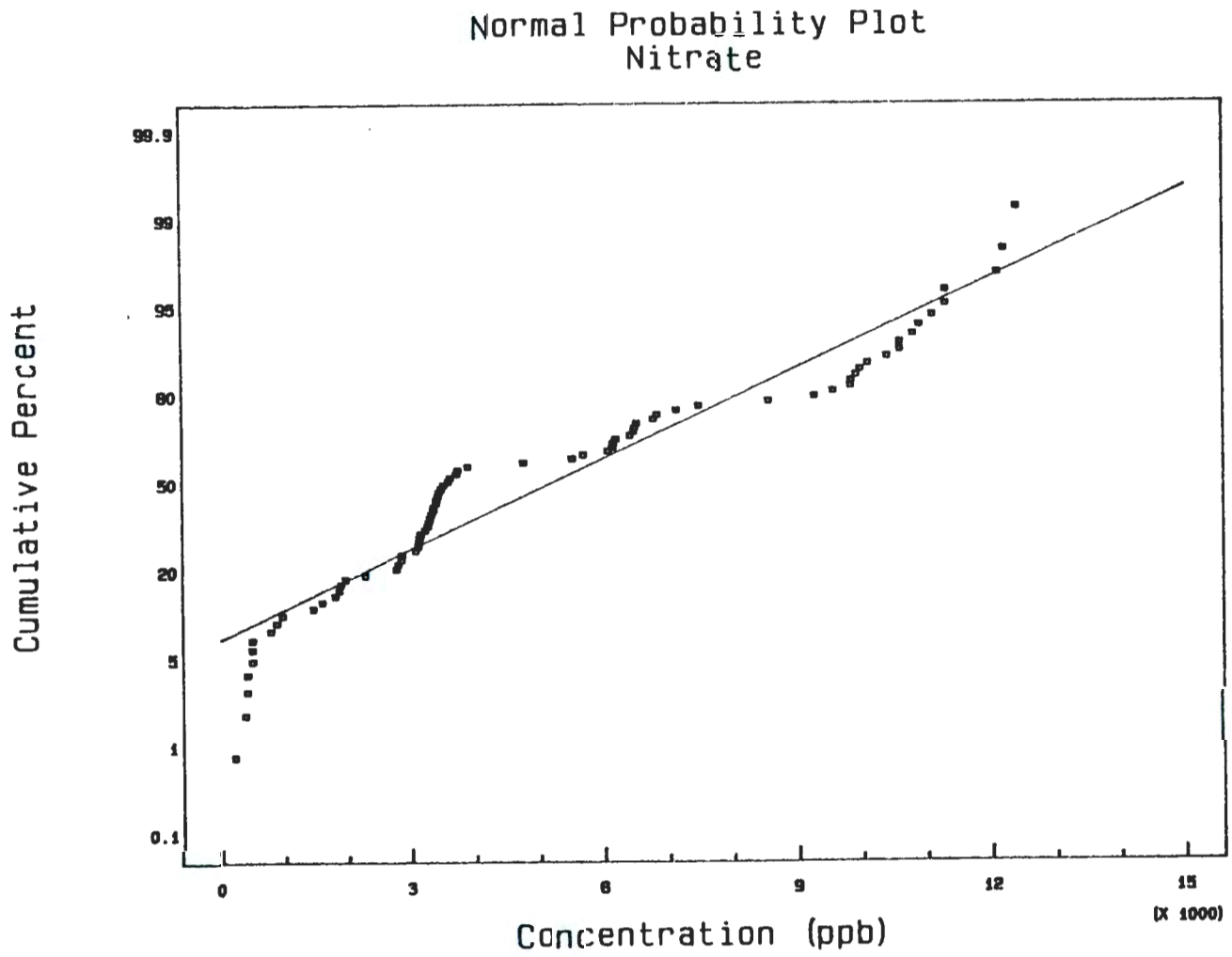

Normal Probability Plot
High Manganese Concentration Group
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
100
120
140
160
180
Concentration (ppb)

Histogram - High Manganese Group

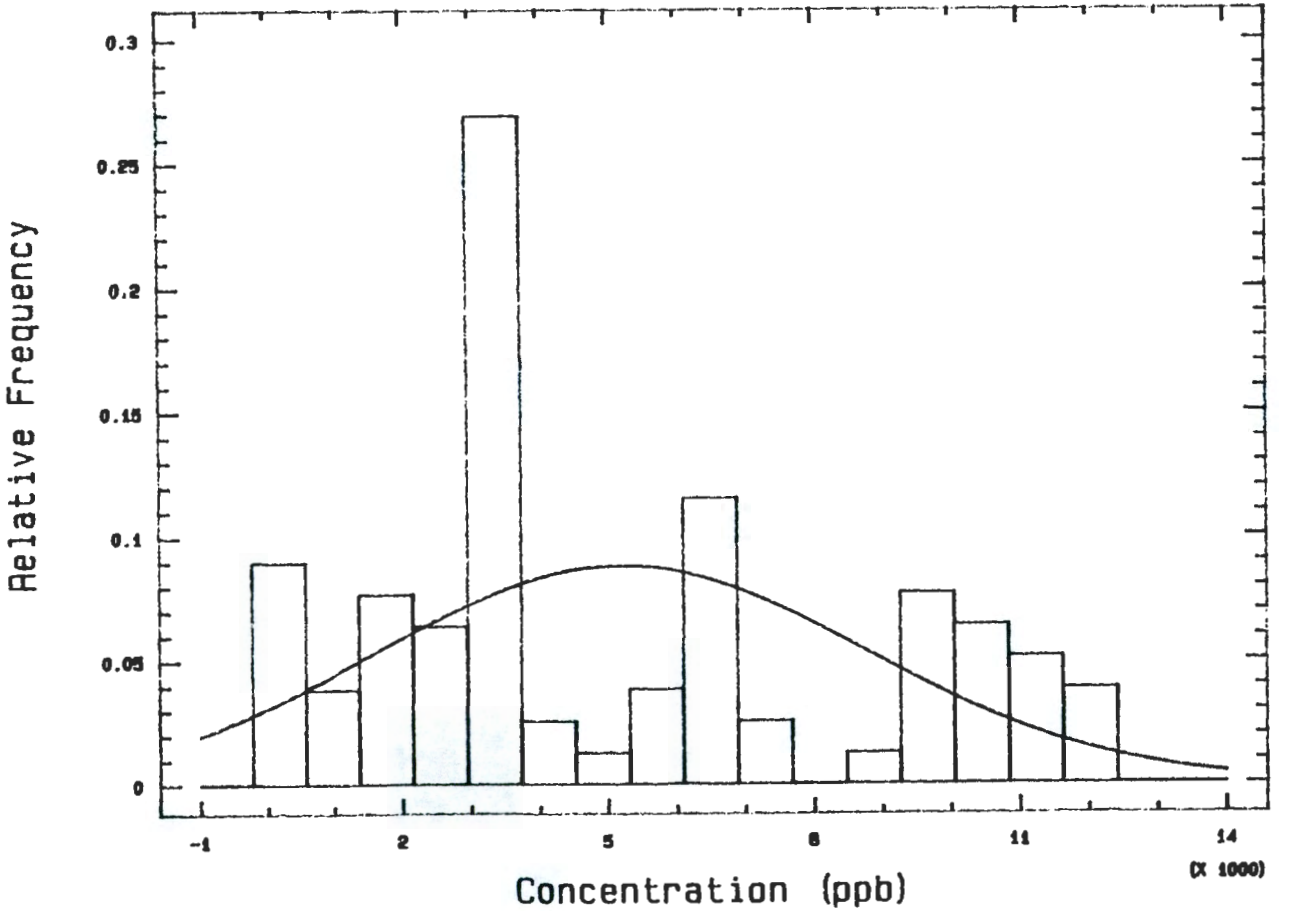


Est. Background Levels in Hanford GW
Nitrate

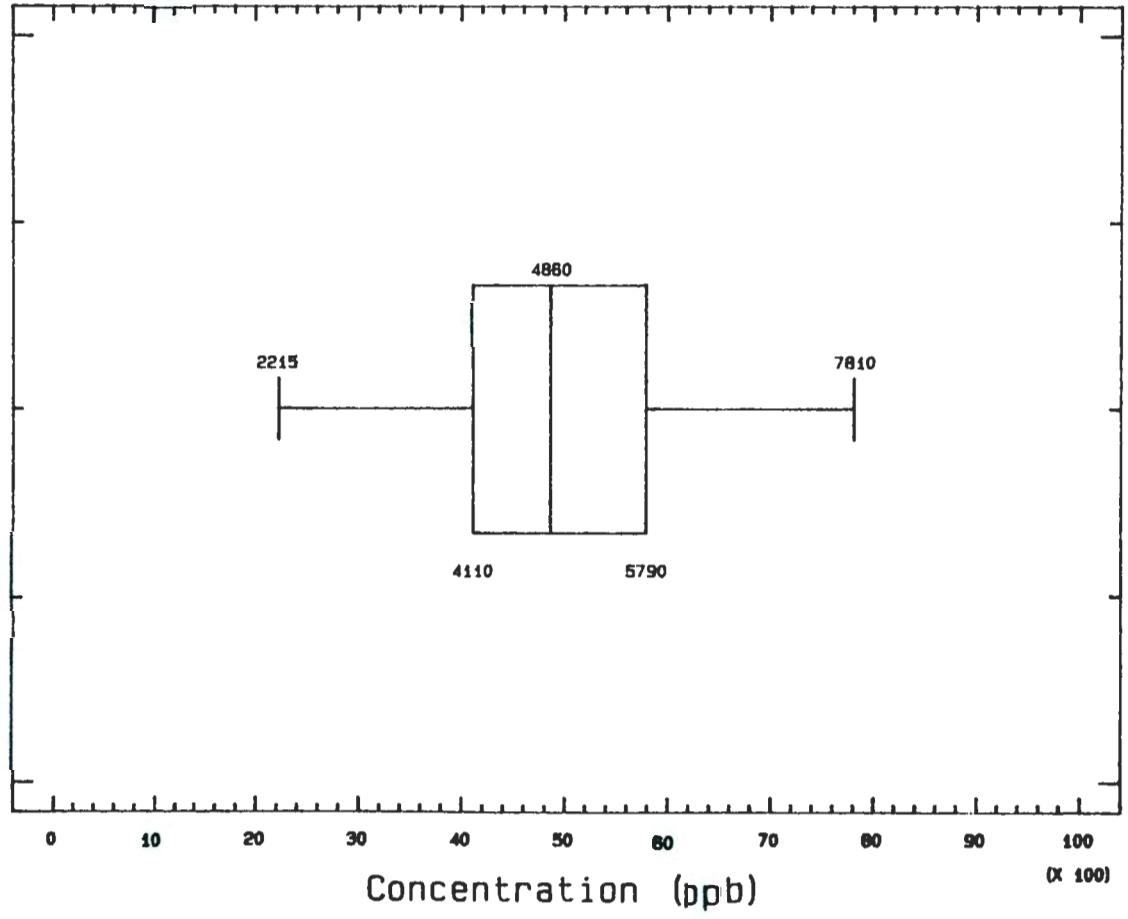


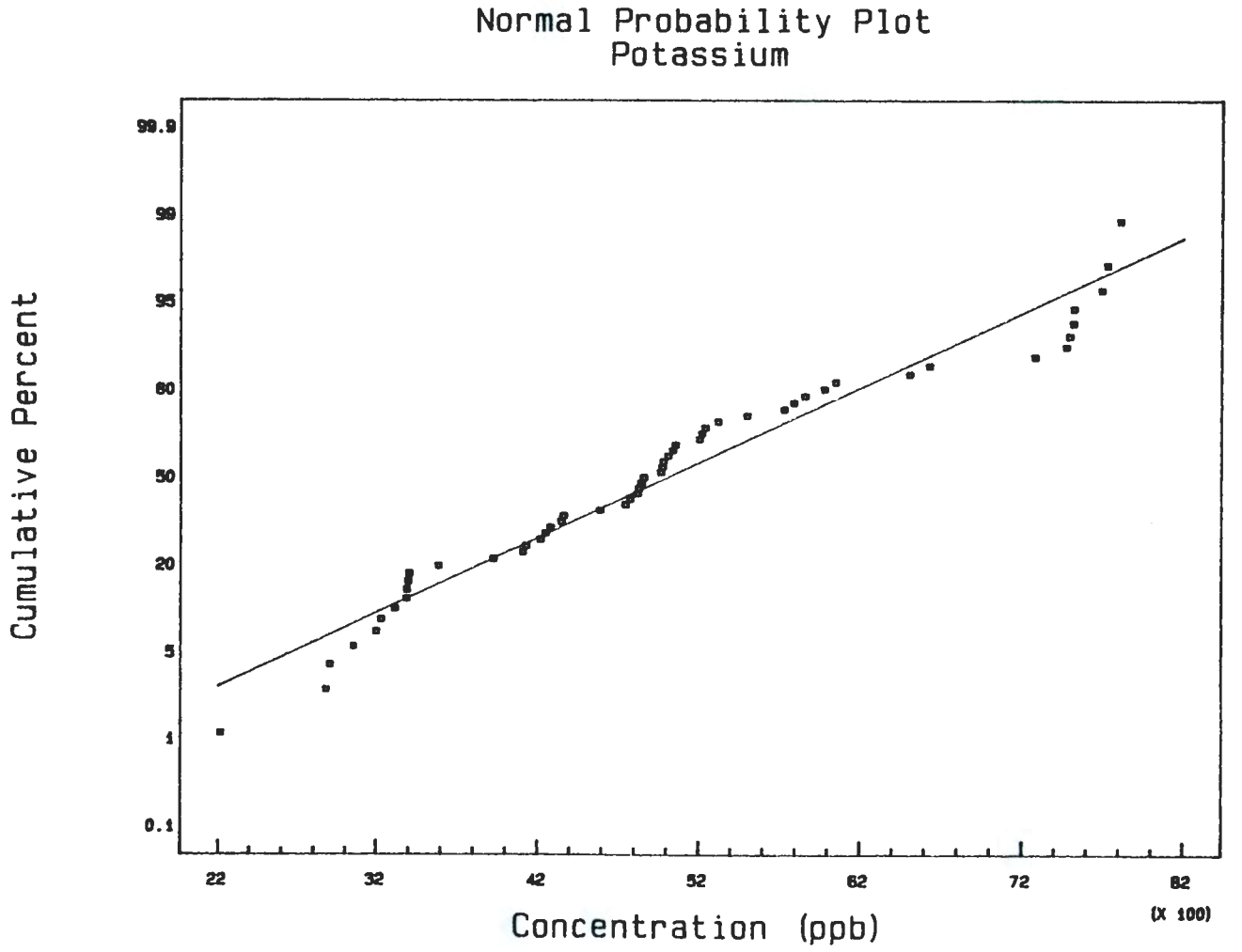

Normal Probability Plot
Nitrate
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
3
6
9
12
15
(X 1000)
Concentration (ppb)

Histogram - Nitrate Concentration

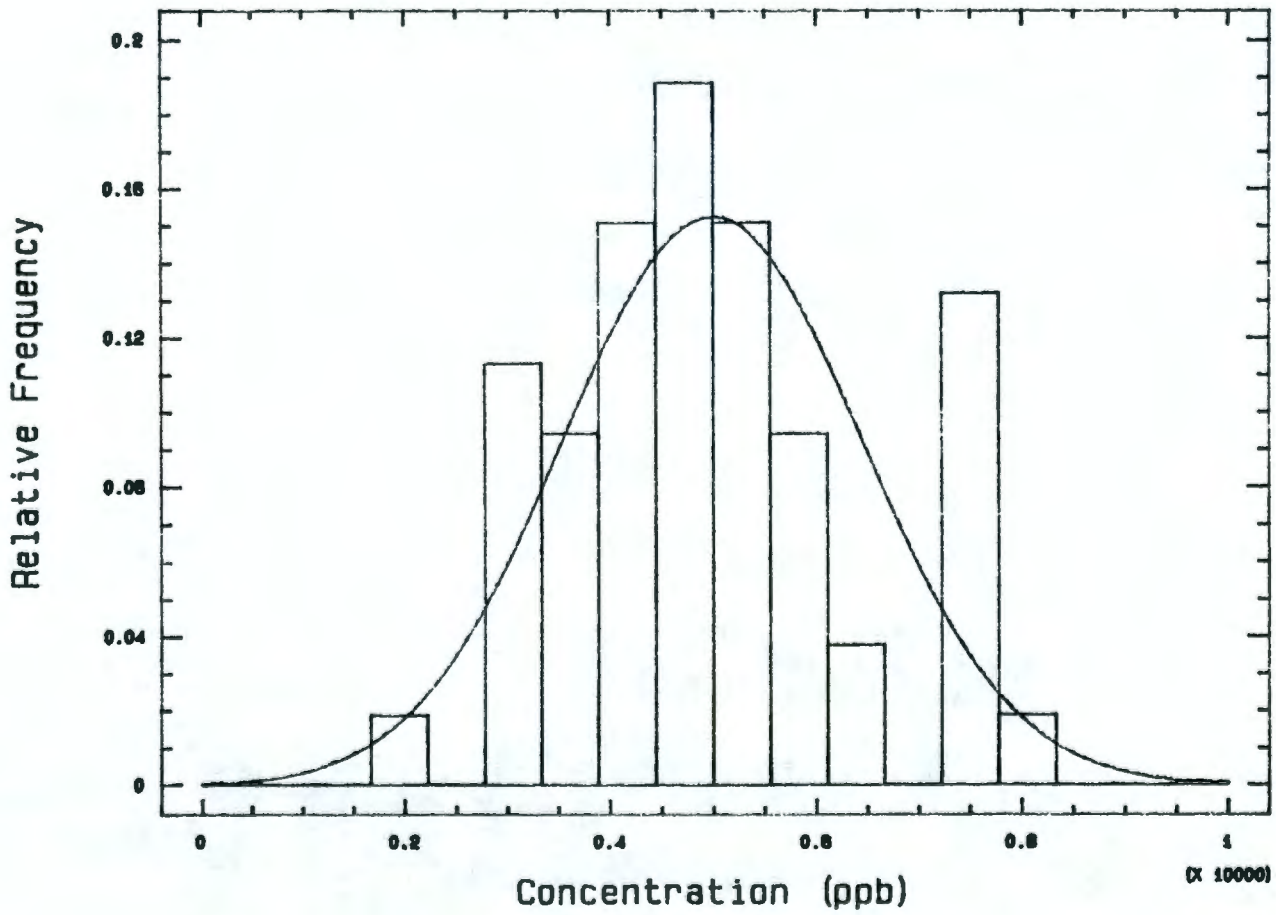


Est. Background Levels in Hanford GW
Potassium

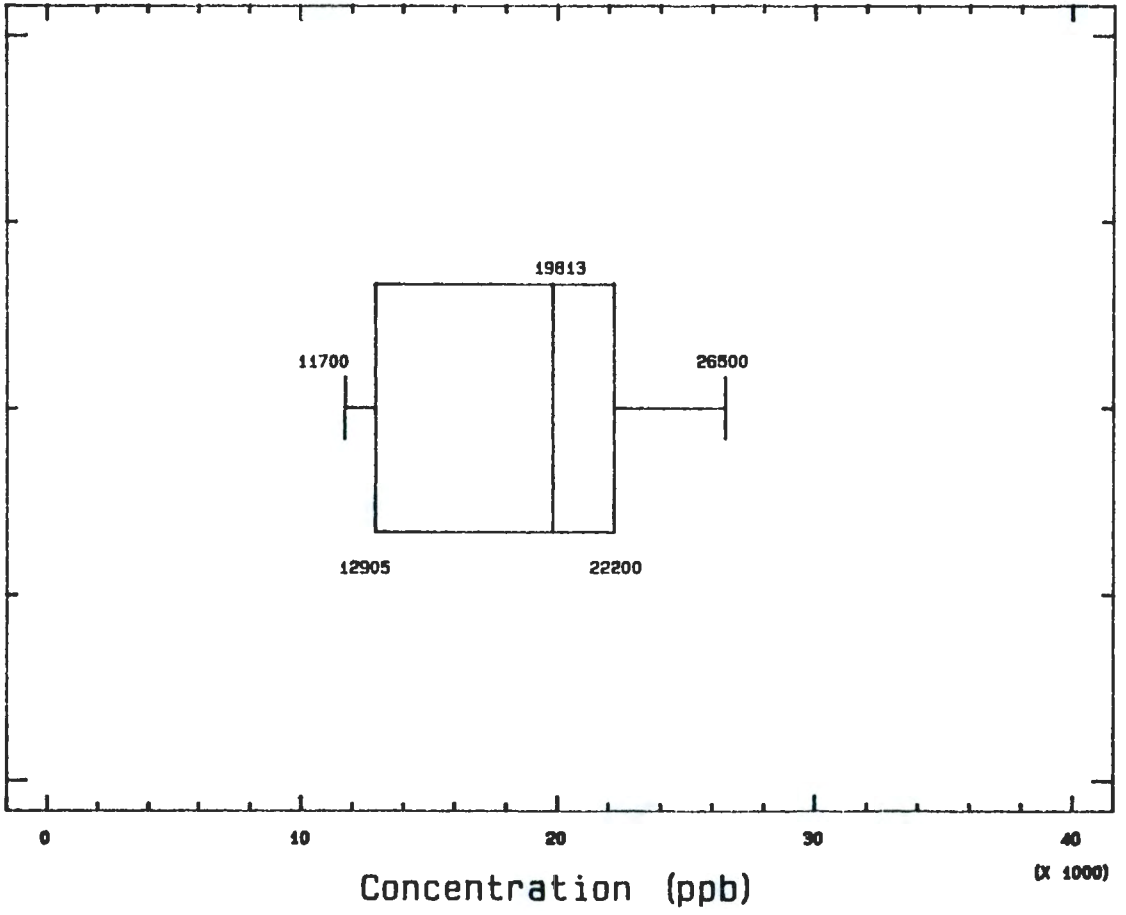


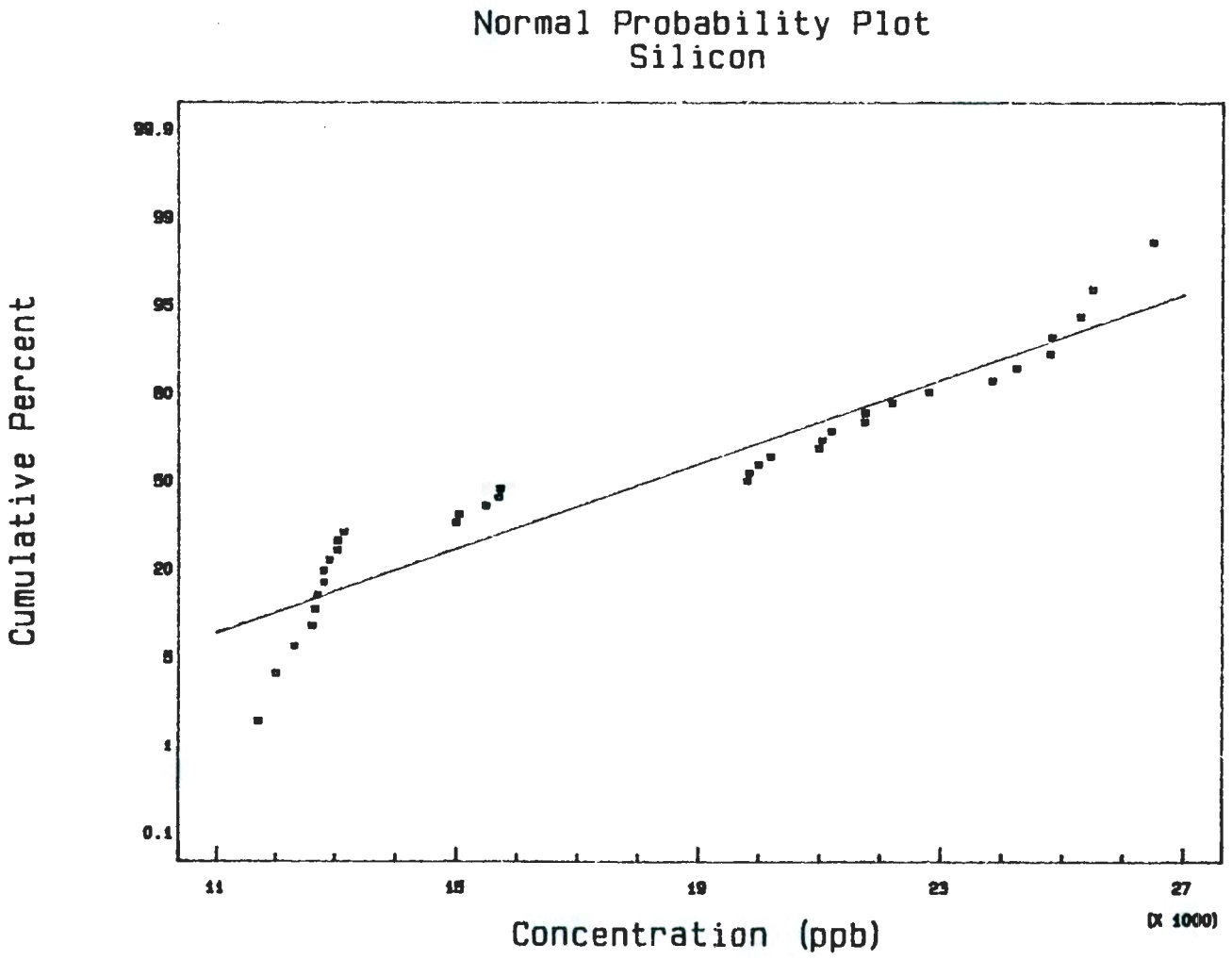

Normal Probability Plot
Potassium
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
22
32
42
52
62
72
82
(X 100)
Concentration (ppb)

Histogram - Potassium Concentration

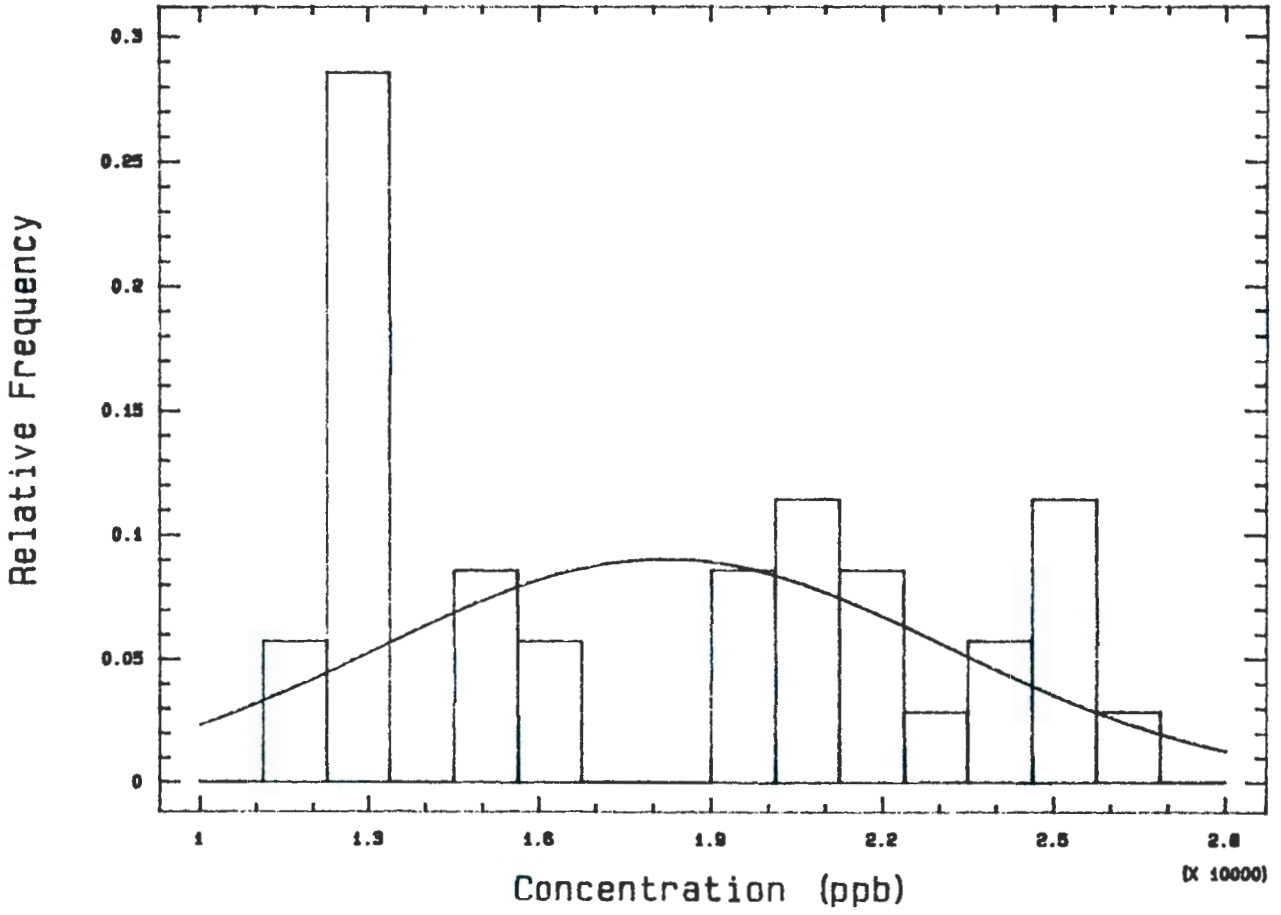


Est. Background Levels in Hanford GW
Silicon

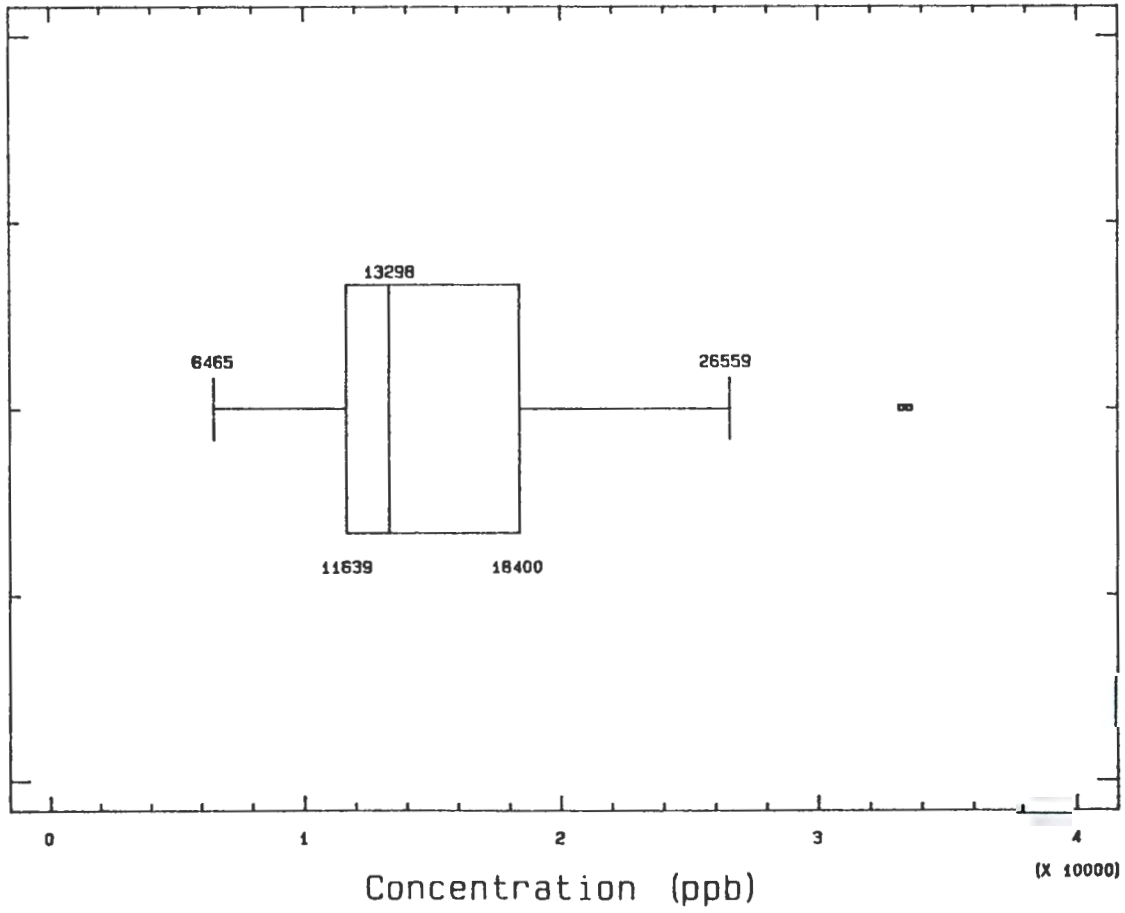


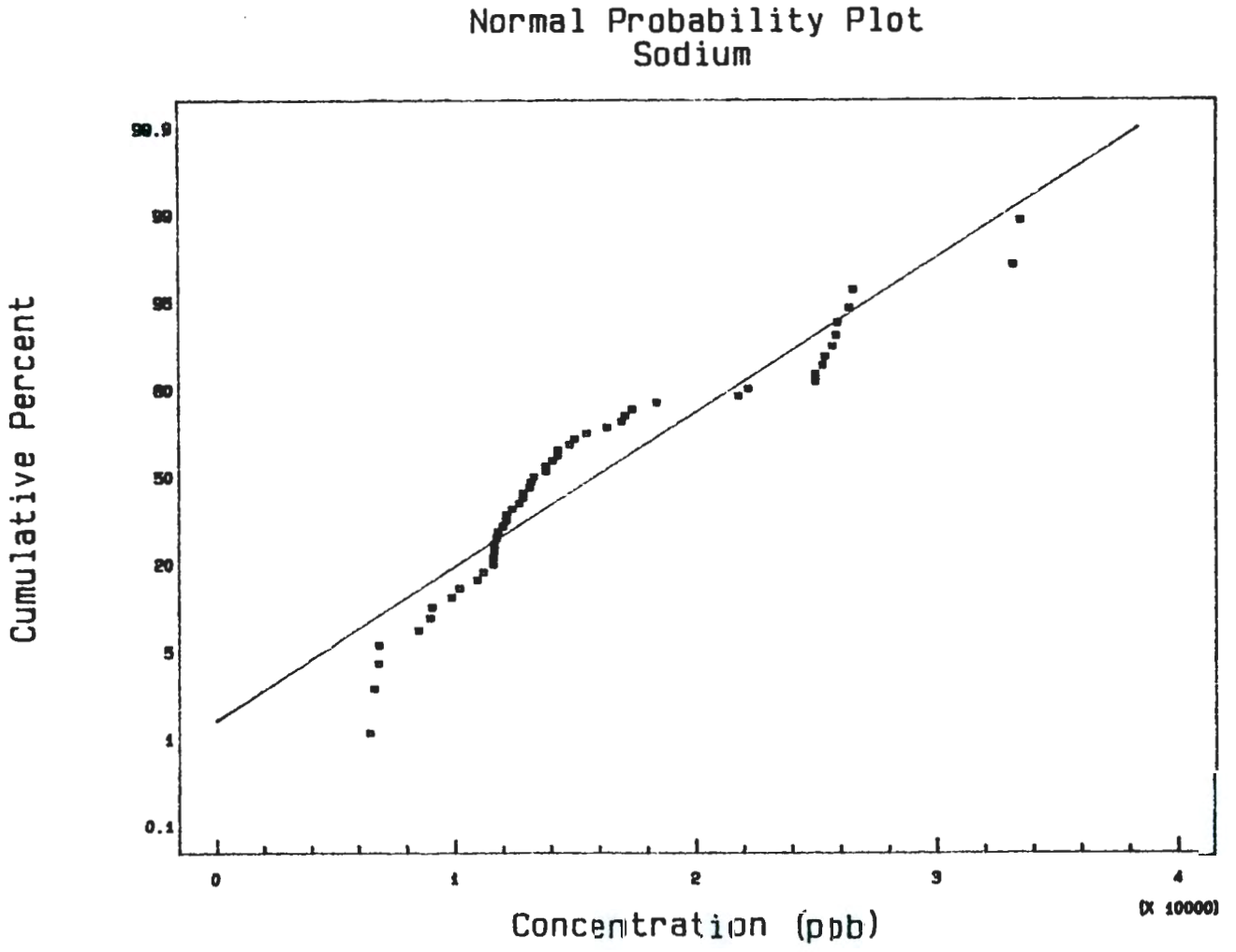

Normal Probability Plot
Silicon
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
11
15
19
23
27
(X 1000)
Concentration (ppb)

Histogram - Silicon Concentration

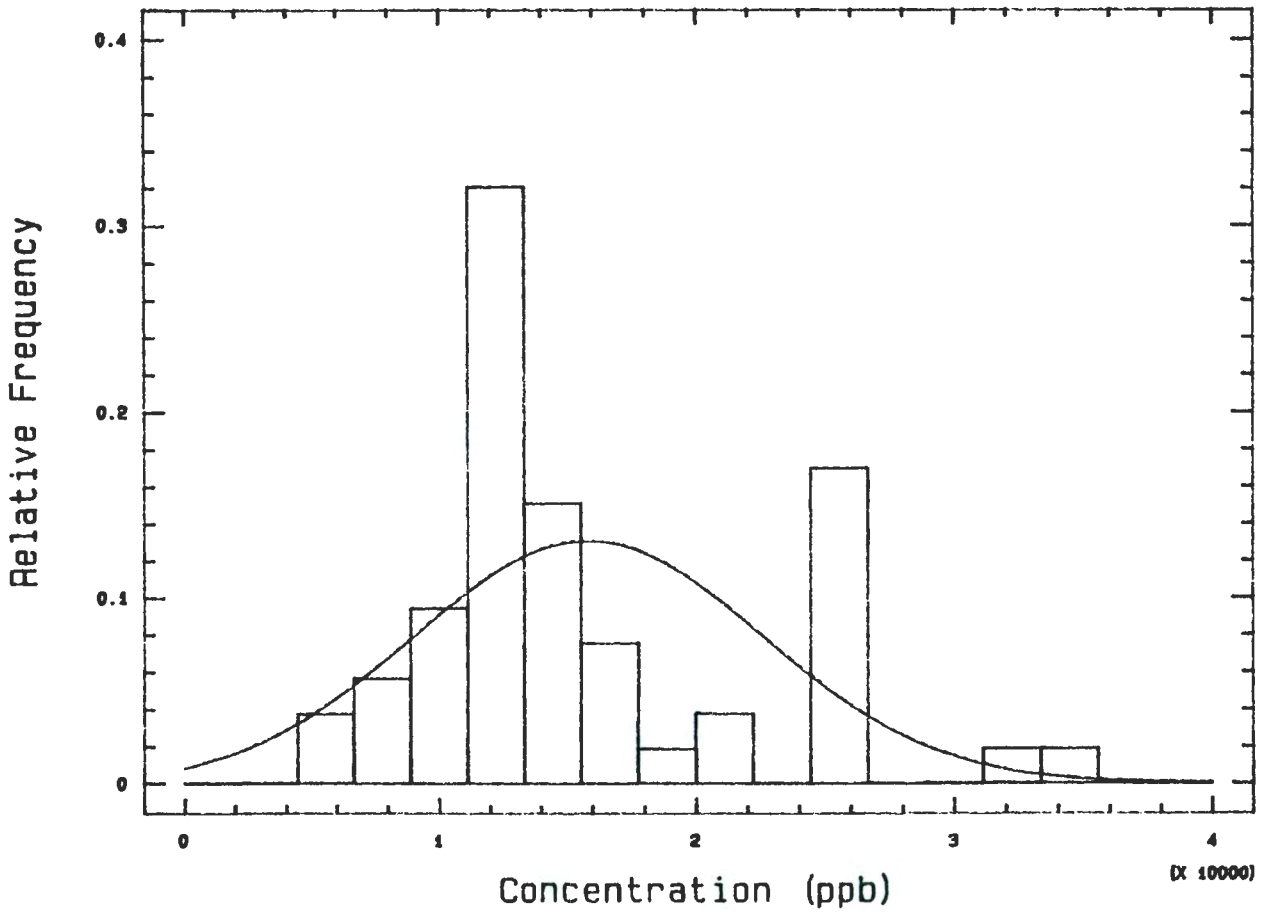


Est. Background Levels in Hanford GW
Sodium

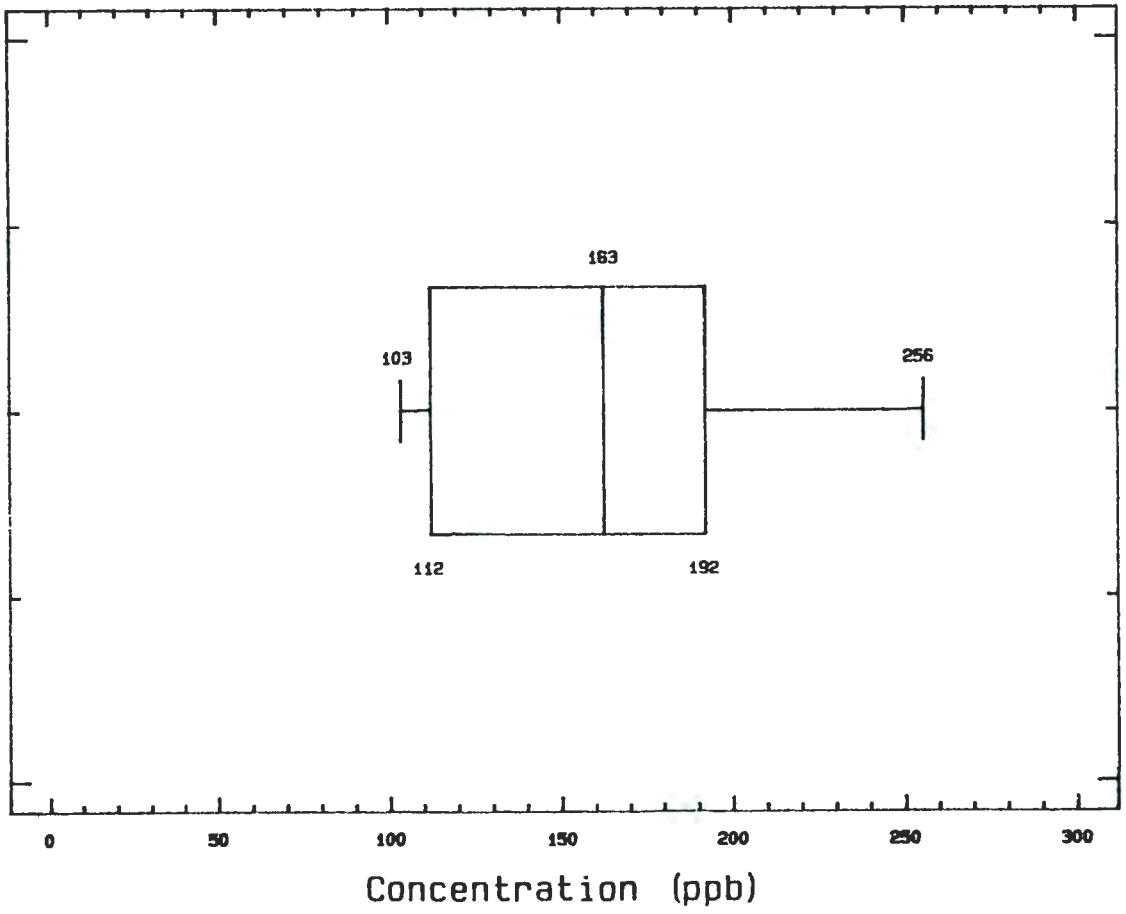


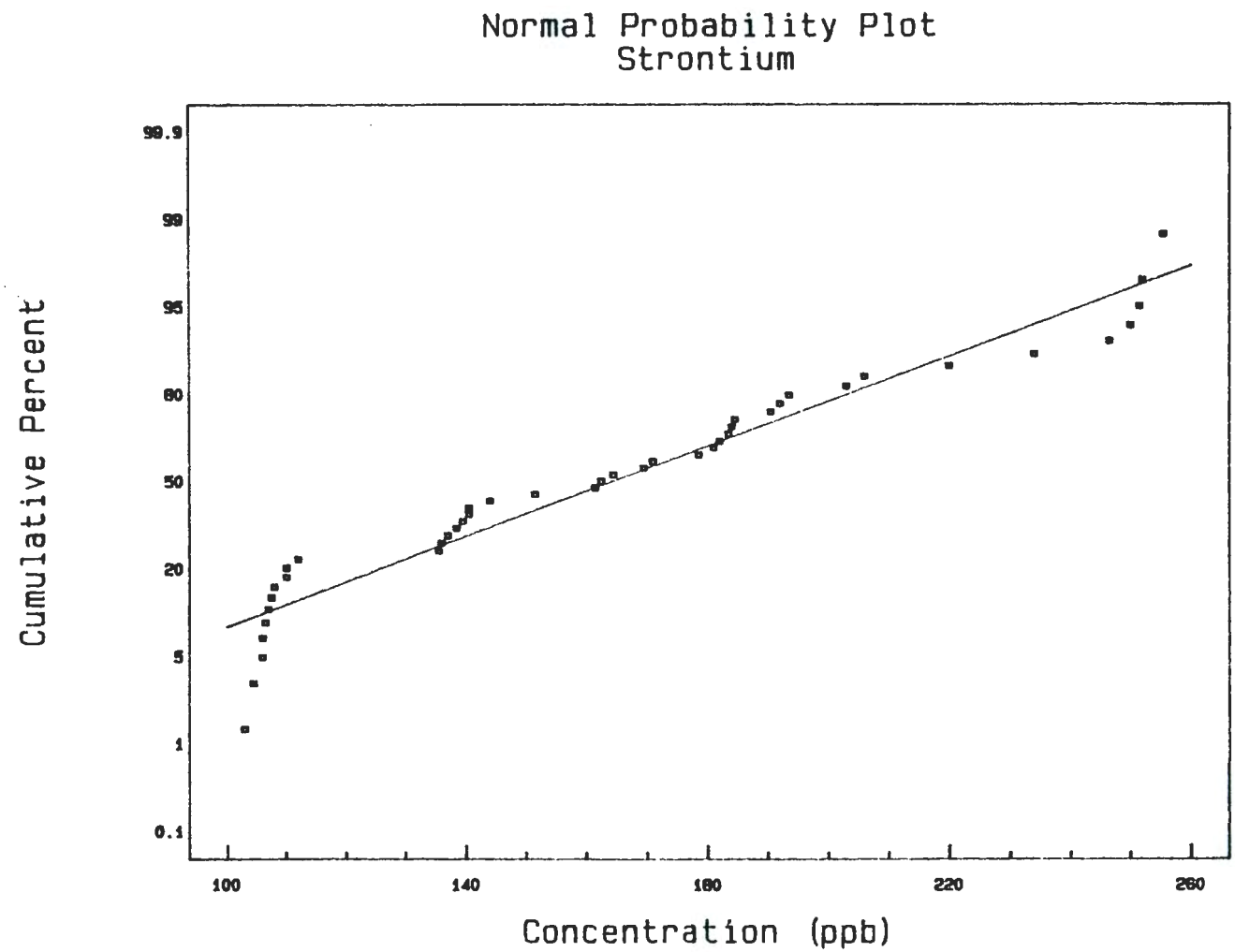

Normal Probability Plot
Sodium
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
1
2
3
4
(X 10000)
Concentration (ppb)

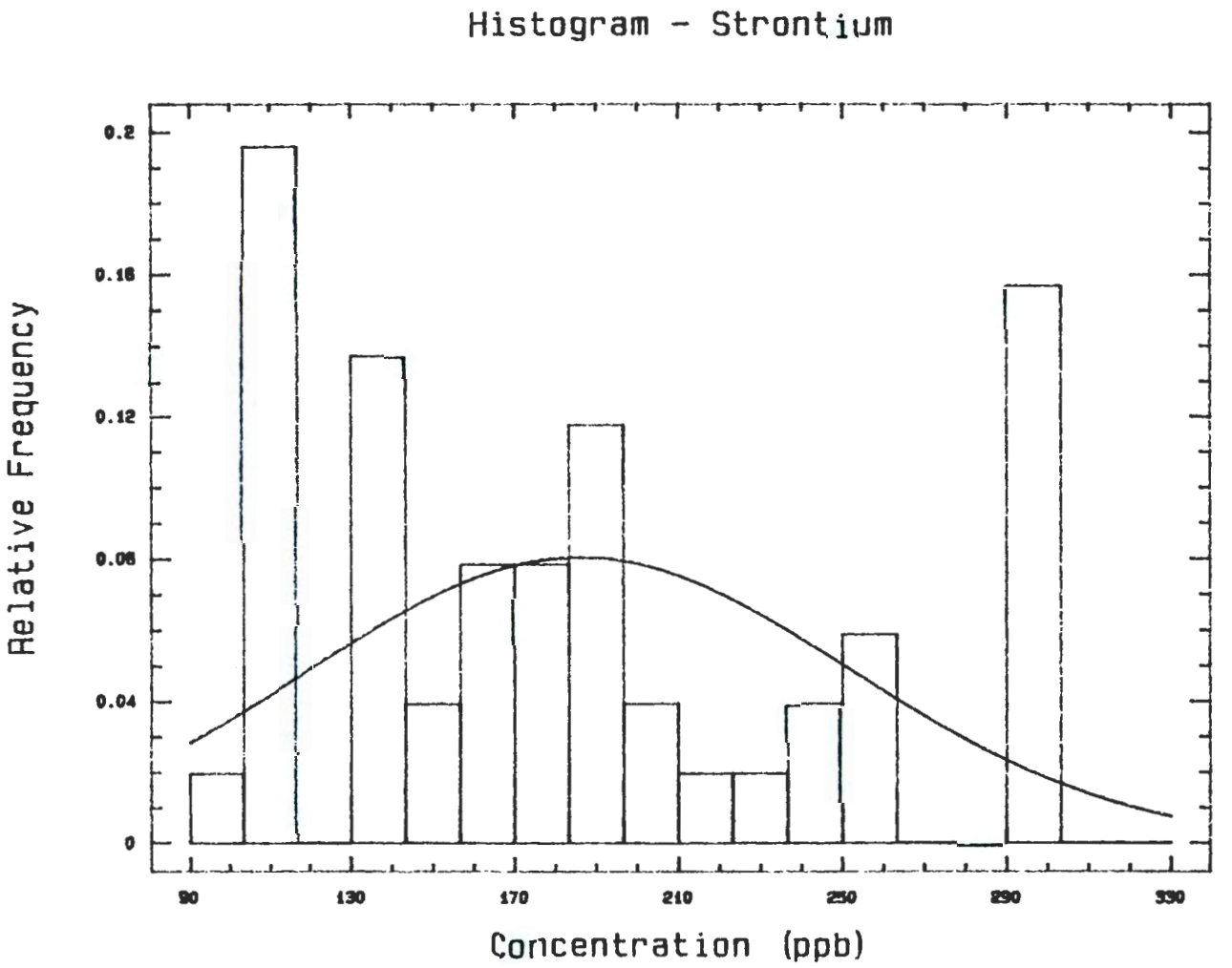
Histogram - Sodium Concentration



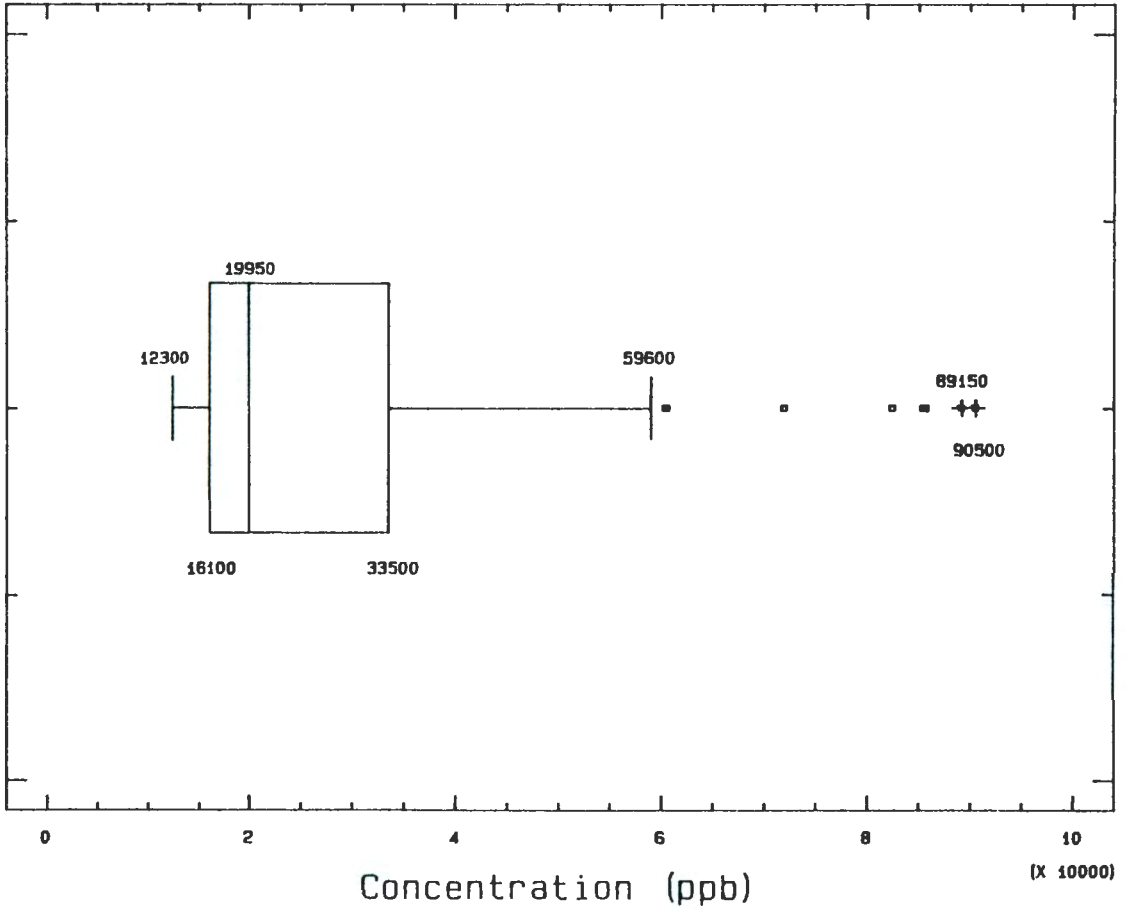
Est. Background Levels in Hanford Gw
Strontium

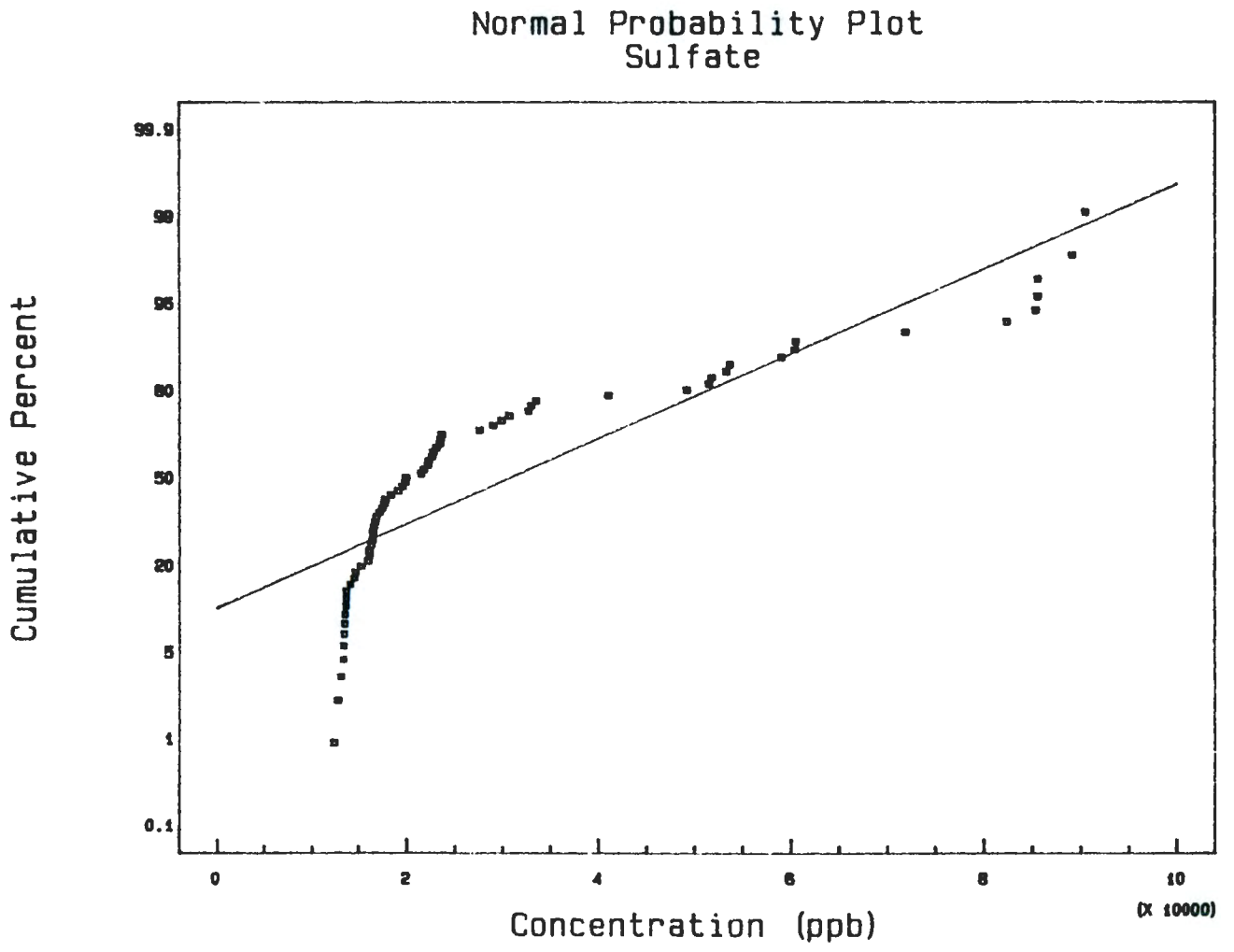


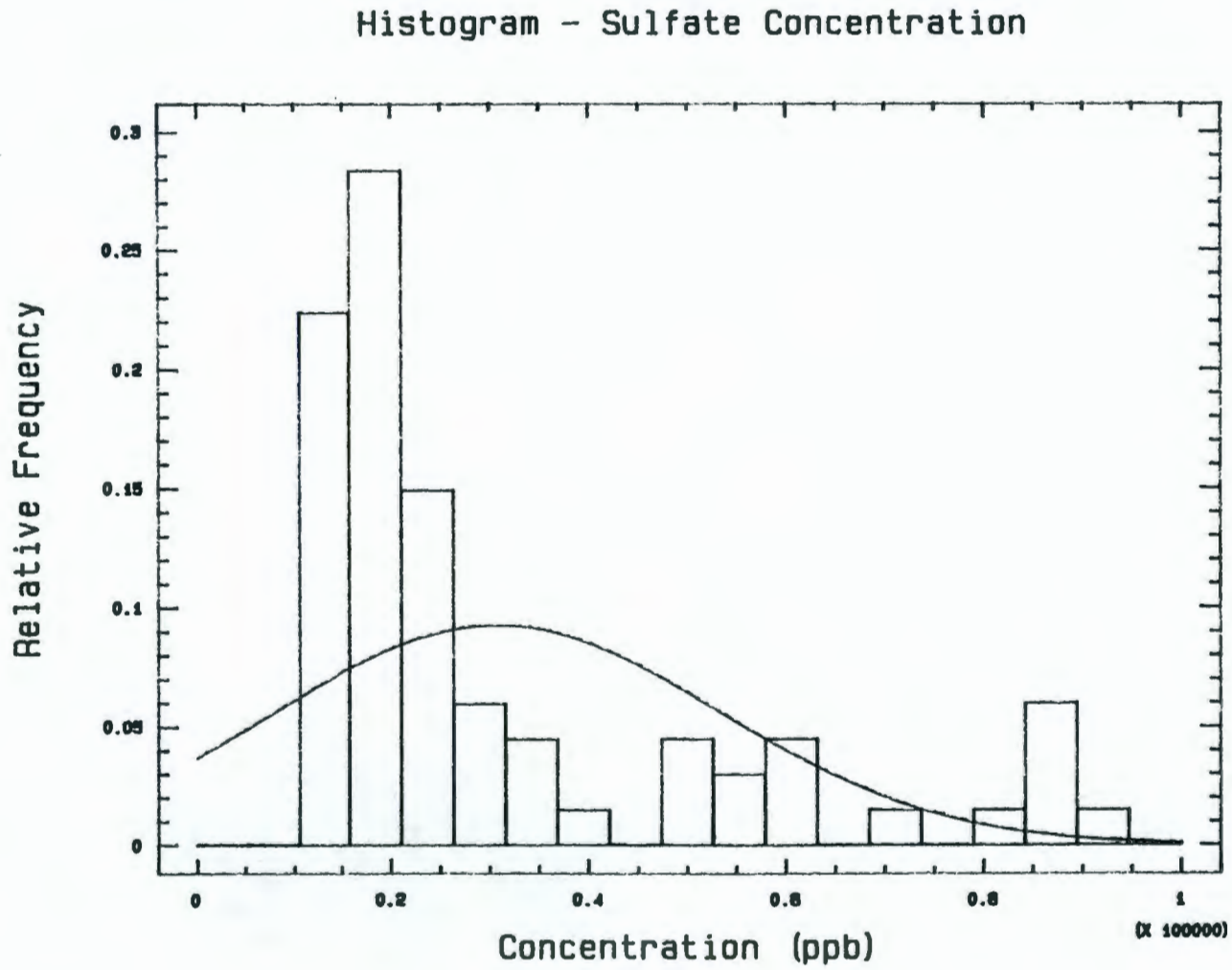

Normal Probability Plot
Strontium
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
100
140
180
220
260
Concentration (ppb)


Histogram - Strontium
Relative Frequency
0.2
0.16
0.12
0.08
0.04
0
90
130
170
210
250
290
330
Concentration (ppb)

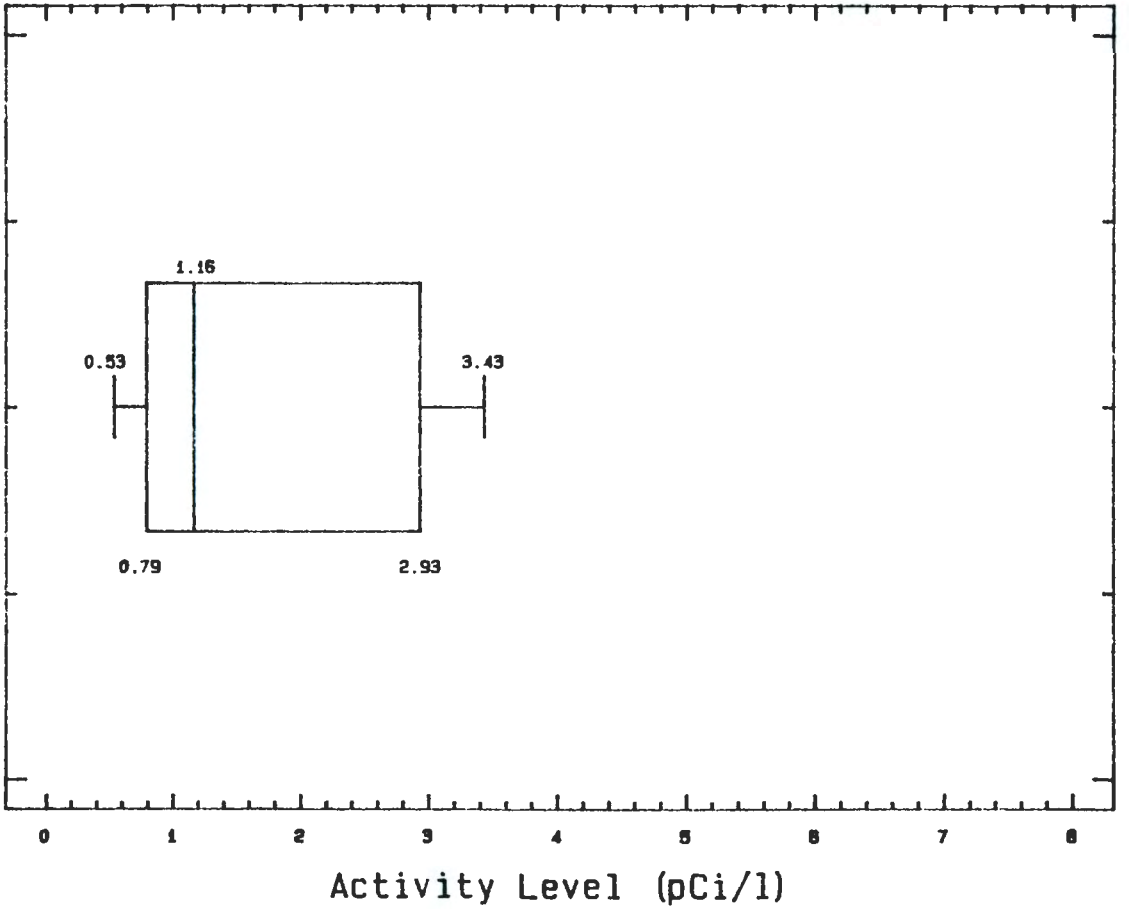
Est. Background Levels in Hanford GW
Sulfate

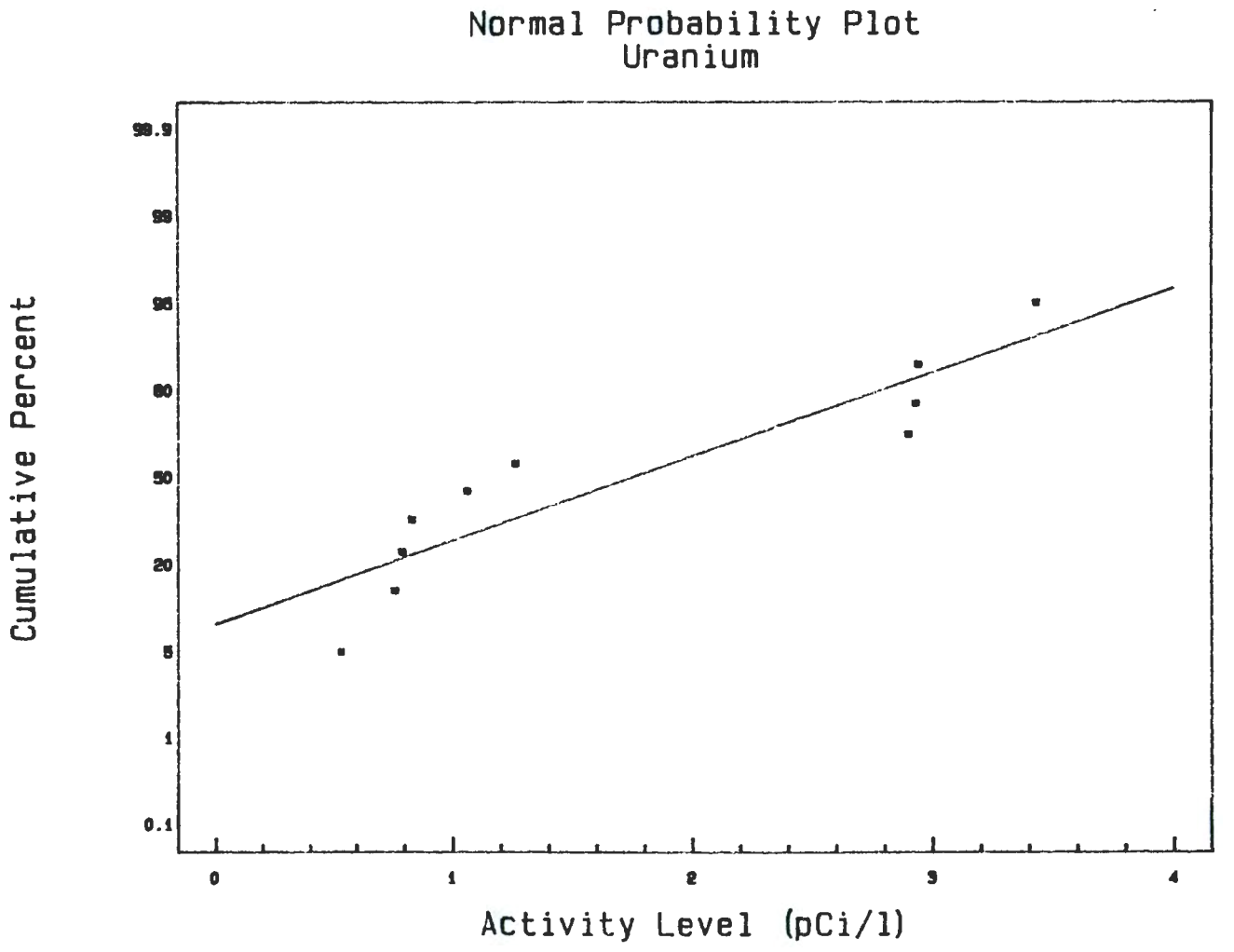


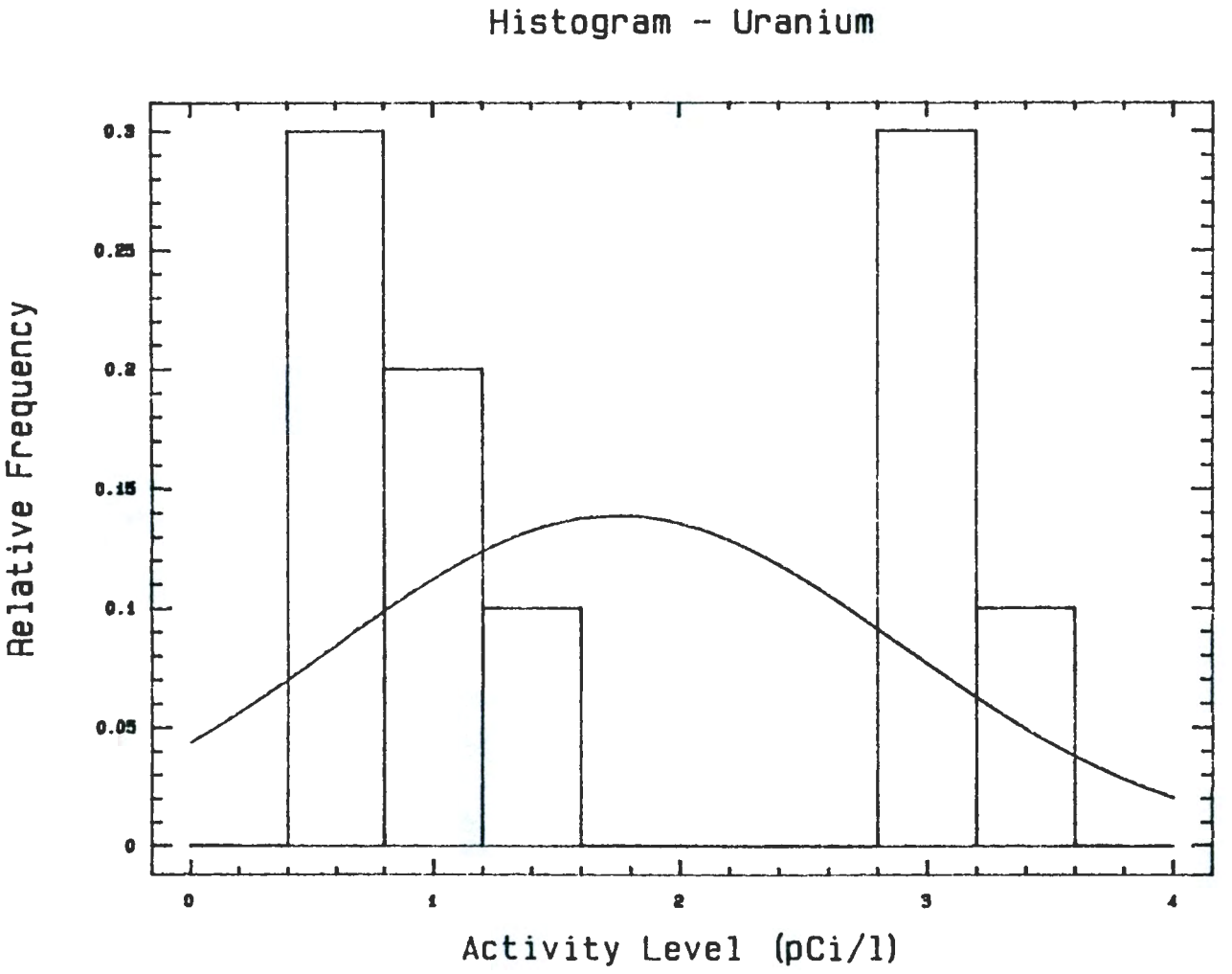

Normal Probability Plot
Sulfate
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
2
4
6
8
10
(X 10000)
Concentration (ppb)


Histogram - Sulfate Concentration
Relative Frequency
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.2
0.4
0.6
0.8
1
(X 100000)
Concentration (ppb)

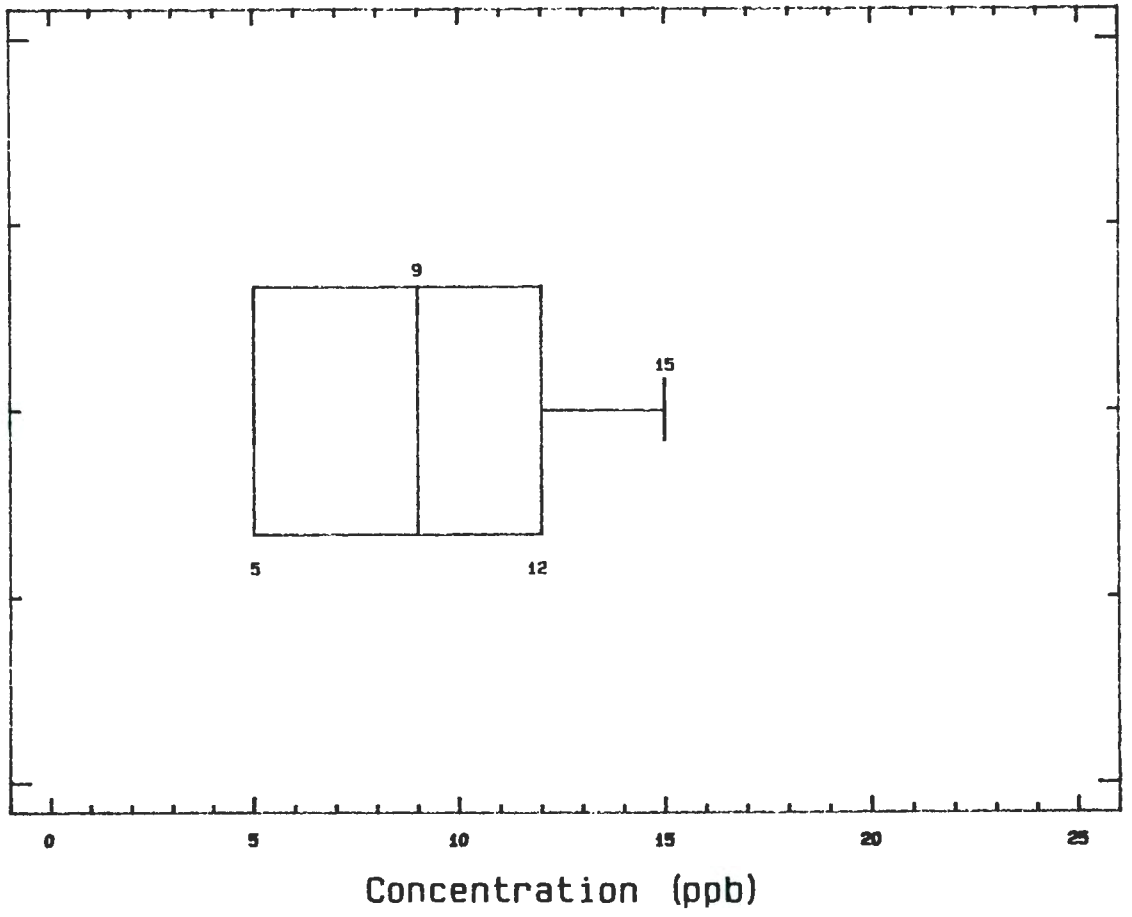
Est. Background Levels in Hanford GW
Uranium

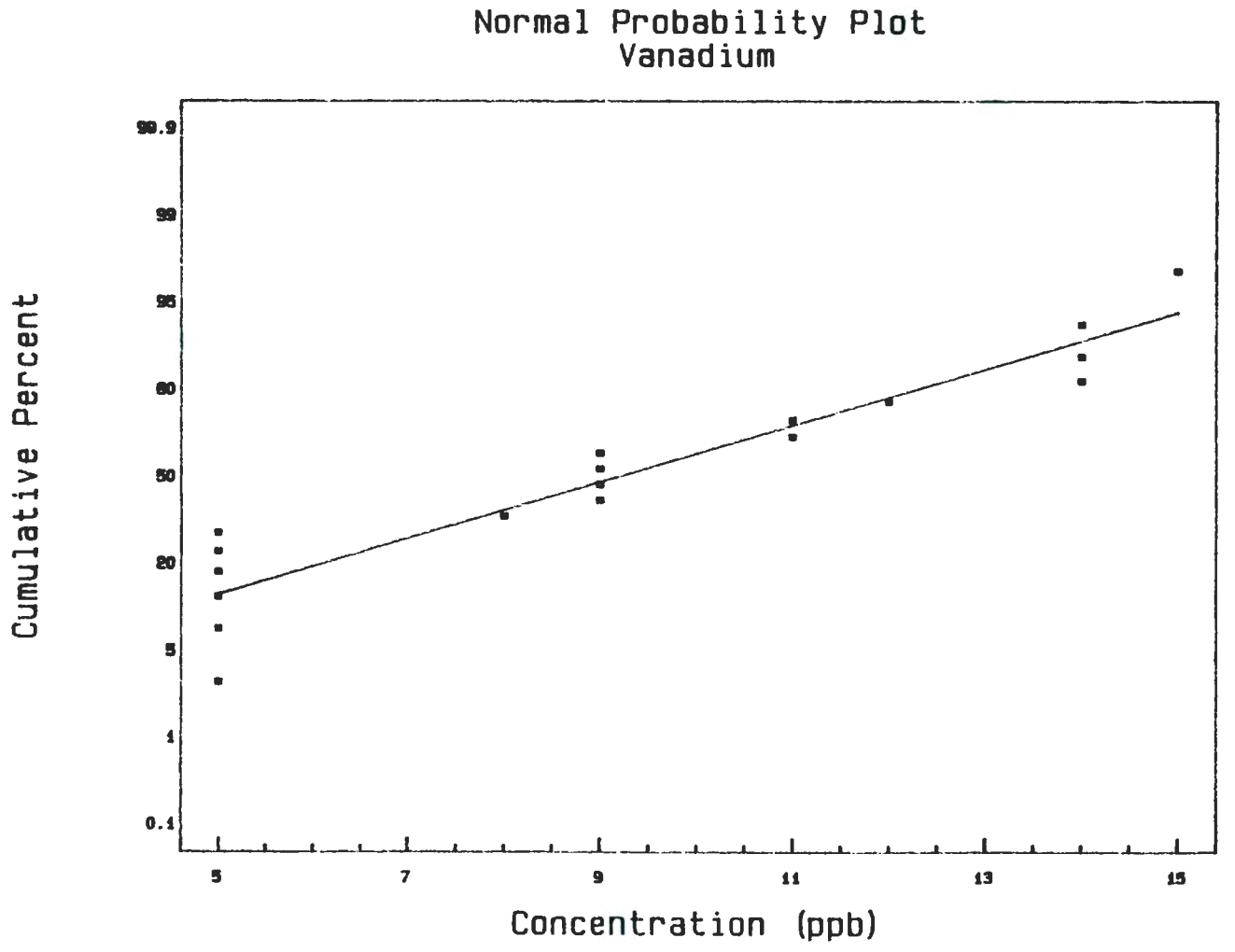



Normal Probability Plot
Uranium
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
1
2
3
4
Activity Level (pCi/l)

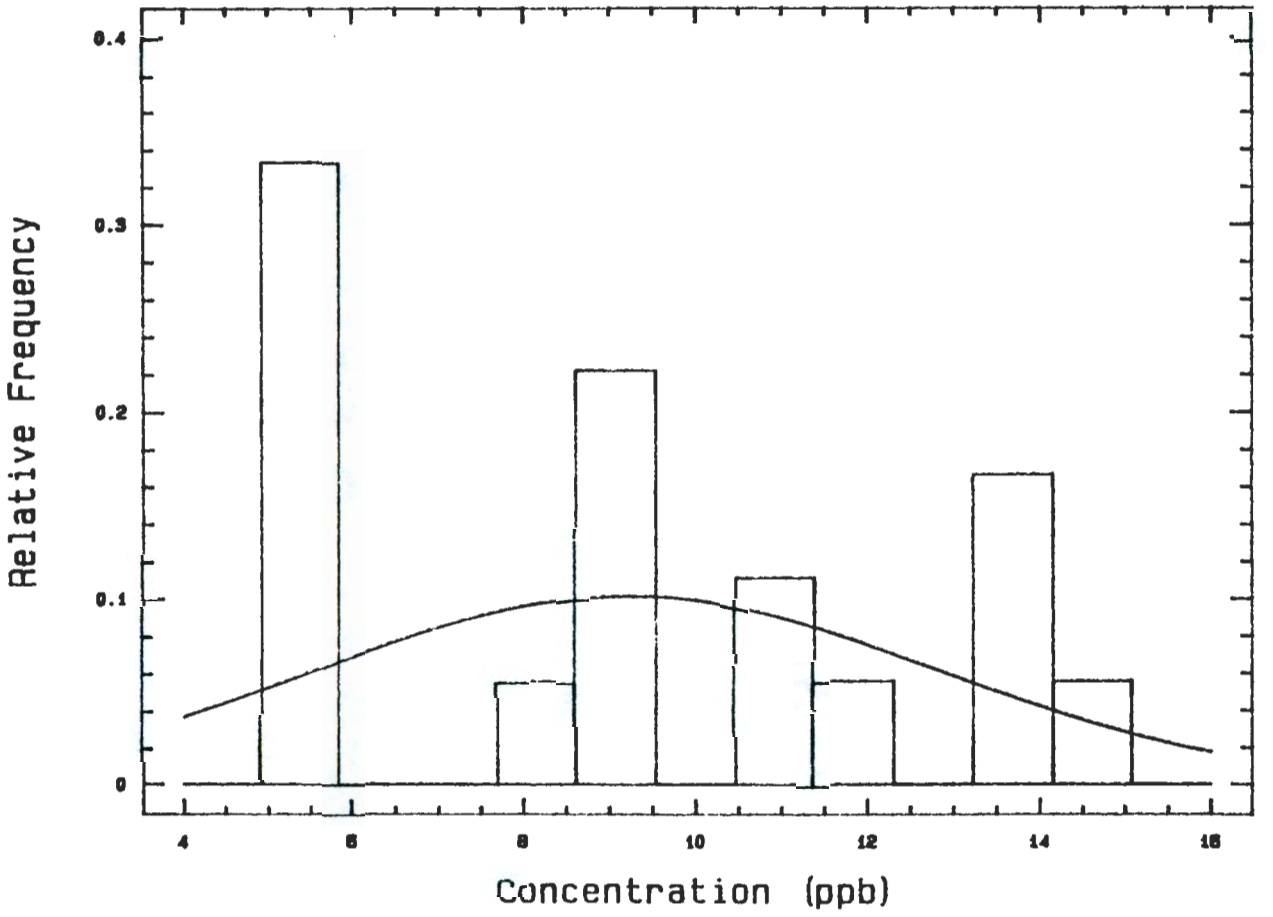

Histogram - Uranium
Relative Frequency
0.3
0.25
0.2
0.15
0.1
0.05
0
0
1
2
3
4
Activity Level (pCi/l)

Est. Background Levels in Hanford GW
Vanadium

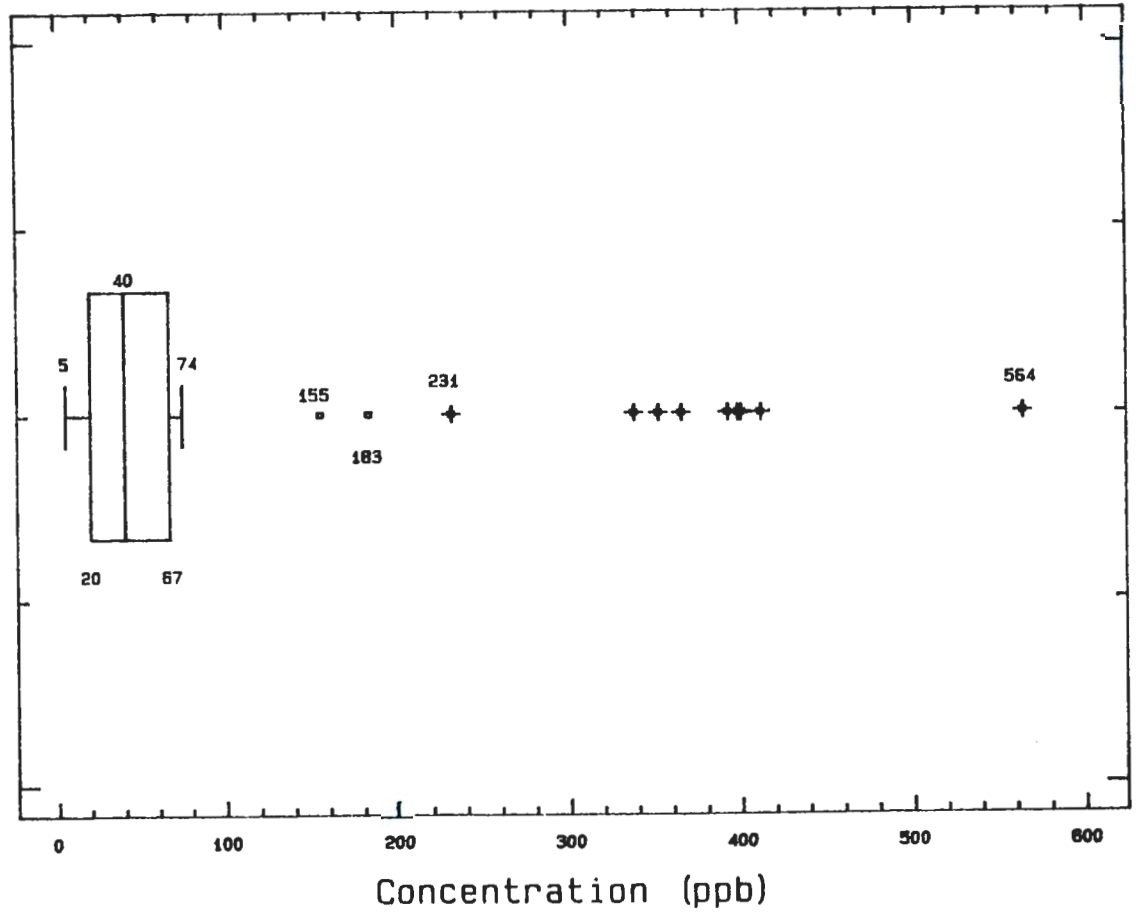


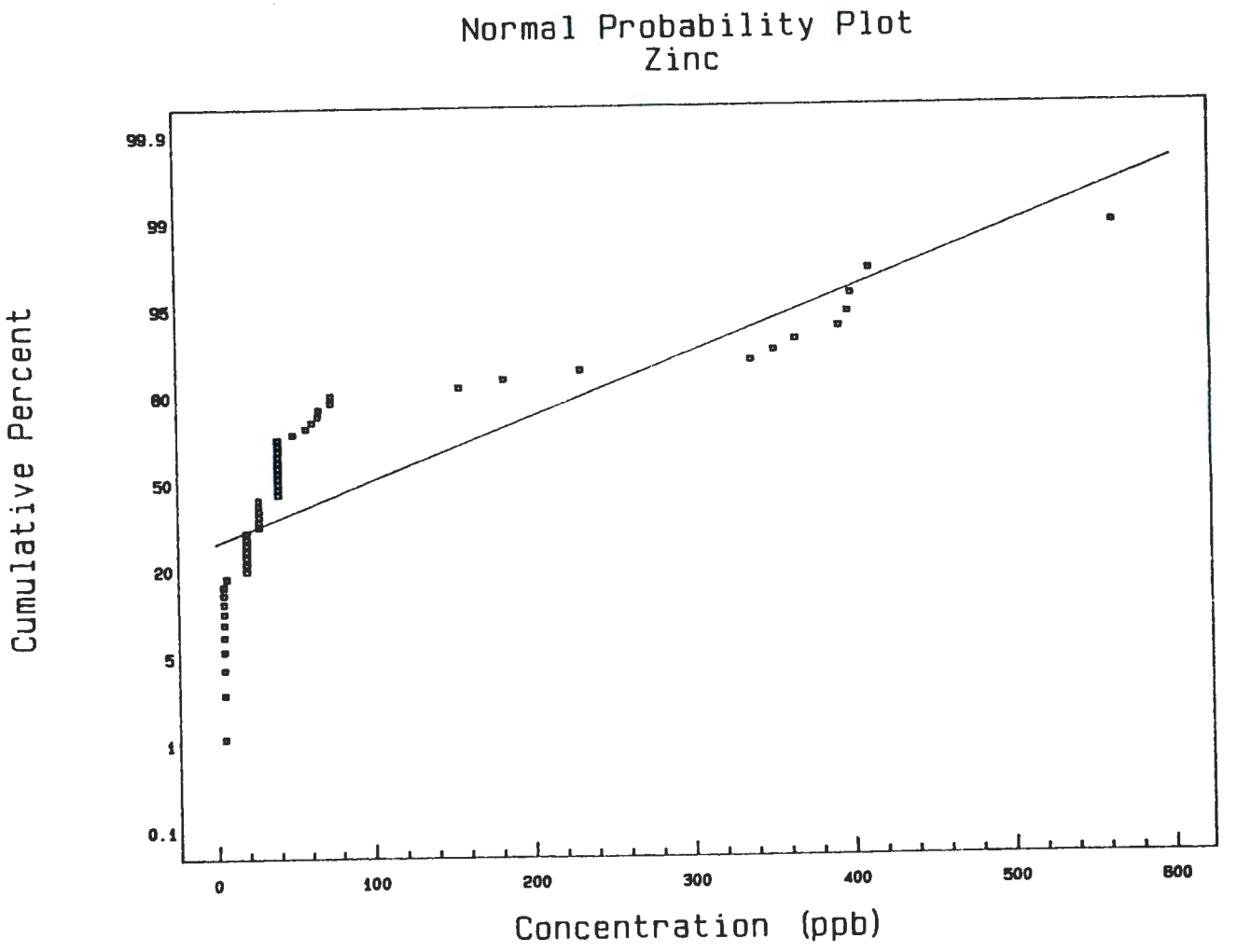

Normal Probability Plot
Vanadium
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
5
7
9
11
13
15
Concentration (ppb)

Histogram - Vanadium

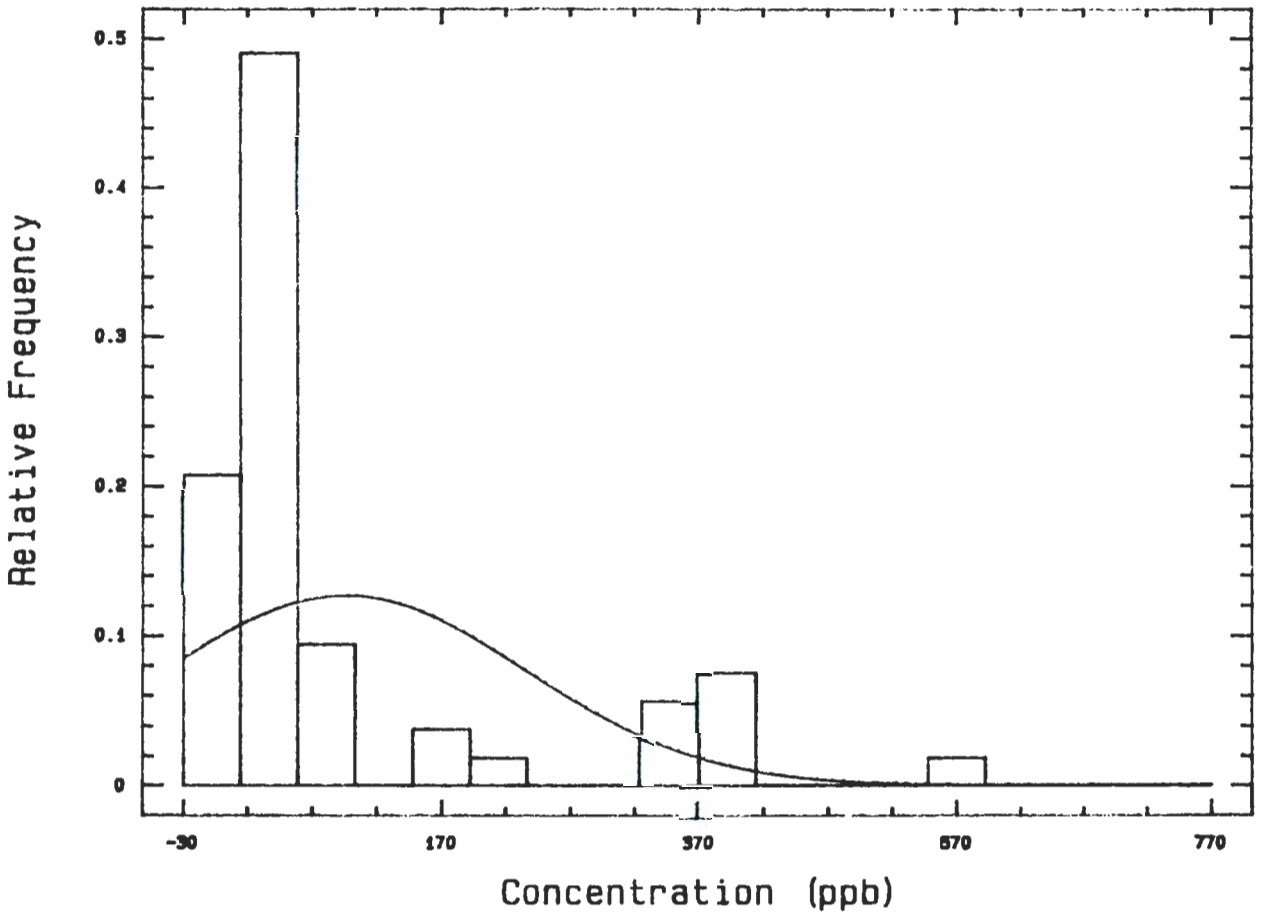


Est. Background Levels in Hanford GW
Zinc



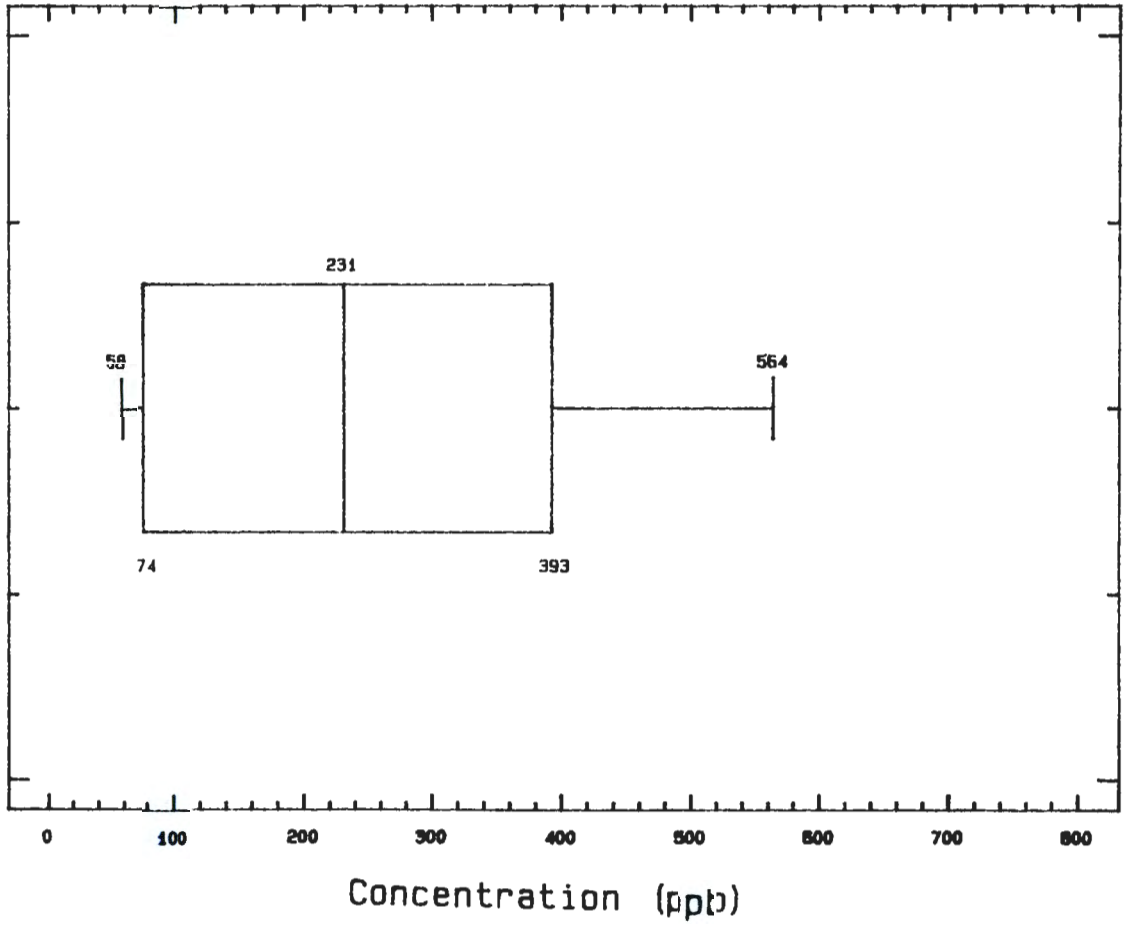

Normal Probability Plot
Zinc
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
100
200
300
400
500
600
Concentration (ppb)

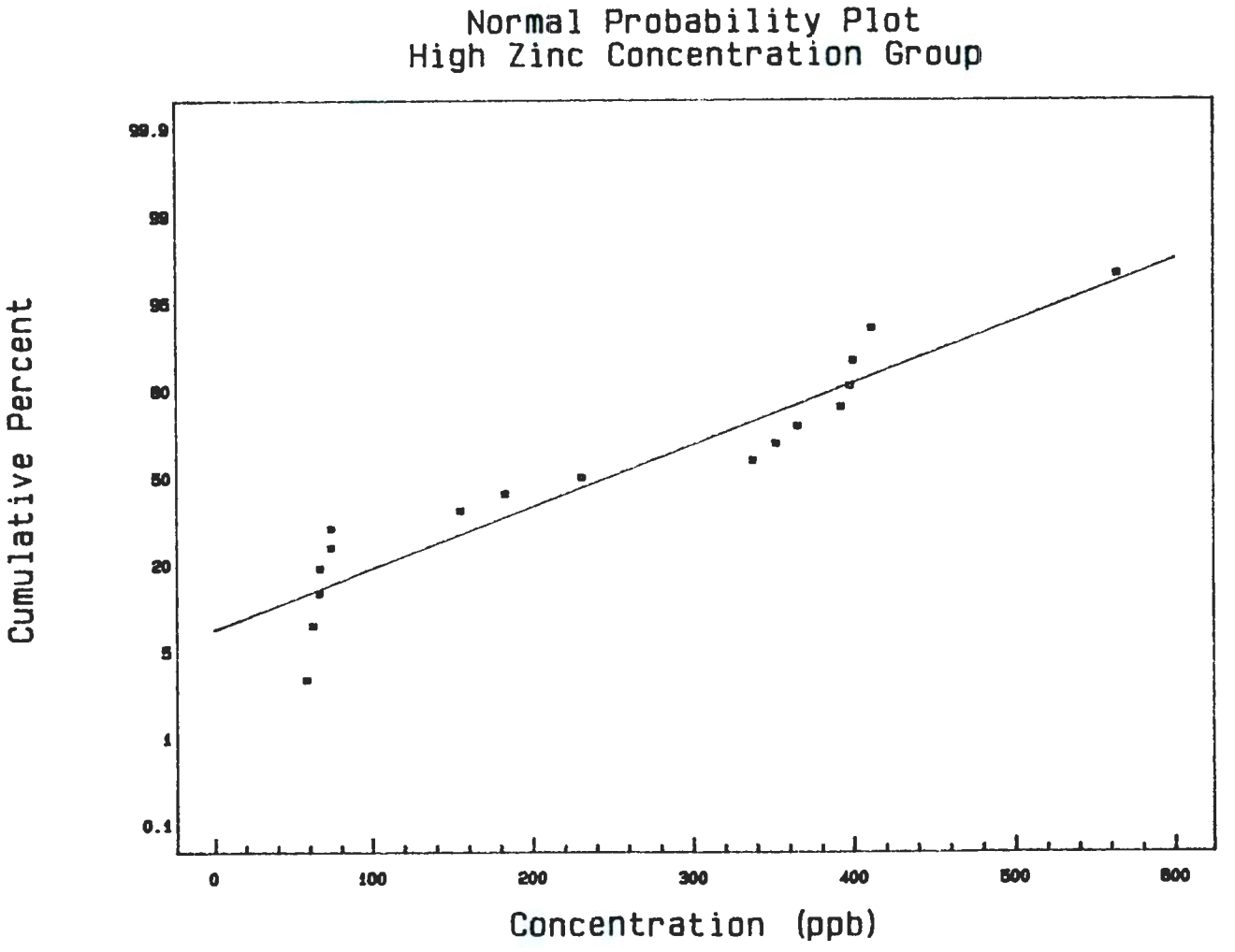
Histogram - Zinc Concentration

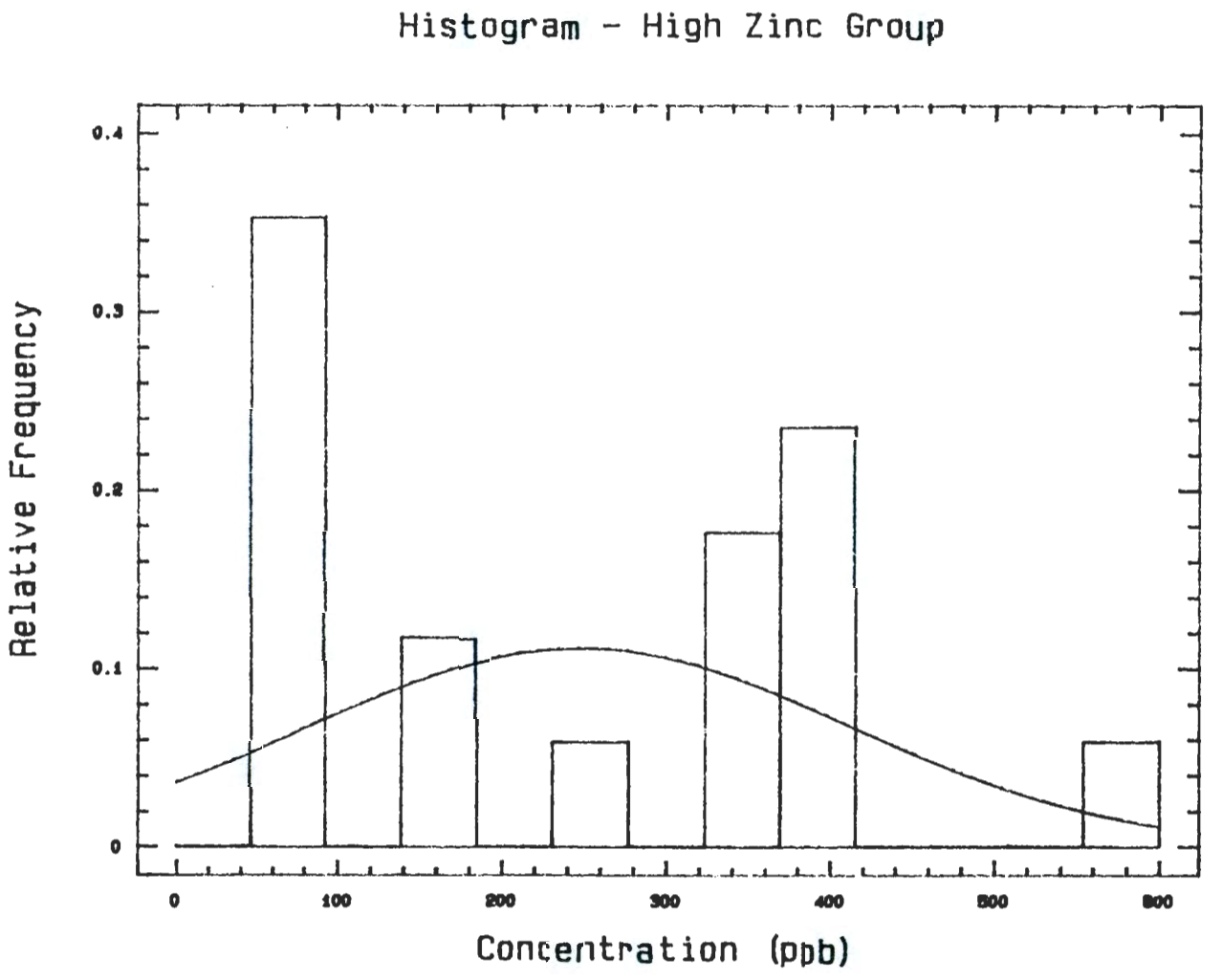


9 2 1 2 6 5 1 4 5 3

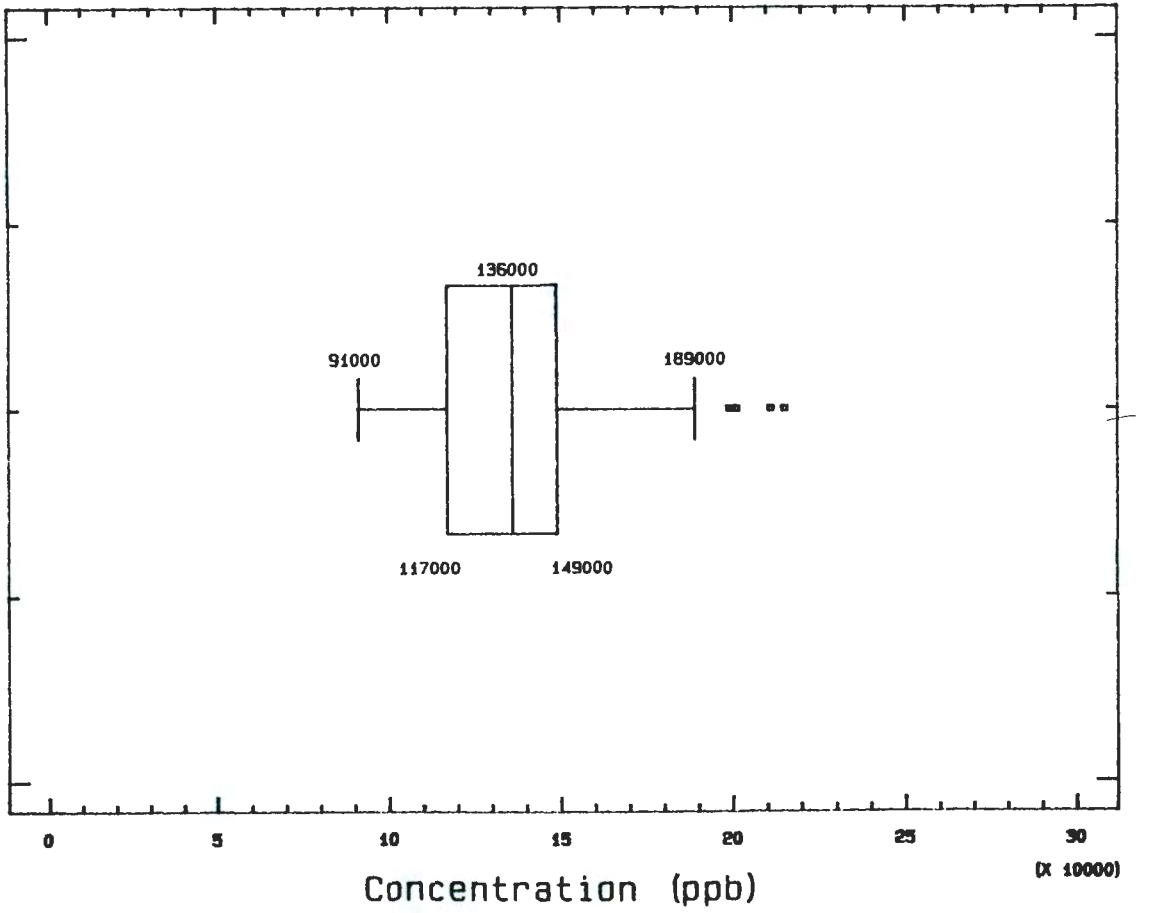
Est. Background Levels in Hanford GW
High Zinc Concentration Group

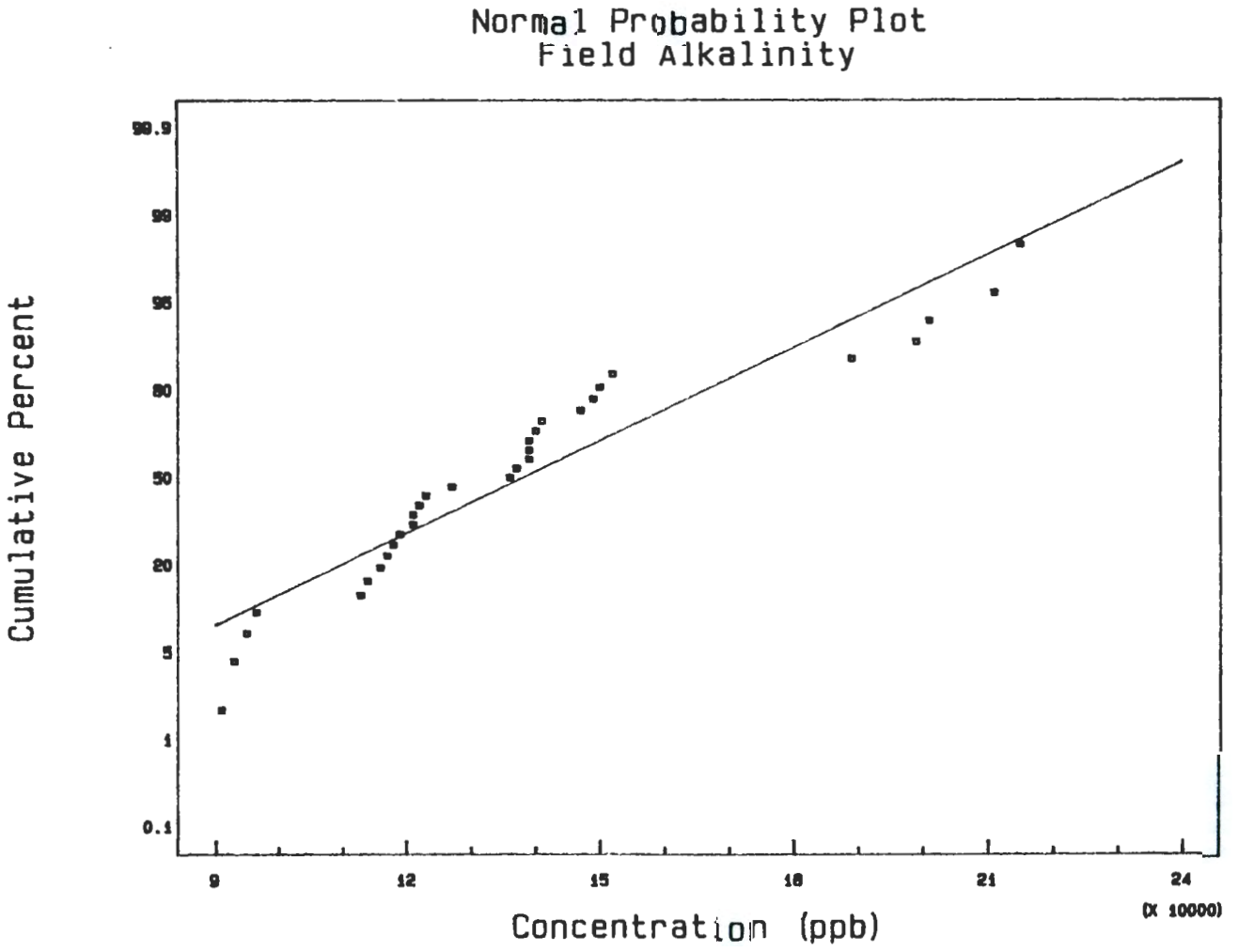



Normal Probability Plot
High Zinc Concentration Group
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
100
200
300
400
500
600
Concentration (ppb)

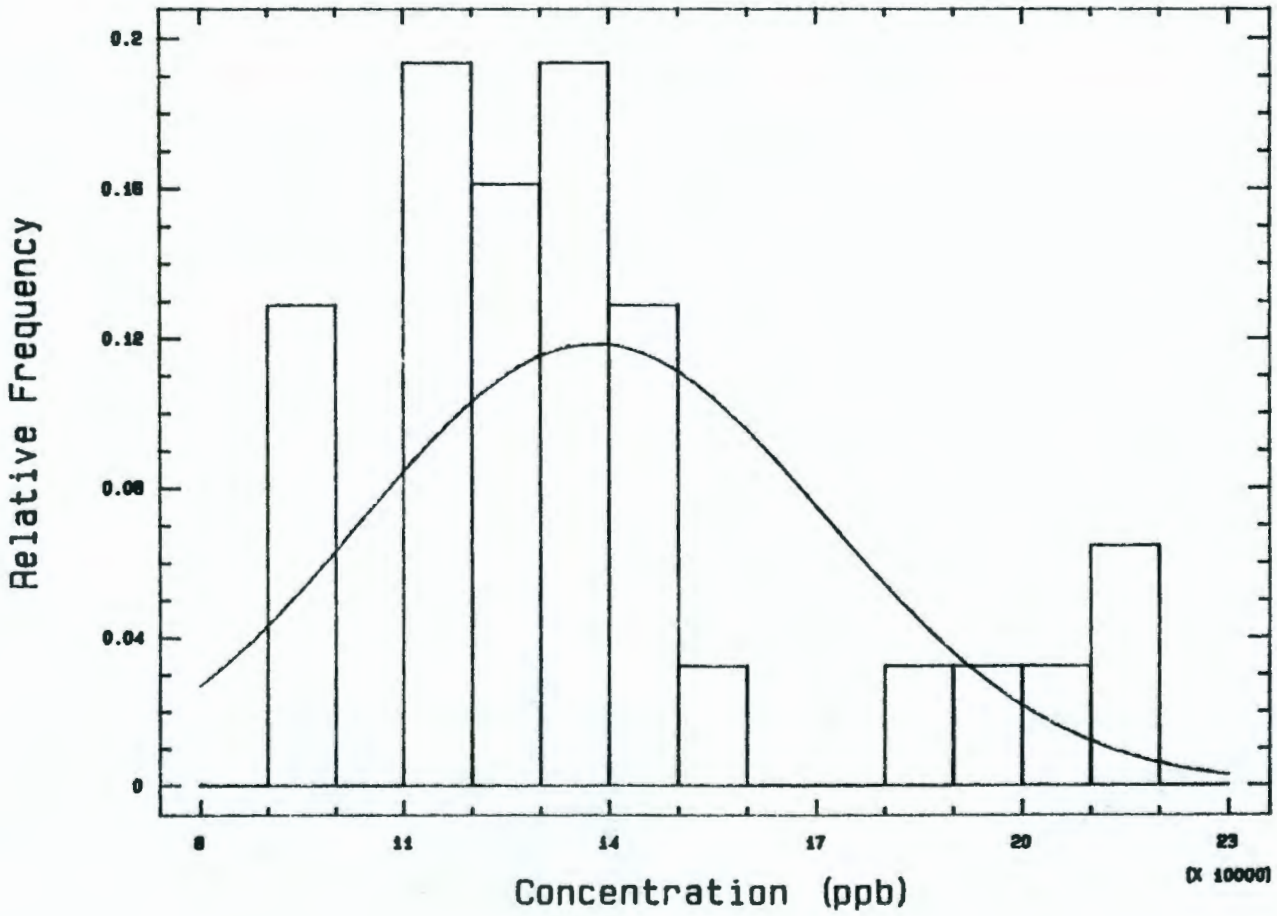

Histogram - High Zinc Group
Relative Frequency
0.4
0.3
0.2
0.1
0
0
100
200
300
400
500
600
Concentration (ppb)

Est. Background Levels in Hanford GW
Field Alkalinity

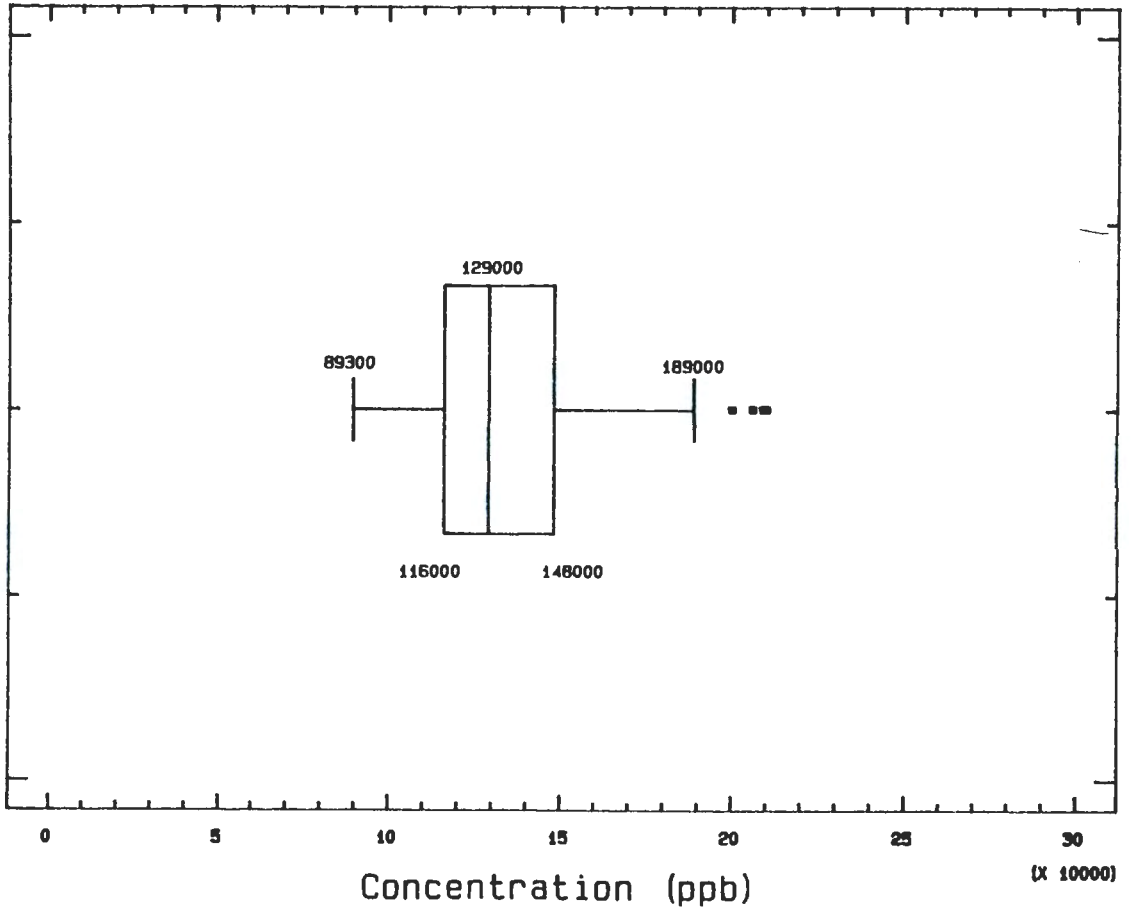


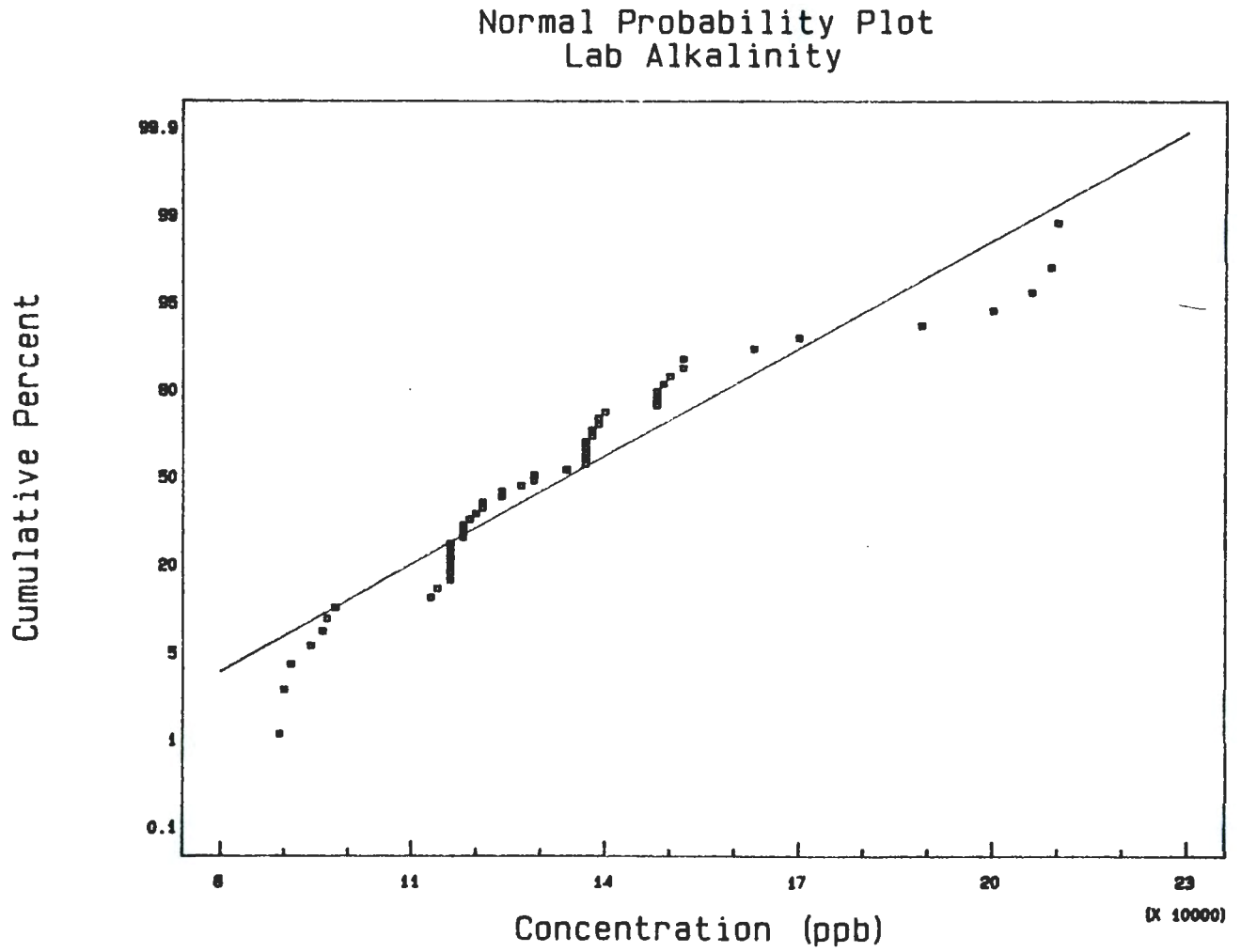

Normal Probability Plot
Field Alkalinity
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
9
12
15
18
21
24
(X 10000)
Concentration (ppb)

Histogram - Field Alkalinity

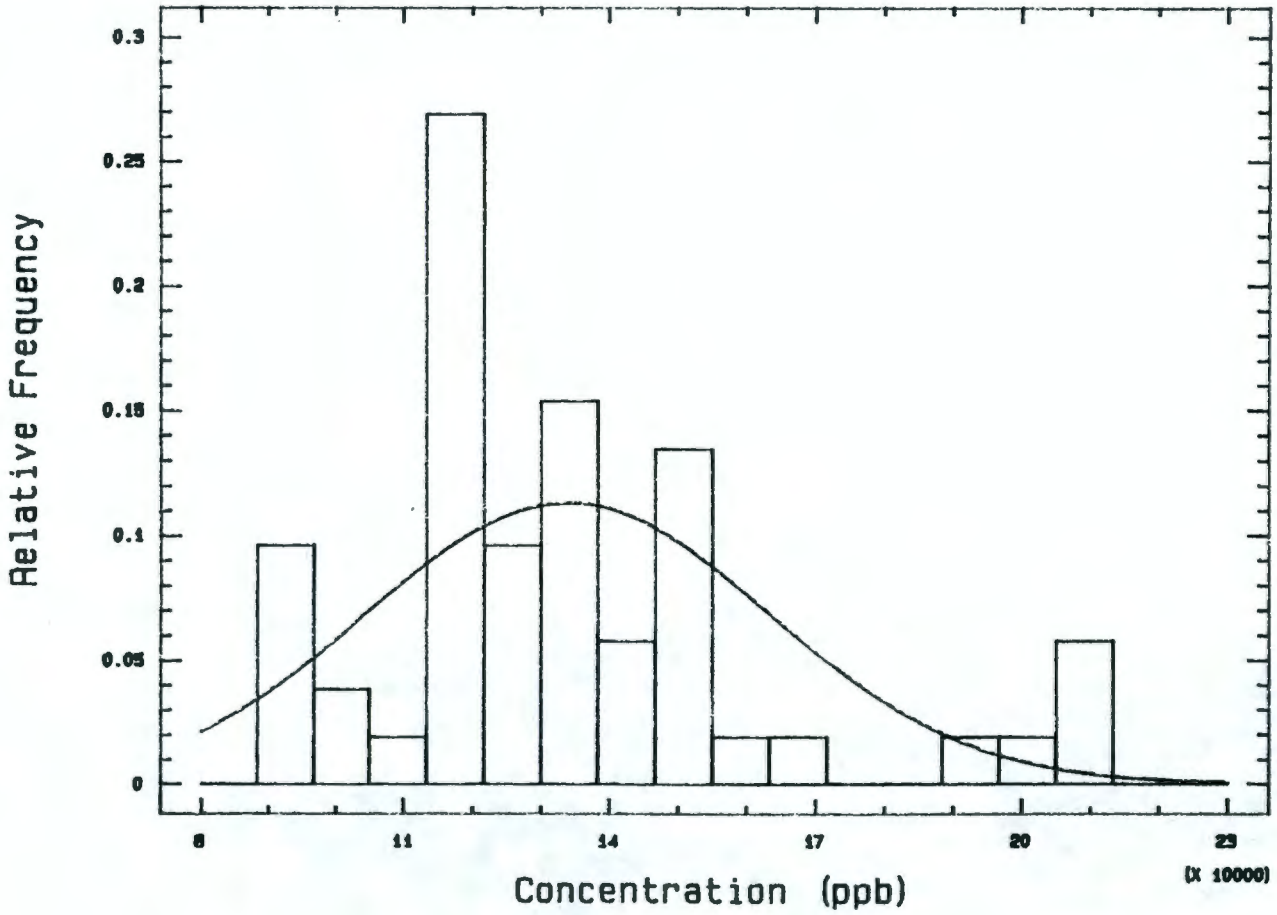


Est. Background Levels in Hanford GW
Lab Alkalinity

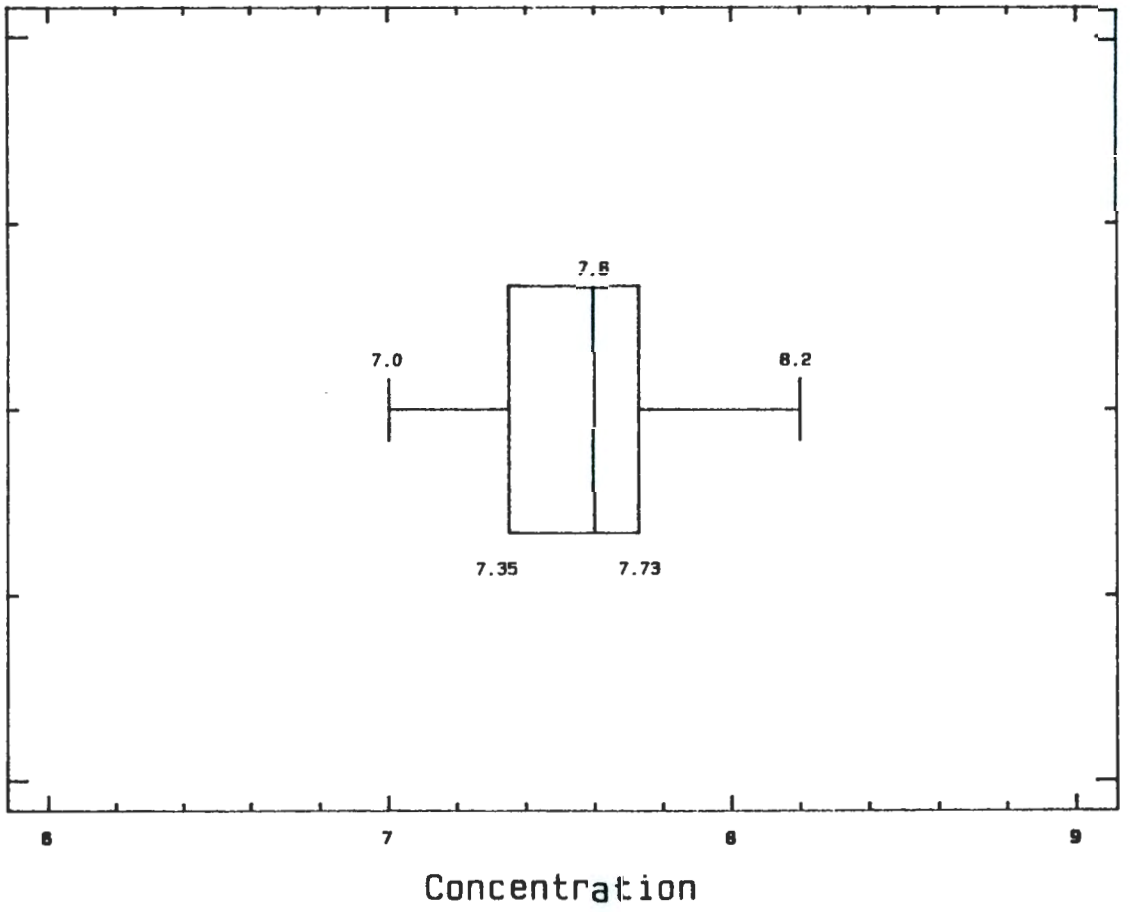


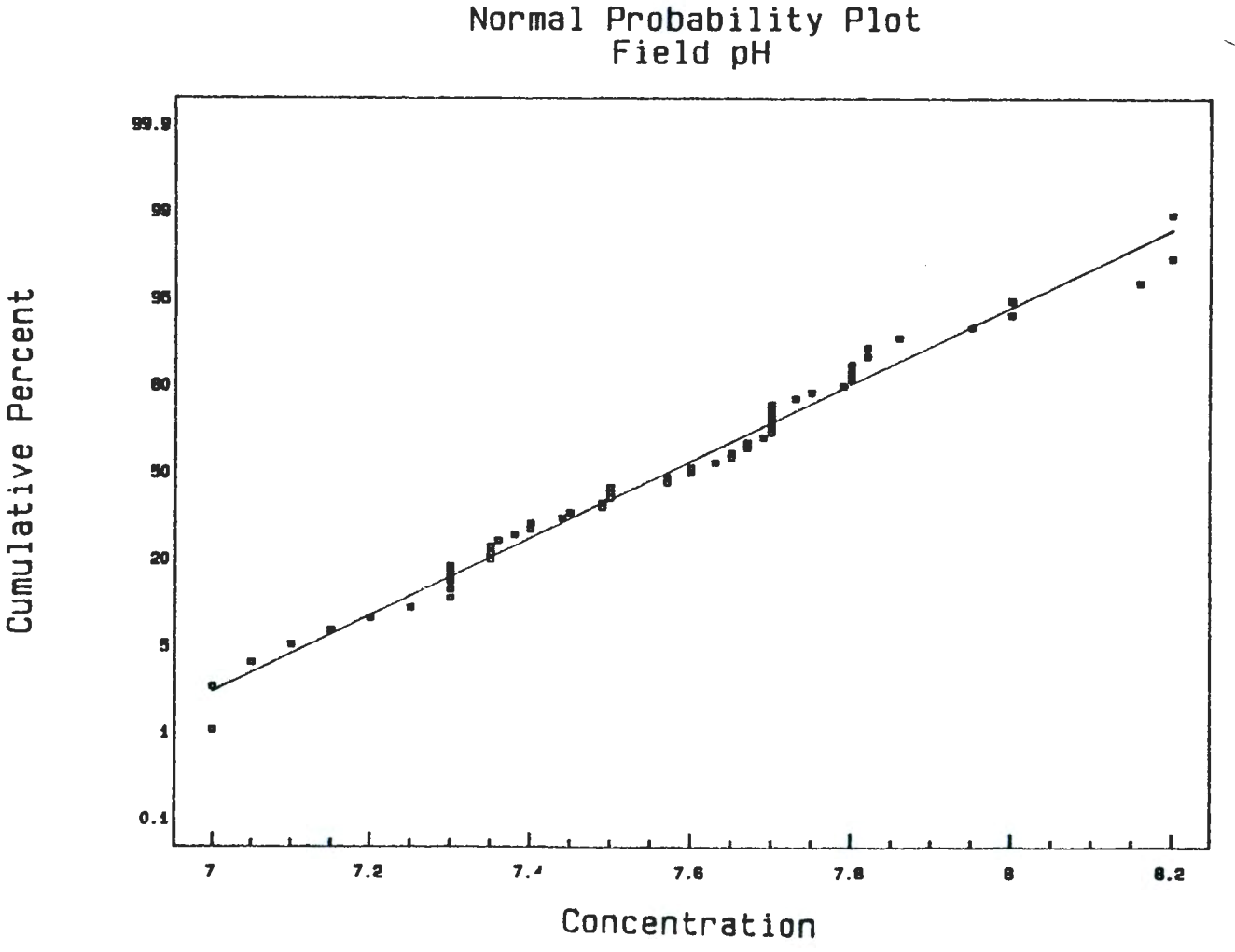

Normal Probability Plot
Lab Alkalinity
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
8
11
14
17
20
23
(X 10000)
Concentration (ppb)

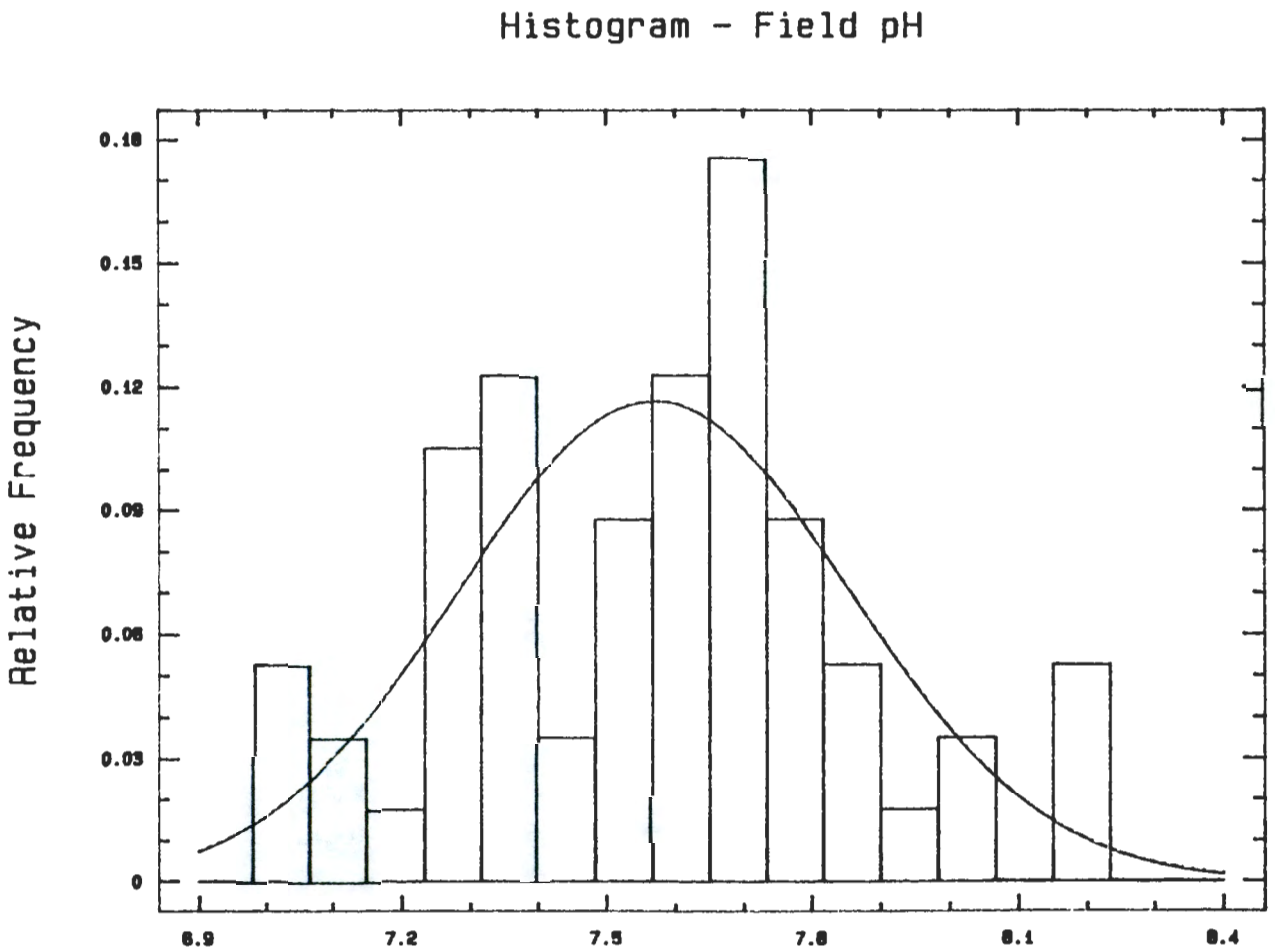
Histogram - Lab Alkalinity



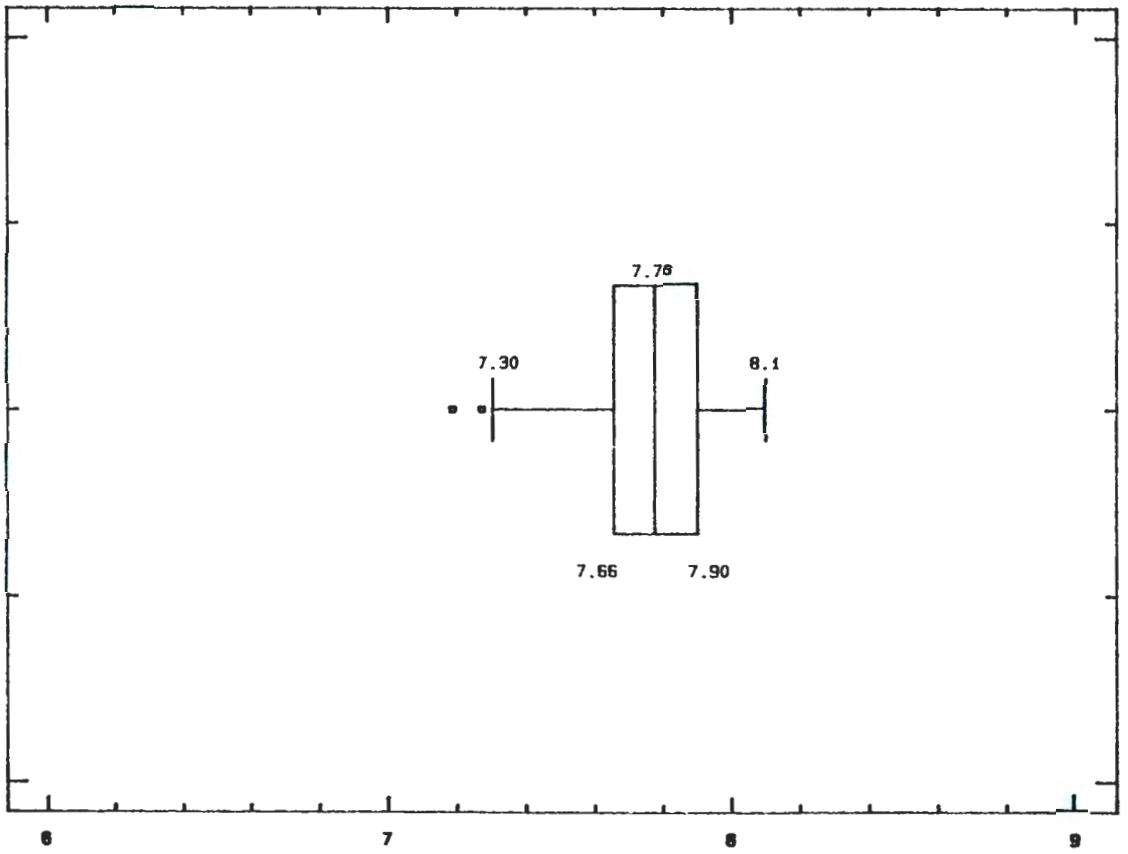
Est. Background Levels in Hanford GW
Field pH



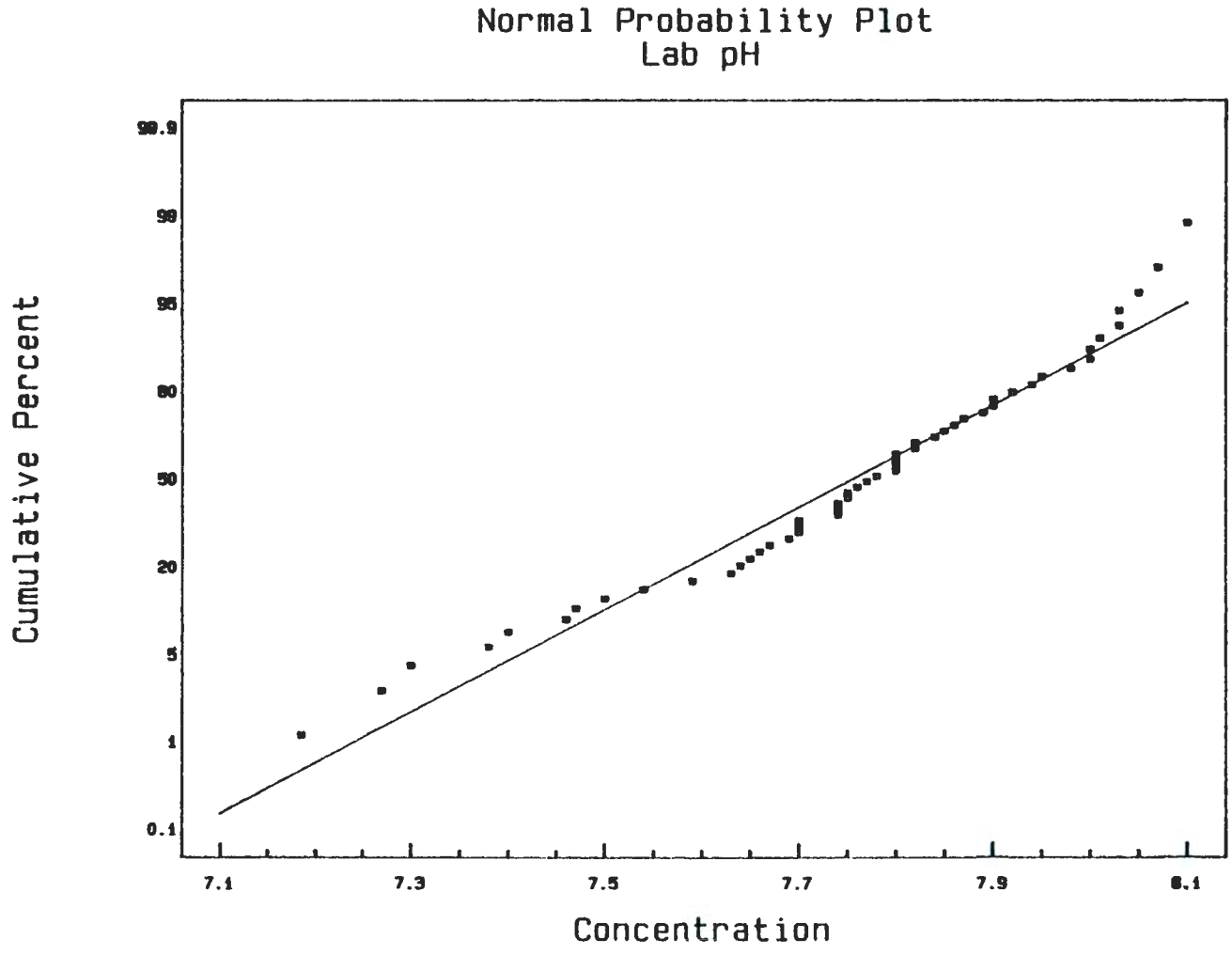

Normal Probability Plot
Field pH
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
7
7.2
7.4
7.6
7.8
8
8.2
Concentration

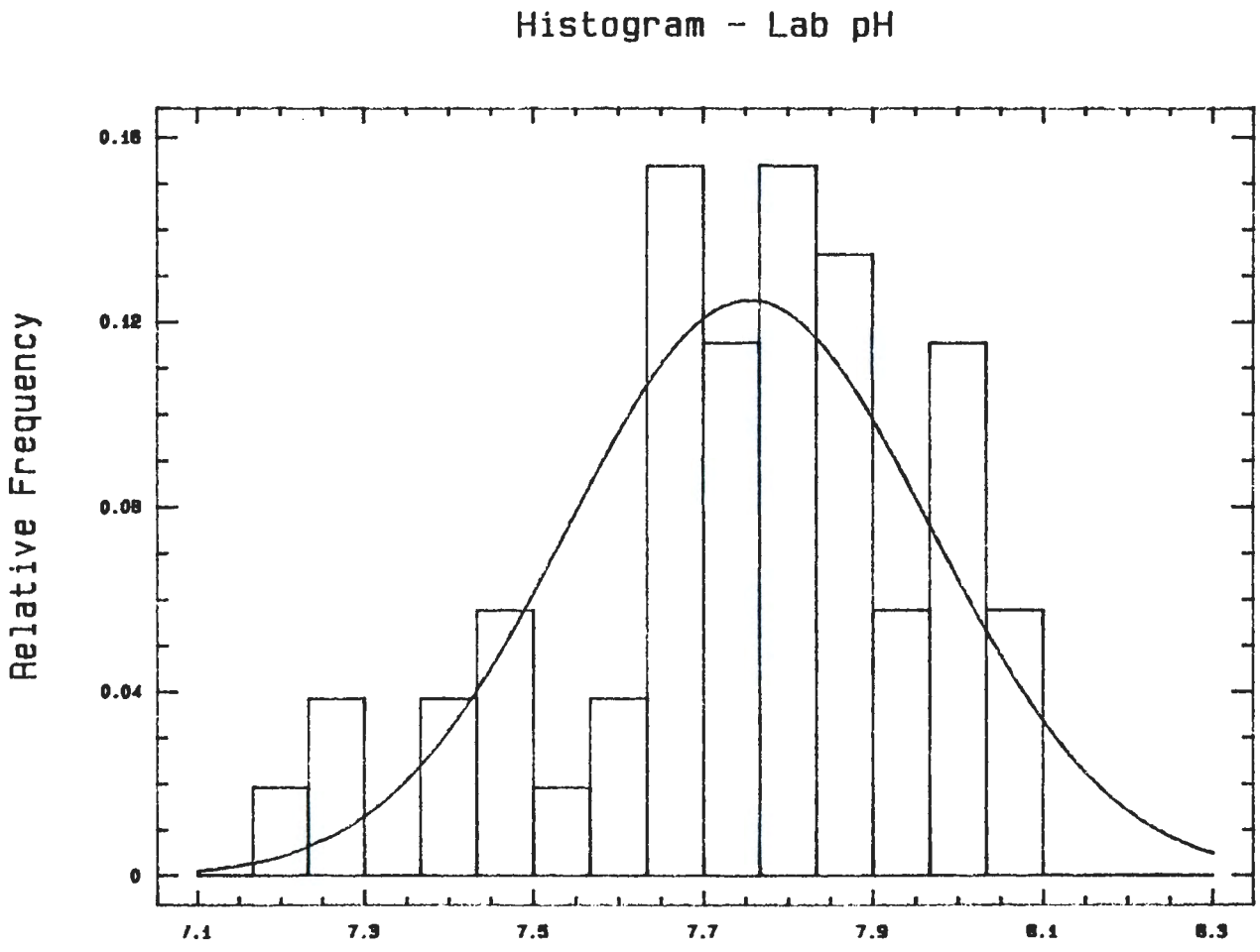

Histogram - Field pH
Relative Frequency
0.18
0.15
0.12
0.09
0.06
0.03
0
6.9
7.2
7.5
7.8
8.1
8.4

Est. Background Levels in Hanford GW
Lab pH

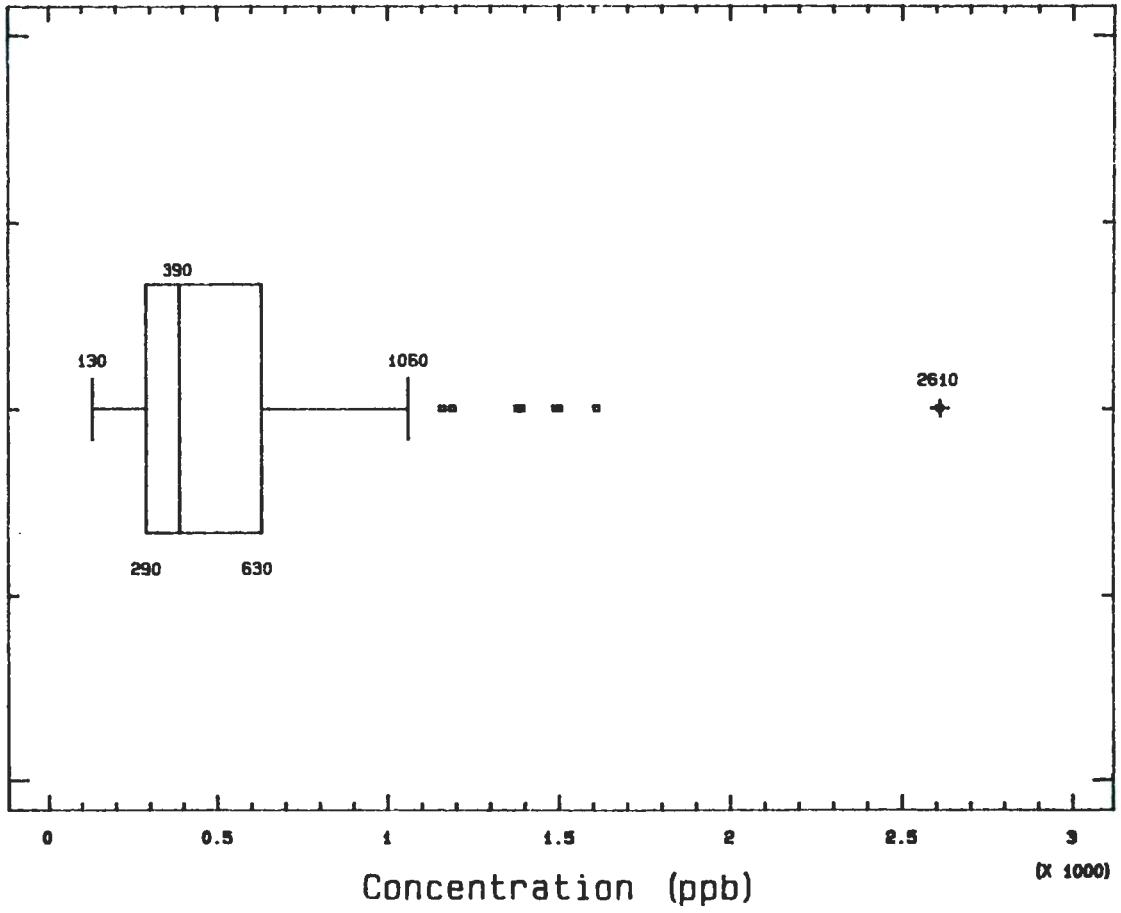


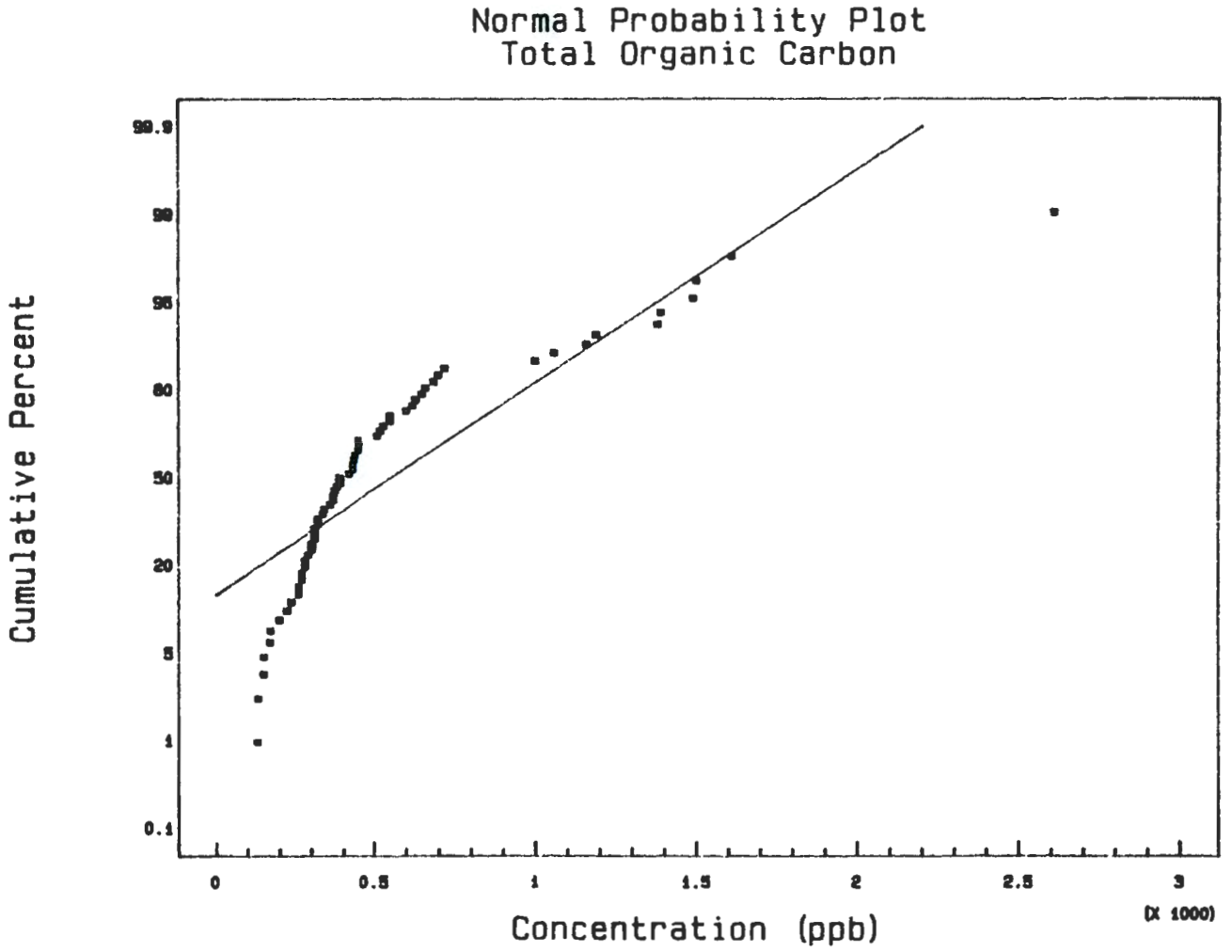
Concentration


Normal Probability Plot
Lab pH
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
7.1
7.3
7.5
7.7
7.9
8.1
Concentration

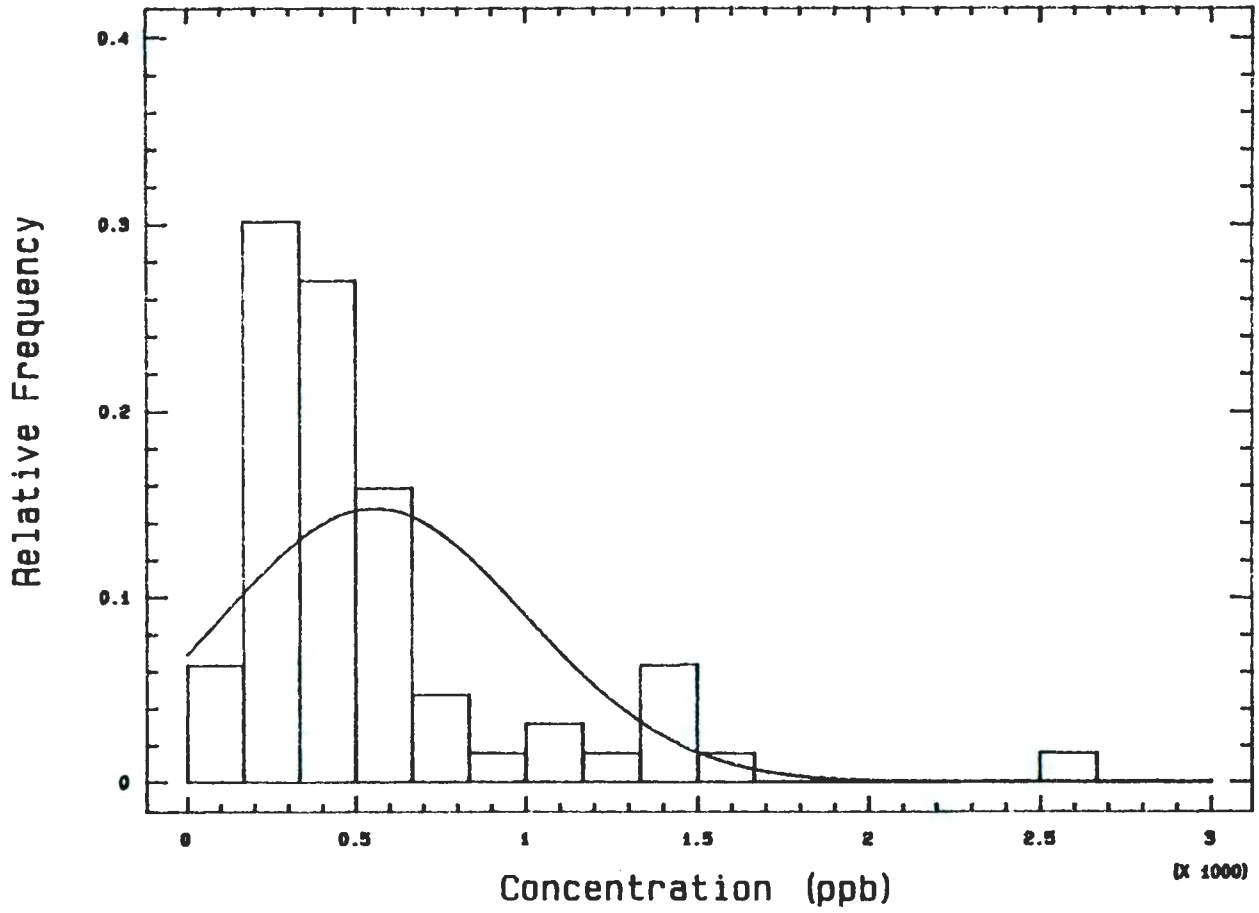

Histogram - Lab pH
Relative Frequency
0.16
0.12
0.08
0.04
0
7.1
7.3
7.5
7.7
7.9
8.1
8.3

Est. Background Levels in Hanford GW
Total Organic Carbon

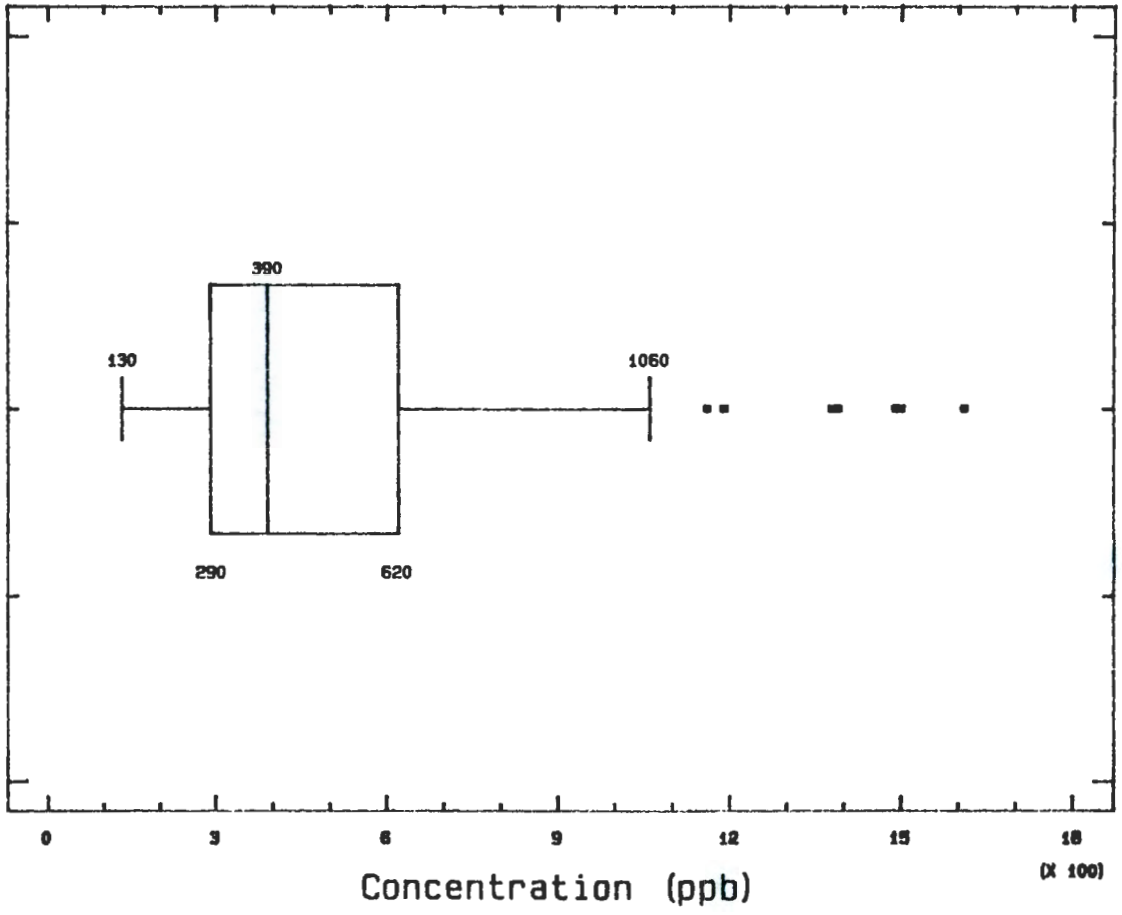


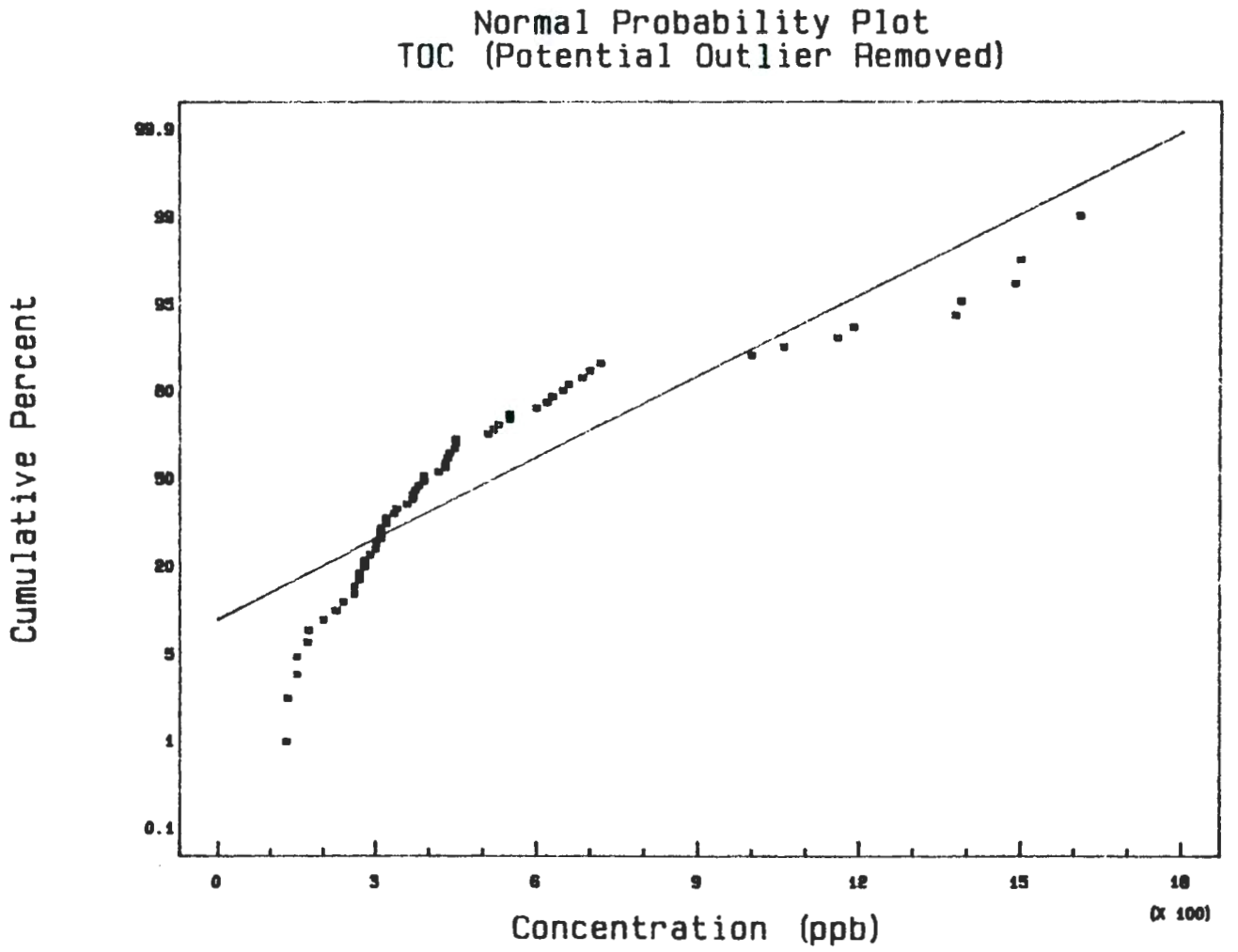

Normal Probability Plot
Total Organic Carbon
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
0.5
1
1.5
2
2.5
3
(X 1000)
Concentration (ppb)

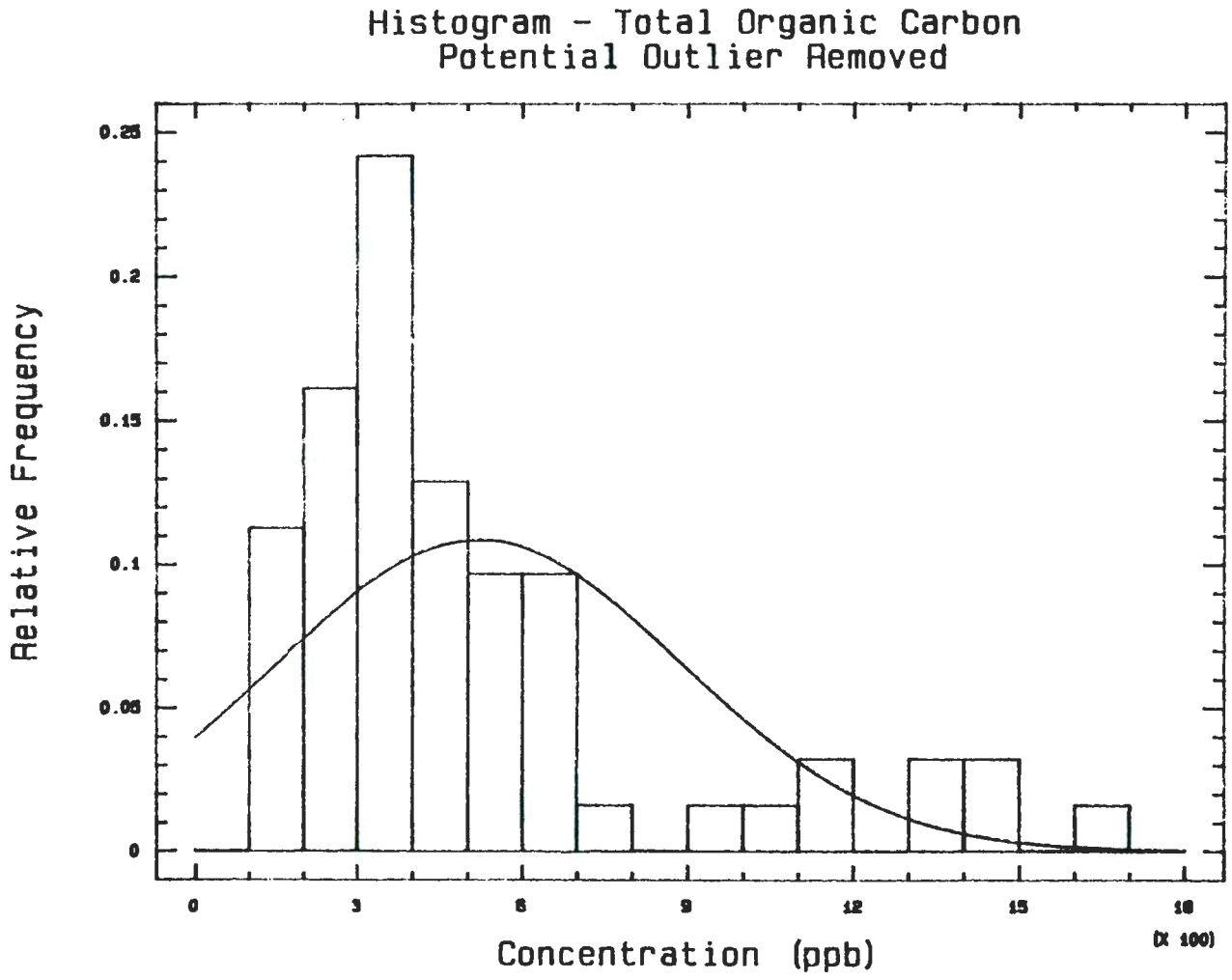
Histogram - Total Organic Carbon



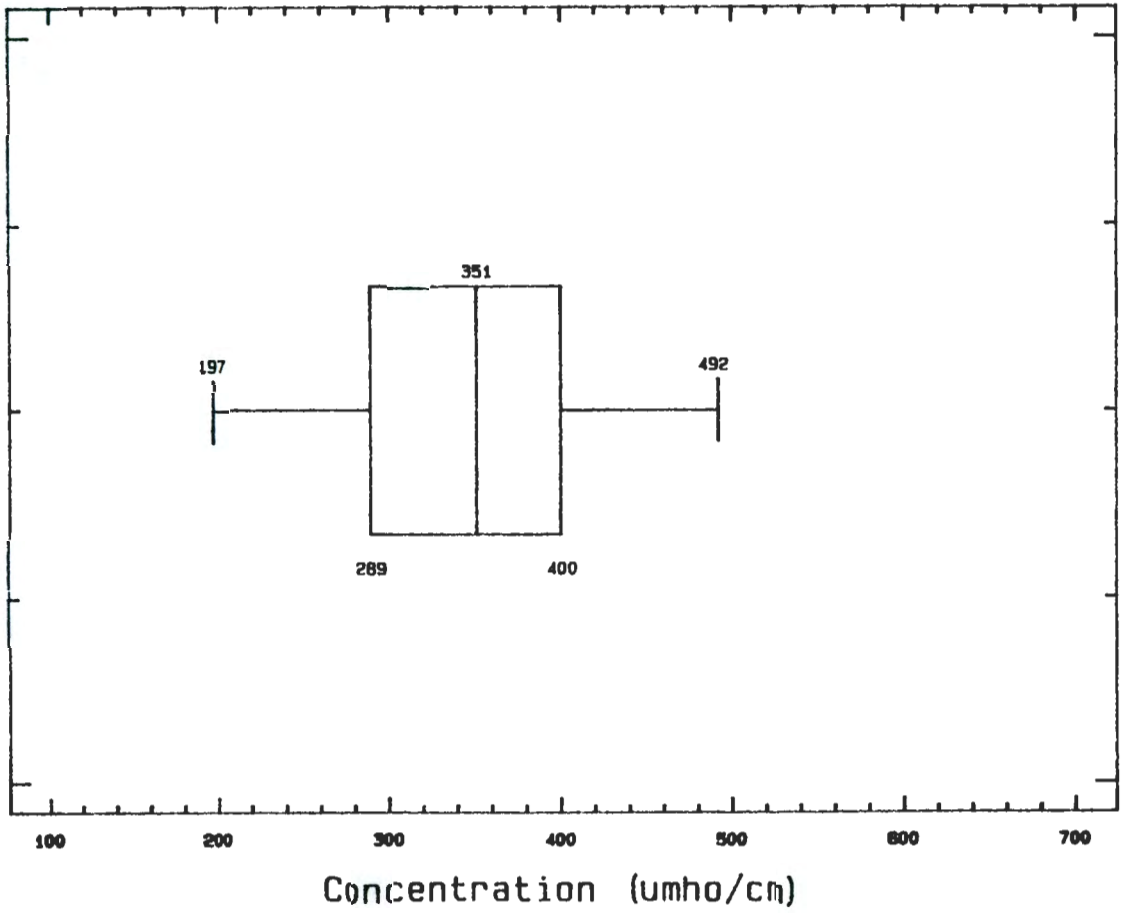
Est. Background Levels in Hanford GW
TOC (Potential Outlier Removed)

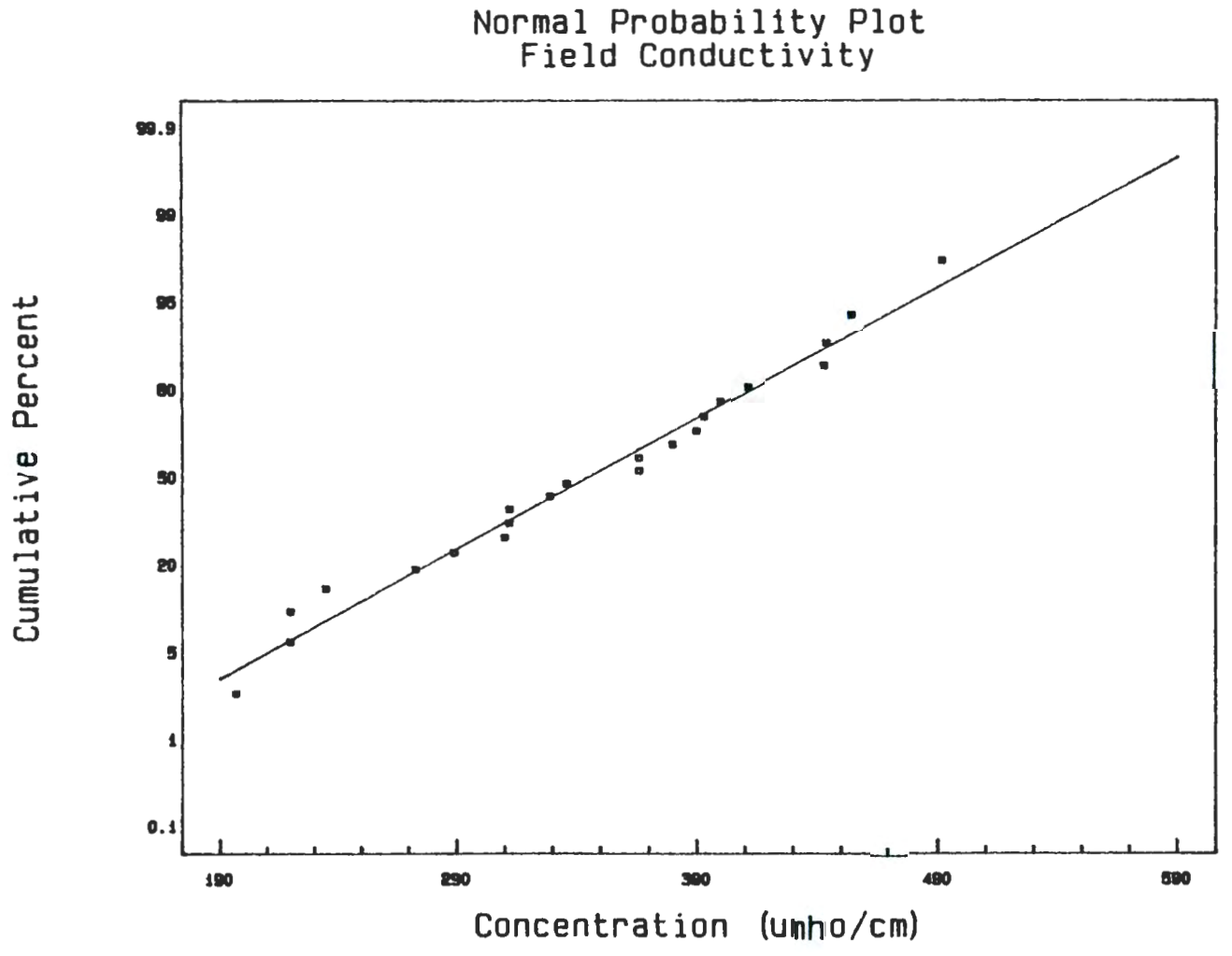


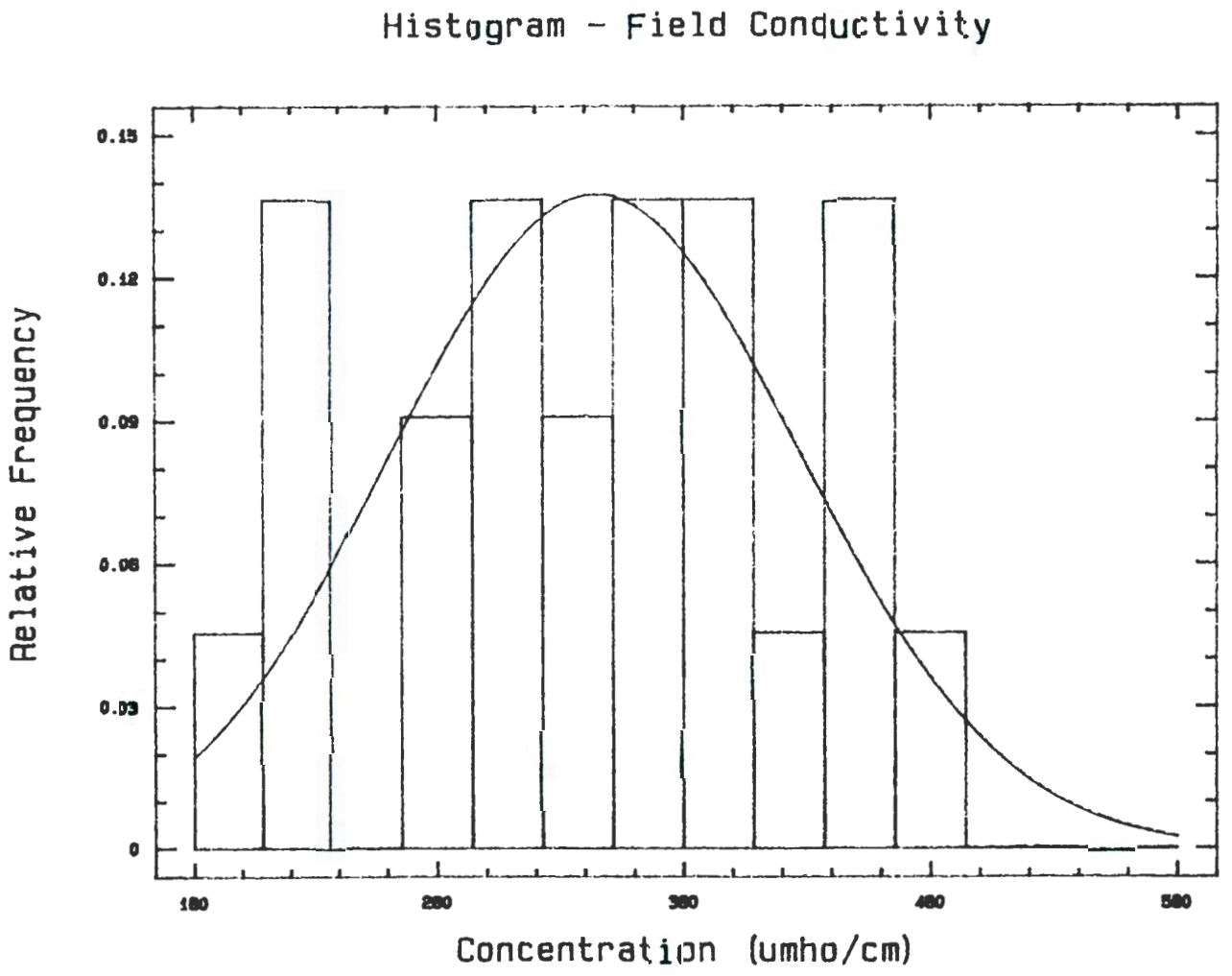

Normal Probability Plot
TOC (Potential Outlier Removed)
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
3
6
9
12
15
18
(X 100)
Concentration (ppb)


Histogram - Total Organic Carbon
Potential Outlier Removed
Relative Frequency
0.25
0.2
0.15
0.1
0.05
0
0
3
6
9
12
15
18
(X 100)
Concentration (ppb)

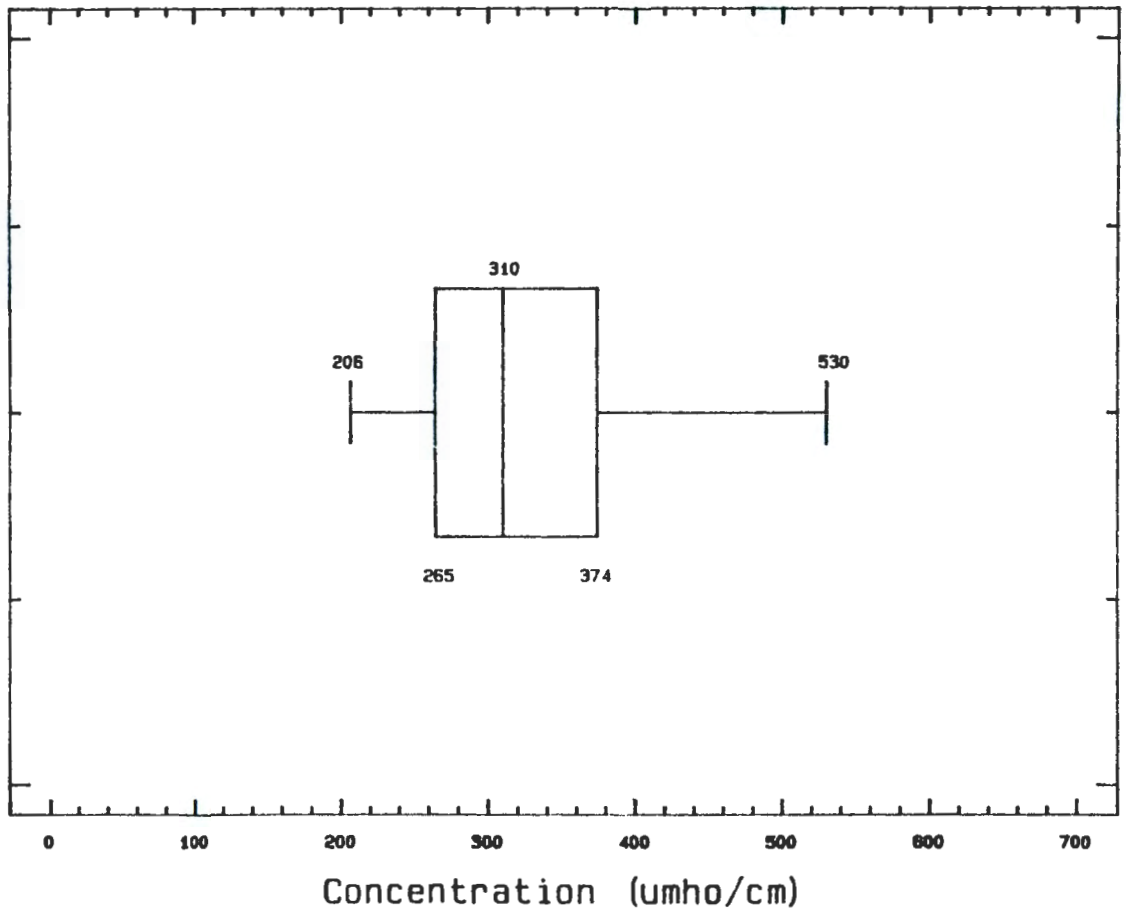
Est. Background Levels in Hanford GW
Field Conductivity

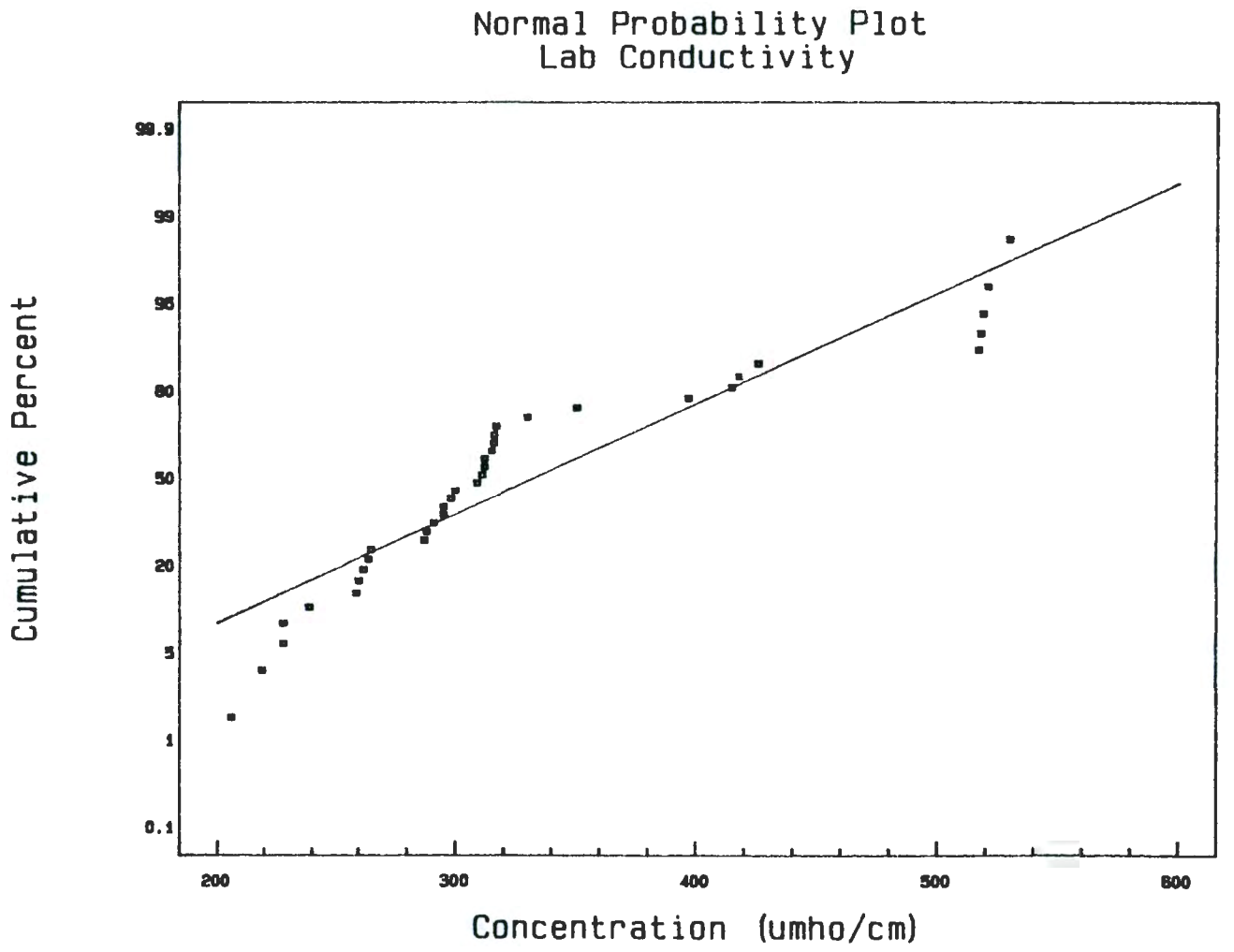



Normal Probability Plot
Field Conductivity
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
190
290
390
490
590
Concentration (umho/cm)

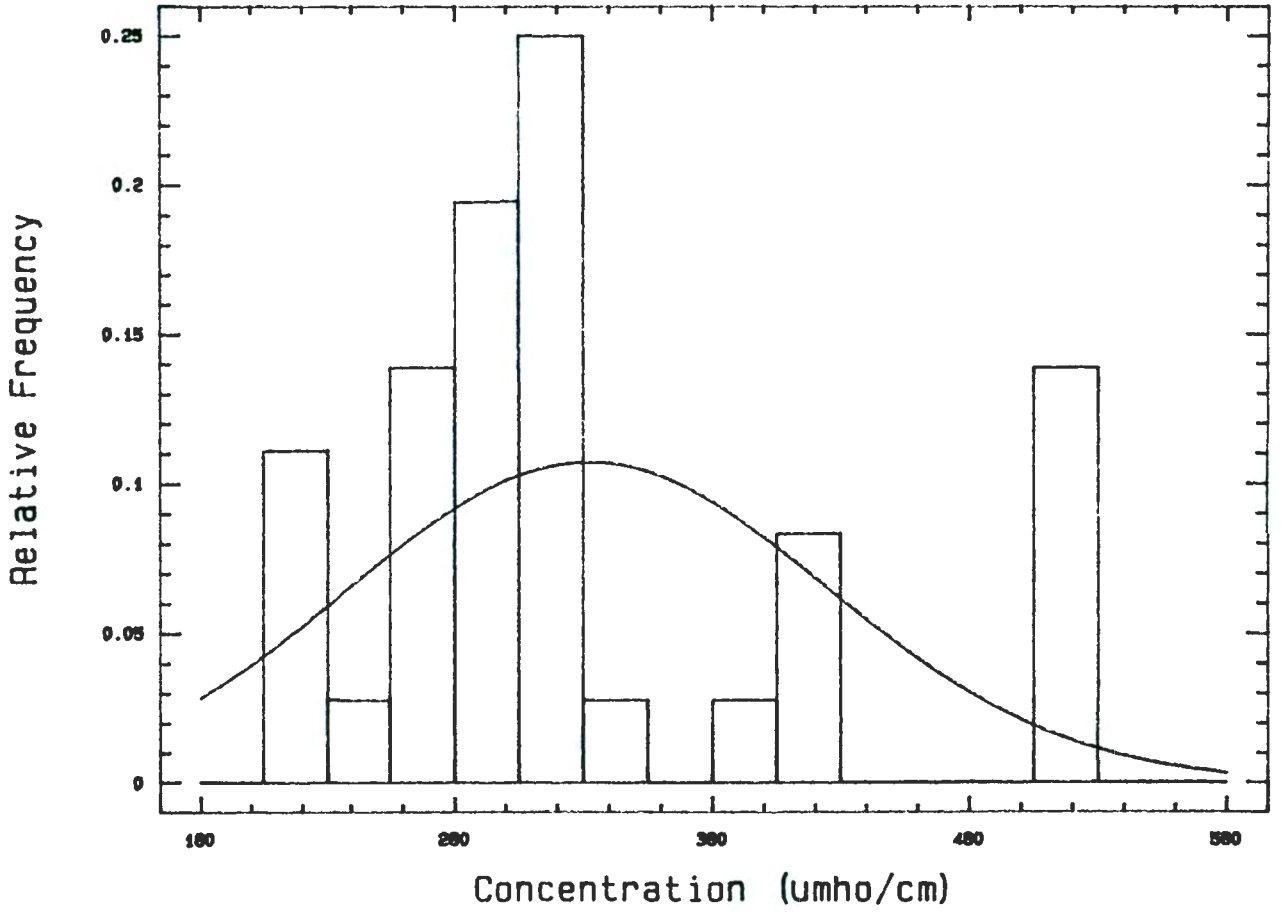

Histogram - Field Conductivity
Relative Frequency
0.15
0.12
0.09
0.06
0.03
0
180
280
380
480
580
Concentration (umho/cm)

Est. Background Levels in Hanford GW
Lab Conductivity

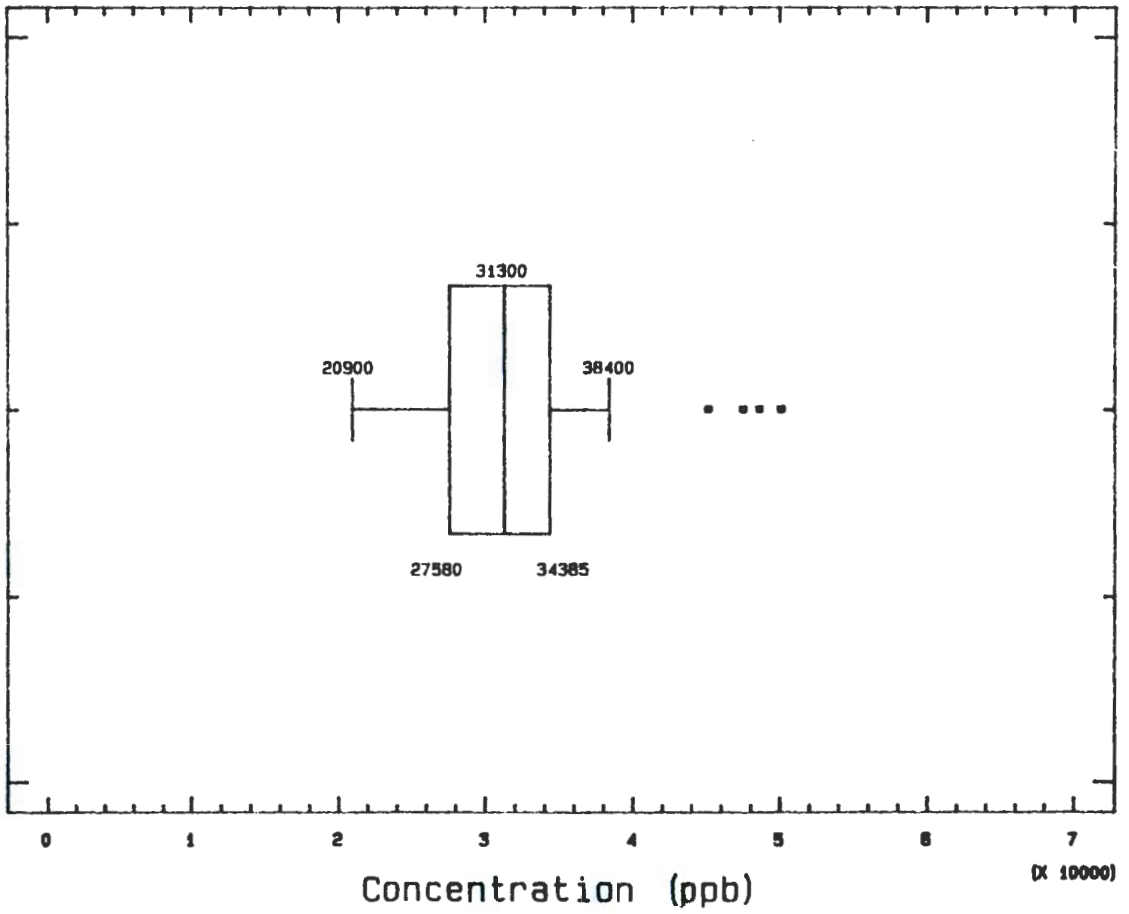


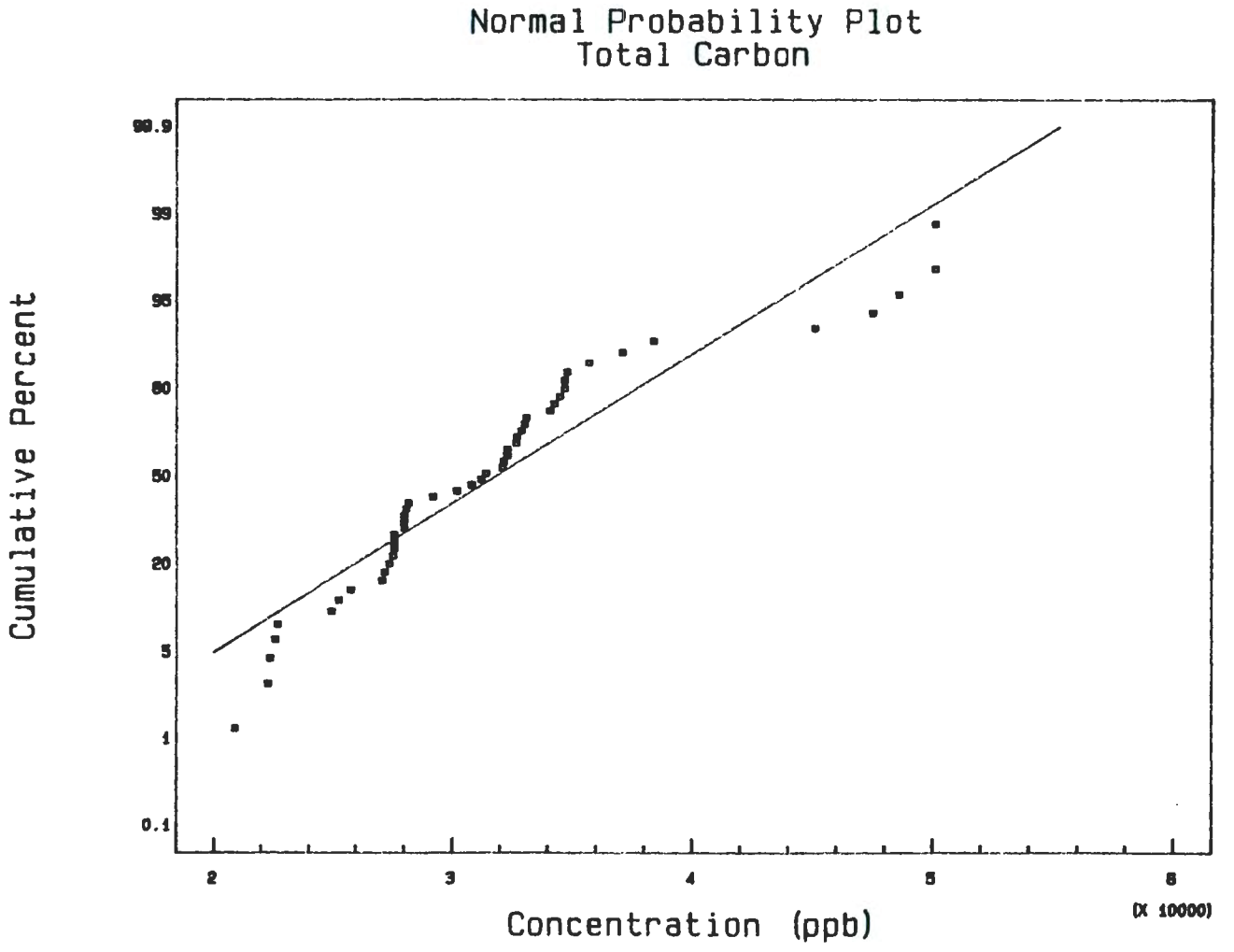

Normal Probability Plot
Lab Conductivity
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
200
300
400
500
600
Concentration (umho/cm)

Histogram - Lab Conductivity

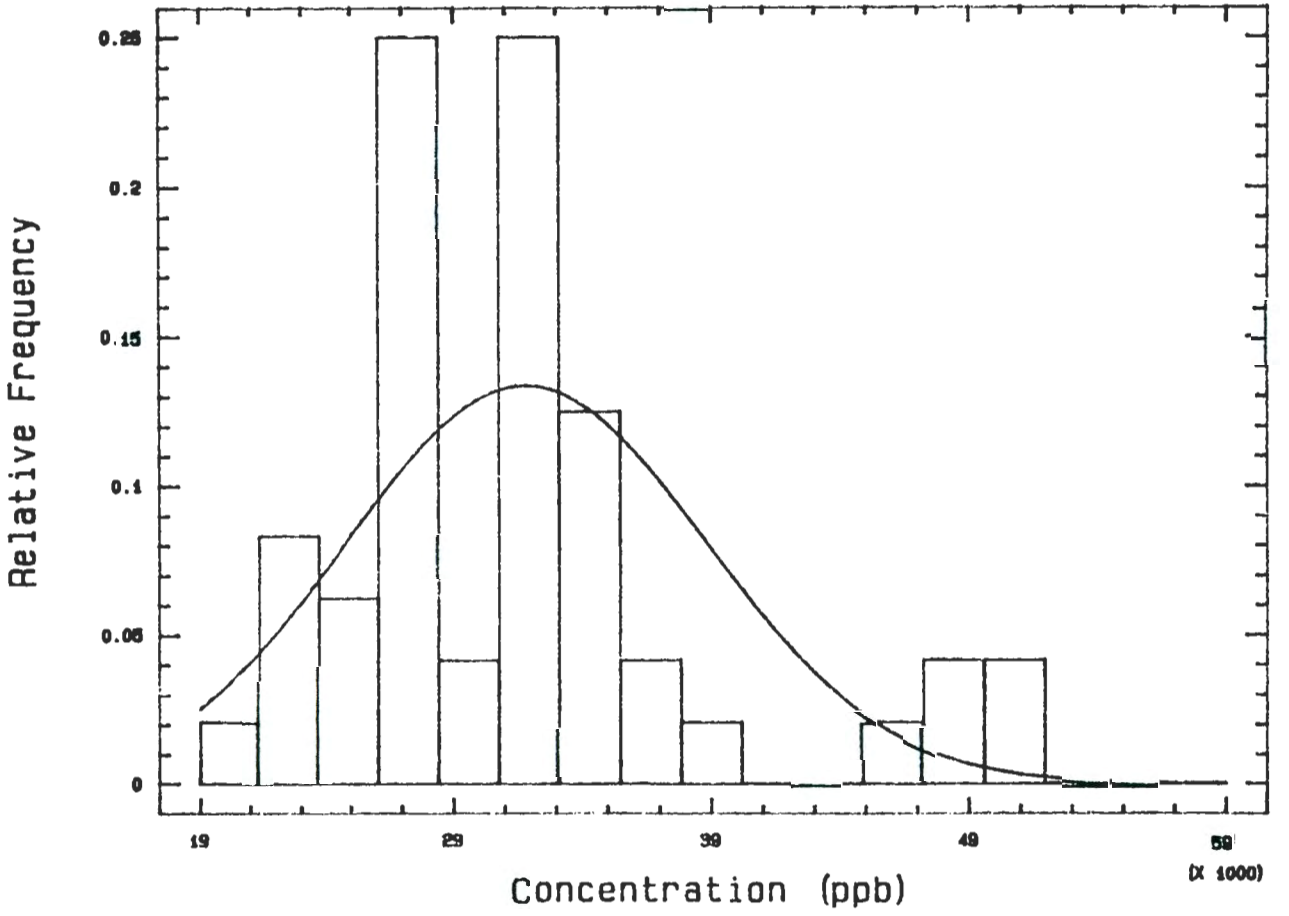


Est. Background Levels in Hanford GW
Total Carbon

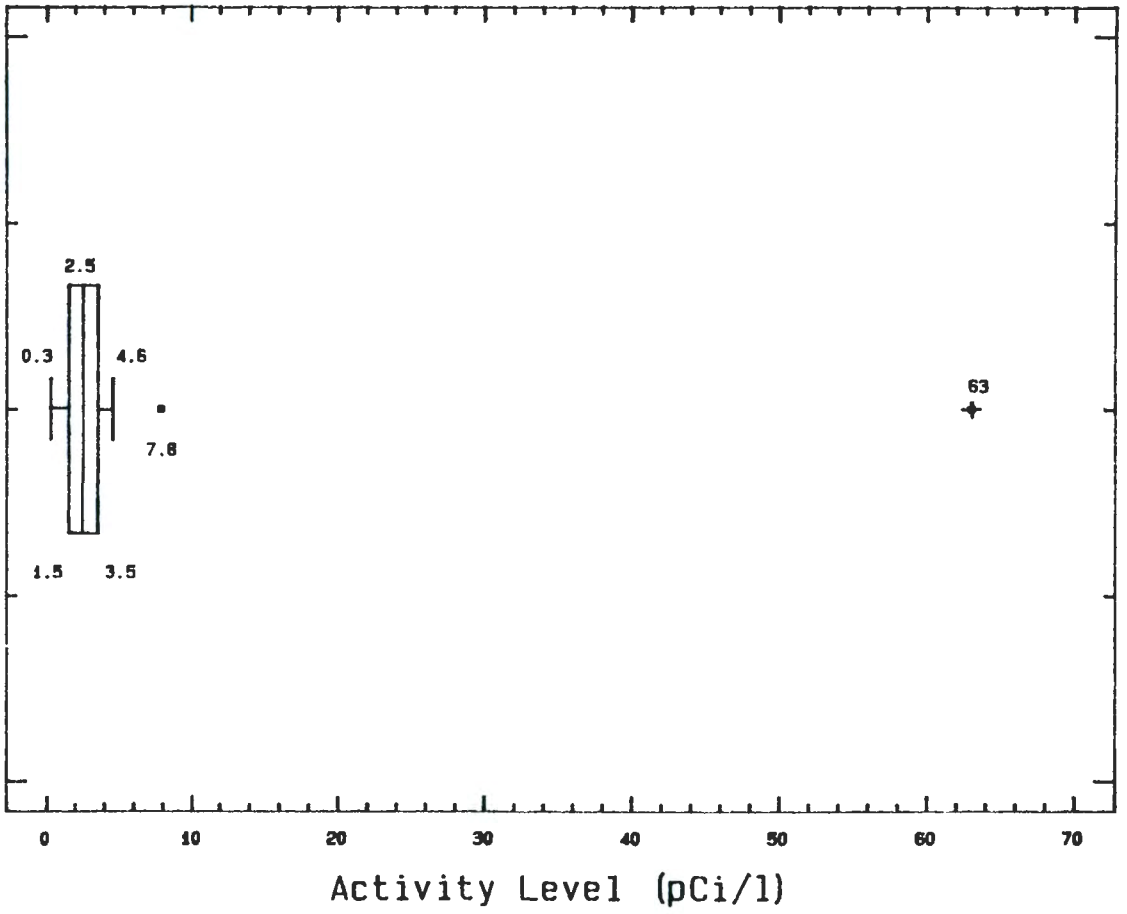


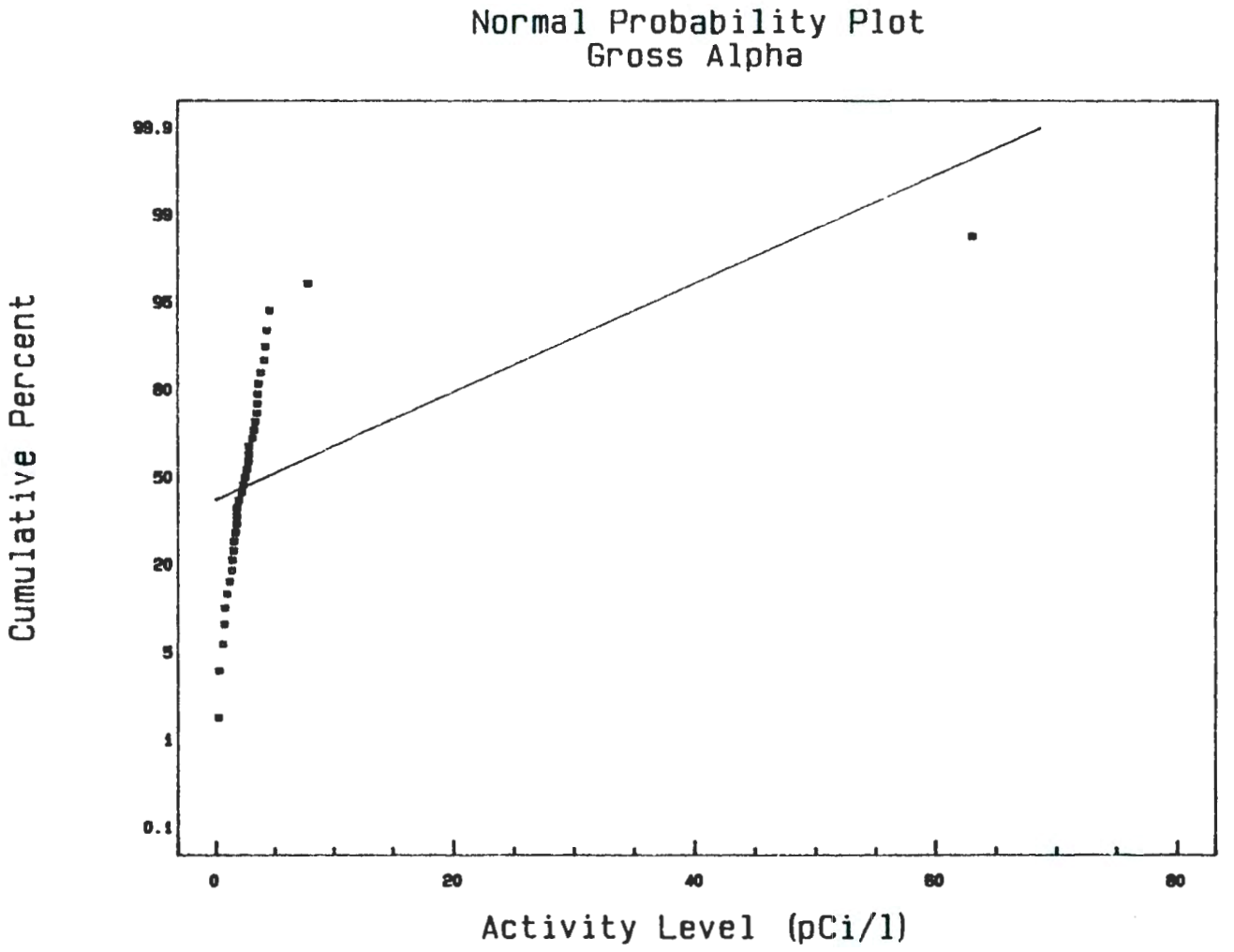

Normal Probability Plot
Total Carbon
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
2
3
4
5
6
(X 10000)
Concentration (ppb)

Histogram - Total Carbon

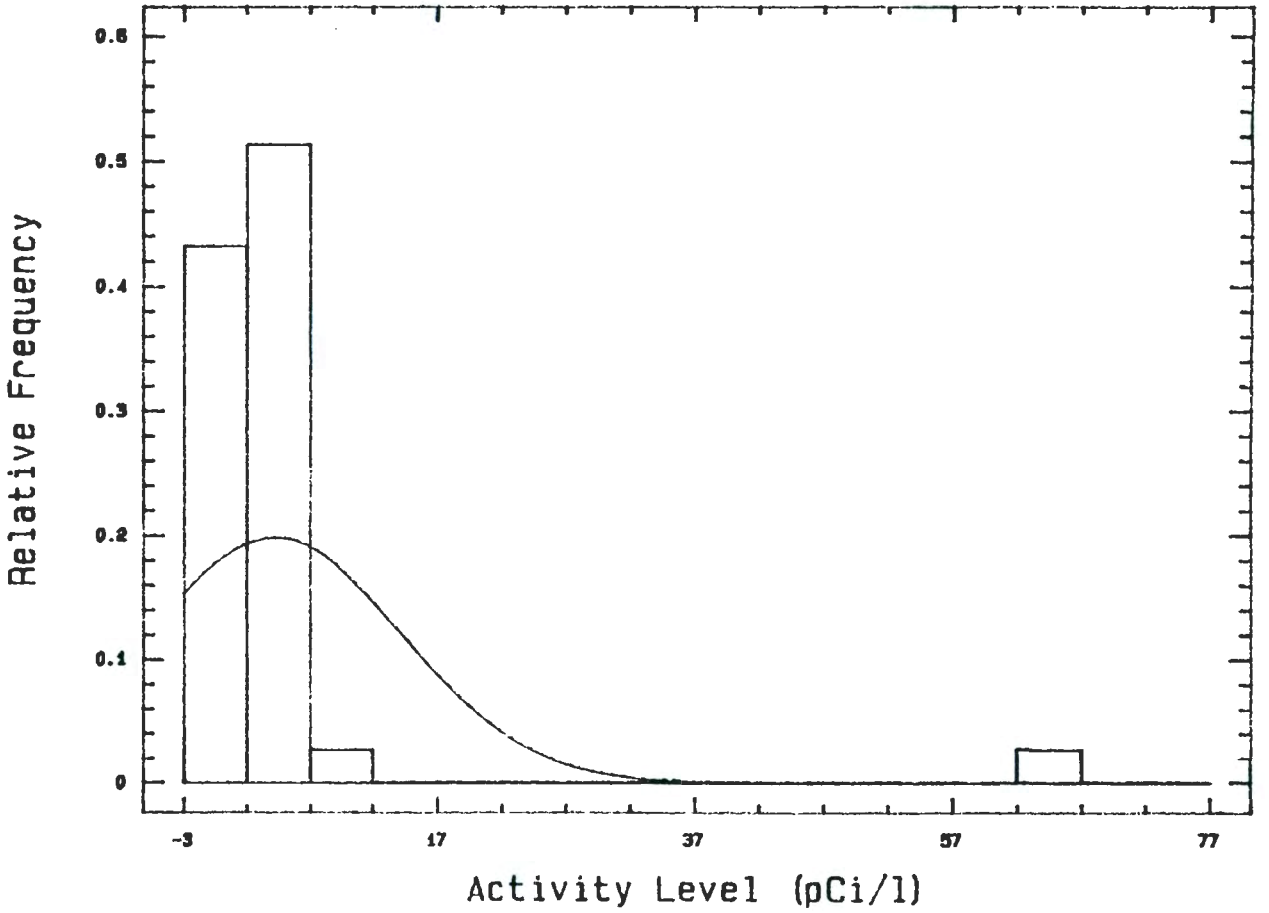


Est. Background Levels in Hanford GW
Gross Alpha



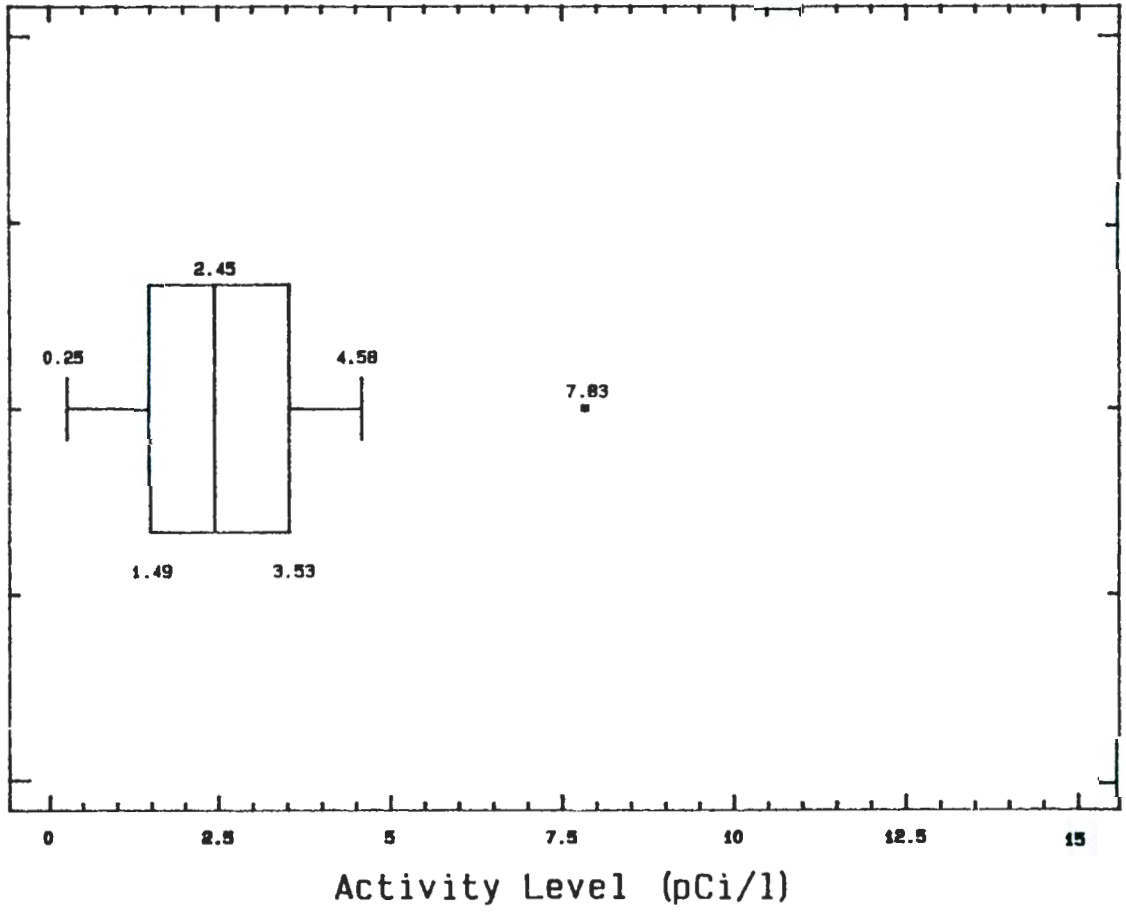

Normal Probability Plot
Gross Alpha
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
20
40
60
80
Activity Level (pCi/l)

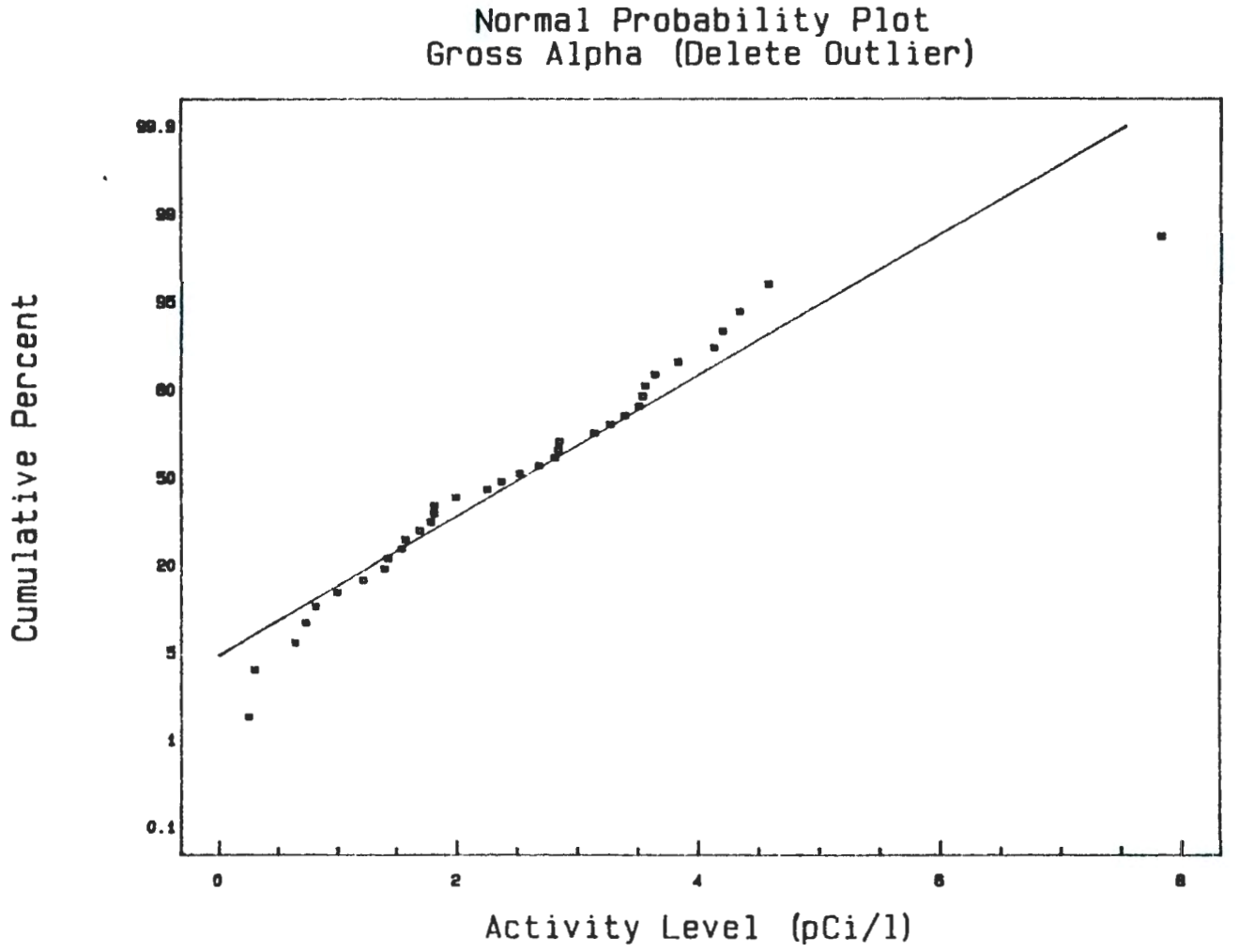
Histogram - Gross Alpha
All Observations

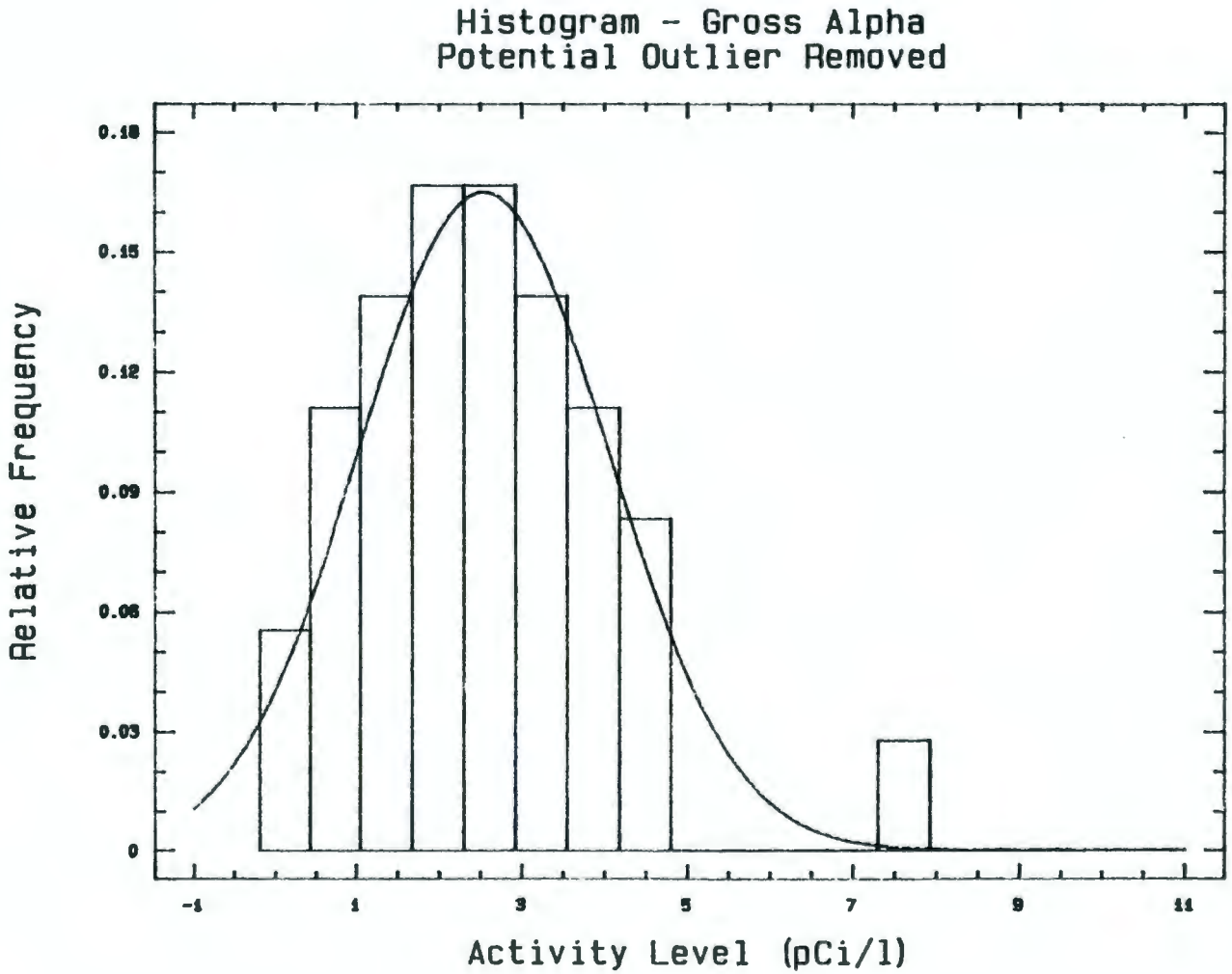


9 2 1 2 , 5 1 1 8 6

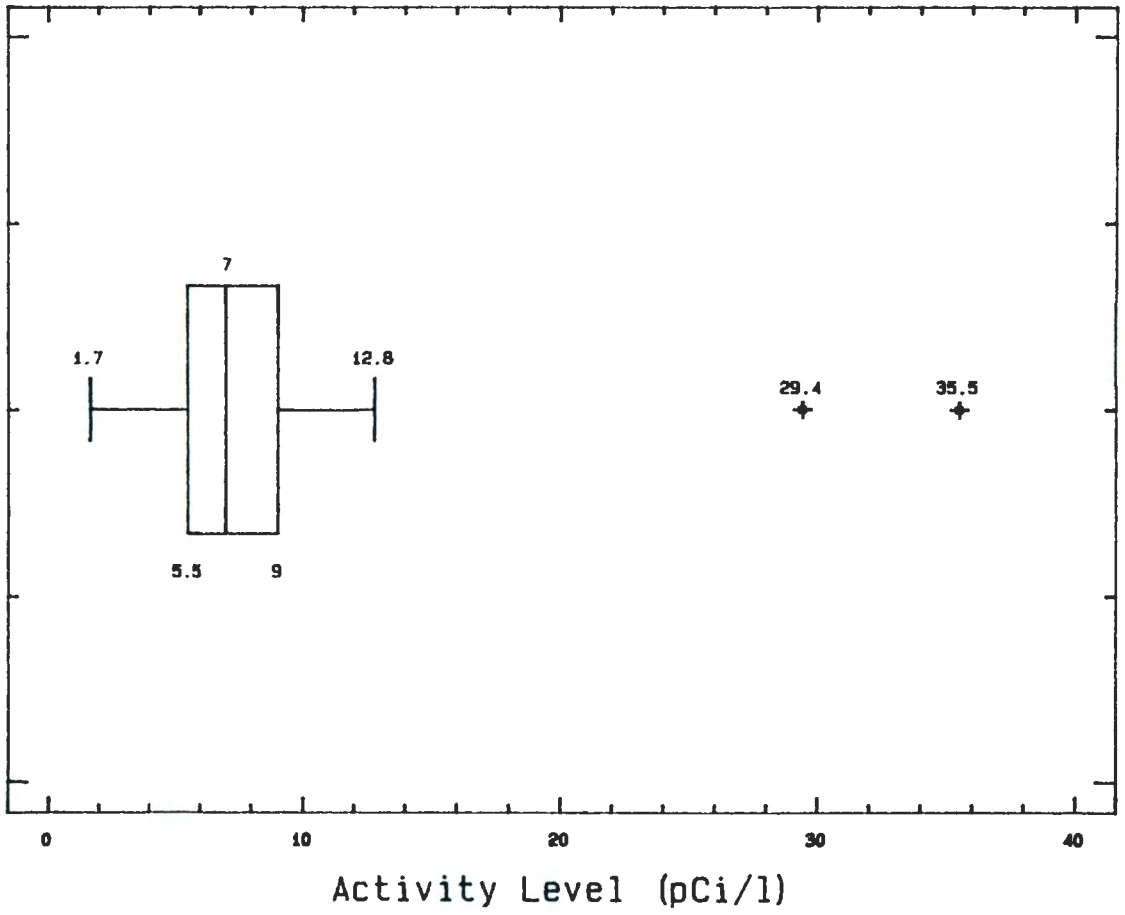
Est. Background Levels in Hanford GW
Gross Alpha (Delete Outlier)



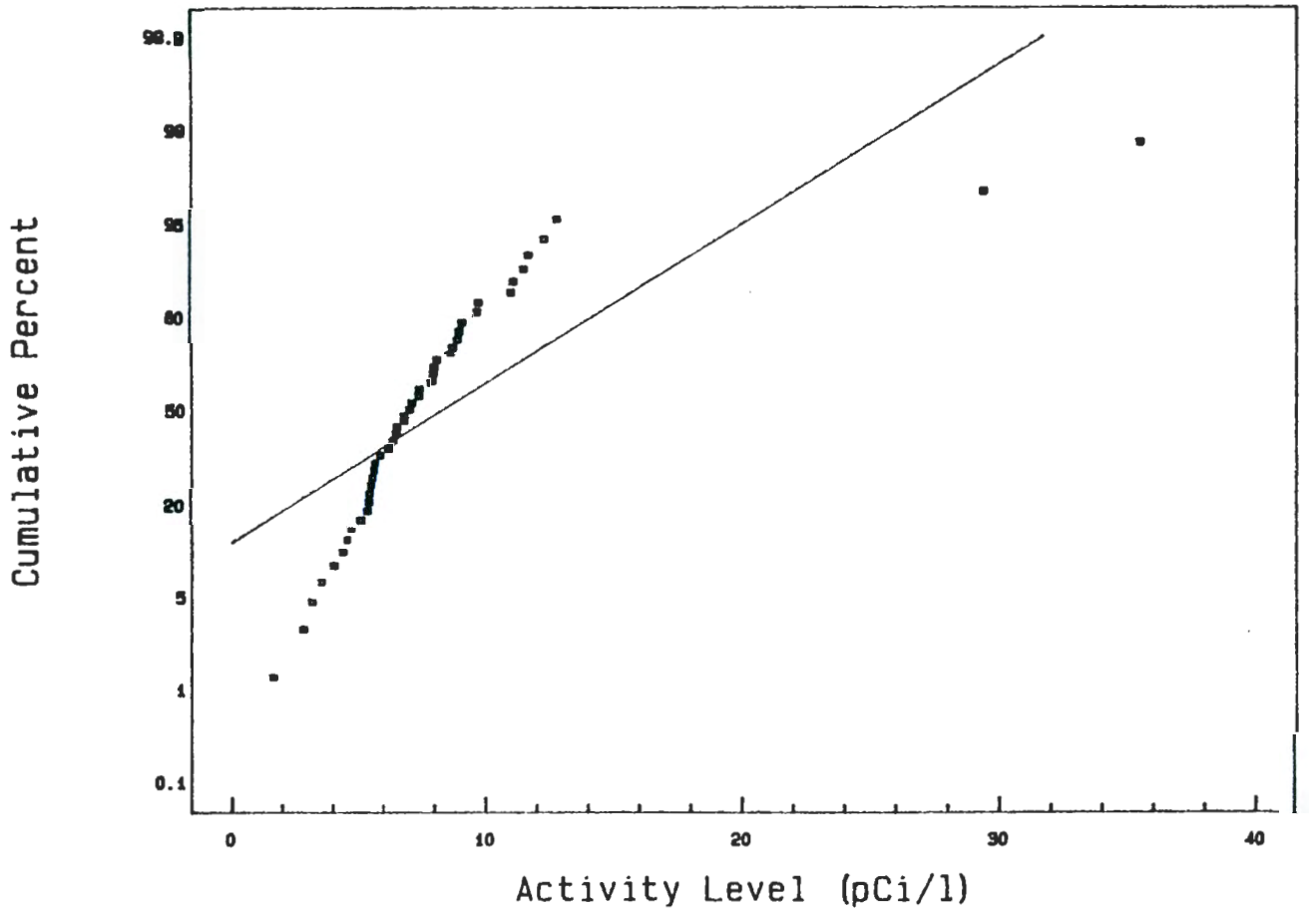

Normal Probability Plot
Gross Alpha (Delete Outlier)
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
2
4
6
8
Activity Level (pCi/l)

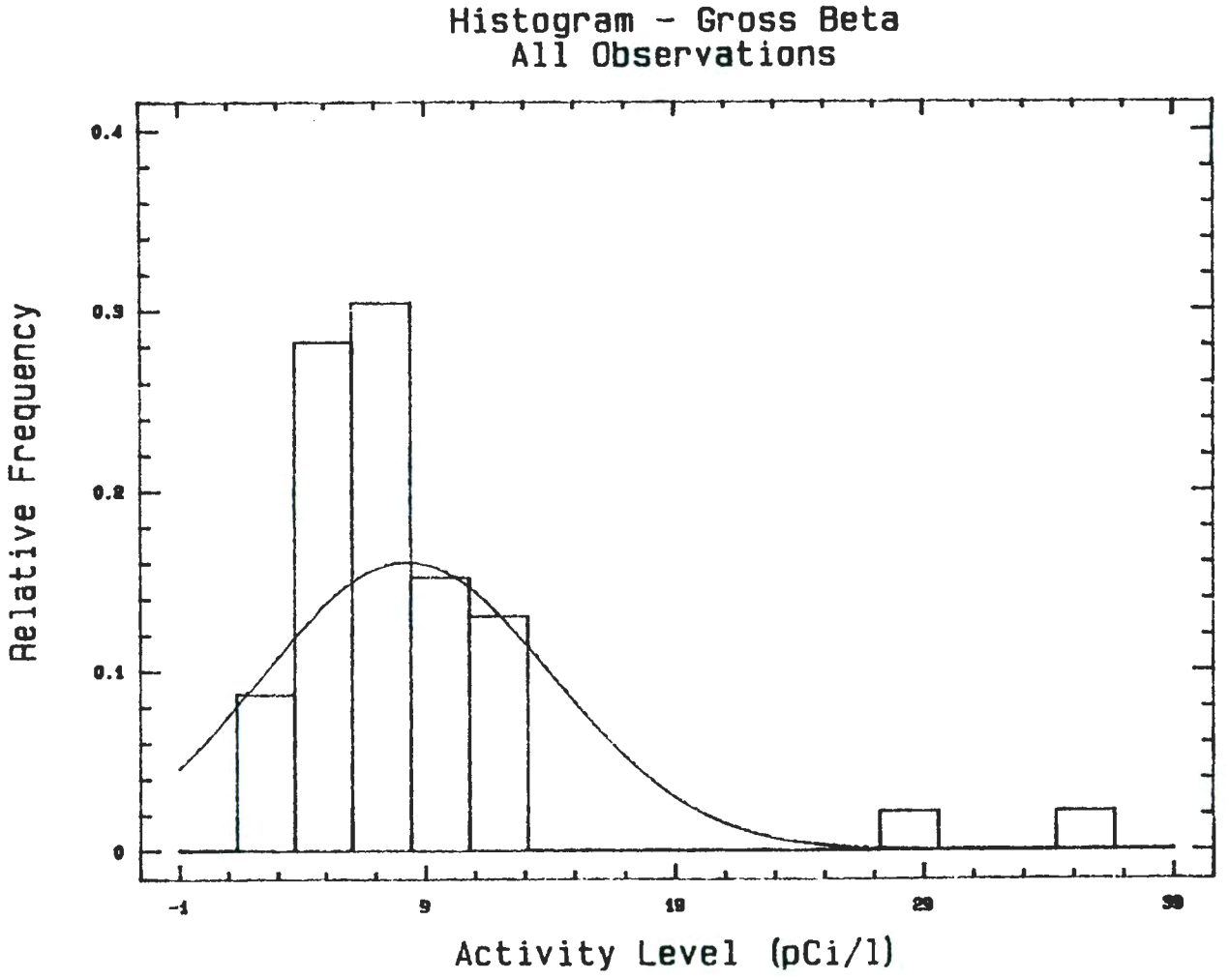

Histogram - Gross Alpha
Potential Outlier Removed
Relative Frequency
0.18
0.15
0.12
0.09
0.06
0.03
0
-1
1
3
5
7
9
11
Activity Level (pCi/l)

Est. Background Levels in Hanford GW
Gross Beta

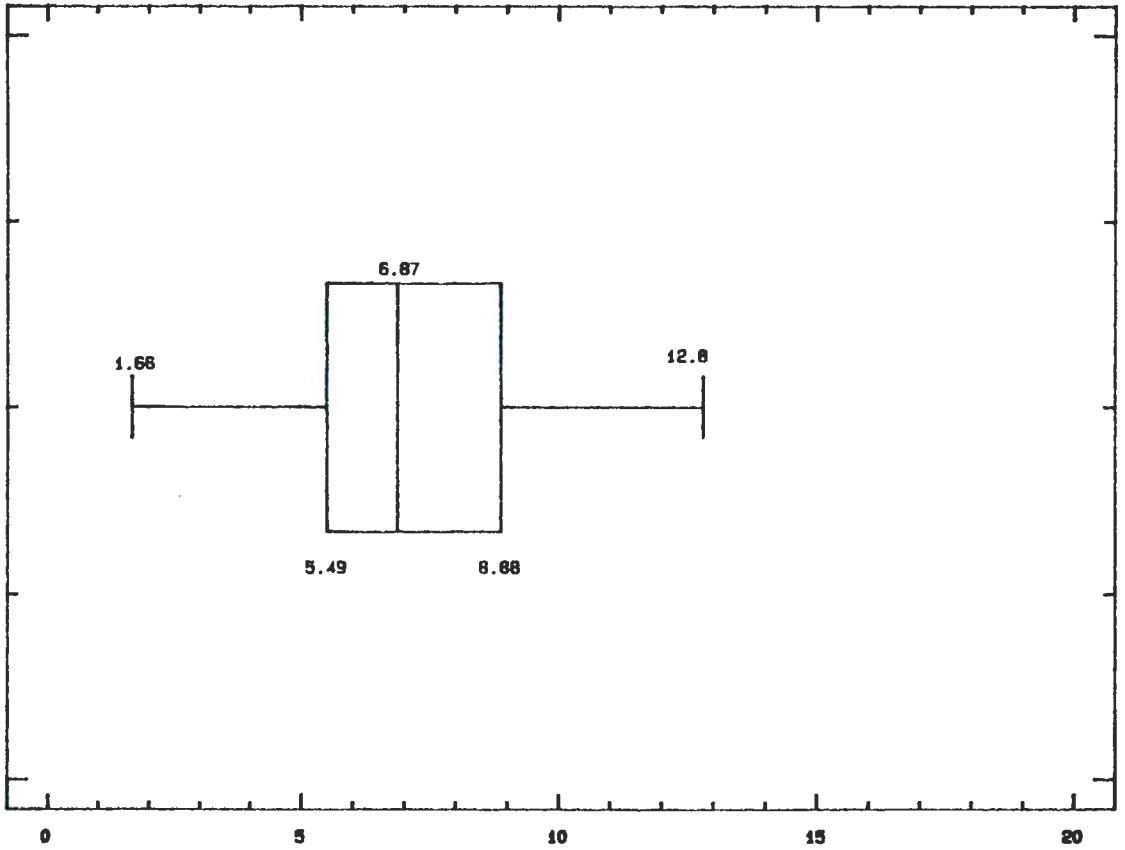


Normal Probability Plot
Gross Beta (All Data)

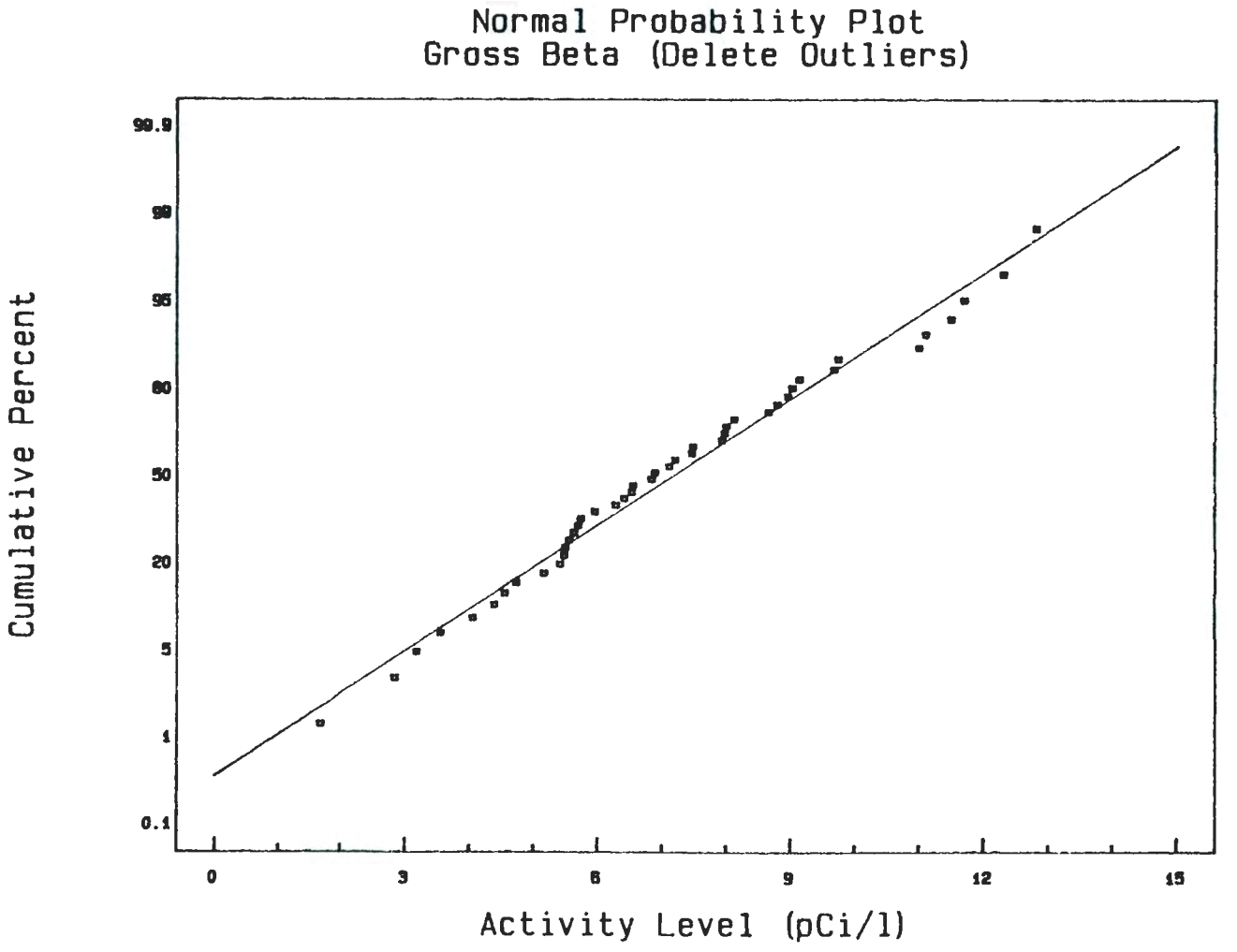


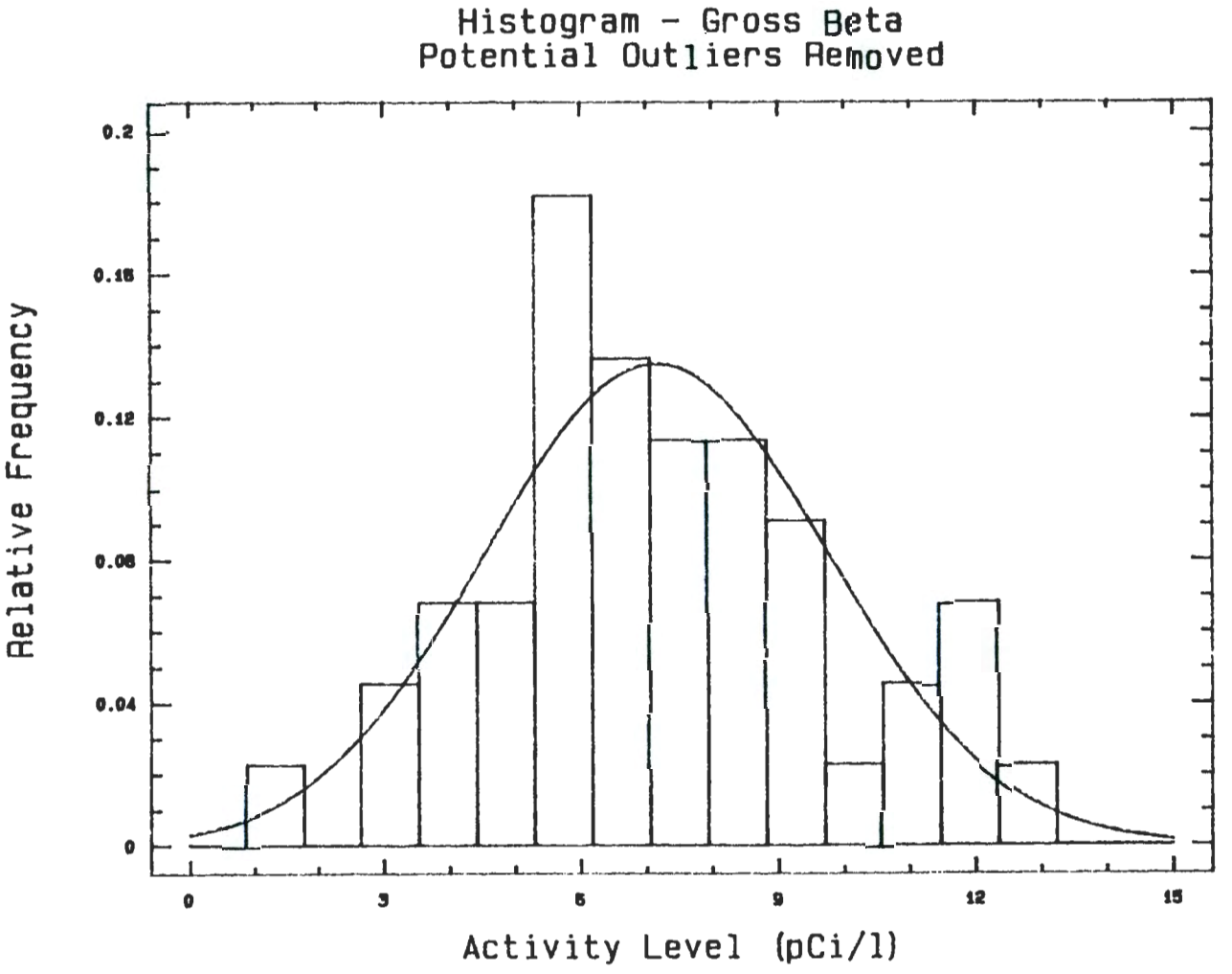

Histogram - Gross Beta
All Observations
Relative Frequency
0.4
0.3
0.2
0.1
0
-1
9
19
29
39
Activity Level (pCi/l)

Est. Background Levels in Hanford GW
Gross Beta (Delete Outliers)



Activity Level (pCi/l)


Normal Probability Plot
Gross Beta (Delete Outliers)
Cumulative Percent
99.9
99
95
80
50
20
5
1
0.1
0
3
6
9
12
15
Activity Level (pCi/l)


Histogram - Gross Beta
Potential Outliers Removed
Relative Frequency
0.2
0.16
0.12
0.08
0.04
0
0
3
6
9
12
15
Activity Level (pCi/l)

APPENDIX D

TO BE DETERMINED

9 2 1 2 6 5 1 4 7 5

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