Y-12

OAK RIDGE Y-12 PLANT

LOCKHEED MARTIN

EVALUATION OF CALENDAR YEAR 1996
GROUNDWATER AND SURFACE WATER
QUALITY DATA FOR THE
UPPER EAST FORK POPLAR CREEK
HYDROGEOLOGIC REGIME
AT THE
U.S. DEPARTMENT OF ENERGY Y-12 PLANT,
OAK RIDGE, TENNESSEE

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Prepared by

AJA TECHNICAL SERVICES, INC.
Under Subcontract No. 70Y-KDS15V

for the

Water Compliance Department
Environmental Compliance Organization
Oak Ridge Y-12 Plant
Oak Ridge, Tennessee 37831

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List of Acronyms and Abbreviations

ASO	Analytical Service Organization
Bear Creek Regime	Bear Creek Hydrogeologic Regime
BCV	Bear Creek Valley
bgs	below ground surface
BT	buried tributary
CA	characterization area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMP	Comprehensive Monitoring Plan
CMTF	Central Mercury Treatment Facility
CY	calendar year
DNAPLs	dense, nonaqueous phase liquids
DOE	U.S. Department of Energy
DQO	data quality objective
East Fork Regime	Upper East Fork Poplar Creek Hydrogeologic Regime
EMTF	East End Mercury Treatment Facility
ft	feet
GWPP	Groundwater Protection Program
GWPS	Groundwater Protection Standard Constituent
ICP	Inductively Coupled Plasma Spectroscopy
LRSPW	Lake Reality Spillway (sampling station)
MCL	maximum contaminant level (for drinking water)
MDA	minimum detectable activity
$\mu\text{g/L}$	micrograms per liter
mgd	million gallons per day
mg/L	milligrams per liter
msl	mean sea level
NPDES	National Pollution Discharge Elimination System
ORR	Oak Ridge Reservation
PCE	tetrachloroethene
pCi/L	picoCuries per liter
PMS	Plasma Mass Spectroscopy
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RPD	relative percent difference
SDWA	Safe Drinking Water Act
TCE	Trichloroethene
TDS	total dissolved solids
UEFPC	Upper East Fork Poplar Creek
UTL	upper tolerance limit

List of Acronyms and Abbreviations (cont'd)

VOC	volatile organic compound
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCE	1,2-dichloroethene
1,1,1-TCA	1,1,1-trichloroethane
⁴⁰ K	potassium-40
⁹⁹ Tc	technetium-99
²³⁴ U	uranium-234
²³⁸ U	uranium-238

1.0 INTRODUCTION

This report presents an evaluation of the groundwater monitoring data obtained in the Upper East Fork Poplar Creek Hydrogeologic Regime (East Fork Regime) during calendar year (CY) 1996. The East Fork Regime encompasses several confirmed and suspected sources of groundwater contamination within industrialized areas of the U.S. Department of Energy (DOE) Y-12 Plant in Bear Creek Valley (BCV) southeast of Oak Ridge, Tennessee (unless otherwise noted, directions are in reference to the Y-12 Plant administrative grid) (Figure 1). The CY 1996 groundwater and surface water monitoring data are presented in *Calendar Year 1996 Annual Groundwater Monitoring Report for the Upper East Fork Poplar Creek Hydrogeologic Regime at the U.S. Department of Energy Y-12 Plant, Oak Ridge, Tennessee*, along with the required data evaluations specified in the Resource Conservation and Recovery Act (RCRA) post-closure permit for the East Fork Regime (AJA Technical Services, Inc. 1997a). This report provides additional evaluation of the CY 1996 groundwater and surface water monitoring data with an emphasis on regime-wide groundwater contamination and long-term concentration trends for regulated and non-regulated monitoring parameters.

2.0 BACKGROUND INFORMATION

The East Fork Regime includes the section of BCV encompassing the Y-12 Plant industrial facilities and support structures located between Scarboro Road to the east of the plant and Old Bear Creek Road at the west end of the plant (Figures 1 and 2). For the purposes of this report, the regime is divided, as shown on Figure 2, into the Western Plant Area (west of the Y-12 Plant grid coordinate easting 55,000), the Central Plant Area (between grid coordinate eastings 55,000 and 62,000), and the Eastern Plant Area (east of grid coordinate easting 62,000). The following sections provide background information regarding confirmed and suspected sources of contamination, the groundwater flow system, and the surface water drainage characteristics in the regime.

2.1 Contaminant Source Areas

There are multiple confirmed and suspected sources of groundwater contamination within the East Fork Regime (Figure 2). These include hazardous and nonhazardous waste treatment, storage, or disposal sites; bulk product transfer, storage, and use areas; petroleum-fuel underground storage tanks and associated dispensing facilities; waste and product spill areas; and the many process pipelines, effluent drains, and utilities associated with the industrial operations at the Y-12 Plant (Table 1). Also, operation of the S-3 Ponds, a closed RCRA-regulated surface impoundment located in the Bear Creek Hydrogeologic Regime (Bear Creek Regime) near the west end of the Y-12 Plant, emplaced a large reservoir of contamination (the Eastern S-3 Ponds Plume) in the groundwater and bedrock (via matrix diffusion) in the Western Plant Area that is the only significant source of some contaminants (e.g., technetium-99 [^{99}Tc]) in the East Fork Regime.

2.2 Topography and Bedrock Geology

Bear Creek Valley is flanked to the north by Pine Ridge and to the south by Chestnut Ridge. Ground elevations range from about 1,300-feet (ft) above mean sea level (msl) on the ridge crests to 900-ft msl along the axis of BCV in the exposed channel of Upper East Fork Poplar Creek (UEFPC). The most prominent local topographic feature is the gap in Pine Ridge cut by UEFPC northeast of the Y-12 Plant (Figure 3). This gap roughly corresponds with a less prominent divide

in Chestnut Ridge to the southeast of the plant and may indicate some type of structural or stratigraphic discontinuity in the vicinity of Scarboro Road.

Alternating sequences of clastic and carbonate strata that form the distinctive topography of the Valley and Ridge Physiographic Province characterize the bedrock geology in the East Fork Regime. Shale and siltstone beds of the Rome Formation form Pine Ridge to the north, limestone and shale formations of the Conasauga Group form BCV, and the primarily dolostone formations of the Knox Group form Chestnut Ridge to the south (Figure 3). Strike and dip of bedding are generally N 55°E and 45°SE, respectively (as referenced to true north). Bedrock is overlain by up to 40-ft of several unconsolidated materials, including man-made fill, alluvium, colluvium, fine-grained residuum from the weathering of the bedrock, and saprolite (weathered bedrock). Where undisturbed, the saprolite often retains primary textural features of the unweathered bedrock, including fractures (Solomon *et al.* 1992).

Extensive cut-and-fill areas within the Y-12 Plant have substantially altered the shallow subsurface throughout much of the East Fork Regime (Figure 4). Most of the fill, which contains many voids and generally consists of a heterogeneous mixture of building debris and recompacted soil/residuum, was placed in the tributaries and main channel of UEFPC (Sutton and Field 1995). The numerous voids, heterogeneous composition, and varying thickness (5 to 25-ft) significantly influence shallow groundwater flow directions and contaminant migration patterns.

2.3 Groundwater System

On the Oak Ridge Reservation (ORR), the Rome Formation, the Conasauga Group, and the Knox Group comprise two basic hydrogeologic units: (1) the Aquifer, consisting of the Maynardville Limestone (upper Conasauga Group) and Knox Group, and (2) the Aquitard, consisting of the remaining Conasauga Group formations (Nolichucky Shale, Maryville Limestone, Rogersville Shale, Rutledge Limestone, and Pumpkin Valley Shale) and the Rome Formation (Figure 3). The Aquifer (Maynardville Limestone) functions as a hydrologic drain in BCV, and provides the principal avenues for contaminant transport in the East Fork Regime. The Aquitard formations underlie many of the contaminant source areas in the regime, and are hydraulically upgradient of the Aquifer.

Fractures provide the primary groundwater flowpaths in the Aquitard and the Aquifer, but dissolution of carbonates in the Aquifer has enlarged fractures and produced solution cavities and conduits that greatly enhance its hydraulic conductivity relative to the Aquitard. Although negligible in both units, flow through the porous rock matrix plays an important role in contaminant migration because of matrix diffusion processes. Most of the flow in both units is primarily parallel to bedding (along strike and dip), which in the Aquitard may or may not coincide with the direction of maximum horizontal hydraulic gradient inferred from groundwater elevation isopleths. Flow tangent to bedding occurs primarily along permeable zones formed by cross-cutting fractures or fracture zones (and possibly small faults). Some of these cross-cutting structures may act as barriers to lateral flow, causing groundwater from deeper intervals to upwell and discharge to the shallower flow system in each hydrogeologic unit. Others may serve as preferential pathways for migration of contaminants from the Aquitard into the Aquifer (Maynardville Limestone), particularly in the shallow flow system.

Nearly all groundwater flow in the Aquitard occurs within a highly permeable interval near the bedrock/residuum interface (the water table interval). Below the water table interval, flow is most active at depths less than 100-ft below ground surface (bgs); however, contaminants in groundwater more than 100-ft bgs clearly indicate permeable flowpaths at depth. Flow occurs in response to precipitation when flowpaths in the residual soils become saturated and rapidly transmit water laterally (stormflow) toward nearby drainage features, and vertically (recharge) to the water table interval. Inflow into the water table interval promotes strike-parallel groundwater flow toward discharge areas in nearby cross-cutting streams. Only a small percentage of total flow ultimately recharges to the deeper bedrock, where upward hydraulic gradients predominate.

Decreasing groundwater flux with depth in the Aquitard also is reflected by distinct changes in groundwater geochemistry. Most water table interval and shallow (<100-ft bgs) bedrock wells monitor calcium-magnesium-bicarbonate groundwater. In the Bear Creek Regime, a fairly abrupt change to sodium-bicarbonate groundwater occurs in the Aquitard at a depth of about 100-ft bgs, and is interpreted to be a function of longer groundwater residence time related to reduced fracture aperture or increased fracture spacing (Solomon *et. al.* 1992). Data for Aquitard wells in the East Fork Regime, however, indicate suggests a similar but shallower (<70-ft bgs) geochemical transition

to sodium-bicarbonate groundwater (AJA Technical Services, Inc. 1996). A shallower transition to this type of groundwater may be the net effect of comparably lower recharge because of the many paved and impervious surfaces in the regime, combined with dewatering of the shallow flow system from long-term operation of basement sumps in buildings throughout the Y-12 Plant. Data for deep Aquitard wells in the Bear Creek Regime indicate a transitional change from sodium-bicarbonate groundwater to sodium-chloride groundwater at a depth of about 400-ft bgs. This transition is usually accompanied by increased total dissolved solids (TDS) and also reflects reduced groundwater flux at depth in the Aquitard.

Most groundwater flow in the Aquifer occurs at shallow depths (<100 ft bgs) in an extensively interconnected maze of solution conduits and cavities (karst network). Flow in the shallow karst network is relatively rapid, and during rainfall, may occur as “quickflow” recharge/discharge toward springs or nearby surface drainage features (Shevenell 1994). Below the shallow karst network, fractures provide the primary flowpaths, and there are important lithologic controls on groundwater flow (Goldstrand 1995). Lithologic characteristics differentiate seven distinct stratigraphic zones (numbered from bottom to top) in the Maynardville Limestone. The more permeable zones lie at the bottom (Zone 2) and top (Zone 6) of the formation (Shevenell *et al.* 1993). Because of vugular porosity related to dissolution of gypsum nodules, Zone 6 is the most permeable interval and probably transmits the bulk of the groundwater in this formation (Goldstrand 1995).

Active groundwater circulation occurs at greater depth in the Aquifer than in the Aquitard, and is reflected by the fairly homogeneous geochemistry of the groundwater; virtually every monitoring well in the Maynardville Limestone, regardless of depth, monitors calcium-magnesium-bicarbonate groundwater. Several wells produce sulfate-enriched groundwater from the upper Maynardville Limestone resulting from dissolution of gypsum, and several deep wells monitor calcium-magnesium-sulfate groundwater with TDS above 1,000 milligrams per liter (mg/L).

The water table in the East Fork Regime, under both seasonally high and low flow conditions, is a subdued replica of the ground surface (Figure 5). Horizontal hydraulic gradients average about 0.038 across BCV (strike-normal) in the Aquitard, and about 0.011 along the axis of BCV (strike-parallel) in the Aquifer (Maynardville Limestone). Static water level data for several

two- and three-well clusters indicate that vertical hydraulic gradients are predominately upward in the Aquitard and downward in the Aquifer, and often reverse in response to seasonal (or episodic) groundwater flow conditions. Upward gradients in the Aquitard average about 0.05, and are highest (>0.2) in the northern Central Plant Area. Downward gradients are more common in the Aquifer, with the highest gradients (>0.5) indicated by data from well clusters in the Eastern Plant Area near New Hope Pond. Vertical gradients also are strongly downward from the water table interval to the shallow bedrock in Aquitard monitoring wells along Scarboro Road at the eastern boundary of the ORR. In the water gap through Pine Ridge (Rome Formation), gradients are strongly upward from the deeper to the shallow bedrock to the point where deep wells are artesian. Vertical gradients (and inferred groundwater flow patterns) in this area probably reflect the hydrologic influence of the bedrock structure associated with the gap in Pine Ridge.

In both the Western Plant Area and Central Plant Area, groundwater generally flows south (across-strike) from the Aquitard toward the Aquifer (Maynardville Limestone), and eastward along strike in the Maynardville Limestone toward the east end of the Y-12 Plant (Figure 5). Flow directions diverge from this general pattern near New Hope Pond in the Eastern Plant Area. In the Aquitard, flow is more directly east (strike parallel) toward UEFPC, and in the Aquifer, flow components are north toward the water gap in Pine Ridge, and east along strike toward Union Valley (Figure 5). Seasonal water table fluctuations, which are greatest (>10 -ft) in wells located along the steep northern flank of Chestnut Ridge (Table 2), do not significantly alter the directions of groundwater flow.

Basement sumps in several buildings within the Y-12 Plant significantly influence local groundwater flow directions. For instance, operation of sumps O-12, E-13, and E-22 in Building 9201-2, which is located near the southeast corner of the Central Plant Area, produces a northwest-southeast oriented zone of influence in the water-table beneath the building (Figure 5). The orientation of the zone of influence is largely controlled by the topography of the basement and the proximity of permeable fill material (Lockheed Martin Energy Systems, Inc. 1996). A partially elliptical, east-west oriented cone-of-depression produced by the O-12 Sump is located at the northwest end of the zone of influence and a persistent mound in the water table corresponding with the location of a spring discharging from the Maynardville Limestone is located at the southeast end

of the zone of influence. This mound probably restricts groundwater flow directly north from UEFPC toward the O-12 Sump, but the zone of influence may draw water northeast from the creek upstream of Building 9201-1 toward the sump (Lockheed Martin Energy Systems, Inc. 1996).

Groundwater flow directions in the Eastern Plant Area are periodically influenced when a 6-ft diameter, 20-ft deep sump is operated to reduce hydraulic pressure on the synthetic liner in Lake Reality. Water level data obtained from nearby water table and shallow bedrock monitoring wells during operation of the sump in July 1995 (Jago 1995) generally define an elongated water table depression in the Aquitard (Nolichucky Shale) oriented parallel with strike, and decreased water levels in the Aquifer (Maynardville Limestone) along the main channel of UEFPC (Figure 6). The elongated water-table depression in the Aquitard reflects greater strike-parallel permeability, and decreased water levels in the Aquifer indicates enhanced, cross-strike permeability along a fracture zone potentially associated with the UEFPC channel.

Shallow groundwater flow directions in the vicinity of New Hope Pond and Lake Reality are also influenced by an underdrain system beneath the concrete diversion channel of UEFPC. The underdrain consists of gravel with a slotted-plastic drain line. Data obtained during a short-term pumping test performed in May 1996 using a shallow, six-inch diameter well (GW-832) installed into the underdrain produced one foot of drawdown in the well after two hours of pumping at 60 gallons per minute. Water levels in the Lake Reality Sump also decreased in response to pumping, indicating a direct hydraulic connection between the underdrain and sump.

2.4 Surface Water System

Surface water in the East Fork Regime is drained by UEFPC, which was extensively modified during construction of the Y-12 Plant. The headwaters and several thousand feet of the main channel in the upper reach of the creek, including all the northern tributaries of the creek in the Western Plant Area and Central Plant Area, were filled and replaced with an extensive network of underground storm drains (Figure 4). For reference purposes, each buried tributary (BT) of UEFPC is designated with a value representing the tributary number counted downstream from the headwaters (e.g., BT-1).

The underground network of storm drains in the Western Plant Area and Central Plant Area direct surface runoff into the exposed portion of the UEFPC channel at a point (North-South Pipe, i.e., Outfall 200) about 3,500-ft upstream of Lake Reality (Figure 3). Lake Reality is a lined surface impoundment that serves to regulate the flow and quality of surface water exiting the Y-12 Plant. With a total surface area of about 2.5-acres, and an average water depth of 7-ft, Lake Reality contains approximately 6-million gallons of water during normal operations. Water enters Lake Reality from an extension of the New Hope Pond inlet diversion ditch, and exits through a weir in the western berm. From the outfall at Lake Reality, UEFPC flows north through a gap in Pine Ridge and exits the ORR. Flow in UEFPC will permanently by-pass Lake Reality in late 1997 or early 1998; a temporary by-pass operation using siphons began in December 1996 and continues to operate. Bypassing Lake Reality reduces mercury contributions to UEFPC during dry-weather flow. Under the new configuration, only a portion of flow from significant storm-events will pass through Lake Reality.

About 70% of dry-weather flow in UEFPC, excluding flow augmentation, is attributable to once-through non-contact cooling water, condensate, and cooling tower blowdown, and the remaining 30% is from groundwater discharge (CDM Federal Programs Corporation 1994). Beginning in July 1996, raw water (i.e., Clinch River water from the intake lines to the DOE water treatment plant that supplies potable water to the Y-12 Plant, ORNL, and City of Oak Ridge) has been discharged near Outfall 200 to augment flow in UEFPC, which decreased from 10-15 million gallons per day (mgd) to about 2.5 mgd because of reduced operations at the Y-12 Plant in recent years. Flow augmentation is needed to achieve the National Pollution Discharge Elimination System (NPDES) minimum daily flow requirement of 7 mgd at Station 17, where UEFPC exits the ORR downstream from Lake Reality. Flow augmentation also allows compliance with NPDES toxicity requirements and helps lower the otherwise elevated water temperature in UEFPC.

Beginning in December 1992, chlorine levels in UEFPC have been reduced using two primary dechlorination systems installed at Outfalls 200 and 21, and about 40 tablet dechlorinators installed on once-through cooling sources that discharge to other outfalls. Chlorine levels in UEFPC are maintained at essentially zero by the controlled addition of sodium bisulfate.

In addition to the dechlorinating operations, mercury levels in UEFPC have been reduced over the past several years under the Reduction of Mercury in Plant Effluent program, which was initiated to achieve compliance with NPDES permit requirements. As part of this program, the East End Mercury Treatment Facility (EMTF) began operating in May 1996, the Central Mercury Treatment Facility (CMTF) began operating in December 1996, and mercury-contaminated piping in Buildings 9201-2, 9204-4, 9201-5, and 9201-4 was replaced or by-passed, with clean water routed from mercury-contaminated basement sumps, and contaminated sump water routed to the CMTF or EMTF. Other projects planned for UEFPC, but not mandated by the NPDES permits, include treatment of mercury-contaminated water from Outfall 51, routing contaminated storm sewer flow to the CMTS, paving contaminated ground to prevent surface water infiltration, and permanent by-passing Lake Reality. These actions are intended to reduce mercury concentrations to meet the NPDES goals of 5 grams per day mercury load at Stations 17 by December 21, 1998, and 0.012 micrograms per liter ($\mu\text{g/L}$) by April 27, 2000. These mercury concentration goals are currently under appeal by DOE.

3.0 SAMPLING AND ANALYSIS SUMMARY

This section provides an overview of the CY 1996 groundwater and surface water sampling and analysis activities performed in the East Fork Regime (and Union Valley east of the ORR Boundary) under the auspices of the Y-12 Plant Groundwater Protection Program (GWPP), including brief descriptions of the sampling locations, sampling frequency, and field measurements/laboratory analytes. More detailed sampling and analysis information is provided in the *Sampling and Analysis Plan for Groundwater and Surface Water Monitoring at the Y-12 Plant during Calendar Year 1996* (HSW Environmental Consultants, Inc. 1995a), as amended in addenda issued throughout the year by the Y-12 Plant GWPP Manager.

3.1 Sampling Locations and Frequency

Groundwater and surface water samples were collected from a total of 82 monitoring wells, ten springs, and four surface water stations. Sampling locations are shown on Figure 7 and sampling dates are listed in Table 3. Sampling was performed for the multiple purposes of: (1) RCRA post-closure corrective action monitoring and RCRA interim status assessment monitoring; (2) the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigation (RI) for the UEFPC Characterization Area (CA); (3) DOE Order 5400.1 exit pathway/perimeter monitoring; (4) DOE Order 5400.1 surveillance monitoring; and (5) monitoring performed as a best management practice of the Y-12 Plant GWPP. As shown in the following summary, most (sixty) of the wells were sampled in compliance with DOE Order 5400.1; however, many monitoring wells were sampled under more than one program.

CY 1996 Monitoring Program	Number of Sampling Locations		
	Monitoring Wells	Springs	Surface Water Stations
RCRA Post-Closure Corrective Action Monitoring	6	.	.
RCRA Interim Status Assessment Monitoring	13	.	.
CERCLA RI Sampling	7	10	3
DOE 5400.1 Exit Pathway/Perimeter Monitoring	12	.	1
DOE Order 5400.1 Surveillance Monitoring	48	.	.
Best-Management Practice Monitoring	12		

Some of the sampling locations are outside the East Fork Regime, including one well (GW-115) in the Bear Creek Regime, and several wells, springs, and surface water stations east of the ORR boundary in Union Valley (Figure 7).

3.2 Sample Collection, Transportation, and Chain-of-Custody Control

Personnel from the Sampling and Environmental Support Department of the Analytical Services Organization (ASO) were responsible for collection, transportation, and chain-of-custody control of the groundwater samples. Sampling was performed in accordance with standardized Y-12 Plant GWPP technical procedures and protocols.

Groundwater samples were obtained from 23 monitoring wells using dedicated bladder pumps (Well Wizards). Samples from the remaining 59 monitoring wells were obtained using portable Bennet Pumps and disposable bailers (Table 4). Surface water samples were collected using grab sample bottles.

Filtered and unfiltered samples were collected from each monitoring well, spring, and surface water station. Groundwater samples collected with Well Wizards and Bennet Pumps were filtered in the field using in-line 0.45 micron filters. Surface water samples, and groundwater samples collected with bailers, were filtered in the laboratory. All samples were labeled, logged, placed in ice-filled coolers, and transported to the appropriate analytical laboratory in accordance with chain-of-custody control requirements.

Most laboratory analyses were performed by the ASO located at the East Tennessee Technology Park (formerly the Oak Ridge K-25 Site). Selected radiochemical analyses were performed by the Oak Ridge National Laboratory ASO and the Y-12 Plant ASO.

3.3 Field Measurements and Laboratory Analytes

Field personnel measured the depth to water before purging and sampling groundwater in each monitoring well. Sampling personnel also recorded field measurements of pH, temperature, specific conductance, dissolved oxygen, and oxidation-reduction potential for each sampling location. Most of the groundwater and surface water samples were analyzed for the following

standard suite of laboratory analytes: (1) principal cations (calcium, magnesium, potassium, and sodium) and anions (carbonate and bicarbonate alkalinity, chloride, fluoride, nitrate, and sulfate), (2) trace metals (the term used hereafter to differentiate metals which are typically minor constituents in groundwater from those that are major ionic species), (3) volatile organic compounds (VOCs), (4) gross alpha activity and gross beta activity, and (5) pH, specific conductance, TDS, total suspended solids, and turbidity (Table 4). Unfiltered samples were analyzed for all of these analytes; filtered samples were analyzed only for the principal cations and trace metals.

Some of the groundwater and surface water samples were analyzed for additional radiological parameters (Table 4). Groundwater samples collected from wells specified for RCRA post-closure corrective action monitoring were analyzed for selected radioisotopes, as were the groundwater samples collected as a best management practice of the Y-12 Plant GWPP. Additionally, the groundwater and surface water samples collected in support of the RI for the UEFPC CA were analyzed for several radioisotopes specified by the Y-12 Environmental Restoration Program. However, only the results for gross alpha, gross beta, and ^{99}Tc were evaluated for the purposes of this report.

4.0 DATA EVALUATION

An evaluation of the groundwater and surface water quality data reported for the network of CY 1996 sampling locations is presented in the following sections. This evaluation is organized by major groups of related analytes (principal ions, trace metals, VOCs, radiological parameters, and miscellaneous field and laboratory analytes). Analytical results that meet the data quality objectives (DQOs) of the Y-12 Plant GWPP, as defined in the *Y-12 Plant Groundwater Protection Program - Groundwater Monitoring Program Data Management Plan* (Martin Marietta Energy Systems, Inc. 1993), were included in the evaluation. A summary of the CY 1996 data qualified by the applicable DQO criteria is provided in Appendix C.

4.1 Principal Ions

Evaluation of the CY 1996 data for the principal cations and anions focused on quantitative results that indicate groundwater or surface water contamination. Principal ion results for each sampling location are quantitative if the ion charge balance error, expressed as the relative percent difference (RPD) between the summed milliequivalent concentrations of the dissolved cations (which exclude digested cations) and the total anions, does not exceed 10%. A total of twenty-one groundwater samples (including two duplicates) from one spring and twelve wells have ion charge balance errors of 10% or more, with the largest RPDs ($\pm 25\%$ or greater) evident for Aquifer wells GW-619 and GW-620. Ion charge balance errors for these samples reflect potential analytical errors or the geochemical influence of groundwater contaminants (AJA Technical Services, Inc. 1997a). Potential analytical errors identified as a result of the charge balance test are forwarded to ASO for resolution as part of data evaluation.

The principal ion data for the bulk of the groundwater and surface water samples obtained during CY 1996 are consistent with historical results and generally reflect the respective geochemical characteristics of the calcium-magnesium bicarbonate groundwater in the Aquitard (Figure 8) and the Aquifer (Figure 9). Results for the majority of sampling locations typically have: (1) calcium, magnesium, and bicarbonate concentrations above 75, 10, and 200 mg/L, respectively; (2) low molar proportions ($<10\%$) of chloride, potassium, sodium, and sulfate; (3) nitrate and fluoride below

1 mg/L; and (4) carbonate alkalinity below the analytical reporting limit (see Appendix C). However, the principal ion data for several Aquitard and Aquifer wells are distinguished by atypically high concentrations of chloride, nitrate, potassium, sodium, or sulfate. Some of these atypical concentrations reflect natural geochemical heterogeneity in each hydrogeologic unit, but many indicate groundwater contamination. Atypical principal ion data that most likely reflect groundwater or surface water contamination in the Western, Central, and Eastern plant areas (including Union Valley east of the ORR boundary) are described in the following discussion.

4.1.1 Western Plant Area

Significant variations from the typical calcium-magnesium-bicarbonate geochemistry of groundwater in the Aquitard and the Aquifer are indicated by the CY 1996 results for five wells in the Western Plant Area: Aquitard well GW-108 and Aquifer wells GW-251, GW-253, GW-619, and GW-620. The principal ion data for these wells are distinguished by unusually high chloride, nitrate, potassium, or sulfate concentrations, and reflect groundwater contamination from the Eastern S-3 Ponds Plume (nitrate and chloride), the S-2 Site (nitrate and chloride), and the Fire Training Facility (potassium).

The Eastern S-3 Ponds Plume is a principal source of groundwater contamination in the Western Plant Area. Nitrate is the primary component of the plume, with other constituents entrained in the acidic wastes (e.g., uranium) disposed at the site and elements dissolved from the saprolite and bedrock minerals (e.g., barium). Highly mobile and chemically stable in groundwater, nitrate effectively traces the transport pattern for all components of the Eastern S-3 Ponds Plume and essentially defines the maximum vertical and horizontal extent of contaminant migration in the Aquitard. The geometry of the nitrate plume in the Aquitard, as defined by the existing network of sampling locations, suggests primarily eastward, strike-parallel transport in the water table interval, shallow bedrock, and deeper bedrock toward the buried headwaters of UEFPC about 600-ft east of the S-3 Ponds and buried tributaries located about 1,800-ft (BT-1), 2,700-ft (BT-2), and 3,600-ft (BT-3) east of the site (Figure 10). The buried headwaters and tributaries provide highly permeable flowpaths that channel the nitrate-contaminated groundwater toward the Maynardville Limestone. Tributaries of UEFPC probably developed along cross-strike structures (e.g., fractures) in the

bedrock. Analogous cross-strike structures associated with tributaries of Bear Creek in the Bear Creek Regime promote upward migration of groundwater from the deeper flow system in the Aquitard, and downward migration from the shallow karst network in the Aquifer into the deeper bedrock (Science Applications International Corporation 1996). Similar groundwater flow (and contaminant transport) patterns in the Aquitard and Aquifer probably occur near bedrock structures associated with the buried tributaries of UEFPC.

As illustrated by the nitrate result (10,900 mg/L) reported for the sample collected from well GW-108 in November 1996, nitrate concentrations in the Aquitard are highest in the groundwater near the southern end of the Y-12 Plant Salvage Yard (Figure 10). This well is completed in the upper Nolichucky Shale at a depth of about 59-ft bgs. Extremely high nitrate concentrations in the groundwater at the well suggests greater contaminant flux along strike-parallel flowpaths that potentially subcrop beneath the S-3 Site. Historical nitrate data indicate a widely fluctuating but decreasing long-term concentration trend. The decreasing concentrations probably reflect reduced flux of nitrate (and other contaminants) following closure of the S-3 Ponds in CY 1984 and installation of a low permeability cap in CY 1989.

Very low nitrate levels in the shallow groundwater at the Waste Coolant Processing Area, as illustrated by CY 1996 results for Aquitard well GW-338 (0.7 to 1.12 mg/L), suggest that the bulk of Eastern S-3 Ponds Plume in the water table interval discharges into BT-1 about 400-ft west of the well (Figure 10). Additionally, long-term operation of basement sumps in Buildings 9204-4 and 9201-5 may have locally reduced nitrate concentrations in the shallow flow system, as well as induced upward migration of nitrate-contaminated groundwater from deeper in the bedrock (upwelling). Upwelling of nitrate from the Eastern S-3 Ponds Plume in the deeper bedrock may account for the very high (>1,000 mg/L) concentration in groundwater pumped from a sump near the southeast corner of the Building 9204-4 and western end of Building 9201-5 (Figure 10).

The S-2 Site is the source of the nitrate in the groundwater at Aquifer wells GW-251 (>70 mg/L) and GW-253 (>500 mg/L), with the higher concentration at the latter well indicating greater flux along strike to the east (Figure 10). Much higher chloride concentrations in the groundwater at well GW-253 (>80 mg/L) compared to GW-251 (<10 mg/L) also support greater contaminant flux to the east. Elevated sulfate concentrations in the groundwater at wells GW-251

(15 - 23 mg/L) and GW-253 (>50 mg/L) reflect contamination from the acidic wastes disposed at the S-2 Site, dissolution of sulfate from the bedrock, or both. Each well produces groundwater from the uppermost Maynardville Limestone (Zone 6) where, as noted in Section 2.2, dissolution of gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) has produced characteristically vugular porosity (Goldstrand 1995). As with sulfate, unusually high (>100 mg/L) calcium concentrations reported for each well also may reflect disposal operations or dissolution of gypsum (see Appendix C).

Although qualitative because all results had ion charge balance errors greater than $\pm 10\%$, the CY 1996 results for wells GW-619 and GW-620 show substantially higher potassium concentrations (10 - 20 mg/L) than typical of samples from all the other Aquifer wells (<5 mg/L). Samples from both wells also are characterized by unusually low bicarbonate alkalinity (<100 mg/L) and high pH (>10). Completed at respective depths of about 41-ft and 75-ft bgs, wells GW-619 and GW-620 produce groundwater from the upper Maynardville Limestone about 100-ft east (downgradient) of the Fire Training Facility (Figure 7). The atypical geochemistry of the groundwater samples from these wells may reflect contamination from grout circulated into the bedrock during their installation. Unlike most other wells at the Y-12 Plant that experienced similar grout contamination problems, however, purging and sampling has had little impact on the chemistry of the samples from either well; all but ten of fifty-two groundwater samples collected from these wells have ion charge balance RPDs that exceed 10%. Instead of grout contamination, the unusual geochemistry of the groundwater at wells GW-619 and GW-620 potentially reflects local influx of inorganic compounds (e.g., potassium bicarbonate) that may have been used to extinguish fires at the Fire Training Facility. One or more of these types of fire-extinguishing compounds (e.g., surfactants) are not included in a charge balance calculation, but may account for the ion charge balance errors typical of samples from these wells.

4.1.2 Central Plant Area

Significant variations from the typical geochemical characteristics of groundwater in the Aquitard are indicated by the CY 1996 chloride, nitrate, sodium, or sulfate results for ten Aquitard wells in the Central Plant Area: wells 55-1A, 55-1C, 55-2B, and 55-2C near Building 9201-5 and Comprehensive Monitoring Plan (CMP) grid wells (listed in order from west to east) GW-792 at

CMP Grid D2, GW-783 at CMP Grid E3, and GW-776 at CMP Grid H3 (Figure 7). Also, nitrate or sulfate concentrations reported for Aquifer wells GW-690, GW-691, GW-692 at the Coal Pile Trench, and GW-698 and GW-700 at Building 8110 probably reflect groundwater contamination. Potential sources of the inorganic contaminants include the Eastern S-3 Ponds Plume (nitrate), the S-2 Site (chloride, nitrate, and sulfate), the coal stockpile overlying the Coal Pile Trench (sulfate), and infiltration of surface runoff and/or leaks from subsurface drains, process lines, or sanitary sewers (chloride, sodium, and sulfate).

The CY 1996 nitrate results for samples collected from Aquitard wells 55-2B (117 mg/L) and 55-2C (118 mg/L) in June 1996 show relatively high concentrations in the water table interval (55-2B) and shallow bedrock interval (55-2C) about 500-ft east of the Waste Coolant Processing Area (Figure 10). This two-well cluster is located near the southwest corner of Building 9201-5. Nitrate concentrations in the groundwater at well 55-2C probably reflect eastward, strike-parallel migration of the Eastern S-3 Ponds Plume at least 75-ft bgs in the upper Nolichucky Shale. Eastward migration in the shallow bedrock is also indicated by the elevated concentrations of barium, boron, and strontium reported for the well (see Section 4.2.1).

Considering the substantially lower nitrate concentrations in the shallow groundwater at the Waste Coolant Processing Area (e.g., GW-338), the nitrate result for well 55-2B indicates either upward migration of nitrate from the deeper flow system east of BT-1, potential influx of nitrate from another source area, or both. This well produces nitrate-contaminated groundwater from less than 30-ft bgs, possibly from fill material within the buried tributary of UEFPC (BT-2) that underlies the west end of Building 9201-5 (Figure 4). Results obtained during CY 1994 show similar nitrate levels in basement sumps located near the northwest (>100 mg/L) and southwest (>300 mg/L) corners of this building (Figure 10). Pre-sampling water level elevations in well 55-2B (970.3-ft above msl) and well 55-2C (970.4-ft above msl) indicate only a slightly upward vertical hydraulic gradient (0.002), but water levels in the wells may have been influenced by operation of the basement sumps and stronger upward gradients may occur during seasonally (and episodically) high flow conditions. Nitrate concentrations in the groundwater at well 55-2B and the basement sumps in Building 9201-5 may be at least partially attributed to inflow from an upgradient source area directed southward through BT-2.

In light of the much lower sulfate concentrations within the Eastern S-3 Site Plume, as illustrated by CY 1996 data for well GW-108 (2.1 mg/L), elevated sulfate levels (>20 mg/L) reported for wells 55-2B and 55-2C also may indicate influx of inorganic contaminants directed southward through BT-2. Similarly elevated sulfate concentrations in the groundwater north and east these wells are indicated by CY 1994 data for basement sumps in Buildings 9201-5, which show higher maximum sulfate levels beneath the northern half (>90 mg/L) compared to the southern half (>40 mg/L) of the building (Figure 4).

Nitrate results for samples collected in June 1996 from wells 55-1A (13.8 mg/L) and 55-1C (2.94 mg/L) also may reflect migration from an upgradient source area rather than strike-parallel transport of nitrate from the Eastern S-3 Ponds Plume (Figure 10). These wells comprise a well cluster located about 200-ft northwest of Building 9201-5; water table interval well 55-1A is completed at a depth of 19.3-ft bgs (probably within the fill material in BT-2) and shallow bedrock well 55-1C is completed in the lower Nolichucky Shale about 76-ft bgs. Higher nitrate concentrations in the shallower groundwater at well 55-1A, along with the downward vertical hydraulic gradient (0.02) indicated by pre-sampling water-level elevations (976.05-ft and 974.85-ft above msl, respectively), suggest lateral transport of nitrate in the shallow flow system rather than upward migration from the bedrock. Elevated chloride (>80 mg/L) and sulfate (>25 mg/L) levels in the groundwater at each well show a similar relationship, with the higher concentrations of both ions reported for well 55-1A (see Appendix C). Chloride, nitrate, and sulfate concentrations in the groundwater at these wells may reflect groundwater transport through BT-2 from an upgradient source area, possibly a plume emplaced during operation of the (Abandoned) Nitric Acid Pipeline, which traverses BT-2 about 500-ft north of this well cluster (AJA Technical Services, Inc. 1996).

Chloride and sodium concentrations are typically below 10 mg/L in the calcium-magnesium-bicarbonate groundwater at shallow depths in the Aquitard and Aquifer. Infiltration of surface water containing dissolved salt used to de-ice nearby roads probably explains the elevated chloride (36.6 - 55.8 mg/L) and sodium (14 - 21 mg/L) concentrations reported for Aquitard well GW-783. This well is completed at a depth of 16.3-ft bgs in the Nolichucky Shale, with the top of the monitored interval only 3.6-ft bgs. Similarly elevated (>20 mg/L) chloride and/or sulfate concentrations

reported for shallow (< 30-ft bgs) wells GW-776 and GW-792 located near utility lines, indicate contamination from leaking industrial process lines or sanitary sewers.

Sulfur leached from the coal stockpile overlying the Coal Pile Trench is the most likely source of the very high sulfate concentrations reported for Aquifer wells GW-690 (471 mg/L), GW-691 (775 mg/L), and GW-692 (328 mg/L). These wells are completed in the lower Maynardville Limestone at depths of about 20-ft bgs (GW-691) and 53-ft bgs (GW-690 and GW-692) approximately 200-ft downgradient of the coal stockpile (Figure 7). Elevated sulfate levels in the upper Maynardville Limestone farther downgradient to the east, as indicated by CY 1996 results for wells GW-698 (35.8 - 36.1 mg/L) and GW-700 (>90 mg/L), probably reflect contamination from the coal stockpile (and/or the S-2 Site), dissolution of gypsum in the upper Maynardville Limestone, or a combination of both.

Eastward, strike-parallel transport of nitrate from the S-2 Site probably explains the elevated concentrations in the groundwater at well GW-698, as indicated by the nitrate results (>25 mg/L) reported for the duplicate samples collected from the well in June 1996 (see Appendix C). This Aquifer well produces nitrate-contaminated groundwater from 63 to 75-ft bgs in the upper Maynardville Limestone about 2,700-ft east of the S-2 Site (Figure 10). Strike-parallel transport in the upper Maynardville Limestone from the S-2 Site also seems likely considering the low nitrate concentrations reported for upgradient wells GW-690 (2.01 mg/L), GW-691 (<0.2 mg/L), and GW-692 (0.3 mg/L), each of which produce groundwater from the lower Maynardville Limestone. Also, the low nitrate concentrations reported for wells GW-690 and GW-692 suggest limited local influx of nitrate-contaminated groundwater from BT-3. It is possible that operation of the basement sumps near the east end of Building 9201-5 and the west end of Building 9201-4 effectively captures nitrate-contaminated groundwater that would otherwise discharge into BT-3.

4.1.3 Eastern Plant Area

Significant variations from the typical geochemical characteristics of groundwater in the Aquitard and the Aquifer are indicated by the CY 1996 results for sixteen Aquitard wells and ten Aquifer wells in the Eastern Plant Area, and three springs (SCR7.14SP, SCR7.16SP, SCR7.18SP) discharging from the Aquitard along Scarboro Creek in Union Valley about 2,300-ft east of the ORR

boundary (Figure 7). As shown in the following summary, the principal ion data for the wells are distinguished by unusually high (90th percentile of CY 1996 data) chloride (>50 mg/L), sodium (>50 mg/L), and/or sulfate (>30 mg/L) concentrations; data for two springs also indicate unusually high levels of these ions as well as potassium (>15 mg/L).

Sampling Point	Well Depth (ft bgs)	Hydrogeologic Unit		Principal Ion			
		Aquitard	Aquifer	Chloride	Potassium	Sodium	Sulfate
GW-148	11.1	.	●	●	.	.	●
GW-154	11.2	.	●	.	.	.	●
GW-222	25.0	.	●	.	.	.	●
GW-240	29.5	.	●	●	.	.	.
GW-380	15.5	.	●	●	.	●	.
GW-605	39.9	.	●	●	.	.	.
GW-748	27.2	●	.	.	.	.	●
GW-749	16.4	●	.	.	.	.	●
GW-752	15.9	●	.	●	.	.	●
GW-763	16.0	●	.	●	.	.	●
GW-817	23.0	●	.	.	.	.	●
GW-832	11.8	.	●	.	.	.	●
SCR7.14SP	.	●	.	●	●	●	.
SCR7.16SP	.	●	.	●	●	●	●
SCR7.18SP	.	●	.	●	.	●	●
GW-149	50.5	.	●	.	.	●	.
GW-223	90.5	.	●	.	.	.	●
GW-735	79.2	●	.	.	.	.	●
GW-207	109.6	●	.	.	.	.	●
GW-208	412.8	●	.	.	.	.	●
GW-230	406.4	.	●	●	.	●	.
GW-232	411.7	.	●	.	.	●	●
GW-385	178.7	●	.	.	.	●	.
GW-606	171.0	●	.	●	.	.	●

Results for the deeper wells (>100-ft bgs) probably reflect the heterogeneous geochemistry of groundwater in the geologic formations comprising the Aquifer and the Aquitard. Conversely, atypically high chloride, sodium, and sulfate concentrations reported for the shallower (<40-ft bgs) Aquitard and Aquifer wells probably reflect groundwater contamination from sources in the Y-12 Plant upgradient of New Hope Pond. Atypical concentrations in the shallow groundwater at these wells would be expected considering that the New Hope Pond lies in the discharge area for groundwater and surface water exiting the Y-12 Plant. Principal ion results for the specified springs

in Union Valley also seem unusual for shallow groundwater and probably reflect contamination from local sources unrelated to the Y-12 Plant.

Transport in groundwater and surface water from upgradient sources within industrialized areas of the Y-12 Plant probably explains the elevated chloride, sodium, and sulfate concentrations in the shallow groundwater upgradient and downgradient of New Hope Pond. Migration from the source areas is likely controlled primarily by hydraulic interaction between surface water in UEFPC and the shallow karst network in the Maynardville Limestone. Interaction with surface water in UEFPC also is indicated by evidence for a direct hydraulic connection with the Oil Skimmer Basin observed during the installation of wells GW-222 and GW-223 (Geraghty & Miller, Inc. 1989). Also, migration patterns are probably influenced by the underdrain system beneath the concrete diversion channel of UEFPC west and northwest of New Hope Pond, and intermittent operation of the Lake Reality Sump.

Although nitrate concentrations in the Eastern Plant Area remain well below the 10 mg/L maximum contaminant level (MCL) for drinking water, statistically-based trend analysis of historical nitrate data for several Aquifer wells indicate statistically significant increasing long-term concentration trends in shallow (<50-ft bgs) and deep (>200-ft bgs) bedrock east of New Hope Pond (Paradigm Data Services, Inc. 1996). For example, nitrate results for samples collected from well GW-151 in March (1.36 mg/L), June (1.37 mg/L), and July (1.36 mg/L) 1996 are almost three-times the concentration (0.5 mg/L) reported for the sample collected in January 1992. Furthermore, data from well GW-151 show consistently increasing nitrate concentrations from CYs 1992 (0.5 to 0.74 mg/L) through 1993 (0.7 to 1.0 mg/L), 1994 (0.99 to 1.2 mg/L), and 1995 (1.1 to 1.4 mg/L). Steadily increasing trends at low concentrations may foretell the leading edge of a nitrate plume or “pulse” of nitrate contamination.

Compared to the much less mineralized groundwater samples (TDS <300 mg/L) collected from nearby springs SCR7.1SP and SCR7.8SSP (see Appendix C), principal ion data reported for groundwater samples collected during CY 1996 from springs SCR7.14SP, SCR7.16SP, and SCR7.18SP are clearly distinguished by elevated chloride, potassium, sodium, or sulfate levels. Particularly high chloride (138 mg/L), sodium (96 mg/L), and potassium (65 mg/L) concentrations were reported for the groundwater sample collected from spring SCR7.14SP in March 1996. Lower

but comparably elevated chloride (26.3 and 27.9 mg/L) and sulfate (32.6 and 30.3 mg/L) were reported for samples from SCR7.16SP and SCR7.18SP in March and June 1996, respectively. Each of these springs discharge groundwater from the Aquitard (Nolichucky Shale) near the intersection of South Illinois Avenue and Union Valley Road (Figure 7). The principal ion results for these springs probably reflect local recharge of surface water containing dissolved road de-icing chemicals.

4.2 Trace Metals

Evaluation of the CY 1996 trace metal data focused on total (unfiltered) concentrations that meet applicable DQO criteria (AJA Technical Services, Inc. 1997a) and exceed the applicable upper tolerance limit (UTL) reported in *Determination of Reference Concentrations for Inorganic Analytes in Groundwater at the Department of Energy Y-12 Plant, Oak Ridge, Tennessee* (HSW Environmental Consultants, Inc. et al. 1995). The UTLs for each metal were determined from statistical analysis of CY 1986 - CY 1993 data for specific groups of Aquifer and Aquitard wells (i.e., clusters) differentiated by similar geochemical characteristics, and represent the maximum concentration expected in the groundwater monitored by the wells comprising each cluster.

The CY 1996 metal concentrations that exceed UTLs were reported for thirteen wells in the Western Plant Area; sixteen wells in the Central Plant Area; twenty-three wells, one spring, and one surface water sampling station in the Eastern Plant Area; and five wells and three springs in Union Valley east of the ORR boundary (Table 5). As noted in previous assessments of groundwater quality in the East Fork Regime, the bulk of these elevated trace metal concentrations are sporadic or reflect extraneous bias. Preservation of highly turbid unfiltered samples, corrosion of the stainless steel well screen, inherent analytical variability and analytical interferences, ambient levels in the deeper bedrock and similar low-yield intervals in the shallow bedrock, or a combination of one or more of these factors can bias sample results (HSW Environmental Consultants, Inc. 1992, 1993, 1994, 1995b; AJA Technical Services, Inc. 1996). The following sections describe the CY 1996 trace metal results for sampling locations in the Western, Central, and Eastern plant areas (including Union Valley) that, based on weight of evidence provided by historical data, most likely reflect groundwater contamination.

4.2.1 Western Plant Area

The Eastern S-3 Ponds Plume and the S-2 Site are the primary sources of trace metal contamination in the Western Plant Area. Acidic groundwater within each plume contains metal ions and/or ion-complexes that are mobile under a wide range of pH conditions (barium, boron, and strontium) as well as other metals that are relatively immobile in less acidic groundwater (cadmium, cobalt, copper, manganese, mercury, nickel, and uranium). Some of these metals (e.g., uranium) were entrained in the acidic wastes disposed at each site whereas others (e.g., barium) were dissolved from the underlying saprolite and bedrock. Maximum concentrations of several trace metals originating from each source area exceed applicable drinking water MCLs.

Analytical results reported for the sample collected from well GW-108 in November 1996 illustrate the very high barium (130 mg/L), manganese (130 mg/L), strontium (45 mg/L), and elevated uranium (0.016 mg/L) levels that are characteristic of the Eastern S-3 Ponds Plume near the southern boundary of the Y-12 Plant Salvage Yard (Figure 11). Also, this sample was diluted in the laboratory and the associated analytical reporting limits may mask elevated concentrations of other trace metals in the groundwater at the well. As with nitrate levels in the groundwater at well GW-108, the very high trace metal concentrations probably reflect a combination of eastward groundwater transport along strike-parallel flowpaths in the upper Nolichucky Shale that subcrop beneath the S-3 Site, and inflow of contaminated groundwater channeled southeast through the buried headwaters of UEFPC. Background levels of barium, manganese, strontium, and uranium in the groundwater farther east at the Waste Coolant Processing Area, as illustrated by CY 1996 data for Aquitard well GW-338, mirror the low nitrate levels in the shallow groundwater at the site and likewise indicate that the bulk of the Eastern S-3 Ponds Plume in the water table interval discharges into BT-1 to the west of the Waste Coolant Processing Area (AJA Technical Services, Inc. 1996).

The CY 1996 analytical results for wells GW-251 and GW-253 are consistent with respective historical data showing elevated concentrations of several trace metals, primarily cadmium (0.079 - 3.5 mg/L), copper (0.25 - 72 mg/L), cobalt (0.025 - 0.33 mg/L), and manganese (2.1 - 41 mg/L), in the Aquifer near the S-2 Site. Stable forms of these metals include oxides (copper and manganese) and carbonate compounds (cadmium and cobalt) that are potentially mobile in groundwater (Fetter 1993). As with nitrate and chloride levels in the groundwater at these wells, higher trace metal

concentrations reported for well GW-253 show greater contaminant flux to the east of the site. Data for each well suggest a relatively slow long-term decrease in trace metal concentrations. Total cadmium concentrations reported for well GW-253, for instance, decreased about 45% between March 1988 (6.5 mg/L) and June 1996 (3.5 mg/L). Assuming limited additional influx of contaminants from wastes remaining in the S-2 Site, elevated trace metal concentrations in the groundwater at both wells may primarily or increasingly reflect relative rates of matrix diffusion from the bedrock into the more permeable flowpaths (fractures and karst features) intercepted by each well. Seasonal (or episodic) flushing of contaminated groundwater is indicated by data for well GW-251 showing a frequently direct relationship between water-level elevations and total cadmium concentrations (Figure 12). These temporal concentration fluctuations may also indicate transport of cadmium in colloidal suspension.

Total and dissolved cadmium concentrations reported for Aquifer monitoring well GW-618 (0.02 - 0.021 mg/L) are consistent with historical data for the well and exceed both the applicable UTL (0.002 mg/L) and the 0.005 mg/L MCL for drinking water. Confirmed sources of cadmium in the Western Plant Area include the Eastern S-3 Ponds Plume and the S-2 Site. A nearby unidentified source is possible but seems unlikely considering that well GW-618 is about 40-ft deep and elevated cadmium concentrations are not observed in the groundwater at adjacent well GW-617 (which is about 18-ft deep). Long-term temporal concentrations indicated by total cadmium data for well GW-618 (Figure 12) show a generally decreasing trend between May 1990 and January 1993 followed by a generally stable or increasing trend punctuated by concentration “spikes” in September 1993 (0.03 mg/L), September 1995 (0.026 mg/L), and December 1995 (0.028 mg/L). The observed trend provides little insight regarding the source of the cadmium.

4.2.2 Central Plant Area

The CY 1996 trace metal concentrations that most likely indicate groundwater contamination were reported for six wells in the Central Plant Area (Figure 11): Aquitard well 55-2C at Building 9201-5 (barium, boron, and strontium), Aquitard wells GW-770 at CMP Grid G3 (boron) and GW-789 at CMP Grid F3 (boron), Aquifer wells GW-692 and GW-698 (mercury), and Aquifer well GW-193 at Tank 2331-U (uranium).

Elevated barium (1.1 mg/L), boron (0.047 mg/L) and strontium (2.4 mg/L) concentrations reported for Aquitard well 55-2C probably reflect groundwater transport of the most mobile trace metals within the Eastern S-3 Ponds Plume in the bedrock to the east of BT-1. As noted in Section 4.1.1, shallow bedrock well 55-2C is paired with water table interval well 55-2B and both yield nitrate-contaminated groundwater from the upper Nolichucky Shale and fill material within BT-2, respectively. In contrast to the similar nitrate levels reported for each well, however, results for well 55-2B indicate substantially lower barium (0.63 mg/L), boron (0.0072 mg/L), and strontium (0.6 mg/L) concentrations (none exceed the applicable UTL) than results for well 55-2C. This order-of-magnitude disparity between the barium, boron, and strontium concentrations possibly reflects dilution from localized inflow of nitrate-contaminated groundwater with lower trace metal concentrations.

Total boron concentrations reported for each of the groundwater samples collected from Aquitard wells GW-770 (0.061 - 0.099 mg/L) and GW-789 (0.075 - 0.08 mg/L) exceed the applicable UTL (0.041 mg/L). Both wells produce calcium-magnesium-bicarbonate groundwater from less than 25-ft bgs in the upper Nolichucky Shale. Boron is probably present in the groundwater as the borate $[B(OH)_3]$ ion, which is chemically stable and mobile in groundwater (Fetter 1993). The elevated concentrations reported for these wells probably indicate contamination from a boron-bearing industrial chemical (or associated waste) such as borax (i.e., hydrated sodium borate). Given the relative mobility of borate, the elevated boron concentrations in the groundwater at these wells may indicate migration from several potential sources within the Central Plant Area, including leaking subsurface drains and sanitary sewers. The source of the boron in the groundwater at well GW-770, however, may lie upgradient to the north (across strike) because the cone-of-depression in the water table created during operation of basement sumps in Building 9201-2 (see Section 2.3), which is about 250-ft southwest of the well, may capture borate (and other contaminants) from sources to the west (along strike) of the well.

Total mercury concentrations reported for Aquifer wells GW-692 (0.0008 mg/L) and GW-698 (0.0054 and 0.0055 mg/L) were the only CY 1996 mercury results to exceed the applicable UTL (0.0003 mg/L); the duplicate sample results for the latter well also exceed the 0.002 mg/L MCL for drinking water. Assuming they accurately reflect concentrations in the groundwater at each well

(few historical data are available), these results indicate groundwater transport of mercury from one or more upgradient source areas, including the many locations within the Y-12 Plant where substantial volumes of elemental mercury were routinely handled (Mercury Process Spill Areas).

The total uranium result (0.018 mg/L) for the unfiltered groundwater sample collected from well GW-193 in November 1996 is consistent with historical data for the well showing concentrations fluctuating between 0.009 and 0.09 mg/L. This well, located about 150-ft north of UEFPC and 300-ft west of Building 9201-2, produces calcium-magnesium-bicarbonate groundwater from less than 20-ft bgs in the lower Maynardville Limestone (Figure 7). Stable forms of uranium in the groundwater probably include uranyl cations (UO_2^{2+}), which tend to form complexes with a variety of anions, including carbonate, that may increase their relative mobility (Fetter 1993).

4.2.3 Eastern Plant Area

The CY 1996 trace metal data for monitoring wells in the Eastern Plant Area that most likely reflect contamination were reported for groundwater samples from Aquifer monitoring wells GW-154 (boron and uranium), GW-222 (uranium), GW-223 (uranium), GW-605 (uranium), and GW-832 (boron) (Figure 11). Similarly elevated boron and uranium concentrations were reported for surface water samples collected from the Lake Reality spillway (LRSPW) (Table 5). These results are generally consistent with historical data for each sampling location.

Elevated total boron concentrations that most likely represent groundwater contamination occur in the shallow groundwater and surface water near New Hope Pond. These results probably reflect transport from upgradient source areas in the Y-12 Plant and the Oil Skimmer Basin via hydraulic interaction between UEFPC and shallow groundwater in the Aquifer. Hydraulic communication with contaminated surface water in UEFPC is indicated by the elevated boron concentrations reported for: surface water station LRSPW (0.082 mg/L); upgradient well GW-154 (0.11 - 0.19 mg/L), which produces groundwater from a depth of 11-ft bgs adjacent to the current UEFPC channel; and upgradient well GW-832 (0.19 mg/L), which produces groundwater from the underdrain system about 12-ft beneath the concrete diversion channel of UEFPC. Consistently elevated boron concentrations reported for other wells in the Eastern Plant Area probably reflect

ambient levels in deeper (50-ft bgs) bedrock (e.g., GW-149, GW-207, GW-208, GW-605, GW-744, and GW-747).

The CY 1996 total uranium results are consistent with respective historical data showing elevated concentrations in the groundwater at wells upgradient and downgradient of New Hope Pond (Figure 11): water table interval well GW-154 (0.2 - 0.47 mg/L), shallow bedrock wells GW-222 (0.045 - 0.28 mg/L) and well GW-223 (0.012 - 0.2 mg/L), and deep bedrock well GW-605 (0.14 - 0.23 mg/L). Elevated uranium concentrations also were reported for both CY 1996 surface water samples obtained from the LRPSW (0.009 and 0.018 mg/L). The source(s) of the uranium is probably within the Central Plant Area, although the high concentrations (and gross alpha activities) in the shallow groundwater at wells GW-154 and GW-222 suggest that the former Oil Skimmer Basin may also be a common source of uranium in these wells.

Total uranium concentrations in the shallow groundwater at well GW-154 have decreased from more than 2 mg/L in January 1990 to 0.2 mg/L in August 1996 (Figure 13), probably as a direct response to closure of the Oil Skimmer Basin in 1988 and completion of the impermeable cap over New Hope Pond in 1989. More variable uranium concentrations in the groundwater at well GW-222, and the direct relationship with groundwater elevations in the well (particularly since November 1994) suggest flow-related concentration fluctuations (Figure 13) and a less direct response to closure of the Oil Skimmer Basin. Steadily increasing uranium concentrations in the groundwater at well GW-223, which exceeded the UTL for the first time in March 1996, indicate increased flux in the deeper groundwater flow system (Figure 13). Increasing uranium concentrations in the deeper groundwater at well GW-223 compared to the relatively steady concentrations in the shallower groundwater at well GW-222, in light of the hydraulic connection with the Oil Skimmer Basin observed during installation of these wells, also suggests increased flux of uranium in the deeper flow system. Increased flux of uranium in the deeper flow system is further indicated by the increasing long-term concentration trend indicated by uranium data (including CY 1996 results) for well GW-605 (AJA Technical Services, Inc. 1996).

4.3 Volatile Organic Compounds

Because of their relative mobility in groundwater and influx from multiple sources in the East Fork Regime, VOCs are the most pervasive groundwater contaminants in the Aquifer and the Aquitard. Groundwater transport patterns in both hydrogeologic units have produced a relatively continuous, commingled plume of dissolved VOCs extending south from the Aquitard in the Western and Central plant areas, and east in the Aquifer for at least 2,000-ft beyond the ORR boundary (Figure 14). Chloroethenes, primarily tetrachloroethene (PCE), trichloroethene (TCE), and 1,2-dichloroethene (1,2-DCE) are the principal plume components in the Western and Central plant areas, whereas chloromethanes (carbon tetrachloride and chloroform) and chloroethenes (primarily PCE) are the major plume components in the Eastern Plant Area (Figure 15). Concentrations of plume constituents exceed 1% of respective maximum solubilities and indicate the presence of dense, non-aqueous phase liquids (DNAPL) at several source areas, including the Waste Coolant Processing Area and unspecified source(s) of carbon tetrachloride upgradient of New Hope Pond. Vertical hydraulic gradients characteristic of the Aquitard in many areas indicate upward migration of VOC-contaminated groundwater, which provides further evidence of DNAPL in the subsurface.

The horizontal and vertical extent of dissolved VOCs in the Aquitard, as defined by the relatively limited well network in the East Fork Regime, suggest similar groundwater transport patterns as indicated by nitrate, with strike-parallel migration in the water table interval and shallow bedrock toward the headwaters and buried tributaries of UEFPC (Figure 14). Limited cross-strike migration in areas between these buried drainage features (and associated structures in the bedrock) is suggested by the apparently separate, strike-oriented plume of dissolved chloroethenes in the shallow groundwater at the Salvage Yard Drum Deheader. The horizontal and vertical extent of dissolved VOCs in the Aquifer generally reflects: (1) inflow of VOC-contaminated groundwater from the sources in the Aquitard (primarily via discharge from the buried tributaries of UEFPC); (2) direct influx of VOCs from sources overlying the Maynardville Limestone; and (3) eastward (strike-parallel) transport in the shallow karst network and deeper bedrock toward the Eastern Plant Area.

Evaluation of the CY 1996 data with regard to VOC source areas and inferred groundwater transport patterns in the East Fork Regime was based on the maximum summed VOC concentrations

determined for each sample from each well, spring, and surface water sampling station. Less-than-reporting limit results were assumed to equal zero for the purposes of calculating the summed VOC concentrations. Zero likewise served as the surrogate value for sixty-one false positive VOC results, most of which are for common laboratory reagents (acetone and 2-butanone) that are not components of the dissolved VOC plumes in the East Fork Regime (AJA Technical Services, Inc. 1997a). Evaluation of the CY 1996 VOC results for sampling locations in the Western, Central, and Eastern plant areas are described in the following sections.

4.3.1 Western Plant Area

Excluding false positive results, VOCs were detected in at least one groundwater sample collected from the following eight wells in the Western Plant Area (Figure 14): Aquitard wells GW-108 and GW-192, and Aquifer wells GW-251, GW-253, GW-617, GW-618, GW-619, and GW-620 (Table 6). Summed concentrations of VOCs detected in the groundwater samples from these wells range from 13 µg/L (GW-617) to 3,791 µg/L (55-2C). As shown in the following summary, maximum concentrations at seven wells exceed drinking water MCLs for PCE, TCE, vinyl chloride, methylene chloride, and carbon tetrachloride.

Monitoring Well	Maximum Concentration (µg/L)				
	PCE	TCE	Vinyl Chloride	Methylene Chloride	Carbon Tetrachloride
GW-108	<MCL	<MCL	<MCL	53	<MCL
GW-251	190	76	<MCL	<MCL	<MCL
GW-253	510	310	16	<MCL	18
GW-617	7	6	<MCL	<MCL	<MCL
GW-618	9	21	<MCL	<MCL	<MCL
GW-619	48	12	<MCL	<MCL	<MCL
GW-620	210	64	<MCL	<MCL	<MCL
MCL	5	5	2	5	5

Results for these wells reflect groundwater transport of VOCs from the following source areas: Eastern S-3 Ponds Plume (GW-108), the Oil/Solvent Drum Storage Area and/or Salvage Yard Drum Deheader (GW-192), the S-2 Site (GW-251 and GW-253), the Fire Training Facility (GW-619 and GW-620), and a combination of these and other confirmed (Waste Coolant Processing Area) and unspecified sources of VOCs in the Western Plant Area (GW-617 and GW-618).

The summed concentration of VOCs detected in the groundwater sample collected in November 1996 from well GW-108 (102 µg/L) illustrates the substantially lower concentrations of VOCs compared to other components (e.g., nitrate) of the Eastern S-3 Ponds Plume. Relatively low VOC concentrations probably reflect a combination of the smaller volume of organic wastes disposed at the site, greater attenuation in the subsurface, and lower relative mobility in the groundwater. The lack of VOCs in the groundwater at well GW-338 (see Appendix C), along with the low nitrate and trace metal concentrations noted previously, also indicates that the bulk of the Eastern S-3 Ponds Plume in the water table interval discharges into BT-1 west of the Waste Coolant Processing Area (Figure 14).

Eastward, strike-parallel groundwater transport from the Oil/Solvent Drum Storage Area and/or Salvage Yard Drum Deheader is the suspected source of the chloroethenes (primarily 1,2-DCE) in the groundwater at well GW-192 (AJA Technical Services, Inc. 1996). This water-table interval well (17-ft bgs) comprises a well cluster with shallow bedrock well GW-191 (60-ft bgs) in the Maryville Limestone east of the Beta-4 Security Pits. The CY 1996 results for each well are consistent with respective historical data showing 1,2-DCE concentrations between 5 and 35 µg/L in the groundwater at well GW-192, but no detection of VOCs in the groundwater at well GW-191 (see Appendix C). Additionally, pre-sampling groundwater elevations in these wells indicate vertically upward hydraulic gradients (0.07 - 0.09) from the shallow bedrock to the water table interval during seasonally high and low groundwater flow conditions. Considering the upward hydraulic gradients and the lack of VOCs in the groundwater at well GW-191, the presence of chloroethenes in the groundwater at well GW-192 suggests strike-parallel transport in the water table interval toward discharge areas in the upper reach of BT-1, which probably passes beneath (or through) the Beta-4 Security Pits and channels the VOC-contaminated groundwater to the south (AJA Technical Services, Inc. 1996).

The Fire Training Facility is the farthest upgradient source of VOCs in the Aquifer in the East Fork Regime (Figure 14), and a source of chloroethenes (primarily PCE and 1,2-DCE) in the Western Plant Area (Figure 15). Maximum summed concentrations of chloroethenes detected in samples collected during CY 1996 from Aquifer monitoring wells GW-619 (77 µg/L) and GW-620 (444 µg/L) reflect strike-parallel groundwater transport in the upper Maynardville Limestone to east

of the site. The higher concentrations in the deeper groundwater at well GW-620 (75-ft bgs) indicate vertically downward migration. Results for these wells are consistent with respective historical data and continue to show decreasing chloroethene concentrations in the groundwater at each well and an inverse correlation with water levels. The downward trend suggests reduced contaminant flux from the Fire Training Facility, and the inverse relationships with groundwater elevations suggests dilution from recharge of less contaminated groundwater (Figure 16).

Data obtained during CY 1996 show several chloroethenes (primarily PCE, TCE, and 1,2-DCE) and chloromethanes (carbon tetrachloride and chloroform) in the shallow groundwater at S-2 Site wells GW-251 and GW-253 (Figure 14). As noted previously regarding principal ion and trace metal concentrations in the groundwater at the S-2 Site, substantially higher summed VOC concentrations are observed in the groundwater at well GW-253 (1,024 µg/L) compared to GW-251 (284 µg/L) suggesting greater contaminant flux in the upper Maynardville Limestone (Zone 6) to the east. Results for both wells also show decreasing long-term concentration trends. For example, the maximum summed concentration of VOCs detected in samples from well GW-251 (284 µg/L) reflects a decrease of about 57% from results for samples collected from the well during CY 1991 (660 µg/L). Strike-parallel groundwater transport of VOCs from the S-2 Site may also contribute to chloroethene concentrations in groundwater from wells in the upper Maynardville Limestone farther downgradient to the east of the site (e.g., GW-698).

Maximum summed concentrations of PCE, TCE, and 1,2-DCE reported for groundwater samples collected during CY 1996 from Aquifer wells GW-617 (13 µg/L) and GW-618 (82 µg/L) are consistent with respective historical data. Results for well GW-617 indicate widely fluctuating temporal trends and consistently inverse relationships between summed VOC concentrations and pre-sampling groundwater elevations (Figure 17). Results for well GW-618 show similar temporal concentration changes but a less consistent relationship with pre-sampling groundwater elevations (Figure 17). The particular source of the chloroethenes in the groundwater at these wells has not been determined. Numerous potential upgradient source areas exist including the S-2 Site and Fire Training Facility in the Aquifer, and the Waste Coolant Processing Area and Eastern S-3 Ponds Plume in the Aquitard.

4.3.2 Central Plant Area

Excluding false positive results, VOCs were detected in at least one groundwater sample collected from eighteen wells in the Central Plant Area (Figure 14). These wells include aquitard wells at Building 9201-5 (55-2B and 55-2C), CMP Grid D2 (GW-791 and GW-792), CMP Grid E3 (GW-782 and GW-783), CMP Grid F3 (GW-789), CMP Grid G3 (GW-769 and GW-770), and CMP Grid H3 (GW-775 and GW-776); and Aquifer wells at the Coal Pile Trench (GW-690, GW-691, and GW-692), Building 8110 (GW-698 and GW-700), Tank 2331-U (GW-193), and the Uranium Oxide Vault (GW-218) (Table 6). Summed concentrations of VOCs detected in the groundwater samples from these wells range from 3 µg/L (GW-789) to 3,791 µg/L (55-2C) and, as shown in the following summary, maximum concentrations in groundwater at 13 wells exceed drinking water MCLs for benzene, PCE, TCE, 1,1,-dichloroethene (1,1-DCE), vinyl chloride, and carbon tetrachloride.

Monitoring Well	Maximum Concentrations (µg/L)					
	Benzene	PCE	TCE	1,1-DCE	Vinyl Chloride	Carbon Tetrachloride
55-2B	<MCL	550	300	42	38	<MCL
55-2C	<MCL	640	350	<MCL	<MCL	<MCL
GW-193	270	<MCL	<MCL	<MCL	<MCL	<MCL
GW-690	<MCL	720	26	<MCL	<MCL	<MCL
GW-691	<MCL	120	7	<MCL	<MCL	<MCL
GW-698	<MCL	6	11	<MCL	<MCL	<MCL
GW-700	<MCL	360	15	<MCL	<MCL	<MCL
GW-769	<MCL	8	<MCL	<MCL	<MCL	6
GW-775	<MCL	<MCL	6	<MCL	<MCL	<MCL
GW-782	<MCL	270	69	56	5	6
GW-783	<MCL	59	23	8	<MCL	<MCL
GW-791	<MCL	1,400	6	<MCL	<MCL	<MCL
GW-792	<MCL	11	<MCL	<MCL	<MCL	<MCL
MCL	5	5	5	7	2	5

Results for the groundwater samples collected from wells 55-2B and 55-2C in June 1996 are consistent with respective historical data showing a plume of dissolved chloroethenes and chloroethanes dominated by 1,2-DCE (>2,000 µg/L), PCE (>500 µg/L), and TCE (>300 µg/L) with lesser amounts (<50 µg/L) of 1,1-DCE, 1,1,1-trichloroethane (1,1,1-TCA), 1,1,-dichloroethane

(1,1-DCA), and vinyl chloride (Table 6). Dissolved components (and degradation products) of the DNAPL in the Aquitard at the Waste Coolant Processing Area seems a likely source of the VOCs in the groundwater at these wells. Historical results show that the dissolved plume of VOCs in the shallow groundwater at the Waste Coolant Processing Area is characterized by significantly higher but proportionally similar concentrations of each compound detected in the groundwater samples from wells 55-2B and 55-2C. Based on groundwater flow/contaminant transport patterns in the Aquitard as indicated by nitrate from the S-3 Ponds, the CY 1996 results for wells 55-2B and 55-2C demonstrate eastward, strike-parallel groundwater transport of VOCs from the Waste Coolant Processing Area toward the buried tributary of UEFPC (BT-2) between buildings 9204-4 and 9201-5 (Figure 14).

Building 9212 is the suspected source of the PCE in the groundwater at shallow bedrock well GW-791 (71-ft bgs) and water table well GW-792 (29-ft bgs). Maximum PCE concentrations reported for well GW-791 ($>1,000 \mu\text{g/L}$) exceed 1% of maximum solubility and suggest the presence of DNAPL in the subsurface. Much lower PCE concentrations reported for well GW-792 (5 - 11 $\mu\text{g/L}$) probably reflect dilution of the PCE-contaminated groundwater discharging upward from the shallow bedrock (pre-sampling water-level elevations in these wells indicate consistently upward hydraulic gradients). The CY 1996 PCE concentrations for well GW-792 are substantially lower than historical results. The lower results may likewise reflect dilution rather than reduced contaminant flux in the shallow bedrock (Figure 18), because groundwater elevations throughout the year were about 3-ft higher than previously recorded. The presence of dissolved PCE in the groundwater at wells GW-791 and GW-792 suggest upward migration from the shallow bedrock, and probable migration along buried utility lines south of Building 9212.

Data for groundwater samples collected in CY 1996 from wells GW-782 (30-ft bgs) And GW-783 (10-ft bgs) are consistent with historical results showing the continued occurrence of chloroethenes, chloroethanes, and chloromethanes in the Aquitard. Tetrachloroethene, 1,2-DCE, TCE, 1,1,1-TCA, and 1,1-DCA are the principal VOCs detected in the samples from these wells (Table 6). Maximum summed VOC concentrations are substantially higher in the groundwater at GW-782 (632 $\mu\text{g/L}$) than in the groundwater at GW-783 (147 $\mu\text{g/L}$). In light of the dominantly upward hydraulic gradients indicated by pre-sampling groundwater elevations (Figure 19), VOC concentrations in the groundwater at these wells probably reflect influx via upward migration from

the deeper bedrock. The general lack of VOCs in the groundwater at bedrock well GW-781 (no VOCs were detected in samples collected during CY 1996) suggests that the screened interval for the well (56.0 - 62.7-ft bgs) is below the primary transport pathways intercepted by well GW-782 (assuming a dip of 45°). Also, long-term concentration trends indicated by the historical data for wells GW-782 and GW-783 suggest that dilution from inflow of relatively uncontaminated groundwater (i.e., resulting from storm events), rather than temporal changes in contaminant flux, produce concentration fluctuations (Figure 19). Either extensive dilution and/or limited strike-parallel transport of VOCs in the shallow groundwater to the east of these wells is suggested by the trace levels of VOCs (<5 µg/L) in the groundwater at CMP Grid F3 well GW-789 (Figure 14).

Maximum summed concentrations of VOCs (chloroethenes and/or chloromethanes) detected in the groundwater samples collected during CY 1996 from Aquitard wells GW-769 (18 µg/L), GW-770 (8 µg/L), GW-775 (6 µg/L), GW-776 (5 µg/L), and GW-789 (3 µg/L) are consistent with historical data. Although source areas are currently unspecified, nearby bulk transfer/handling areas along a railroad spur, historical process areas, and the former Z-Oil distribution system all may be sources of VOCs in the groundwater.

Influx from multiple source areas potentially explains the presence of chloromethanes and chloroethenes in the groundwater at shallow bedrock well GW-769 (60-ft bgs) and water table well GW-770 (19-ft bgs). Vertically upward hydraulic gradients and higher carbon tetrachloride and PCE concentrations in the groundwater at well GW-769 compared to well GW-770 suggest upward inflow of VOC-contaminated groundwater from shallow bedrock into the water table interval (Figure 20). Long-term concentration trends also show an apparent “pulse” of carbon tetrachloride (GW-769 and GW-770) and PCE (GW-769) between mid-1994 and late-1995 corresponding with a generally similar trend in the pre-sampling groundwater elevations in each well. In contrast, higher chloroform concentrations in the groundwater at well GW-770 compared to well GW-769, and the generally direct relationship between chloroform concentrations and groundwater elevations in the well, suggest lateral groundwater transport in the water table interval rather than upward migration from the bedrock (Figure 20). As noted in Section 4.2.2, the basement sumps in Building 9201-2 locally influence groundwater flow and contaminant transport patterns to the west and southwest of the wells, which suggests that the source(s) of VOCs (and boron) is probably north of the wells. Potential sources north of these wells include Buildings 9202, 9203, and 9205 where large amounts

of carbon tetrachloride were used to convert uranium trioxide to uranium tetrachloride (Chemrisk 1993).

Summed concentrations of chloroethenes (primarily PCE) detected in the groundwater samples collected in June 1996 from shallow bedrock well GW-690 (790 µg/L) and water table interval well GW-691 (154 µg/L) are substantially higher than evident for upgradient Aquifer wells GW-617 and GW-618 and suggest local influx of VOCs from the Coal Pile Trench or other nearby upgradient source area(s). The disparity between VOC results for these wells may also reflect inflow of VOC-contaminated groundwater discharged from BT-2 about 450-ft downgradient (east) of wells GW-617 and GW-618 (Figure 14). Additional influx of VOCs downgradient of wells GW-690 and GW-691, possibly from inflow of contaminated groundwater discharged from BT-3 into the lower Maynardville Limestone about 200-ft east of these wells, is indicated by the summed concentrations of chloroethenes (PCE, TCE, and 1,2-DCE) detected in groundwater collected from well GW-700 (421 µg/L). This water table well (31-ft bgs) is located less than 100-ft north of a buried meander in the original main channel of UEFPC (Sutton and Field 1996). Preferential migration through the buried creek channel may be partially responsible for substantially lower VOC concentrations in the groundwater south of the creek, as suggested by the summed concentration of chloroethenes detected in groundwater samples collected from well GW-698 (19 and 20 µg/L).

A petroleum fuel underground storage tank (Tank 2331-U) that was excavated and removed in December 1988 is the source of the residual plume of dissolved petroleum hydrocarbons in the shallow groundwater at Aquifer well GW-193. Benzene (250 and 270 µg/L), toluene (27 and 27 µg/L), ethylbenzene (48 and 58 µg/L), and xylenes (55 and 59 µg/L) results reported for groundwater samples collected from the well in November 1996 show that dissolved petroleum hydrocarbon concentrations have substantially decreased compared to summed concentrations of these compounds in groundwater samples collected from the well during CY 1992 (>6,000 µg/L) and CY 1993 (>3,000 µg/L). Rapidly decreased concentrations of dissolved petroleum hydrocarbons in the shallow groundwater also are evident at other sites in the East Fork Regime, including the Rust Garage Area in the Western Plant Area and the Building 9754-2 Fuel Facility in the Eastern Plant Area (HSW Environmental Consultants, Inc. 1993 and 1994). Decreased concentrations in the groundwater at each of the sites reflect the effects of remedial actions and natural attenuation in the subsurface. Reduced concentrations in the shallow groundwater near Tank 2331-U also may be

partially attributable to removal of contaminated groundwater via operation of the basement sumps in Building 9201-1.

4.3.3 Eastern Plant Area

Excluding false positive results, VOCs were detected in at least one groundwater sample collected during CY 1996 from 16 wells and one surface water station in the Eastern Plant Area (Figure 14). Summed concentrations of VOCs range from 1 µg/L (GW-604) to 1,102 µg/L (GW-606). As shown in the following summary, maximum concentrations of PCE, TCE, and carbon tetrachloride reported for 13 sampling locations exceed respective MCLs (5 µg/L) for drinking water.

CY 1996 Sampling Location	Maximum Concentration (µg/L)		
	PCE	TCE	Carbon Tetrachloride
Upgradient of New Hope Pond			
GW-153	8	<MCL	270
GW-222	110	28	14
GW-223	420	110	29
GW-240	<MCL	<MCL	17
GW-383	500	200	<MCL
GW-605	14	5	250
GW-606	12	<MCL	850
GW-763	22	5	<MCL
Downgradient of New Hope Pond			
GW-151	59	10	750
GW-220	32	<MCL	410
GW-733	<MCL	<MCL	51
GW-832	6	<MCL	23
LRSPW	6	<MCL	15

These results are consistent with historical data showing dissolved chloromethanes (primarily carbon tetrachloride) and chloroethenes (primarily PCE) in the groundwater upgradient and downgradient of New Hope Pond (Figure 15). As shown in the following summary, the CY 1996 data also conform with historical results, which show that higher summed chloroethene concentrations are characteristic of the shallow groundwater and chloromethane concentrations are normally higher in deep groundwater.

CY 1996 Sampling Location	Well Depth (ft. bgs)	Maximum Summed Concentration (µg/L)	
		Chloroethenes	Chloromethanes
Upgradient of New Hope Pond			
GW-380	15.5	1	2
GW-763	16.0	119	Not Detected
GW-383	23.6	824	3
GW-222	25.0	156	19
GW-605	39.9	32	273
GW-153	60.0	8	270
GW-240	29.5	Not Detected	20
GW-223	90.5	579	40
GW-604	112.4	Not Detected	1
GW-606	171.0	12	1,090
Downgradient of New Hope Pond			
LRSPW	.	7	17
GW-148	11.1	8	Not Detected
GW-154	11.2	2	Not Detected
GW-832	11.8	7	26
GW-220	45.2	32	431
GW-151	96.5	73	798
GW-733	256.5	2	51

The horizontal extent and distribution of the dissolved chloroethenes and chloromethanes in the Eastern Plant Area reflect influx from multiple upgradient sources in the East Fork Regime, and somewhat divergent transport patterns in the shallow groundwater near New Hope Pond. Dissolved VOCs in the water table interval and shallow bedrock generally migrate north in apparent association with surface water in UEFPC, the permeable underdrain system of the diversion channel, and the former UEFPC stream channel. Conversely, dissolved VOCs (primarily chloromethanes) in the deeper groundwater migrate along strike in the upper and middle Maynardville Limestone into Union Valley east of the ORR boundary (Figure 14). Movement to the north (up-dip) beneath UEFPC is apparently restricted at the contact between the Maynardville Limestone and the Nolichucky Shale (HSW Environmental Consultants, Inc. 1994). Data for groundwater samples from a multi-level sampling system in well GW-722 indicate that the lower boundary of the dissolved VOC plume, as indicated by carbon tetrachloride concentrations, generally occurs at 560-ft bgs in the Maynardville Limestone (Figure 21). Furthermore, data from well GW-722 in October 1996 show that the highest

carbon tetrachloride concentration ($>1,000 \mu\text{g/L}$) occurs in groundwater from about 310 to 340-ft bgs near the ORR boundary.

Dissolved concentrations of chloroethenes in the groundwater upgradient of New Hope Pond clearly indicate one or more upgradient sources areas. For example, the Oil Skimmer Basin adjacent to the inlet to New Hope Pond may be a source of chloroethenes in the shallow groundwater, particularly groundwater in wells GW-222 and GW-223. During operation of New Hope Pond, a boom installed across the inlet diverted oils and floating debris in UEFPC into this 25 x 40-ft retention basin. Another potential upgradient source area to the west of Lake Reality is indicated by VOC results for shallow bedrock well GW-762 (58.7-ft bgs) and water table interval well GW-763 (16.0-ft bgs). Historical data show that PCE concentrations exceed $1,000 \mu\text{g/L}$ in the groundwater at well GW-762, which potentially indicate the presence of DNAPL in the shallow bedrock, compared to PCE concentrations above $100 \mu\text{g/L}$ in the shallow groundwater at well GW-763. Pre-sampling groundwater elevations in wells GW-762 and GW-763 indicate vertically downward hydraulic gradients during seasonally high and low groundwater flow conditions. These wells are located adjacent to the railroad spur that parallels Second Street in the Y-12 Plant, and PCE in the groundwater at the wells may reflect infiltration of chlorinated solvents that spilled or leaked from railroad tankers. Alternatively, results for these wells may indicate strike-parallel migration from a source area within industrialized sections of the Eastern Plant Area. In either case, chloroethenes in the groundwater at these wells probably migrate along strike in the shallow bedrock toward UEFPC and along the former UEFPC channel (Figure 4). This may explain the relatively high PCE ($403 \mu\text{g/L}$) concentrations in the groundwater at shallow bedrock well GW-383.

Potential sources of the chloromethanes upgradient of New Hope Pond include Buildings 9202, 9203, and 9205 in the Central Plant Area, and spills or leaks from railroad tankers along the rail spur that roughly parallels UEFPC toward the west end of the Y-12 Plant (AJA Technical Services, Inc. 1996). Multiple migration pathways from these source areas are suggested by the carbon tetrachloride results for shallow bedrock well GW-605 (39.9-ft bgs) and deep bedrock well GW-606 (171-ft bgs). Historical data for these wells show very high ($> 1,000 \mu\text{g/L}$) but generally decreasing carbon tetrachloride in the deeper groundwater at well GW-606, and much lower but generally increasing concentrations in the shallow groundwater at well GW-605 (Figure 22). High

concentrations in the groundwater at well GW-606 suggest a nearby source area, possibly DNAPL, in the intermediate to deep bedrock. Lower concentrations in the shallow groundwater at well GW-605, in light of the vertically downward hydraulic gradients suggest dilution during downgradient transport in the shallow karst network or diffusion of dissolved VOCs from residual DNAPL in unconsolidated zone matrix materials.

Increasing concentrations of carbon tetrachloride in the groundwater at shallow bedrock wells GW-151 (96.5-ft bgs) and GW-220 (45.2-ft bgs) probably began when New Hope Pond was capped in 1988, and operational history of the Lake Reality Sump may have accelerated the trend (Figure 23). As noted in Section 2.3, groundwater is pumped intermittently from the sump to reduce hydrostatic pressure below the synthetic liner in Lake Reality, which probably increases groundwater flow and contaminant flux toward the sump. Additionally, data for these wells (and other well clusters in the East Fork Regime) show a change from flow-related VOC concentration/water level correlations to dilution-related VOC concentration/water level correlations. This generally coincides with a change in the sampling protocol initiated in CY 1994 wherein groundwater samples were collected from the deeper well (GW-222) before the samples were collected from the shallower well (GW-151); samples were previously collected first from GW-151 then from well GW-222 (AJA Technical Services, Inc. 1996).

Excluding false positive results, VOCs were detected in at least one groundwater sample collected during CY 1996 from three Aquifer wells (GW-169, GW-170, and GW-230) and four springs (SCR7.1SP, SCR7.14SP, SCR7.18SP, and SCR7.8SSP) in Union Valley east of the ORR boundary (Figure 14). Compounds detected in the groundwater samples include carbon tetrachloride (GW-170), chloroform (GW-170), PCE (GW-169 and GW-170), TCE (GW-169 and GW-170), 1,2-DCE (GW-170), cis-1,2-dichloroethene (GW-230), and vinyl chloride (GW-230). Maximum summed VOC concentrations range from 3 µg/L (GW-169) to 95 µg/L (GW-170) (Table 6). Also, maximum concentrations of carbon tetrachloride reported for wells GW-170 (81 µg/L) and GW-230 (17 µg/L), and vinyl chloride reported for well GW-230 (4 µg/L) exceed the drinking water MCLs (5 µg/L and 2 µg/L, respectively). The results for shallow bedrock well GW-169 (34.7-ft bgs) and deeper bedrock well GW-170 (156.9-ft bgs) are consistent with respective historical data and indicate that the plume of dissolved VOCs in the Maynardville Limestone at the east end of the

Y-12 Plant extends at least 2,000-ft east into Union Valley (Figure 14). Results for well GW-230 also may reflect strike-parallel migration in the Aquifer east of the Y-12 Plant, although the depth (406.4-ft bgs) of the well and the sodium-bicarbonate geochemistry of the groundwater in the well (Figure 9) suggest that it does not intercept highly permeable flowpaths in the Maynardville Limestone.

Volatile organic compounds detected in the groundwater samples from the springs in Union Valley (Table 6) are benzene and chlorobenzene (SCR7.14SP), PCE (SCR7.1SP and SCR7.8SSP), TCE (SCR7.1SP and SCR7.18SP), 1,1-DCE (SCR7.18SP), carbon tetrachloride (SCR7.1SP and SCR7.18SP), 1,1,1-TCA (SCR7.18SP and SCR7.8SSP), and 1,1-DCA (SCR7.18SP). Summed VOC concentrations range from 3 µg/L (SCR7.8SSP) to 16 µg/L (SCR7.14SP), but concentrations of individual compounds are less than 10 µg/L and only the benzene result for SCR7.14 SP (7 µg/L) exceeds the drinking water MCL (5 µg/L). Dissolved VOC plumes in the Eastern Plant Area are potential sources of the chloroethenes and chloromethanes in the groundwater discharged from springs SCR7.1SP, SCR7.18SP, and SCR7.8SSP. However, neither 1,1,1-TCA nor 1,1-DCA are major components of the VOC plumes in the Eastern Plant Area, which suggests that the trace levels of chloroethanes detected in the samples from springs (SCR7.18SP and SCR7.8SSP) reflect groundwater transport from another source of VOCs that may or may not be associated with the Y-12 Plant. Also, the source of benzene and chlorobenzene detected in the sample from spring SCR7.14SP is probably not within the Y-12 Plant because neither compound is present in the Aquifer (Maynardville Limestone) in the Eastern Plant Area.

4.4 Radioactivity

Evaluation of groundwater quality with respect to radiological contamination was based primarily on CY 1996 analytical results for gross alpha and gross beta that exceed the associated minimum detectable activity (MDA) and counting error (which expresses the degree of analytical uncertainty) reported for each sample (AJA Technical Services, Inc. 1997a). Results that exceed MDAs and counting errors were used to determine the annual average gross alpha and/or gross beta activity for each applicable sampling location. Annual average gross alpha activity above the Safe Drinking Water Act (SDWA) drinking water MCL of 15 picoCuries per liter (pCi/L) and annual

average gross beta activity above the SWDA threshold value of 50 pCi/L were the focus of this evaluation.

Gross alpha and/or gross beta activity that exceed the associated MDAs and counting errors were reported for groundwater samples from thirty-two monitoring wells in the East Fork Regime, two springs in Union Valley, and surface water samples from the LRSPW (Table 7). However, annual average gross alpha activity above 15 pCi/L and/or gross beta activity above 50 pCi/L is indicated only by the results for wells GW-108 and GW-253 in the Western Plant Area, GW-782 and GW-690 in the Central Plant Area, and wells GW-154, GW-222, and GW-605 in the Eastern Plant Area (Figures 24 and 25). Results for these wells are described in the following sections.

4.4.1 Western Plant Area

Groundwater with gross alpha activity above 15 pCi/L and/or gross beta activity above 50 pCi/L (Table 7) occurs primarily in the Aquitard within the Eastern S-3 Ponds Plume in the Western Plant Area (Figures 24 and 25). Gross alpha and gross beta activity within the plume exceed 500 pCi/L and 1,000 pCi/L, respectively. Historical groundwater monitoring data and operational information for the S-3 Ponds indicate a diverse population of radioisotopes within the plume, but alpha radioactivity is primarily from uranium-234 (^{234}U) and uranium-238 (^{238}U), and beta radioactivity is primarily from ^{99}Tc . Gross alpha and gross beta results for the existing network of Aquitard monitoring wells in the Western Plant Area suggest substantially greater transport of ^{99}Tc relative to ^{234}U and ^{238}U . Under oxidizing groundwater conditions, ^{99}Tc occurs as the pertechnetate anion (TcO_4^-) which is soluble and highly mobile (Gee *et al.* 1983), whereas uranium isotopes probably occur in groundwater as uranyl cations that are more prone to pH-sensitive sorption reactions (Fetter 1993). Because it is the sole source of ^{99}Tc in the East Fork Regime, confirmed detection of ^{99}Tc in groundwater and surface water is direct evidence for migration of the Eastern S-3 Ponds Plume.

As illustrated by the results for the November 1996 groundwater sample from well GW-108, gross alpha (700 ± 180 pCi/L) and gross beta ($5,960 \pm 700$ pCi/L) activity in the Western Plant Area is highest in the shallow bedrock south of the Y-12 Plant Salvage Yard (Figures 24 and 25). The low ^{234}U (13.1 ± 4.4 pCi/L) and ^{238}U (6.22 ± 2.8 pCi/L) concentrations reported for the sample from

well GW-108 suggests that the gross alpha activity reported for the well may be inaccurate. Gross alpha activities reported for well GW-108 during previous assessments have been below the MDA (1995) or the associated counting error (1989 and 1990). Gross beta activity, however, is clearly from ^{99}Tc ($8,690 \pm 870$ pCi/L). Very high radioactivity in the groundwater at the well, as with the extremely high nitrate and trace metal concentrations reported for the well, reflect strike-parallel migration of radionuclides along strike-parallel flowpaths that subcrop beneath the S-3 Ponds, and inflow of contaminated groundwater directed toward the well through the buried headwaters of UEFPC.

The radionuclide(s) contributing to the radioactivity in the groundwater at the S-2 Site (Figure 24), as indicated by CY 1996 gross alpha (47.1 ± 23 pCi/L) and gross beta (34.4 ± 22 pCi/L) results reported for the sample collected from well GW-253 in June 1996, has not been conclusively determined. Analytical results for samples collected from the well in CY 1990 indicate concentrations of ^{234}U , ^{238}U , and ^{99}Tc below associated MDAs, which, assuming these results are accurate, suggest the presence of other alpha- and beta-emitting radionuclides in the groundwater at the site. Compared to the CY 1996 gross alpha (8.9 ± 3.1 pCi/L annual average) and gross beta (<MDA) results for well GW-251 (Table 7), the CY 1996 data for well GW-253 indicate greater flux of radionuclides toward the east (strike-parallel) of the S-2 Site.

Although less than 50 pCi/L, the CY 1996 gross beta results for Aquifer wells GW-619 and GW-620 exceed the associated MDAs (Table 7) and are consistent with historical results showing gross beta activity in the groundwater downgradient (east) of the Fire Training Facility (Figure 25). These wells are located upgradient of all known sources of radionuclides in the Western Plant Area. As noted in Section 4.1.1, both wells yield groundwater with unusually high potassium concentrations (10 - 20 mg/L) compared to other Aquifer and Aquitard wells in the East Fork Regime. Beta-decay of potassium-40 (^{40}K), which is typically about 0.012% of total potassium (Brownlow 1979), may account for the gross beta activity in the groundwater at the Fire Training Facility.

4.4.2 Central Plant Area

The CY 1996 data for Aquitard and Aquifer wells in the Central Plant Area are consistent with historical results showing gross alpha activity above 15 pCi/L in the groundwater at CMP Grid E3 well GW-782 (Figure 24). Gross alpha activity reported for each groundwater sample collected from well GW-782 exceeded 15 pCi/L and averaged 36.1 ± 5.2 pCi/L. In contrast, CY 1996 and historical analytical results show gross alpha activities below MDAs in the groundwater at the deeper well GW-781 (69.3-ft bgs) and shallower well GW-783 (16.3-ft bgs) clustered with well GW-782 (35.9-ft bgs). Assuming the gross alpha activity is from uranium isotopes in the groundwater, the results for these wells suggest stratabound, strike- or dip-parallel transport in the upper Nolichucky Shale. Historical gross alpha data for well GW-782 show a frequently inverse relationship with groundwater elevations in the well (Figure 26), including a particularly sharp activity decrease and water level increase following a 1.8-inch rainfall in March 1995 (AJA Technical Services, Inc. 1996), that suggest dilution-related temporal fluctuations. The source of elevated alpha radioactivity in the groundwater at this well has not been identified, but may coincide with the unspecified source of alpha radioactivity in the groundwater at Tank 0134-U (HSW Environmental Consultants, Inc. 1995b), which is about 700-ft to the west (hydraulically upgradient) of well GW-782 (Figure 7).

Gross beta activity (51.8 ± 15 pCi/L) and ^{99}Tc (21 ± 15 pCi/L) reported for the groundwater sample collected from Aquifer well GW-690 in June 1996 indicate transport of ^{99}Tc from the Eastern S-3 Ponds Plume in the lower Maynardville Limestone downgradient (east) of the Coal Pile Trench (Figure 25). However, these gross beta and ^{99}Tc results are conspicuous considering the very low nitrate concentration (0.3 mg/L) reported for the well and the greater mobility of nitrate relative to ^{99}Tc in groundwater. The disparity between nitrate and ^{99}Tc concentrations in the groundwater at well GW-690 is not explained by existing data for the well.

4.4.3 Eastern Plant Area

Gross alpha activities that exceeded MDAs for groundwater samples collected from monitoring wells in the Eastern Plant Area during CY 1996 were typically below 10 pCi/L (Table 7). Annual average alpha activities were above the 15 pCi/L MCL only for wells GW-154 (374 ± 25 pCi/L), GW-222 (39.5 ± 5 pCi/L), and GW-605 (86.9 ± 10 pCi/L). These results are consistent with

historical data showing alpha radioactivity in the groundwater both upgradient and downgradient of New Hope Pond (Figure 24). Historical data for these wells show that gross alpha activity generally mirrors the uranium concentration trends and relationships with water level elevations described in Section 4.2.3. Alpha radioactivity in the shallow groundwater at well GW-154 decreased slightly from about 800 pCi/L in January 1990 to less than 500 pCi/L in November 1996. More widely variable alpha radioactivity in the groundwater at well GW-222, and direct relationships with groundwater elevations, suggest flow-related activity fluctuations. Seasonally fluctuating but generally increasing alpha radioactivity in the groundwater at well GW-605 potentially reflects an increased flux of uranium isotopes in the deeper groundwater flow system (Figure 26).

The CY 1996 gross beta results for wells GW-154, GW-222, and GW-605 (Table 7) are consistent with respective historical data, with annual average gross beta activity above 50 pCi/L at well GW-154 (80.1 ± 6.4 pCi/L). Similar long-term temporal trends and relationships with water level elevations observed for the gross alpha results for each well are seen in the gross beta data. Results for well GW-154 show that gross beta radioactivity in the shallow groundwater at the well decreased from about 700 pCi/L to about 100 pCi/L between January 1990 and November 1996. More widely variable beta radioactivity in the groundwater at well GW-222 and direct relationships with groundwater elevations suggest flow-related activity fluctuations. Gross beta results for well GW-605 show similar seasonal fluctuations, but generally do not indicate an increasing trend. The lack of ^{99}Tc in the groundwater at these wells, as indicated by analytical results for groundwater samples collected from each well during CYs 1990 and 1991, suggests that beta radioactivity in the groundwater near New Hope Pond is primarily from decay of daughter isotopes of ^{238}U (e.g., thorium-234).

The CY 1996 gross alpha results reported for groundwater samples collected from Aquifer wells GW-169, GW-171, GW-172, GW-230, and GW-232 are below the specified MDAs and do not indicate extensive migration of alpha- or beta-emitting radioisotopes in the Maynardville Limestone east of the ORR boundary (Figures 24 and 25). Only the gross beta result reported for the sample collected from well GW-171 in June 1996 (27.7 ± 6.4 pCi/L) exceeds MDA (Table 7), and this result is suspect because gross beta reported for all groundwater samples previously collected from the well are below the specified MDAs.

The CY 1996 radioanalyte results for springs in Union Valley do not indicate off-site migration of the radionuclides in the groundwater in the Eastern Plant Area. Gross alpha activity reported for the groundwater samples collected from each spring are below MDAs (Table 7), however, gross beta above the MDA was reported for the samples collected in March 1996 from springs SCR7.14SP (42.2 ± 9.2 pCi/L) and SCR7.16SP (14.3 ± 6.2 pCi/L). As noted in Section 4.1.3, principal ion data indicate unusually high total and dissolved potassium concentrations in the groundwater discharging from each spring. Potassium levels were 65 and 68 mg/L in the filtered and unfiltered samples from SCR7.14SP, and 17 mg/L in the filtered and unfiltered samples from SCR7.16SP. These results suggest that the gross beta activity in the groundwater at springs SCR7.14SP and SCR16SP may be at least partially attributable to beta decay of ^{40}K in the groundwater.

5.0 SUMMARY AND CONCLUSIONS

Groundwater and surface water quality data obtained during CY 1996 are consistent with previous monitoring results showing VOCs, nitrate, trace metals, and radioactivity as the primary groundwater contaminants in the East Fork Regime.

The overall pattern of groundwater flow is generally from the Aquitard to the Aquifer, and along strike in the Aquifer toward the Eastern Plant Area. Vertical hydraulic gradients in the Aquitard and the Aquifer are consistently upward and consistently downward, respectively, during both seasonally high and low groundwater flow conditions. However, the buried former headwaters and northern tributaries of UEFPC, as well as underground utilities, substantially influence groundwater flow and contaminant migration patterns in the shallow subsurface.

Calcium-magnesium-bicarbonate groundwater usually occurs only at shallow depths in the Aquitard, but generally occurs throughout the Aquifer regardless of depth. In the Aquitard, the transition from calcium-magnesium-bicarbonate groundwater to sodium bicarbonate groundwater may occur at a shallower depth (i.e., <80 ft bgs) in the East Fork Regime than in the Bear Creek Regime (typically 100-ft bgs). Variations from the typical geochemical characteristics of the shallow calcium-magnesium-bicarbonate groundwater in the Aquitard and the Aquifer are primarily related to chloride, nitrate, potassium, sodium, and sulfate contamination.

The Eastern S-3 Ponds Plume is a primary source of nitrate, trace metals, and radioactivity in the East Fork Regime. Nitrate is the principal and most mobile component of the Eastern S-3 Ponds Plume. Based on the current conceptual models for groundwater flow and contaminant transport, the distribution of nitrate indicates the following migration pattern in the Aquitard: (1) eastward, strike-parallel transport in the water table interval, shallow bedrock, and deep bedrock toward the buried former headwaters of UEFPC; (2) upward migration from the deep bedrock to the shallow bedrock to the water table interval, and discharge from the water table interval into the buried headwater channel, which directs the contaminated groundwater into the Aquifer to the southeast; and (3) eastward, strike-parallel transport in the water table and shallow bedrock intervals toward discharge areas in the water table interval along a buried tributary of UEFPC (BT-1) which also channels contaminated groundwater into the Aquifer.

Elevated trace metal concentrations occur primarily in the acidic groundwater within the Eastern S-3 Ponds Plume, but also in groundwater with more neutral pH in the Eastern Plant area, where contamination appears to reflect combined surface water/shallow groundwater transport.

Alpha and beta radioactivity are highest in the groundwater within the Eastern S-3 Ponds Plume. Alpha activity is primarily from uranium isotopes, and beta activity is primarily from ^{99}Tc . The distribution of elevated gross alpha activity in the Eastern S-3 Ponds Plume suggests limited migration of uranium isotopes relative to ^{99}Tc . Relative to nitrate in the Eastern S-3 Ponds Plume, the extent of gross beta activity suggests similar extent and migration patterns for ^{99}Tc .

The overall lack of nitrate and beta activity in the Aquifer downgradient of the Eastern S-3 Ponds Plume contrasts with the Bear Creek Regime where nitrate and beta activity in the Aquifer extend for more than 9,000-ft downgradient of the S-3 Site. This may indicate greater dilution in the Aquifer from surface runoff and process water discharge in the Y-12 Plant.

Volatile organic compounds are the most extensive groundwater contaminants in the East Fork Regime. Principal components of dissolved VOC plumes are chloroethenes (PCE, TCE, and 1,2-DCE), chloroethanes (1,1,1-TCA and 1,1-DCA), and chloromethanes (carbon tetrachloride and chloroform). There are multiple sources within the East Fork Regime, and CY 1996 data continues to suggest that DNAPL occurs in the Aquitard at the Waste Coolant Processing Area in the Western Plant Area, Building 9212 in the Central Plant Area (historical data also indicate DNAPL in the Aquitard near Building 9206), and an unspecified source in the Aquifer in the Eastern Plant area upgradient of New Hope Pond. Carbon tetrachloride and several chloroethenes that are components of the dissolved plume of VOCs in the groundwater near New Hope Pond were detected in samples from springs located in Union Valley several thousand feet east of the ORR Boundary. Several chloroethanes and petroleum hydrocarbons also were detected in samples from two of the springs. It is not clear if results for these springs indicate migration of VOCs from sources associated with the Y-12 Plant.

The extent of VOCs in the Aquitard suggest similar migration patterns as indicated by the distribution of nitrate in the Eastern S-3 Ponds Plume: upward migration from the bedrock to the water table interval, and strike parallel transport toward discharge areas in the buried tributaries of UEFPC. The strike-oriented plume of dissolved chloroethenes (primarily 1,2-DCE) from the

Oil/Solvent Drum Storage Area and/or the Salvage Yard Drum Deheader also reflect this migration pattern in the Aquifer. Volatile organic compounds are more pervasive in the Aquifer, which reflects inputs from multiple source areas (including influx of contaminated groundwater from the buried tributaries of UEFPC), downward migration into the bedrock, and strike-parallel transport toward the Eastern Plant Area and beyond the ORR boundary into Union Valley.

Groundwater and surface water sampling and analysis activities planned for the East Fork Regime during CY 1998 are specified in the *Y-12 Plant Groundwater Protection Program Groundwater and Surface Water Sampling and Analysis Plan for Calendar Year 1998* (AJA Technical Services, Inc. 1997b). Besides these planned monitoring activities, the following actions are recommended:

- ☐ Continued collection of groundwater samples from wells GW-617 should be discontinued. Data obtained from this well provides little additional information from that obtained from the paired well GW-618.
- ☐ Groundwater samples from well GW-620 should be analyzed for ^{40}K to determine if gross beta activity in the groundwater at the Fire Training Facility is attributable to this radioisotope.
- ☐ Groundwater samples should be collected from wells 56-2A, 56-2B, 56-2C, 59-1A, 59-1B, 59-1C, GW-818, GW-819, and GW-820. These wells may provide data regarding the extent and distribution of dissolved VOCs in the Central Plant Area and inflow of contaminated groundwater into the Maynardville Limestone via discharge from BT-3.

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APPENDIX A

FIGURES

PREPARED FOR:
**LOCKHEED MARTIN
ENERGY SYSTEMS, INC.**

LOCATION:

Y-12 PLANT
OAK RIDGE, TN.

PREPARED BY:

**AJA TECHNICAL
SERVICES, INC.**

DOC NUMBER:

97-D003

DWG ID.:

97-007

DATE:

5-10-97

FIGURE 1

HYDROGEOLOGIC REGIMES
AT THE Y-12 PLANT

2 — COMPREHENSIVE GROUNDWATER MONITORING GRID

SOURCE: King and Haase, 1987

SYSTEM GROUP	HYDRO UNIT	FORMATION	MAP SYMBOL	THICKNESS (ft)
CAMBRIAN	UPPER	COPPER RIDGE DOLOMITE	Ock	NOT DETERMINED
		MAYNARDVILLE LIMESTONE	Cmn	418-450
	MIDDLE	NOLICHUCKY SHALE	Cn	422-550
		MARYVILLE LIMESTONE	Cm	346-445
		ROGERSVILLE SHALE	Crg	90-120
LOWER	CONASAUGA	RUTLEDGE LIMESTONE	Cr	90-120
		PUMPKIN VALLEY SHALE	Cpv	260-320
		ROME FORMATION	Cr	NOT DETERMINED

PREPARED FOR:
LOCKHEED MARTIN
ENERGY SYSTEMS, INC.

LOCATION:

Y-12 PLANT
OAK RIDGE, TN.

PREPARED BY:

AJA TECHNICAL
SERVICES, INC.

DOC NUMBER:

96-D007

DWG ID.:

96-071

DATE:

7-7-97

FIGURE 3

TOPOGRAPHY AND BEDROCK GEOLOGY
IN THE EAST FORK REGIME

PREPARED FOR:
**LOCKHEED MARTIN
 ENERGY SYSTEMS, INC.**

PREPARED BY:
**AJA TECHNICAL
 SERVICES, INC.**

LOCATION:
**Y-12 PLANT
 OAK RIDGE, TN.**

DOC NUMBER:
96-DD007

DWG ID.:
96-068

DATE:
7-7-97

FIGURE 4

**FILL AREAS IN THE Y-12 PLANT
 AND PRECONSTRUCTION DRAINAGE FEATURES**

0 1400
 SCALE (ft)

EXPLANATION

- THICKNESS GREATER THAN 5 FT
- BURIED TRIBUTARY (BT-)
- 2 - COMPREHENSIVE GROUNDWATER MONITORING GRID
- p - SPRING

APRIL

SEPTEMBER 30

EXPLANATION

- GW-618 971.04 ■ — Water Table Interval and Water Level Elevation (ft msl)
- Approximate Water-Level Isopleth (ft msl)
- - - Surface Drainage Feature
- ⊙ — Building Sump 9201-2

Vertical Hydraulic Gradient Determined From Data For Paired Wells		
0.01-0.09	0.1-0.9	
⊕	⊕	— Upward Gradient
⊖	⊖	— Downward Gradient
		— Less Than 0.01 was Considered Insignificant

OCTOBER 7, 1996

1000
SCALE (ft)

PREPARED FOR:
LOCKHEED MARTIN
ENERGY SYSTEMS, INC.

PREPARED BY:
AJA TECHNICAL
SERVICES, INC.

LOCATION:

Y-12 PLANT
OAK RIDGE, TN.

DOC NUMBER: 97-003

DWG ID.: 97-010

DATE: 7-7-97

FIGURE 5

SEASONAL GROUNDWATER ELEVATIONS
IN THE WATER TABLE INTERVAL, CY 1996

WATER TABLE INTERVAL

BEDROCK INTERVAL

EXPLANATION

- — Water Table Interval Monitoring Well
- — Bedrock Interval Monitoring Well
- - - — Upper East Fork Poplar Creek
- ±3.51 — Drawdown: Change in Water Level (ft) After 20 Days of Pumping From the Sump (+ Denotes a Water Level Increase)
- - - — Approximate Line of Equal Drawdown in ft
- - - — Approximate Geologic Contact

PREPARED FOR:
LOCKHEED MARTIN
ENERGY SYSTEMS, INC.

LOCATION:

Y-12 PLANT
OAK RIDGE, TN.

PREPARED BY:

AJA TECHNICAL
SERVICES, INC.

DOC NUMBER:

97-003

DWG ID.:

96-066

DATE:

7-7-97

FIGURE 6

INFLUENCE ON GROUNDWATER
FLOW DURING OPERATION OF
THE LAKE REALITY SUMP

- EX**
- — Monitoring \
 - ▲ — RCRA Backg
 - — RCRA Point-
 - ★ — Plume Boun
 - ◇ — Spring (SP)
- LRSPW — Lake Reality
- EXP-J — Exit Pathwa
- K**
- 1 — Comprehens
- En — NOLICHUCK
- Emn — MAYNARDVI
- Ock — KNOX GROI

EXPLANATION

— GROUNDWATER COMPOSITIONS CLUSTER IN THESE AREAS
30 WELLS ARE PLOTTED

■ — WATER TABLE MONITORING WELL

○ — BEDROCK MONITORING WELL, LESS THAN 100 FT DEEP

● — BEDROCK MONITORING WELL, 100 TO 300 FT DEEP

▲ — BEDROCK MONITORING WELL, GREATER THAN 300 FT DEEP

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**LOCKHEED MARTIN
ENERGY SYSTEMS, INC.**

LOCATION: Y-12 PLANT
OAK RIDGE, TN.

FIGURE 9

PREPARED BY:
**AJA TECHNICAL
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DOC NUMBER: 96-D007
DWG ID.: 96-054
DATE: 7-7-97

PRINCIPAL ION CHEMISTRY
OF CY 1996 GROUNDWATER SAMPLES
FROM AQUIFER WELLS

EXPLANATION

▲ — SURFACE WATER OR SPRING SAMPLING LOCATION	25.3 — CY 1996 Maximum Nitrate Concentration
✦ — BUILDING SUMP	ND — Not Detected
■ — WATER TABLE INTERVAL MONITORING WELL	Approximate Plume Boundary Based on Historic
● — BEDROCK INTERVAL MONITORING WELL	— 10-100 mg/L
— NOLICHUCKY SHALE — AQUITARD	— >mg/L
— MAYNARDVILLE LIMESTONE — AQUIFER	— Statistically Significant Increasing Trend (Selected from Paradigm Data Service)
— KNOX GROUP — AQUIFER	

on (mg/L)

al Data

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ENERGY SYSTEMS, INC.

PREPARED BY:
AJA TECHNICAL

LOCATION:

Y-12 PLANT
OAK RIDGE, TN.

DOC NUMBER:

96-D006

DWG ID.:

PCNIT

FIGURE 10

EXTENT OF NITRATE IN GROUNDWATER
IN THE EAST FORK REGIME, 1996

- — Water Table Zone Monitor
- — Bedrock Zone Monitoring
- ▲ — Surface Water Sampling
- LRSPW — Lake Reality Emergency

K — 1 — Comprehensive Groundwater

EXPLANATION

Monitoring Well
g Well
g Location
Spillway

Ba — Barium
B — Boron
Cd — Cadmium
Co — Cobalt
Cu — Copper
Pb — Lead
Mn — Manganese
Hg — Mercury
Ni — Nickel
U — Uranium

Water Monitoring Grid

PREPARED FOR:
LOCKHEED MARTIN
ENERGY SYSTEMS, INC.

PREPARED BY:
AJA TECHNICAL

LOCATION:

Y-12 PLANT
OAK RIDGE, TN.

DOC NUMBER:

96-D006

DWG ID.:

96-064

FIGURE 11

TRACE METALS IN GROUNDWATER
IN THE EAST FORK REGIME, 1996

PREPARED FOR: LOCKHEED MARTIN ENERGY SYSTEMS, INC.	LOCATION: OAK RIDGE, TN.	FIGURE 12 CADMIUM CONCENTRATIONS IN GROUNDWATER AT WELLS GW-251 AND GW-618	
PREPARED BY: ATA TECHNICAL SERVICES, INC.	DOC No.: 97-006		
	DWG ID.: PC PT296		
	DATE: 8/30/97

PREPARED FOR:
**LOCKHEED MARTIN
 ENERGY SYSTEMS, INC.**

LOCATION:

Y-12 PLANT
 OAK RIDGE, TN.

PREPARED BY:
**AJA TECHNICAL
 SERVICES, INC.**

DOC No.:

97-006

DWG ID.:

PC PT296

DATE:

8/30/97

FIGURE 13

**URANIUM CONCENTRATIONS IN
 GROUNDWATER AT WELLS
 GW-154, GW-222, AND GW-223**

EXPLANATION

▲ — SURFACE WATER OR SPRING SAMPLING LOCATION	82 — CY 1996 Maximum Summed VOC C
■ — WATER TABLE INTERVAL MONITORING WELL	ND — Not Detected
● — BEDROCK INTERVAL MONITORING WELL	
— Cn — NOLICHUCKY SHALE — AQUITARD	Approximate Plume Boundary Based on Histor
— Cmn — MAYNARDVILLE LIMESTONE — AQUIFER	— 0-100 ug/L
— Ock — KNOX GROUP — AQUIFER	— >100 ug/L
	⊙ — Statistically Significant Increasing Tr

Concentration (ug/L)

Original Data

end

PREPARED FOR: LOCKHEED MARTIN ENERGY SYSTEMS, INC.	LOCATION: Y-12 PLANT OAK RIDGE, TN.	FIGURE 14	
PREPARED BY: AJA TECHNICAL SERVICES, INC.	DOC NUMBER: 96-D006 DWG ID.: 19-063 DATE: 7-7-97	EXTENT OF DISSOLVED VOCs IN GROUNDWATER IN THE EAST FORK REGIME, 1996

- EXPLAN
- — MONITORING WELL
 - ▲ — SURFACE WATER OR SPRING SAMPLING LOCATION
 - 454 — Summed Chlorinated Solvents
(Maximum CY 1996 concentration of each compound)

DOMINANT COMPOUNDS

- CHLOROETHENES
- CHLOROMETHANES

- B4 — Beta 4
- 88810 — Building
- CPT — Cool F
- EXP — Exit P
- FTF — Fire T
- GRID — Grid L
- NHP — New H
- S2 — S-2 S
- S3 — S-3 S
- UOV — Uranium

From Maximum 1996 Concentrations

Trichloroethene + 1,2-Dichloroethene
 + 1,1-Dichloroethane
 + Chloroform + Methylene Chloride

LEGEND

- Security Pits
- g 8110
- ie Trench
- pathway
- oining Facility
- ocation
- ope Pond
- ite
- ite
- m Oxide Vault

1 - COMPREHENSIVE GROUNDWATER MONITORING GRID

— — — — — ϵ_n — — — — — NOLICHUCKY SHALE — — — — — AQUITARD
 — — — — — ϵ_{mn} — — — — — MAYNARDVILLE LIMESTONE — — — — —
 — — — — — $O\epsilon k$ — — — — — KNOX GROUP — — — — — AQUIFER

PREPARED FOR:
**LOCKHEED MARTIN
 ENERGY SYSTEMS, INC.**

PREPARED BY:
**AJA TECHNICAL
 SERVICES, INC.**

LOCATION: Y-12 PLANT
 OAK RIDGE, TN.

DOC NUMBER:
 DWG ID.: 96-067
 DATE: 7-29-97

FIGURE 15

DISTRIBUTION OF CHLORINATED
 SOLVENTS IN GROUNDWATER, 1996

PREPARED FOR:
**LOCKHEED MARTIN
ENERGY SYSTEMS, INC.**

LOCATION:

Y-12 PLANT
OAK RIDGE, TN.

FIGURE 16

PREPARED BY:
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DATE:

8/30/97

VOC CONCENTRATIONS IN
GROUNDWATER AT WELLS
GW-619 AND GW-620

PREPARED FOR:
**LOCKHEED MARTIN
ENERGY SYSTEMS, INC.**

LOCATION:

Y-12 PLANT
OAK RIDGE, TN.

FIGURE 17

PREPARED BY:
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PC PT296

DATE:

8/30/97

VOC CONCENTRATIONS IN
GROUNDWATER AT WELLS
GW-617 AND GW-618

PREPARED FOR: LOCKHEED MARTIN ENERGY SYSTEMS, INC.	LOCATION:	Y-12 PLANT OAK RIDGE, TN.	FIGURE 18	
			TETRACHLOROETHENE CONCENTRATIONS IN GROUNDWATER AT WELLS GW-791 AND GW-792	
PREPARED BY: AJA TECHNICAL SERVICES, INC.	DOC No.:	97-006		
	DWG ID.:	PC PT296		
	DATE:	8/30/97

PREPARED FOR:
**LOCKHEED MARTIN
ENERGY SYSTEMS, INC.**

PREPARED BY:
**AJA TECHNICAL
SERVICES, INC.**

LOCATION:

Y-12 PLANT
OAK RIDGE, TN.

DOC No.:

97-006

DWG ID.:

PC PT296

DATE:

8/30/97

FIGURE 19

**VOC CONCENTRATIONS IN
GROUNDWATER AT WELLS
GW-782 AND GW-783**

PREPARED FOR: LOCKHEED MARTIN ENERGY SYSTEMS, INC.	LOCATION:	Y-12 PLANT OAK RIDGE, TN.	FIGURE 20 VOC CONCENTRATIONS IN GROUNDWATER AT WELLS GW-769 AND GW-770
	DOC No.:	97-006	
	DWG ID.:	PC PT296	
	DATE:	8/30/97	
PREPARED BY: AJA TECHNICAL SERVICES, INC.

EXPLANATION		MAXIMUM 1996 CARBON TETRACHLORIDE CONCENTRATION (ug/L)	
GW-606 ●	BEDROCK MONITORING WELL, < 300 FT	ND	NOT DETECTED
GW-131 ▼	BEDROCK MONITORING WELL, > 300 FT	-5	-5
●	SAMPLED BEFORE 1996 (QUALITATIVE DATA)	-5-100	-5-100
	SCREENED WELL CONSTRUCTION	-100-1,000	-100-1,000
□	OPEN-HOLE WELL CONSTRUCTION	-> 1,000	-> 1,000
—	WESTBAY SYSTEM SAMPLING PORTS		
—	SAMPLES COLLECTED IN 1996		

PREPARED FOR:
LOCKHEED MARTIN
ENERGY SYSTEMS, INC.

LOCATION: Y-12 PLANT
OAK RIDGE, TN.

PREPARED BY:
AJA TECHNICAL
SERVICES, INC.

DOC NUMBER: 96-D007
DWG ID.: 96-024
DATE: 7-15-96

FIGURE 21

CARBON TETRACHLORIDE IN GROUNDWATER
IN THE EASTERN PLANT AREA

PREPARED FOR:
**LOCKHEED MARTIN
 ENERGY SYSTEMS, INC.**

LOCATION:

Y-12 PLANT
 OAK RIDGE, TN.

PREPARED BY:
**AJA TECHNICAL
 SERVICES, INC.**

DOC No.:

97-006

DWG ID.:

PC PT296

DATE:

8/30/97

FIGURE 22

**CARBON TETRACHLORIDE
 CONCENTRATIONS IN GROUNDWATER
 AT WELLS GW-605 AND GW-606**

Note: MI = Monitored Interval of the well, depth below ground surface.

PREPARED FOR: LOCKHEED MARTIN ENERGY SYSTEMS, INC.	LOCATION: OAK RIDGE, TN.	FIGURE 23	
PREPARED BY: AJA TECHNICAL SERVICES, INC.	DOC No.:	97-006	SELECTED VOC CONCENTRATIONS IN GROUNDWATER AT WELLS GW-151 AND GW-220
	DWG ID.:	PC PT296	
	DATE:	8/30/97

EXPLANATION

▲	SURFACE WATER OR SPRING SAMPLING LOCATION	11	— CY 1996 Maximum Gross Alpha Activity
■	WATER TABLE INTERVAL MONITORING WELL	ND	— Not Detected
●	BEDROCK INTERVAL MONITORING WELL	<u>Approximate Plume Boundary Based on Historic</u>	
—	NOLICHUCKY SHALE — AQUITARD		— 15-100 pCi/L
—	MAYNARDVILLE LIMESTONE — AQUIFER		— >100 pCi/L
—	KNOX GROUP — AQUIFER	⊙	— Statistically Significant Increasing Trend

ty (pCi/L)

al Data

PREPARED FOR:
LOCKHEED MARTIN
ENERGY SYSTEMS, INC.

PREPARED BY:
AJA TECHNICAL
SERVICES, INC.

LOCATION:

Y-12 PLANT
OAK RIDGE, TN.

DOC NUMBER:

96-D006

DWG ID.:

pcalph

DATE:

7-7-97

FIGURE 24

EXTENT OF GROSS ALPHA ACTIVITY
IN GROUNDWATER IN THE
EAST FORK REGIME, 1996

EXPLANATION

▲ — SURFACE WATER OR SPRING SAMPLING LOCATION	51.8 — CY 1996 Maximum Gross Beta Activity
■ — WATER TABLE INTERVAL MONITORING WELL	ND — Not Detected
● — BEDROCK INTERVAL MONITORING WELL	Approximate Plume Boundary Based on Historic:
— Nolichucky Shale — Aquitard	— 50-100 pCi/L
— Maynardville Limestone — Aquifer	— >100 pCi/L
— Knox Group — Aquifer	● — Statistically Significant Increasing Trend

(pCi/L)

al Data

PREPARED FOR: <i>LOCKHEED MARTIN ENERGY SYSTEMS, INC.</i>	LOCATION:	Y-12 PLANT OAK RIDGE, TN.	FIGURE 25 EXTENT OF GROSS BETA ACTIVITY IN GROUNDWATER IN THE EAST FORK REGIME, 1996
PREPARED BY: <i>AJA TECHNICAL SERVICES, INC.</i>	DOC NUMBER:	96-D006	
	DWG ID.:	PCBTA	
	DATE:	7-7-97

PREPARED FOR:
**LOCKHEED MARTIN
ENERGY SYSTEMS, INC.**

LOCATION:

Y-12 PLANT
OAK RIDGE, TN.

FIGURE 26

PREPARED BY:
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DOC No.:

97-006

DWG ID.:

PC PT296

DATE:

8/30/97

**GROSS ALPHA ACTIVITY IN
GROUNDWATER AT WELLS
GW-605 AND GW-782**

APPENDIX B

TABLES

Table 1.
Confirmed and Suspected Sources of Groundwater Contamination
in the East Fork Regime

EASTERN PLANT AREA								
CENTRAL PLANT AREA								
WESTERN PLANT AREA								
Confirmed (★) or Suspected (?) Contamination Source Area	Type of Groundwater Contaminant							
	Inorganics	Trace Metals	VOCs	Radioactivity				
S-3 Ponds	★	★	★	★	●			
Abandoned Nitric Acid Pipeline	?	.	.	?	●			
Rust Garage Area	.	.	★	.	●			
Y-12 Plant Salvage Yard	.	★	★	.	●			
Mercury Process Spill Areas	.	?	.	.	●			
Interim Drum Yard	.	.	★	.	●			
Fire Training Facility	.	.	★	.	●			
S-2 Site	.	★	★	.	●			
Waste Coolant Processing Area	.	.	★	.	●			
Tank 0134-U	.		?	.		●		
Tank 2331-U	.	.	★	.		●		
Building 9212 Complex (CMP GRID D2)	?	?	★	.		●		
Unspecified Source (CMP GRID E2)	?	?	?	.		●		
Unspecified Source (CMP GRID E3)	?	?	?	.		●		
Unspecified Source (CMP GRID F3)	?	?	?	.		●		
Unspecified Source (CMP GRID G3)	?	?	?	.		●		
Unspecified Source (CMP GRID H3)	?	?	?	.		●		
Building 9754-2 Fuel Facility	.	.	★	.			●	
Unspecified Source (CMP GRID J3)	.	.	?	.			●	
Unspecified Source (EXP-I)	.	.	?	.			●	
Unspecified Source (EXP-J)	.	.	?	.			●	
Oil Skimmer Basin	.	★	★	★			●	

Note:

- 1 Unspecified sources of contamination indicated by groundwater quality data for Comprehensive Monitoring Plan (CMP) Grid Network monitoring wells, and Maynardville Limestone Exit-Pathway (EXP) Picket I and Picket J monitoring wells.

- Not applicable

Table 2.
Groundwater Elevations in the East Fork Regime, April 2 - 4, 1996 and
September 30 - October 7, 1996

Groundwater Elevation (ft msl)		September 30 - October 7, 1996							
		April 2 - 4, 1996							
		Seasonal Fluctuation (+/- ft)							
Depth-to-Water (ft below Top of Casing)		September 30 - October 7, 1996							
		April 2 - 4, 1996							
Well No.	Location ²	Hydrogeologic Unit		Top of Casing Elevation (ft msl)					
		Aquifer	Aquitard						
55-1A	Y12		●	986.67	10.5	10.6	-0.1	976.17	976.07
55-1C	Y12		●	986.73	11.3	11.5	-0.2	975.43	975.23
55-6A	Y12		●	989.04	7.8	8.6	-0.8	981.24	980.44
56-1A	Y12		●	969.25	8.0	7.9	+0.1	961.25	961.35
56-2A	Y12		●	963.3	7.8	8.1	-0.3	955.50	955.20
60-1A	Y12	●		929.66	12.4	13.3	-0.9	917.26	916.36
GW-105	S3		●	1017.35	7.9	8.7	-0.8	1009.50	1008.70
GW-106	S3		●	1016.01	4.2	4.3	-0.1	1011.80	1011.70
GW-107	S3		●	998.19	7.3	7.5	-0.2	990.89	990.69
GW-148	NHP	●		907.36	7.4	7.7	-0.3	899.96	899.66
GW-150	NHP	●		915.56	14.1	14.1	0.0	901.46	901.46
GW-152	NHP	●		921.18	19.3	19.9	-0.6	901.88	901.28
GW-154	NHP	●		911.5	8.5	9.3	-0.8	903.00	902.20
GW-167	EXP	●		931.38	26.1	30.5	-4.4	905.28	900.88
GW-169	EXP-UV	●		931.87	26.8	31.3	-4.5	905.07	900.57
GW-171	EXP-UV	●		920.1	7.9	12.6	-4.7	912.20	907.50
GW-191	B4		●	1011.14	3.3	4.0	-0.7	1007.80	1007.10
GW-192	B4		●	1008.63	4.3	4.7	-0.4	1004.30	1003.90
GW-193	T2331		●	934	7.9	8.6	-0.7	926.10	925.40
GW-199	GRID11		●	961.08	16.4	17.1	-0.7	944.68	943.98
GW-201	RDS		●	968.89	18.9	19.4	-0.5	949.99	949.49
GW-218	UOV	●		935.81	13.6	15.4	-1.8	922.21	920.41
GW-219	UOV	●		935.64	9.5	11.4	-1.9	926.14	924.24
GW-255	S2	●		1027.13	20.1	32.6	-12.5	1007.00	994.50
GW-261	SY		●	1049.99	16.6	18.2	-1.6	1033.40	1031.80
GW-263	SY		●	1057.73	23.4	28.5	-5.1	1034.30	1029.20
GW-334	WC		●	983.73	11.0	11.1	-0.1	972.73	972.63
GW-335	WC		●	981.88	9.6	9.7	-0.1	972.28	972.18
GW-349	S2	●		993.5	3.7	4.9	-1.2	989.80	988.60
GW-380	NHP	●		913.55	9.6	11.1	-1.5	903.95	902.45
GW-383	NHP		●	908.5	8.8	9.3	-0.5	899.70	899.20
GW-384	NHP		●	908.38	10.5	10.6	-0.1	897.88	897.78

Table 2 (cont'd)

Groundwater Elevation (ft msl)		September 30 - October 7, 1996							
		April 2 - 4, 1996							
		Seasonal Fluctuation (+/- ft)							
Depth-to-Water (ft below Top of Casing)		September 30 - October 7, 1996							
		April 2 - 4, 1996							
Well No. ¹	Location ²	Hydrogeologic Unit		Top of Casing Elevation (ft msl)					
		Aquifer	Aquitard						
GW-617	EXP-E	●		985.11	12.8	14.2	-1.4	972.31	970.91
GW-618	EXP-E	●		984.94	12.5	13.9	-1.4	972.44	971.04
GW-619	FTF	●		1015.24	16.8	24.2	-7.4	998.40	991.00
GW-620	FTF	●		1015.34	19.4	26.2	-6.8	995.90	989.10
GW-634	RG		●	1007.15	7.5	8.4	-0.9	999.70	998.80
GW-686	CPT	●		963.76	12.3	12.7	-0.4	951.46	951.06
GW-691	CPT	●		968.59	11.5	12.1	-0.6	957.09	956.49
GW-692	CPT	●		964.38	9.2	9.3	-0.1	955.18	955.08
GW-699	B8110	●		971.14	16.1	16.1	0.0	955.04	955.04
GW-735	EXP-J		●	924.28	20.5	22.7	-2.2	903.78	901.58
GW-746	GRIDK1		●	906.88	3.8	5.9	-2.1	903.08	900.98
GW-749	GRIDK2		●	921.19	3.7	7.0	-3.3	917.49	914.19
GW-752	GRIDJ3		●	912.78	3.1	4.6	-1.5	909.68	908.18
GW-754	GRIDJ2		●	928.59	7.6	11.0	-3.4	920.99	917.59
GW-756	GRIDJ1		●	927.92	5.3	6.0	-0.7	922.62	921.92
GW-759	GRIDG1		●	994.01	15.1	17.4	-2.3	978.91	976.61
GW-761	GRIDG2		●	968.23	7.4	11.4	-4.0	960.83	956.83
GW-763	GRIDJ3		●	914.85	9.6	10.2	-0.6	905.25	904.65
GW-765	GRIDE1		●	1008.54	19.1	19.7	-0.6	989.40	988.80
GW-767	GRIDI2		●	948.54	10.4	12.2	-1.8	938.14	936.34
GW-770	GRIDG3		●	944.55	12.7	11.4	+1.3	931.85	933.15
GW-772	GRIDC1		●	1012.66	8.8	10.6	-1.8	1003.90	1002.10
GW-774	GRIDH2		●	963.16	10.2	15.3	-5.1	952.96	947.86
GW-780	GRIDF2		●	963.4	12.0	12.9	-0.9	951.40	950.50
GW-783	GRIDE3		●	948.32	10.1	10.3	-0.2	938.22	938.02
GW-785	GRIDD1		●	1009.43	7.8	10.0	-2.2	1001.60	999.40
GW-787	GRIDE2		●	987.85	11.5	16.6	-5.1	976.35	971.25
GW-792	GRIDD2		●	990.53	23.6	24.7	-1.1	968.97	967.87
GW-816	EXP-SR		●	898.21	12.1	12.6	-0.5	886.11	885.61
GW-817	GRIDK3		●	918.12	6.1	7.7	-1.6	912.02	910.42

Table 2 (cont'd)

Notes:

- 1 Bold typeface denotes wells sampled during CY 1996 (see Table 3).
- 2 B4 - Beta-4 Security Pits
 B8110 - Building 8110
 CPT - Coal Pile Trench
 EXP - Exit Pathway (Maynardville Limestone) monitoring well
 - -E or -J: Maynardville Limestone Picket
 - -UV: Offsite spring or surface water station in Union Valley
 - -SR: Along Scarboro Road in the gap through Pine Ridge
 FTF - Fire Training Facility
 GRID - Comprehensive Groundwater Monitoring Plan Grid Location
 NHP - New Hope Pond
 RDS - Ravine Disposal Site
 RG - Rust Garage Area
 S2 - S-2 Site
 S3 - S-3 Ponds Site
 SY - Y-12 Plant Salvage Yard
 T2331 - Tank 2331-U
 UOV - Uranium Oxide Vault
 WC - Waste Coolant Processing Area
 Y12 - Y-12 Plant Complex (Central Plant Area)

Table 3.
CY 1996 Sampling Dates for Monitoring Wells, Springs, and Surface Water Stations

MONITORING PROGRAM		RCRA Interim Status Assessment(●) /RCRA Post-Closure Corrective Action Monitoring (▲)									
		CERCLA Monitoring									
		DOE Order 5400.1 Monitoring									
		Best Management Practice Monitoring									
Sampling Point		Sampling Equipment ³		Sampling Date							
No. ¹	Location ²	Dedicated	Portable	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.				
55-1A	GRIDB2	.	●	.	06/05/96	.	.	●	.	.	.
55-1C	GRIDB2	.	●	.	06/07/96	.	.	●	.	.	.
55-2B	GRIDB3	.	●	.	06/10/96	.	.	●	.	.	.
55-2C	GRIDB3	.	●	.	06/09/96	.	.	●	.	.	.
55-6A	GRIDC2	.	●	.	06/05/96	.	.	●	.	.	.
GW-108	S3	.	●	.	.	.	11/04/96	.	.	.	▲
GW-115	S3	.	●	.	.	.	10/29/96	.	.	.	▲
GW-148	NHP	.	●	03/07/96	06/10/96	08/20/96	11/14/96	.	●	.	●
GW-149	NHP	.	●	03/14/96	06/10/96	08/20/96	11/14/96	.	●	.	●
GW-151	NHP	.	●	03/20/96	06/17/96	07/09/96	11/20/96	.	●	.	●
GW-153	NHP	.	●	03/14/96	06/11/96	08/21/96	11/18/96	.	●	.	●
GW-154	NHP	●	.	02/23/96	06/12/96	08/22/96	11/19/96	.	●	.	●
GW-169	EXP-UV	●	.	02/27/96	.	.	.	.	.	●	.
GW-170	EXP-UV	●	.	03/18/96	06/19/96	.	.	.	.	●	.
GW-171	EXP-UV	●	.	02/29/96	06/18/96	.	.	.	.	●	.
GW-172	EXP-UV	●	.	03/11/96	.	.	.	.	.	●	.
GW-191	B4	●	.	02/24/96	05/22/96	.	11/6/96	.	●	.	.
GW-192	B4	.	●	03/04/96	05/23/96	.	11/13/96	.	●	.	.
GW-193	T2331	.	●	.	.	.	11/04/96	.	.	.	▲
GW-194	B4	●	.	02/23/96	05/22/96	.	11/07/96	.	●	.	.
GW-195	B4	.	●	03/04/96	05/22/96	.	11/07/96	.	●	.	.
GW-207	EXP-SR	.	●	02/20/96	05/29/96	09/10/96	11/20/96	.	●	.	.
GW-208	EXP-SR	.	●	02/21/96	05/30/96	09/11/96	11/21/96	.	●	.	.
GW-218	UOV	.	●	.	06/07/96	.	.	●	.	.	.
GW-220	NHP	.	●	03/20/96	06/13/96	08/26/96	11/20/96	.	●	.	●
GW-222	NHP	.	●	03/19/96	06/12/96	08/22/96	11/18/96	.	●	.	●
GW-223	NHP	.	●	03/14/96	06/11/96	08/21/96	11/18/96	.	●	.	●
GW-230	EXP-UV	●	.	03/11/96	06/18/96	.	.	.	.	●	.
GW-232	EXP-UV	●	.	03/12/96	.	.	.	.	.	●	.
GW-240	NHP	.	●	03/19/96	06/13/96	08/26/96	11/19/96	.	●	.	●
GW-251	S2	●	.	02/21/96	05/23/96	.	11/07/96	.	●	.	.
GW-253	S2	●	.	.	06/10/96	.	.	●	.	.	.
GW-338	WC	.	●	03/04/96	05/22/96	.	11/11/96	.	●	.	.

Table 3 (cont'd)

MONITORING PROGRAM		RCRA Interim Status Assessment(●) /RCRA Post-Closure Corrective Action Monitoring (▲)									
		CERCLA Monitoring									
		DOE Order 5400.1 Monitoring									
		Best Management Practice Monitoring									
		Sampling Point		Sampling Equipment ³		Sampling Date					
No. ¹	Location ²	Dedicated	Portable	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.				
GW-380	NHP	.	●	03/19/96	06/12/96	08/22/96	11/19/96	.	●	.	●
GW-383	NHP	.	●	03/21/96	06/17/96	08/26/96	11/20/96	.	●	.	●
GW-384	NHP	.	●	01/23/96	05/08/96	09/25/96	11/21/96	.	●	.	●
GW-385	NHP	.	●	01/22/96	05/08/96	09/18/96	11/19/96	.	●	.	●
GW-603	EXP-J	.	●	03/25/96	05/31/96	09/12/96	11/25/96	.	●	.	.
GW-604	EXP-J	.	●	03/25/96	06/04/96	09/12/96	11/26/96	.	●	.	.
GW-605	EXP-I	●	.	02/15/96	06/08/96	09/19/96	10/31/96	.	●	.	▲
GW-606	EXP-I	.	●	02/22/96	06/08/96	09/19/96	10/31/96	.	●	.	▲
GW-617	EXP-E	●	.	02/20/96	06/04/96	.	11/13/96	.	●	.	.
GW-618	EXP-E	.	●	03/06/96	06/04/96	.	11/11/96	.	●	.	.
GW-619	FTF	.	●	03/06/96	06/04/96	.	11/13/96	.	●	.	.
GW-620	FTF	..	●	03/07/96	06/04/96	.	11/13/96	.	●	.	.
GW-690	CPT	.	●	.	06/08/96	.	.	●	.	.	.
GW-691	CPT	.	●	.	06/08/96	.	.	●	.	.	.
GW-692	CPT	.	●	.	06/08/96	.	.	●	.	.	.
GW-698	B8110	.	●	.	06/09/96	.	.	●	.	.	.
GW-700	B8110	.	●	.	06/08/96	.	.	●	.	.	.
GW-733	EXP-J	.	●	03/28/96	06/07/96	09/17/96	10/30/96	.	●	.	▲
GW-735	EXP-J	●	.	03/05/96	06/04/96	09/18/96	11/21/96	.	●	.	.
GW-744	GRIDK1	●	.	02/13/96	05/09/96	09/03/96	11/13/96	.	●	.	.
GW-745	GRIDK1	●	.	02/13/96	05/09/96	09/04/96	11/13/96	.	●	.	.
GW-746	GRIDK1	●	.	02/13/96	05/09/96	09/04/96	11/13/96	.	●	.	.
GW-747	GRIDK2	●	.	02/14/96	05/20/96	09/05/96	11/13/96	.	●	.	.
GW-748	GRIDK2	●	.	02/14/96	05/20/96	09/05/96	11/14/96	.	●	.	.
GW-749	GRIDK2	●	.	02/14/96	05/20/96	09/06/96	11/14/96	.	●	.	.
GW-750	EXP-J	.	●	03/26/96	06/04/96	09/16/96	11/26/96	.	●	.	.
GW-751	GRIDJ3	.	●	01/18/96	05/07/96	.	11/18/96	.	●	.	.
GW-752	GRIDJ3	.	●	01/18/96	05/07/96	.	11/18/96	.	●	.	.
GW-763	GRIDJ3	.	●	03/06/96	06/10/96	08/20/96	11/14/96	.	●	.	.
GW-766	GRIDI2	.	●	01/10/96	05/09/96	.	10/09/96	.	●	.	.
GW-767	GRIDI2	.	●	01/10/96	05/09/96	.	10/09/96	.	●	.	.
GW-769	GRIDG3	.	●	01/11/96	05/20/96	.	10/15/96	.	●	.	.
GW-770	GRIDG3	.	●	01/11/96	05/20/96	.	10/15/96	.	●	.	.
GW-775	GRIDH3	.	●	01/10/96	05/09/96	.	10/10/96	.	●	.	.
GW-776	GRIDH3	.	●	01/10/96	05/20/96	.	10/10/96	.	●	.	.

Table 3 (cont'd)

MONITORING PROGRAM		RCRA Interim Status Assessment(●) /RCRA Post-Closure Corrective Action Monitoring (▲)									
		CERCLA Monitoring									
		DOE Order 5400.1 Monitoring									
		Best Management Practice Monitoring									
Sampling Point		Sampling Equipment ³		Sampling Date							
No. ¹	Location ²	Dedicated	Portable	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.				
GW-779	GRIDF2	.	●	02/25/96	05/21/96	.	11/07/96	.	●	.	.
GW-780	GRIDF2	.	●	02/25/96	05/22/96	.	11/07/96	.	●	.	.
GW-781	GRIDE3	.	●	03/06/96	05/23/96	.	11/11/96	.	●	.	.
GW-782	GRIDE3	●	.	02/19/96	05/28/96	.	11/12/96	.	●	.	.
GW-783	GRIDE3	.	●	03/06/96	05/23/96	.	11/12/96	.	●	.	.
GW-786	GRIDE2	.	●	02/25/96	05/21/96	.	11/07/96	.	●	.	.
GW-787	GRIDE2	.	●	02/25/96	05/21/96	.	11/07/96	.	●	.	.
GW-788	GRIDF3	.	●	03/04/96	05/22/96	.	11/11/96	.	●	.	.
GW-789	GRIDF3	.	●	03/04/96	05/22/96	.	11/11/96	.	●	.	.
GW-791	GRIDD2	.	●	03/06/96	05/23/96	.	11/12/96	.	●	.	.
GW-792	GRIDD2	.	●	03/05/96	5/22/96	.	11/11/96	.	●	.	.
GW-816	EXP-SR	●	.	02/13/96	5/31/96	9/18/96	11/21/96	.	●	.	.
GW-817	GRIDK3	●	.	01/18/96	05/20/96	09/06/96	11/14/96	.	●	.	.
GW-832	NHP	.	●	.	05/14/96	.	.	.	.	●	.
LRSPW	EXP-SW	.	●	02/20/96	.	09/03/96	.	.	●	.	.
NHP CEM SP	EXP-SW	.	●	03/11/96	.	09/03/96	.	.	.	●	.
RGQ WW SP	EXP-UV	.	●	.	06/19/96	.	.	.	.	●	.
SCR 7.12 SW	EXP-UV	.	●	03/18/96	.	.	.	.	.	●	.
SCR 7.14 SP	EXP-UV	.	●	03/21/96	.	.	.	.	.	●	.
SCR 7.16 SP	EXP-UV	.	●	03/21/96	.	.	.	.	.	●	.
SCR 7.18 SP	EXP-UV	.	●	03/21/96	06/20/96	.	.	.	.	●	.
SCR 7.1 SP	EXP-UV	.	●	03/11/96	06/20/96	.	.	.	.	●	.
SCR 7.8S SP	EXP-UV	.	●	03/18/96	06/20/96	.	.	.	.	●	.
SCR 7.9 SW	EXP-UV	.	●	03/18/96	.	.	.	.	.	●	.
UV 8.2 SW	EXP-UV	.	●	03/14/96	.	.	.	.	.	●	.
UV 8.5 SP	EXP-UV	.	●	.	06/19/96	07/17/96	.	.	.	●	.
UV 8.6 SP	EXP-UV	.	●	.	.	07/17/96	.	.	.	●	.
UV 8.7 SP	EXP-UV	.	●	.	.	07/17/96	.	.	.	●	.
TOTAL SAMPLING LOCATIONS					Monitoring Wells:			12	60	7	19
					Springs:			0	0	10	0
					Surface Water Stations:			0	1	3	0

Table 3 (cont'd)

Notes:

- 1 Locations of monitoring wells, springs, and surface water stations shown on Figure 7.
- 2
 - B4 - Beta-4 Security Pits
 - B8110 - Building 8110
 - CPT - Coal Pile Trench
 - EXP - Exit Pathway (Maynardville Limestone) monitoring location
 - -E, -I, or -J: Maynardville Limestone Picket monitoring well.
 - -SW: Onsite spring or surface water station
 - -UV: Offsite sampling location station in Union Valley
 - -SR: Along Scarboro Road in the gap through Pine Ridge
 - FTF - Fire Training Facility
 - GRID - Comprehensive Groundwater Monitoring Plan Grid Location
 - NHP - New Hope Pond
 - S2 - S-2 Site
 - S3 - S-3 Ponds Site
 - T2331 - Tank 2331-U
 - UOV - Uranium Oxide Vault
 - WC - Waste Coolant Processing Area
- 3 Dedicated: Well Wizard (bladder pump that remains in the well)
Portable: Bennet Pumps and disposable bailers (monitoring wells); grab sample bottles (springs and surface water stations)

. - Not applicable

Table 4.
Laboratory Analytes and Field Measurements

MONITORING PROGRAM	RCRA Interim Status Assessment(●)/RCRA Post-Closure Corrective Action Monitoring (▲)							
	CERCLA Monitoring							
	DOE Order 5400.1 Monitoring							
	Best Management Practice Monitoring							
PRINCIPAL IONS	Analytical Method ¹	GWPS Constituent ²	Sample Type ³					
			Filtered	Unfiltered				
Alkalinity - HCO3	SM-2320 B	.	.	●.	●	●	●	●
Alkalinity - CO3	SM-2320 B	.	.	●	●	●	●	●
Calcium	EPA-6010	.	●	●	●	●	●	●
Chloride	EPA-300.0	.	.	●	●	●	●	●
Fluoride	EPA-340.2	.	.	●	●	●	●	●
Magnesium	EPA-6010	.	●	●	●	●	●	●
Nitrate (as N)	EPA-300.0	●	.	●	●	●	●	●
Potassium	EPA-6010	.	●	●	●	●	●	●
Sodium	EPA-6010	.	●	●	●	●	●	●
Sulfate	EPA-300.0	.	.	●	●	●	●	●
TRACE METALS	Analytical Method	GWPS Constituent	Sample Type					
			Filtered	Unfiltered				
Aluminum	EPA-6010	.	●	●	●	●	●	●
Antimony	EPA-6010	.	●	●	●	●	●	●
Arsenic	EPA-6010	.	●	●	●	●	●	●
	EPA-200.8	.	●	●	●	●	.	●
Barium	EPA-6010	●	●	●	●	●	●	●
Beryllium	EPA-6010	.	●	●	●	●	●	●
Boron	EPA-6010	.	●	●	●	●	●	●
Cadmium	EPA-6010	●	●	●	●	●	●	●
Chromium	EPA-6010	●	●	●	●	●	●	●
Cobalt	EPA-6010	.	●	●	●	●	●	●
Copper	EPA-6010	.	●	●	●	●	●	●
Iron	EPA-6010	.	●	●	●	●	●	●
Lead	EPA-6010	●	●	●	●	●	●	●
	EPA-7421	●	●	●	.	.	●	.
	EPA-200.8	●	●	●	●	●	●	●
Lithium	EPA-6010	.	●	●	●	●	●	●
Manganese	EPA-6010	.	●	●	●	●	●	●
Mercury	EPA-7470	●	●	●	●	●	●	●
Molybdenum	EPA-6010	.	●	●	●	●	●	●
Nickel	EPA-6010	●	●	●	●	●	●	●
Selenium	EPA-6010	.	●	●	●	●	●	●
Silver	EPA-6010	.	●	●	●	●	●	●
Strontium	EPA-6010	.	●	●	●	●	●	●

Table 4 (cont'd)

MONITORING PROGRAM	RCRA Interim Status Assessment(●)/RCRA Post-Closure Corrective Action Monitoring (▲)							
	CERCLA Monitoring							
	DOE Order 5400.1 Monitoring							
	Best Management Practice Monitoring							
TRACE METALS (cont'd)	Analytical Method ¹	GWPS Constituent ²	Sample Type ³					
			Filtered	Unfiltered				
Thallium	EPA-200.8	.	●	●	●	●	●	●
Thorium	EPA-6010	.	●	●	●	●	●	●
Uranium	EPA-200.8	●	●	●	●	●	●	●
Vanadium	EPA-6010	.	●	●	●	●	●	●
Zinc	EPA-6010	.	●	●	●	●	●	●
VOLATILE ORGANIC COMPOUNDS	Analytical Method	GWPS Constituent	Sample Type					
			Filtered	Unfiltered				
Acetone	ACD-24004	.	.	●	●	●	●	●
Benzene	ACD-24004	●	.	●	●	●	●	●
Bromodichloromethane	ACD-24004	.	.	●	●	●	●	●
Bromoform	ACD-24004	●	.	●	●	●	●	●
Bromomethane	ACD-24004	.	.	●	●	●	●	●
2-Butanone	ACD-24004	.	.	●	●	●	●	●
Carbon Disulfide	ACD-24004	.	.	●	●	●	●	●
Carbon Tetrachloride	ACD-24004	●	.	●	●	●	●	●
Chlorobenzene	ACD-24004	.	.	●	●	●	●	●
Chlorodibromomethane	ACD-24004	.	.	●	●	●	●	●
Chloroethane	ACD-24004	.	.	●	●	●	●	●
Chloroform	ACD-24004	●	.	●	●	●	●	●
Chloromethane	ACD-24004	.	.	●	●	●	●	●
1,1-Dichloroethane	ACD-24004	.	.	●	●	●	●	●
1,2-Dichloroethane	ACD-24004	.	.	●	●	●	●	●
1,1-Dichloroethene	ACD-24004	●	.	●	●	●	●	●
1,2-Dichloroethene	ACD-24004	.	.	●	●	●	●	●
Trans-1,2-Dichloroethene	ACD-24004	●	.	●	●	●	●	●
1,2-Dichloropropane	ACD-24004	.	.	●	●	●	●	●
Cis-1,3-Dichloropropene	ACD-24004	.	.	●	●	●	●	●
Trans-1,3-Dichloropropene	ACD-24004	.	.	●	●	●	●	●
Ethylbenzene	ACD-24004	.	.	●	●	●	●	●
2-Hexanone	ACD-24004	.	.	●	●	●	●	●
4-Methyl-2-Pentanone	ACD-24004	●	.	●	●	●	●	●
Methylene Chloride	ACD-24004	●	.	●	●	●	●	●
Styrene	ACD-24004	.	.	●	●	●	●	●
Tetrachloroethene	ACD-24004	●	.	●	●	●	●	●
1,1,2,2-Tetrachloroethane	ACD-24004	.	.	●	●	●	●	●
Toluene	ACD-24004	●	.	●	●	●	●	●

Table 4 (cont'd)

MONITORING PROGRAM	RCRA Interim Status Assessment(●)/RCRA Post-Closure Corrective Action Monitoring (▲)							
	CERCLA Monitoring							
	DOE Order 5400.1 Monitoring							
	Best Management Practice Monitoring							
VOLATILE ORGANIC COMPOUNDS (cont'd)	Analytical Method ¹	GWPS Constituent ²	Sample Type ³					
			Filtered	Unfiltered				
1,1,1-Trichloroethane	ACD-24004	●	.	●	●	●	●	●
1,1,2-Trichloroethane	ACD-24004	.	.	●	●	●	●	●
Trichloroethene	ACD-24004	●	.	●	●	●	●	●
Vinyl Acetate	ACD-24004	.	.	●	●	●	●	●
Vinyl Chloride	ACD-24004	.	.	●	●	●	●	●
Xylenes	ACD-24004	.	.	●	●	●	●	●
RADIOLOGICAL ANALYTES	Analytical Method	GWPS Constituent	Sample Type					
			Filtered	Unfiltered				
Gross Alpha Activity	Y/P65-7162	●	.	●	●	●	●	●
Gross Beta Activity	Y/P65-7162	●	.	●	●	●	●	●
Gamma Activity (Spectrum)	Y/P65-7171	.	.	●	.	.	●	
Americium-241	Y/P65-7157	.	.	●	.	.	●	▲
Iodine-129	EPA-901.1	.	.	●	.	.	.	▲
Neptunium-237	Y/P65-7158	.	.	●	.	.	●	▲
Plutonium-238	Y/P65-7159	.	.	●	.	.	●	▲
Plutonium-239/240	Y/P65-7159	.	.	●	.	.	●	▲
Radium-223/224/226	EPA-903.0	.	.	●	.	.	●	▲
Radium-228	Y/P65-7165	.	.	●	.	.	●	▲
Strontium-89/90	Y/P65-7196	.	.	●	●	.	●	▲
Technetium-99	Y/P65-7154	●	.	●	●	.	●	▲
Thorium-228	Y/P65-7150	.	.	●	.	.	●	.
Thorium-230	Y/P65-7150	.	.	●	.	.	●	.
Thorium-232	Y/P65-7150	.	.	●	.	.	●	.
Tritium	EPA-906.0	.	.	●	.	.	●	▲
Uranium-234	Y/P65-7161	.	.	●	●	.	●	▲
Uranium-235	Y/P65-7161	.	.	●	●	.	●	▲
Uranium-238	Y/P65-7161	.	.	●	●	.	●	▲
MISCELLANEOUS LABORATORY ANALYTES	Analytical Method	GWPS Constituent	Sample Type					
			Filtered	Unfiltered				
pH	EPA-150.1	.	.	●	●	●	●	●
Specific Conductance	EPA-129.1	.	.	●	●	●	●	●
Total Dissolved Solids	EPA-160.1	.	.	●	●	●	●	●
Total Suspended Solids	EPA-160.2	.	.	●	●	●	●	●
Turbidity	EPA-180.1	.	.	●	●	●	●	●

Table 4 (cont'd)

MONITORING PROGRAM	RCRA Interim Status Assessment(●)/RCRA Post-Closure Corrective Action Monitoring (▲)							
	CERCLA Monitoring							
	DOE Order 5400.1 Monitoring							
	Best Management Practice Monitoring							
FIELD MEASUREMENTS	Analytical Method ¹	GWPS Constituent ²	Sample Type ³					
			Filtered	Unfiltered				
Depth-to-Water	ESP 302-1	.	.	.	●	●	●	●
Water Temperature	ESP 307-1	.	.	●	●	●	●	●
pH	ESP 307-2	.	.	●	●	●	●	●
Specific Conductance	ESP 307-8	.	.	●	●	●	●	●
Dissolved Oxygen	ESP 307-5	.	.	●	●	●	●	●

Notes:

- 1 Analytical/field methods and procedures from:

- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods* (U.S. Environmental Protection Agency 1986)
- *Methods for Chemical Analysis of Water and Wastes* (U.S. Environmental Protection Agency 1983)
- *Environmental Surveillance Procedures Quality Control Program* (Martin Marietta Energy Systems, Inc. 1988)
- K-25 Site Analytical Chemistry Department Procedures Manual

Volatile organic compound (VOC) analyses performed in accordance with the K-25 Analytical Service Organization method ACD-240040 until October 1, 1996; VOC analyses subsequently performed in accordance with EPA-8240.

The analytical method for arsenic changed September 1, 1996 from Inductively Coupled Plasma (ICP) method (EPA-6010) to Plasma Mass Spectroscopy (PMS) method (EPA-200.8).

The analytical method for lead changed July 1, 1996 from ICP (EPA-6010) or Atomic Absorption Spectroscopy (EPA-7841) methods to PMS method (EPA-200.8).

- 2 Groundwater Protection Standard (GWPS) Constituent, as listed in Attachment 3, Section F of the RCRA Post-Closure Permit for Upper East Fork Poplar Creek Hydrogeologic Regime.
- 3 Groundwater samples collected with dedicated sampling equipment or portable Bennet Pumps (see Table 3) were filtered in the field; all other samples filtered in the laboratory.

. - Not Applicable.

Table 5.
CY 1996 Trace Metal Concentrations that Exceed UTLs

Metal ¹	Sampling Point	Location ²	Concentration (mg/L)		Number of Samples	
			UTL ³	CY 1996 Maximum ⁴	Exceeding UTL	Total Analyzed
WESTERN PLANT AREA						
Aluminum	GW-194	B4	2.4	3.9	1	3
	GW-195	B4	2.4	7.4	2	3
	GW-251	S2	2.4	4.3	1	3
	GW-253	S2	2.4	5.6	1	1
Barium	GW-108	S3	0.79	130	1	1
Beryllium	GW-251	S2	0.00045	0.001	2	3
	GW-253	S2	0.00045	0.01	1	1
Boron	GW-115	S3	0.041	0.051	1	1
	GW-192	B4	0.041	0.21	1	3
	GW-195	B4	0.041	0.081	1	3
	GW-253	S2	0.12	0.35	1	1
	GW-338	WC	0.041	0.067	1	3
	GW-617	EXP-E	0.12	0.41	3	3
	GW-618	EXP-E	0.12	0.17	2	3
Cadmium	GW-251	S2	0.002	0.16	3	3
	GW-253	S2	0.002	3.5	1	1
	GW-618	EXP-E	0.002	0.021	3	3
Cobalt	GW-251	S2	0.014	0.035	2	3
	GW-253	S2	0.014	0.33	1	1
Copper	GW-195	B4	0.012	0.022	2	3
	GW-251	S2	0.012	0.57	3	3
	GW-253	S2	0.012	72	1	1
	GW-338	WC	0.012	0.017	1	3
Iron	GW-192	B4	8.7	12	1	3
	GW-195	B4	8.7	10	2	3
Lead (AAS)	GW-253	S2	0.0096	0.045	1	1
Manganese	GW-108	S3	1.7	130	1	1
	GW-192	B4	1.7	2.1	2	3
	GW-251	S2	1.7	4.8	3	3
	GW-253	S2	1.7	41	1	1
	GW-617	EXP-E	1.7	2.7	1	3
Mercury (CVAA)	GW-253	S2	0.0003	0.0084	1	1
Nickel	GW-253	S2	0.06	2.1	1	1
Selenium	GW-192	B4	0.05	0.062	1	3
	GW-195	B4	0.05	0.074	1	3

Table 5 (cont'd)

Metal ¹	Sampling Point	Location ²	Concentration (mg/L)		Number of Samples	
			UTL ³	CY 1996 Maximum ⁴	Exceeding UTL	Total Analyzed
WESTERN PLANT AREA						
Selenium (cont'd)	GW-618	EXP-E	0.05	0.051	1	3
	GW-620	FTF	0.05	0.06	1	3
Silver	GW-253	S2	0.006	0.021	1	1
Strontium	GW-108	S3	0.92	45	1	1
Uranium (PMS)	GW-108	S3	0.005	0.016	1	1
Vanadium	GW-195	B4	0.005	0.0072	1	3
	GW-619	FTF	0.005	0.0088	3	3
Zinc	GW-192	B4	0.041	0.075	2	3
	GW-194	B4	0.041	0.058	1	3
	GW-195	B4	0.041	0.052	2	3
	GW-251	S2	0.041	0.11	2	3
	GW-253	S2	0.041	5.1	1	1
	GW-617	EXP-E	0.041	0.092	1	3
CENTRAL PLANT AREA						
Aluminum	GW-690	CPT	2.4	8.1	1	1
	GW-691	CPT	2.4	9.1	1	1
	GW-700	B8110	2.4	12	1	1
	GW-770	GRIDG3	2.4	2.9	1	3
	GW-776	GRIDH3	2.4	3.2	1	3
	GW-781	GRIDE3	2.4	2.7	1	3
	GW-788	GRIDF3	2.4	6.9	2	3
	GW-789	GRIDF3	2.4	4.3	2	3
Barium	55-2C	GRIDB3	0.79	1.1	1	1
	GW-782	GRIDE3	0.71	0.76	1	3
Beryllium	GW-691	CPT	0.00045	0.0018	1	1
	GW-700	B8110	0.00045	0.00079	1	1
Boron	55-2C	GRIDB3	0.041	0.047	1	1
	GW-691	CPT	0.12	0.2	1	1
	GW-700	B8110	0.12	0.14	1	1
	GW-770	GRIDG3	0.041	0.099	3	3
	GW-781	GRIDE3	0.041	0.58	3	3
	GW-782	GRIDE3	0.12	0.2	2	3
	GW-786	GRIDE2	0.041	0.046	1	3
	GW-788	GRIDF3	0.12	1.5	3	3
	GW-789	GRIDF3	0.041	0.08	3	3
GW-792	GRIDD2	0.028	0.06	1	3	

Table 5 (cont'd)

Metal ¹	Sampling Point	Location ²	Concentration (mg/L)		Number of Samples	
			UTL ³	CY 1996 Maximum ⁴	Exceeding UTL	Total Analyzed
CENTRAL PLANT AREA						
Cadmium	GW-789	GRIDF3	0.002	0.0056	1	3
Chromium	55-1A	GRIDB2	0.041	1.2	1	1
	55-6A	GRIDC2	0.041	0.052	1	1
	GW-218	UOV	0.029	0.2	1	1
	GW-776	GRIDH3	0.029	0.69	3	3
	GW-783	GRIDE3	0.029	1	3	3
Cobalt	GW-691	CPT	0.019	0.021	1	1
Copper	55-1A	GRIDB2	0.012	0.024	1	1
	55-6A	GRIDC2	0.012	0.015	1	1
	GW-691	CPT	0.012	0.018	1	1
	GW-700	B8110	0.012	0.015	1	1
	GW-776	GRIDH3	0.012	0.016	1	3
	GW-783	GRIDE3	0.012	0.03	2	3
	GW-788	GRIDF3	0.012	0.02	2	3
	GW-789	GRIDF3	0.012	0.013	1	3
Iron	55-1A	GRIDB2	8.7	12	1	1
	GW-690	CPT	8.7	9.3	1	1
	GW-691	CPT	8.7	9.1	1	1
	GW-700	B8110	8.7	13	1	1
Lead (PMS)	GW-789	GRIDF3	0.0096	0.015	1	3
Manganese	GW-691	CPT	1.7	5.9	1	1
Mercury (CVAA)	GW-692	CPT	0.0003	0.0008	1	1
	GW-698	B8110	0.0003	0.0054	1	1
Molybdenum	55-1A	GRIDB2	0.018	0.019	1	1
Nickel	55-1A	GRIDB2	0.02	0.59	1	1
	55-6A	GRIDC2	0.02	0.028	1	1
	GW-218	UOV	0.06	0.11	1	1
	GW-776	GRIDH3	0.06	0.55	3	3
	GW-783	GRIDE3	0.06	0.69	3	3
	GW-789	GRIDF3	0.02	0.021	1	3
Selenium	GW-691	CPT	0.05	0.058	1	1
Silver	GW-692	CPT	0.006	0.0068	1	1
	GW-769	GRIDG3	0.006	0.009	1	3
	GW-775	GRIDH3	0.006	0.0081	1	3
	GW-788	GRIDF3	0.006	0.019	1	3
	GW-789	GRIDF3	0.006	0.014	1	3

Table 5 (cont'd)

Metal ¹	Sampling Point	Location ²	Concentration (mg/L)		Number of Samples	
			UTL ³	CY 1996 Maximum ⁴	Exceeding UTL	Total Analyzed
CENTRAL PLANT AREA						
Strontium	55-2C	GRIDB3	0.92	2.4	1	1
	GW-781	GRIDE3	0.92	0.93	1	3
Uranium (PMS)	GW-193	T2331	0.012	0.018	1	1
Vanadium	55-1A	GRIDB2	0.005	0.0076	1	1
	GW-690	CPT	0.005	0.0088	1	1
	GW-691	CPT	0.005	0.01	1	1
	GW-692	CPT	0.005	0.0082	1	1
	GW-700	B8110	0.005	0.019	1	1
	GW-779	GRIDF2	0.005	0.0057	1	3
	GW-788	GRIDF3	0.005	0.0079	2	3
Zinc	55-6A	GRIDC2	0.041	0.076	1	1
	GW-700	B8110	0.041	0.081	1	1
	GW-780	GRIDF2	0.041	0.045	1	3
	GW-787	GRIDE2	0.043	0.24	3	3
	GW-788	GRIDF3	0.041	0.06	1	3
	GW-789	GRIDF3	0.041	0.05	1	3
EASTERN PLANT AREA						
Aluminum	GW-220	NHP	2.4	8.5	1	4
	GW-605	EXP-I	2.4	7.4	1	4
	GW-735	EXP-J	2.4	3.6	2	4
	GW-832	NHP	2.4	3.5	1	1
	SCR7.16SP	EXP-UV	2.4	8.2	1	1
Arsenic	GW-222	NHP	0.05	0.054	1	4
Barium	GW-750	EXP-J	0.71	0.81	3	4
Beryllium	GW-148	NHP	0.00045	0.00059	1	4
	GW-149	NHP	0.00045	0.00061	1	4
	GW-151	NHP	0.00045	0.00053	1	4
	GW-220	NHP	0.00045	0.0011	1	4
	GW-240	NHP	0.00045	0.0016	1	4
	GW-606	EXP-I	0.00045	0.00047	1	4
	GW-817	GRIDK3	0.00045	0.01	1	4
Boron	GW-149	NHP	0.12	0.53	4	4
	GW-154	NHP	0.12	0.19	3	4
	GW-169	EXP-UV	0.041	0.055	1	1
	GW-207	EXP-SR	0.12	0.15	4	4
	GW-208	EXP-SR	0.12	0.27	4	4
	GW-604	EXP-J	0.028	0.053	1	4

Table 5 (cont'd)

Metal ¹	Sampling Point	Location ²	Concentration (mg/L)		Number of Samples	
			UTL ³	CY 1996 Maximum ⁴	Exceeding UTL	Total Analyzed
EASTERN PLANT AREA						
Boron (cont'd)	GW-605	EXP-I	0.12	0.18	4	4
	GW-744	GRIDK1	0.041	0.1	4	4
	GW-745	GRIDK1	0.12	0.18	1	4
	GW-746	GRIDK1	0.041	0.054	1	4
	GW-747	GRIDK2	0.041	0.1	4	4
	GW-748	GRIDK2	0.12	0.13	1	4
	GW-749	GRIDK2	0.12	0.26	1	4
	GW-763	GRIDJ3	0.12	0.29	1	4
	GW-766	GRIDI2	0.041	0.061	1	3
	GW-816	EXP-SR	0.028	0.11	4	4
	GW-817	GRIDK3	0.041	0.043	1	4
	GW-832	NHP	0.12	0.19	1	1
	LRSPW	EXP-SW	0.041	0.082	1	2
	NHPCEMSP	EXP-SW	0.041	0.044	1	2
	SCR7.14SP	EXP-UV	0.12	0.83	1	1
Cadmium	GW-817	GRIDK3	0.002	0.01	1	4
Chromium	GW-151	NHP	0.029	0.44	1	4
	GW-207	EXP-SR	0.029	0.21	1	4
	GW-380	NHP	0.029	0.83	4	4
	GW-603	EXP-J	0.029	0.15	4	4
	GW-746	GRIDK1	0.041	0.046	3	4
Copper	GW-151	NHP	0.012	0.091	1	4
	GW-207	EXP-SR	0.012	0.035	1	4
	GW-380	NHP	0.012	0.014	1	4
	GW-751	GRIDJ3	0.012	0.035	1	3
	GW-817	GRIDK3	0.012	0.015	1	4
Iron	GW-171	EXP-UV	8.7	9.7	1	2
	GW-220	NHP	8.7	9.2	1	4
	GW-605	EXP-I	8.7	10	1	4
	GW-763	GRIDJ3	8.7	20	4	4
	GW-816	EXP-SR	4.6	27	4	4
	SCR7.14SP	EXP-UV	8.7	44	1	1
	SCR7.16SP	EXP-UV	8.7	19	1	1
Lead (AAS)	GW-170	EXP-UV	0.0096	0.021	1	2
	SCR7.16SP	EXP-UV	0.0096	0.01	1	1
Lead (PMS)	GW-208	EXP-SR	0.0096	0.014	1	4

Table 5 (cont'd)

Metal ¹	Sampling Point	Location ²	Concentration (mg/L)		Number of Samples	
			UTL ³	CY 1996 Maximum ⁴	Exceeding UTL	Total Analyzed
EASTERN PLANT AREA						
Manganese	GW-171	EXP-UV	1.7	8.8	1	2
	GW-172	EXP-UV	1.7	2.1	1	1
	GW-749	GRIDK2	1.7	3.1	2	4
	GW-816	EXP-SR	0.13	1.3	4	4
	SCR7.16SP	EXP-UV	1.7	2.9	1	1
Mercury (CVAA)	GW-222	NHP	0.0003	0.00034	1	4
Nickel	GW-151	NHP	0.06	0.25	1	4
	GW-207	EXP-SR	0.06	0.09	1	4
	GW-380	NHP	0.06	0.8	4	4
	GW-603	EXP-J	0.06	0.28	4	4
	GW-746	GRIDK1	0.02	0.22	4	4
	GW-751	GRIDJ3	0.02	0.024	1	4
	GW-752	GRIDJ3	0.02	0.029	2	4
Selenium	GW-240	NHP	0.05	0.076	1	4
	GW-817	GRIDK3	0.05	0.053	1	4
Silver	GW-148	NHP	0.006	0.0074	1	4
	GW-154	NHP	0.006	0.0068	1	4
	GW-169	EXP-UV	0.006	0.0075	1	1
	GW-170	EXP-UV	0.006	0.0072	1	2
	GW-171	EXP-UV	0.006	0.0097	1	2
	GW-172	EXP-UV	0.006	0.0068	1	1
	GW-230	EXP-UV	0.006	0.0074	1	2
	GW-817	GRIDK3	0.006	0.012	1	4
	SCR7.1SP	EXP-UV	0.006	0.007	1	2
Strontium	GW-744	GRIDK1	0.92	1.1	4	4
	GW-816	EXP-SR	0.079	0.098	3	4
Uranium (PMS)	GW-154	NHP	0.012	0.47	4	4
	GW-222	NHP	0.012	0.28	4	4
	GW-223	NHP	0.012	0.02	3	4
	GW-605	EXP-I	0.012	0.23	4	4
	LRSPW	EXP-SW	0.005	0.018	2	2
	NHPCEMSP	EXP-SW	0.005	0.0051	1	2
Vanadium	GW-220	NHP	0.005	0.011	1	4
	GW-605	EXP-I	0.005	0.012	1	4
	GW-733	EXP-J	0.005	0.006	1	4
	GW-817	GRIDK3	0.005	0.0084	1	4
	SCR7.16SP	EXP-UV	0.005	0.012	1	1

Table 5 (cont'd)

Metal ¹	Sampling Point	Location ²	Concentration (mg/L)		Number of Samples	
			UTL ³	CY 1996 Maximum ⁴	Exceeding UTL	Total Analyzed
EASTERN PLANT AREA						
Zinc	GW-148	NHP	0.041	0.072	1	4
	GW-170	EXP-UV	0.041	0.077	2	2
	GW-172	EXP-UV	0.041	3.2	1	1
	GW-208	EXP-SR	0.041	4.4	4	4
	GW-230	EXP-UV	0.041	12	2	2
	GW-603	EXP-J	0.041	0.056	1	4
	GW-605	EXP-I	0.041	0.047	1	4
	GW-763	GRIDJ3	0.041	0.092	3	4
	GW-767	GRIDI2	0.043	0.42	3	3
	GW-832	NHP	0.041	0.058	1	1
	SCR7.16SP	EXP-UV	0.041	0.11	1	1

Notes:

- 1 Results were obtained by Inductively Coupled Plasma spectroscopy unless otherwise noted.

AAS - Atomic Absorption Spectroscopy
PMS - Plasma Mass Spectroscopy

- 2 B4 - Beta-4 Security Pits
B8110 - Building 8110
CPT - Coal Pile Trench
EXP - Exit Pathway (Maynardville Limestone) monitoring location
 ● -E, -I, or -J: Maynardville Limestone Picket monitoring well
 ● -SW: Onsite spring or surface water station
 ● -UV: Offsite in Union Valley
 ● -SR: Along Scarboro Road in the gap through Pine Ridge
FTF - Fire Training Facility
GRID - Comprehensive Groundwater Monitoring Plan Grid Location
NHP - New Hope Pond
S2 - S-2 Site
S3 - S-3 Ponds Site
T2331 - Tank 2331-U
UOV - Uranium Oxide Vault
WC - Waste Coolant Processing Area

Table 5 (cont'd)

Notes: (cont'd)

- 3 UTL - Upper Tolerance Limit in milligrams per liter (mg/L) that represents a background concentration for clusters of wells grouped by geochemical characteristics. The cluster designation for each sampling location is provided in Appendix C.
- 4 Results shown in **bold** typeface exceed the applicable drinking water standard.

Table 6.
Maximum Summed Concentration of VOCs Detected in CY 1996
Groundwater and Surface Water Samples

MCL ²	Sampling Point Location ³ Date Sampled	Maximum CY 1996 Summed Concentration ¹ (µg/L)				
		55-2B	55-2C	GW-108	GW-148	GW-151
		GRIDB3	GRIDB3	S3	NHP	NHP
		06/10/96	06/09/96	11/04/96	08/20/96	11/20/96
Chloroethenes						
5	Tetrachloroethene	550	640	0	0	59
5	Trichloroethene	300	350	0	0	10
-	1,2-Dichloroethene	2,200	2,700	0	8	4
7	1,1-Dichloroethene	42	0	0	0	0
2	Vinyl Chloride	38	0	0	0	0
Subtotal		3,130	3,690	0	8	73
Chloromethanes						
5	Carbon Tetrachloride	0	0	0	0	750
-	Chloroform	1	0	0	0	48
5	Methylene Chloride	0	0	53	0	0
Subtotal		1	0	53	0	798
Chloroethanes						
200	1,1,1-Trichloroethane	13	34	0	0	0
5	1,1,2-Trichloroethane	0	0	0	0	0
-	1,1-Dichloroethane	33	45	0	0	0
Subtotal		46	79	0	0	0
Summed Chlorinated Solvents		3,177	3,769	53	8	871
Summed Petroleum Hydrocarbons⁴		0	22	0	0	0
Summed Laboratory Reagents⁵		0	0	49	0	0
PLUME DELINEATION VALUE		3,177	3,791	102	8	871
DATA SUMMARY						
% Chloroethenes		99%	98%	0%	100%	8%
% Chloromethanes		0%	0%	100%	0%	92%
% Chloroethanes		1%	2%	0%	0%	0%

Table 6 (cont'd)

MCL ²	Sampling Point	Maximum CY 1996 Summed Concentration ¹ (µg/L)				
		GW-153	GW-154	GW-169	GW-170	GW-192
	Location ³	NHP	NHP	EXP-UV	EXP-UV	B4
	Date Sampled	11/18/96	06/12/96	02/27/96	03/18/96	05/23/96
Chloroethenes						
5	Tetrachloroethene	8	2	2	4	2
5	Trichloroethene	0	0	1	3	3
-	1,2-Dichloroethene	0	0	0	0	25
7	1,1-Dichloroethene	0	0	0	0	0
2	Vinyl Chloride	0	0	0	0	0
Subtotal		8	2	3	7	30
Chloromethanes						
5	Carbon Tetrachloride	270	0	0	81	0
-	Chloroform	10	0	0	7	0
5	Methylene Chloride	0	0	0	0	0
Subtotal		280	0	0	88	0
Chloroethanes						
200	1,1,1-Trichloroethane	0	0	0	0	0
5	1,1,2-Trichloroethane	0	0	0	0	0
-	1,1-Dichloroethane	0	0	0	0	0
Subtotal		0	0	0	0	0
Summed Chlorinated Solvents		288	2	3	95	30
Summed Petroleum Hydrocarbons⁴		0	0	0	0	0
Summed Laboratory Reagents⁵		0	0	0	0	0
PEUME DELINEATION VALUE		288	2	3	95	30
DATA SUMMARY						
% Chloroethenes		3%	100%	100%	7%	100%
% Chloromethanes		97%	0%	0%	93%	0%
% Chloroethanes		0%	0%	0%	0%	0%

Table 6 (cont'd)

MCL ²	Sampling Point	Maximum CY 1996 Summed Concentration ¹ (µg/L)				
		GW-193	GW-218	GW-220	GW-222	GW-223
	Location ³	T2331	UOV	NHP	NHP	NHP
	Date Sampled	11/04/96	06/07/96	03/20/96	11/18/96	11/18/96
Chloroethenes						
5	Tetrachloroethene	0	0	32	110	420
5	Trichloroethene	0	0	0	28	110
-	1,2-Dichloroethene	0	4	0	18	49
7	1,1-Dichloroethene	0	0	0	0	0
2	Vinyl Chloride	0	0	0	0	0
Subtotal		0	4	32	156	579
Chloromethanes						
5	Carbon Tetrachloride	0	0	410	14	29
-	Chloroform	0	0	21	5	11
5	Methylene Chloride	0	0	0	0	0
Subtotal		0	0	431	19	40
Chloroethanes						
200	1,1,1-Trichloroethane	0	0	0	0	0
5	1,1,2-Trichloroethane	0	0	0	0	0
-	1,1-Dichloroethane	0	0	0	0	0
Subtotal		0	0	0	0	0
Summed Chlorinated Solvents		0	4	463	175	619
Summed Petroleum Hydrocarbons ⁴		404	0	0	0	0
Summed Laboratory Reagents ⁵		0	0	0	0	0
PLUME DELINEATION VALUE		404	4	463	175	619
DATA SUMMARY						
% Chloroethenes		0%	100%	7%	89%	94%
% Chloromethanes		0%	0%	93%	11%	6%
% Chloroethanes		0%	0%	0%	0%	0%

Table 6 (cont'd)

MCL ²	Sampling Point Location ³ Date Sampled	Maximum CY 1996 Summed Concentration ¹ (µg/L)				
		GW-230	GW-240	GW-251	GW-253	GW-380
		EXP-UV	NHP	S2	S2	NHP
		06/18/96	11/19/96	05/23/96	06/10/96	11/19/96
Chloroethenes						
5	Tetrachloroethene	0	0	190	510	1
5	Trichloroethene	0	0	76	310	0
-	1,2-Dichloroethene	13	0	5	140	0
7	1,1-Dichloroethene	0	0	0	0	0
2	Vinyl Chloride	4	0	0	16	0
Subtotal		17	0	271	976	1
Chloromethanes						
5	Carbon Tetrachloride	0	17	5	18	0
-	Chloroform	0	3	8	30	2
5	Methylene Chloride	0	0	0	0	0
Subtotal		0	20	13	48	2
Chloroethanes						
200	1,1,1-Trichloroethane	0	0	0	0	0
5	1,1,2-Trichloroethane	0	0	0	0	0
-	1,1-Dichloroethane	0	0	0	0	0
Subtotal		0	0	0	0	0
Summed Chlorinated Solvents		17	20	284	1,024	3
Summed Petroleum Hydrocarbons ⁴		3	0	0	0	0
Summed Laboratory Reagents ⁵		0	0	0	0	0
PLUME DELINEATION VALUE		20	20	284	1,024	3
DATA SUMMARY						
% Chloroethenes		100%	0%	95%	95%	33%
% Chloromethanes		0%	100%	5%	5%	67%
% Chloroethanes		0%	0%	0%	0%	0%

Table 6 (cont'd)

MCL ²	Sampling Point	Maximum CY 1996 Summed Concentration ¹ (µg/L)				
		GW-383	GW-604	GW-605	GW-606	GW-617
	Location ³	NHP	EXP-J	EXP-I	EXP-I	EXP-E
	Date Sampled	11/20/96	03/25/96	06/08/96	10/31/96	11/13/96
Chloroethenes						
5	Tetrachloroethene	500	0	14	12	7
5	Trichloroethene	200	0	5	0	6
-	1,2-Dichloroethene	120	0	13	0	0
7	1,1-Dichloroethene	2	0	0	0	0
2	Vinyl Chloride	2	0	0	0	0
Subtotal		824	0	32	12	13
Chloromethanes						
5	Carbon Tetrachloride	2	0	250	850	0
-	Chloroform	1	1	23	240	0
5	Methylene Chloride	0	0	0	0	0
Subtotal		3	1	273	1,090	0
Chloroethanes						
200	1,1,1-Trichloroethane	0	0	0	0	0
5	1,1,2-Trichloroethane	0	0	0	0	0
-	1,1-Dichloroethane	0	0	2	0	0
Subtotal		0	0	2	0	0
Summed Chlorinated Solvents		827	1	307	1,102	13
Summed Petroleum Hydrocarbons ⁴		0	0	0	0	0
Summed Laboratory Reagents ⁵		0	0	0	0	0
PLUME DELINEATION VALUE		827	1	307	1,102	13
DATA SUMMARY						
% Chloroethenes		100%	0%	10%	1%	100%
% Chloromethanes		0%	100%	89%	99%	0%
% Chloroethanes		0%	0%	1%	0%	0%

Table 6 (cont'd)

MCL ²	Sampling Point	Maximum CY 1996 Summed Concentration ¹ (µg/L)				
		GW-618	GW-619	GW-620	GW-690	GW-691
	Location ³	EXP-E	FTF	FTF	CPT	CPT
	Date Sampled	11/11/96	06/04/96	03/07/96	06/08/96	06/08/96
Chloroethenes						
5	Tetrachloroethene	9	48	210	720	120
5	Trichloroethene	21	12	64	26	7
-	1,2-Dichloroethene	52	17	170	44	27
7	1,1-Dichloroethene	0	0	0	0	0
2	Vinyl Chloride	0	0	0	0	0
Subtotal		82	77	444	790	154
Chloromethanes						
5	Carbon Tetrachloride	0	0	0	0	0
-	Chloroform	0	0	0	0	0
5	Methylene Chloride	0	0	0	0	0
Subtotal		0	0	0	0	0
Chloroethanes						
200	1,1,1-Trichloroethane	0	0	0	0	0
5	1,1,2-Trichloroethane	0	0	0	0	0
-	1,1-Dichloroethane	0	0	0	0	0
Subtotal		0	0	0	0	0
Summed Chlorinated Solvents		82	77	444	790	154
Summed Petroleum Hydrocarbons ⁴		0	0	0	0	0
Summed Laboratory Reagents ⁵		0	0	0	0	0
PLUME DELINEATION VALUE		82	77	444	790	154
DATA SUMMARY						
% Chloroethenes		100%	100%	100%	100%	100%
% Chloromethanes		0%	0%	0%	0%	0%
% Chloroethanes		0%	0%	0%	0%	0%

Table 6 (cont'd)

MCL ²	Sampling Point	Maximum CY 1996 Summed Concentration ¹ (µg/L)				
		GW-692	GW-698	GW-700	GW-733	GW-763
	Location ³	CPT	B8110	B8110	EXP-J	GRIDJ3
	Date Sampled	06/08/96	06/09/96	06/08/96	06/07/96	08/20/96
Chloroethenes						
5	Tetrachloroethene	0	6	360	2	22
5	Trichloroethene	0	11	15	0	5
-	1,2-Dichloroethene	0	3	46	0	78
7	1,1-Dichloroethene	0	0	0	0	2
2	Vinyl Chloride	0	0	0	0	12
Subtotal		0	20	421	2	119
Chloromethanes						
5	Carbon Tetrachloride	0	0	0	51	0
-	Chloroform	14	0	0	0	0
5	Methylene Chloride	0	0	0	0	0
Subtotal		14	0	0	51	0
Chloroethanes						
200	1,1,1-Trichloroethane	0	0	0	0	0
5	1,1,2-Trichloroethane	0	0	4	0	0
-	1,1-Dichloroethane	0	0	0	0	0
Subtotal		0	0	4	0	0
Summed Chlorinated Solvents		14	20	425	53	119
Summed Petroleum Hydrocarbons ⁴		0	0	0	0	0
Summed Laboratory Reagents ⁵		0	0	0	0	0
PLUME DELINEATION VALUE		14	20	425	53	119
DATA SUMMARY						
% Chloroethenes		0%	100%	99%	4%	100%
% Chloromethanes		100%	0%	0%	96%	0%
% Chloroethanes		0%	0%	1%	0%	0%

Table 6 (cont'd)

MCL ²	Sampling Point Location ³ Date Sampled	Maximum CY 1996 Summed Concentration ¹ (µg/L)				
		GW-769	GW-770	GW-775	GW-776	GW-782
		GRIDG3	GRIDG3	GRIDH3	GRIDH3	GRIDE3
		05/20/96	01/11/96	10/10/96	01/10/96	11/12/96
Chloroethenes						
5	Tetrachloroethene	6	0	0	2	270
5	Trichloroethene	2	0	6	3	69
-	1,2-Dichloroethene	2	0	0	0	33
7	1,1-Dichloroethene	1	0	0	0	56
2	Vinyl Chloride	0	0	0	0	5
Subtotal		11	0	6	5	433
Chloromethanes						
5	Carbon Tetrachloride	6	5	0	0	6
-	Chloroform	1	3	0	0	2
5	Methylene Chloride	0	0	0	0	0
Subtotal		7	8	0	0	8
Chloroethanes						
200	1,1,1-Trichloroethane	0	0	0	0	21
5	1,1,2-Trichloroethane	0	0	0	0	0
-	1,1-Dichloroethane	0	0	0	0	170
Subtotal		0	0	0	0	191
Summed Chlorinated Solvents		18	8	6	5	632
Summed Petroleum Hydrocarbons ⁴		0	0	0	0	0
Summed Laboratory Reagents ⁵		0	0	0	0	0
PLUME DELINEATION VALUE		18	8	6	5	632
DATA SUMMARY						
% Chloroethenes		61%	0%	100%	100%	69%
% Chloromethanes		39%	100%	0%	0%	1%
% Chloroethanes		0%	0%	0%	0%	30%

Table 6 (cont'd)

MCL ²	Sampling Point	Maximum CY 1996 Summed Concentration ¹ (µg/L)				
		GW-783	GW-789	GW-791	GW-792	GW-832
	Location ³	GRIDE3	GRIDE3	GRIDD2	GRIDD2	NHP
	Date Sampled	11/12/96	03/04/96	05/23/96	11/11/96	05/14/96
Chloroethenes						
5	Tetrachloroethene	59	0	1,400	11	6
5	Trichloroethene	23	2	0	0	1
-	1,2-Dichloroethene	35	0	0	0	0
7	1,1-Dichloroethene	8	0	0	0	0
2	Vinyl Chloride	0	0	0	0	0
Subtotal		125	2	1,400	11	7
Chloromethanes						
5	Carbon Tetrachloride	0	0	0	0	23
-	Chloroform	0	1	0	0	3
5	Methylene Chloride	0	0	0	0	0
Subtotal		0	1	0	0	26
Chloroethanes						
200	1,1,1-Trichloroethane	0	0	0	0	0
5	1,1,2-Trichloroethane	0	0	0	0	0
-	1,1-Dichloroethane	22	0	0	0	0
Subtotal		22	0	0	0	0
Summed Chlorinated Solvents		147	3	1,400	11	33
Summed Petroleum Hydrocarbons ⁴		0	0	0	0	0
Summed Laboratory Reagents ⁵		0	0	0	0	0
PLUME DELINEATION VALUE		147	3	1,400	11	33
DATA SUMMARY						
% Chloroethenes		85%	67%	100%	100%	21%
% Chloromethanes		0%	33%	0%	0%	79%
% Chloroethanes		15%	0%	0%	0%	0%

Table 6 (cont'd)

MCL ²	Sampling Point	Maximum CY 1996 Summed Concentration ¹ (µg/L)				
		LRSPW	SCR7.14SP	SCR7.18SP	SCR7.1SP	SCR7.8SSP
	Location ³	EXP-SW	EXP-UV	EXP-UV	EXP-UV	EXP-UV
	Date Sampled	02/20/96	03/21/96	06/20/96	03/11/96	06/20/96
Chloroethenes						
5	Tetrachloroethene	6	0	0	1	2
5	Trichloroethene	1	0	2	2	0
-	1,2-Dichloroethene	0	0	2	0	0
7	1,1-Dichloroethene	0	0	0	0	0
2	Vinyl Chloride	0	0	0	0	0
Subtotal		7	0	4	3	2
Chloromethanes						
5	Carbon Tetrachloride	15	0	0	3	0
-	Chloroform	2	0	0	0	0
5	Methylene Chloride	0	0	0	0	0
Subtotal		17	0	0	3	0
Chloroethanes						
200	1,1,1-Trichloroethane	0	0	2	0	1
5	1,1,2-Trichloroethane	0	0	0	0	0
-	1,1-Dichloroethane	0	0	3	0	0
Subtotal		0	0	5	0	1
Summed Chlorinated Solvents		24	0	9	6	3
Summed Petroleum Hydrocarbons ⁴		0	16	0	0	0
Summed Laboratory Reagents ⁵		0	0	0	0	0
PLUME DELINEATION VALUE		24	16	9	6	3
DATA SUMMARY						
% Chloroethenes		29%	0%	44%	50%	67%
% Chloromethanes		71%	0%	0%	50%	0%
% Chloroethanes		0%	0%	56%	0%	33%

Notes:

- Concentrations are reported in micrograms per liter (µg/L). Only results for the sample date with the highest summed concentration are presented. Results less than 10 µg/L are below the analytical detection limit and are considered qualitative.
- MCL - Maximum Contaminant Level.

Table 6 (cont'd)

Notes: (cont'd)

- 3 B4 - Beta-4 Security Pits
 B8110 - Building 8110
 CPT - Coal Pile Trench
 EXP - Exit Pathway (Maynardville Limestone) monitoring location
 ● -E, -I, or -J: Maynardville Limestone Picket monitoring well
 ● -SW: Onsite spring or surface water station
 ● -UV: Offsite in Union Valley
 FTF - Fire Training Facility
 GRID - Comprehensive Groundwater Monitoring Plan Grid Location
 NHP - New Hope Pond
 S2 - S-2 Site
 S3 - S-3 Ponds Site
 T2331 - Tank 2331-U
 UOV - Uranium Oxide Vault
- 4 Petroleum hydrocarbons include benzene, ethylbenzene, chlorobenzene, toluene, and xylenes.
- 5 Laboratory reagents include acetone and 2-butanone.

Table 7.
CY 1996 Gross Alpha and Gross Beta Activities that Exceed
MDAs and Counting Errors

Sampling Point	Location ¹	Sampling Date	Activity ² (pCi/L)	
			Gross Alpha	Gross Beta
WESTERN PLANT AREA				
GW-108	S3	11/04/96	700 ± 180	5,690 ± 700
GW-191	B4	05/22/96	.	9.26 ± 5.5
GW-195	B4	03/04/96	.	10.1 ± 5.6
		05/22/96	.	23.9 ± 7
		11/07/96	.	9.74 ± 5.4
GW-251	S2	02/21/96	11 ± 5.8	.
		05/23/96	8.96 ± 6	.
		11/07/96	6.77 ± 4.1	.
GW-253	S2	06/10/96	47.1 ± 23	34.4 ± 22
GW-619	FTF	06/04/96	.	9.38 ± 5.7
		11/13/96	.	18.8 ± 5.4
GW-620	FTF	03/07/96	.	15.1 ± 6.1
		11/13/96	.	15.1 ± 5.6
CENTRAL PLANT AREA				
GW-193	T2331	11/04/96	9.7 ± 3.7	.
GW-690	CPT	06/08/96	.	51.8 ± 24
GW-700	B8110	06/08/96	.	15.9 ± 6.2
GW-770	GRIDG3	10/15/96	2.98 ± 2.2	.
GW-782	GRIDE3	02/19/96	52 ± 11	11 ± 5.7
		05/28/96	30.1 ± 8.7	.
		11/12/96	26.2 ± 6.7	.
GW-788	GRIDF3	03/04/96	.	9.77 ± 5.6
EASTERN PLANT AREA				
GW-148	NHP	11/14/96	3.32 ± 2.3	.
GW-149	NHP	06/10/96	.	9.56 ± 5.6
GW-153	NHP	11/18/96	3.37 ± 2.2	.
GW-154	NHP	02/23/96	500 ± 65	96 ± 15
		06/12/96	271 ± 38	57.9 ± 11
		08/22/96	278 ± 35	58.4 ± 9.5
		11/19/96	447 ± 53	108 ± 15
GW-171	EXP-UV	06/18/96	.	27.4 ± 7.5
GW-208	EXP-SR	09/11/96	.	13 ± 5.7
GW-222	NHP	03/19/96	95.8 ± 17	37.6 ± 8.5
		06/12/96	24.7 ± 7.7	.
		08/22/96	19.7 ± 5.3	10 ± 5
		11/18/96	18 ± 5	14.8 ± 5

Table 7 (cont'd)

Sampling Point	Location ¹	Sampling Date	Activity ² (pCi/L)	
			Gross Alpha	Gross Beta
EASTERN PLANT AREA (cont'd)				
GW-223	NHP	06/11/96	8.46 ± 5.3	.
		08/21/96	3.68 ± 2.5	.
		11/18/96	5.81 ± 2.9	.
GW-240	NHP	11/19/96	3.14 ± 2.2	.
GW-385	NHP	09/18/96	.	17.9 ± 6.4
GW-603	EXP-J	03/25/96	.	13.8 ± 5.4
GW-605	EXP-I	02/15/96	94.7 ± 17	34 ± 8
		06/08/96	.	36.4 ± 8.3
		09/19/96	132 ± 19	39.2 ± 7.4
		10/31/96	103 ± 16	53.9 ± 9.9
GW-606	EXP-I	02/22/96	8.7 ± 5.3	.
		09/19/96	7.35 ± 3.4	7.48 ± 5.1
		10/31/96	4.56 ± 2.7	.
GW-733	EXP-J	03/28/96	.	9.86 ± 5
GW-744	GRIDK1	11/13/96	2.18 ± 1.8	.
GW-745	GRIDK1	09/04/96	.	6.72 ± 4.6
GW-746	GRIDK1	09/04/96	.	7.45 ± 4.9
GW-749	GRIDK2	09/06/96	.	6.86 ± 4.1
GW-817	GRIDK3	11/14/96	2.65 ± 1.9	.
LRSPW	EXP-SW	02/20/96	11 ± 5.6	.
		09/03/96	3.68 ± 2.7	.
SCR7.14SP	EXP-UV	03/21/96	.	42.2 ± 9.2
SCR7.16SP	EXP-UV	03/21/96	.	14.3 ± 6.2

Notes:

- 1 B4 - Beta-4 Security Pits
 B8110 - Building 8110
 CPT - Coal Pile Trench
 EXP - Exit Pathway (Maynardville Limestone) monitoring location
 • -I or -J: Maynardville Limestone Picket monitoring well
 • -SW: Onsite spring or surface water station
 • -UV: Offsite in Union Valley
 • -SR: Along Scarboro Road in the gap through Pine Ridge
 FTF - Fire Training Facility
 GRID - Comprehensive Groundwater Monitoring Plan Grid Location
 NHP - New Hope Pond

Table 7 (cont'd)

Notes: (cont'd)

S2 - S-2 Site
S3 - S-3 Ponds Site
T2331 - Tank 2331-U
UOV - Uranium Oxide Vault

2 Activity, in picoCuries per liter (pCi/L), above the sample-specific minimum detectable activity and counting error. Results shown in **bold** exceed drinking water standards.

. - Result less than MDA or the associated counting error.

APPENDIX C

SCREENED DATA SUMMARY

CY 1996 GROUNDWATER AND SURFACE WATER SAMPLES

EXPLANATION

SAMPLING POINT:

LRSPW	-	Lake Reality Emergengy Spillway
NHPCEMSP	-	New Hope Pond Cemetary Spring
RGQWWSP	-	Rogers Quarry (in Union Valley) West Wall Spring
SCR	-	Surface water (SW ending) or spring (SP ending) sampling location along Scarboro Creek in Union Valley

LOCATION:

B4	-	Beta-4 Security Pits
B8110	-	Building 8110
CPT	-	Coal Pile Trench
EXP	-	Exit Pathway (Maynardville Limestone) monitoring location <ul style="list-style-type: none">• -E, -I, or -J: Maynardville Limestone Picket monitoring well.• -SW: Onsite spring or surface water station• -UV: Offsite in Union Valley• -SR: Along Scarboro Road in the gap through Pine Ridge
FTF	-	Fire Training Facility
GRID	-	Comprehensive Groundwater Monitoring Plan Grid Location
NHP	-	New Hope Pond
S2	-	S-2 Site
S3	-	S-3 Ponds Site
T2331	-	Tank 2331-U
UOV	-	Uranium Oxide Vault
WC	-	Waste Coolant Processing Area

UNITS:

ft	-	feet (water-level elevation is in feet above mean sea level)
mg/L	-	milligrams per liter
ug/L	-	micrograms per liter
pCi/L	-	picoCuries per liter

DATA QUALIFIERS:

.	-	Not detected or not analyzed
TOT < DIS	-	Total concentration (Unfiltered Sample) is at least an order-of-magnitude less than the dissolved concentration (Filtered Sample).
FP2	-	False positive VOC result, screened by trip blank data.
<MDA	-	Reported activity is less than the Minimum Detectable Activity.
<CE	-	Reported activity is greater than the MDA, but less than the associated counting error.

EXPLANATION (cont'd)

NOTES:

Only unfiltered results that meet data quality objectives of the Y-12 Plant Groundwater Protection Program for the constituents most often detected in CY 1996 are presented in this appendix. Results for some organics (acetone, 2-butanone, and methylene chloride in GW-108) and metals (arsenic, molybdenum, selenium, and thallium) are not included in this appendix because of the infrequency of detection (less than 10 results each) and page space limitations. All of the analytical results for groundwater and surface water samples collected in 1996 are available in the Annual Groundwater Monitoring Report (AJA Technical Services, Inc. 1997a).

Miscellaneous:

TSS - Total Suspended Solids

Major Ions:

The relative percent difference (RPD) between summed positive and negative charges (Charge Balance) is used to evaluate the accuracy of the data. Results for major ions are considered qualitative if the Charge Balance RPD is greater than 10 or less than -10.

Trace Metals:

The Cluster Designation reflects a group (numbered 1,2,3,4,6, or 10), based on similar geochemical characteristics, assigned to each sampling location (HSW Environmental Consultants, Inc. *et al.* 1995). Upper tolerance limits (UTLs) that represent trace metal background levels have been determined for each cluster (see Section 4.2).

All metals analyses were performed using the inductively coupled plasma (ICP) spectroscopy method unless otherwise noted.

AAS - Atomic Absorption Spectroscopy
CVAA - Cold Vapor Atomic Absorption
PMS - Plasma Mass Spectroscopy

Organics:

All results below 10 ug/L are below the analytical reporting limit, and are considered qualitative.

The maximum Summed VOCs value for each sampling location is used a plume delineation value (see Table 6, Appendix B).

APPENDIX C.1
Screened Data Summary, 1996

1

Sampling Point	55-1A	55-1C	55-2B	55-2C	55-6A	GW-108	GW-115	GW-148		
Location	GRIDB2	GRIDB2	GRIDB3	GRIDB3	GRIDC2	S3	S3	NHP		
Date Sampled	06/05/96	06/07/96	06/10/96	06/09/96	06/05/96	11/04/96	10/29/96	03/07/96	06/10/96	08/20/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	976.05	974.85	970.3	970.04	980.75	989.76	1041.04	900.43	900.2	899.62
Water in Well (ft)	9.15	64.75	21.73	69.84	6.83	52.75	42.14	7	6.77	6.19
TSS (mg/L)	310	17	2	1.5	11.6	8	.	18	17	17
pH (Field)	7.5	6.8	6.3	6.8	6.5	5.7	7.3	7	6.7	6
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-6.3	-8.2	-1.5	-4.4	-4.2	5.6	-1.2	-2.7	-5	-2.1
Calcium	130	100	200	170	57	15000	80	140	150	160
Magnesium	14	13	16	25	9.9	1400	12	9.4	9.6	11
Potassium	3	2	1.3	7.1	2.6	.	1.1	2.1	2.2	4.5
Sodium	18	12	8.3	36	4.4	580	11	16	16	17
Alkalinity-HCO3	168	198	173	226	172	672	246	348	350	346
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	137	82	14.6	13.9	4.27	116	10	47.5	55.6	63.7
Fluoride	.	.	.	.	0.2	.	.	.	.	.
Sulfate	37.2	27.4	22.5	20.9	33	2.1	18.8	33.7	35.6	36.3
Nitrate-N	13.8	2.94	117	118	1.44	10900	.	.	.	0.03
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	3	1	3	3	3	3	3	1	1	1
Aluminum	1.4	0.71	0.27	0.11	0.88	1.2	0.053	0.63	0.64	1.4
Barium	0.28	0.32	0.63	1.1	0.1	130	0.23	0.28	0.3	0.36
Beryllium	.	.	0.00031	.	.	.	.	0.00059	.	.
Boron	0.0078	0.013	0.0072	0.047	0.019	.	0.051	0.047	0.034	0.079
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	1.2	.	.	.	0.052	.	0.035	.	.	.
Cobalt	0.016	.	0.0057	.	.	.	.	.	.	.
Copper	0.024	.	.	.	0.015	.	.	0.0049	.	.
Iron	12	0.85	0.25	0.11	1.2	.	0.58	0.56	0.65	1.2
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	.	.	0.0012	.	.	.	0.0014
Lithium	0.022	0.019	0.011	0.028	0.0079	0.33	0.013	0.0043	0.0057	0.0086
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.43	0.24	1.2	0.75	0.11	130	0.36	0.17	0.33	0.52
Nickel	0.59	.	.	.	0.028	.	0.014	.	.	.
Silver	.	.	.	.	.	.	.	.	.	0.0074
Strontium	0.25	0.46	0.6	2.4	0.11	45	0.13	0.48	0.5	0.57
Uranium (PMS)	0.00051	0.00056	0.0005	.	0.00071	0.016	.	0.0015	0.0013	0.0011
Vanadium	0.0076	.	.	.	.	.	.	.	.	.
Zinc	0.012	0.011	0.0044	0.0062	0.076	.	0.0037	0.018	0.032	0.072
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	3177	3791	ND	102	ND	5	7	8
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	1	.	.	FP2	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	33	45	.	.	.	.	.	.
1,1-Dichloroethene	.	.	42	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	2200	2700	.	.	.	5	7	8
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	550	640	.	.	.	.	.	.
Toluene	.	.	.	22	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	13	34	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	300	350	.	.	.	.	.	.
Vinyl chloride	.	.	38	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	700	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	5690	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

2

Sampling Point	GW-148	GW-149				GW-151				GW-153
Location	NHP	NHP				NHP				NHP
Date Sampled	11/14/96	03/14/96	06/10/96	08/20/96	11/14/96	03/20/96	06/17/96	07/09/96	11/20/96	03/14/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	899.76	897.55	897.79	897.57	898.07	901.57	902.12	901.07	901.69	901.77
Water in Well (ft)	6.33	43.29	43.53	43.31	43.81	85.01	85.56	84.51	85.13	43.24
TSS (mg/L)	9	6.5	12.5	.	5	.	.	.	.	21
pH (Field)	7.5	7.8	7.6	5.1	7.6	7.3	6.1	6	7.6	8.2
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-2.1	-3	-4.4	-0.9	0.4	-5.1	-6.7	0.8	-3	-1.1
Calcium	160	31	28	47	36	55	55	58	57	41
Magnesium	10	8.8	7.4	12	9.7	25	25	26	24	18
Potassium	2	6.2	5.4	8	6.5	2.7	2.2	2.6	2.1	3.1
Sodium	19	66	85	47	76	7.6	7.5	7.5	7.4	12
Alkalinity-HCO3	374	277	281	262	280	230	229	220	232	169
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	69.6	11.4	12.6	10.4	16.2	13.4	14.1	15.7	14.2	15.4
Fluoride	0.11	0.41	0.37	0.31	0.41	0.11	0.1	0.11	0.11	0.18
Sulfate	35.6	6.13	6.37	5.86	6.86	18.9	19.2	19.1	17.2	12.9
Nitrate-N	.	.	.	0.04	.	1.36	1.37	1.36	1.4	1.04
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	1	1	1	1	1	1	1	1	1	1
Aluminum	0.51	1.3	0.97	0.081	0.36	.	0.063	.	.	1.4
Barium	0.31	0.48	0.37	0.55	0.51	0.19	0.19	0.19	0.18	0.052
Beryllium	.	.	0.00061	.	.	.	.	.	0.00053	.
Boron	0.073	0.42	0.53	0.39	0.51	0.093	0.1	0.1	0.077	0.024
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	0.44	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	.	.	0.0052	.	.	.	0.091	.
Iron	0.65	0.73	0.9	0.38	0.4	.	0.06	0.016	1.6	1.1
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	.	0.0015	.	.	.	0.00056	.
Lithium	0.0058	0.042	0.045	0.043	0.053	0.0048	0.0068	0.0073	0.0084	0.01
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.24	0.078	0.097	0.14	0.08	.	0.001	.	0.056	0.095
Nickel	.	.	.	.	.	.	.	.	0.25	.
Silver	.	.	.	.	TOT<DIS	.	.	.	.	.
Strontium	0.53	0.85	0.74	1.2	0.99	0.52	0.58	0.55	0.52	0.14
Uranium (PMS)	0.0012	.	.	.	.	.	.	.	.	0.0016
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.0068	0.0085	0.0083	0.0052	0.0057	0.0041	.	0.0053	0.0039	0.014
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	463	455	466	871	151
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	410	400	420	750	140
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	22	22	20	48	6
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	2	2	.	4	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	25	27	22	59	5
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	4	4	4	10	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	3.32	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	9.56	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

3

Sampling Point	GW-153			GW-154			GW-169	GW-170		
Location	NHP			NHP			EXP-UV	EXP-UV		
Date Sampled	06/11/96	08/21/96	11/18/96	02/23/96	06/12/96	08/22/96	11/19/96	02/27/96	03/18/96	06/19/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	903.13	901.53	901.67	902.53	903.76	902.5	903.18	902.92	900.99	901.64
Water in Well (ft)	44.6	43	43.14	5.13	6.36	5.1	5.78	7.67	127.19	127.84
TSS (mg/L)	24	2	8.5	2	3.5	.	3	3	17	36
pH (Field)	7.9	7.5	7.7	7.7	7.2	7.2	7.2	6.8	8.1	7.3
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-2.6	-0.1	-4.4	-0.8	-8.9	-3.1	-2	-5.6	0.9	-1.7
Calcium	42	40	44	100	91	84	110	50	49	50
Magnesium	18	18	19	18	17	17	18	2.8	24	23
Potassium	2.5	3.3	1.9	5.5	6.4	8.2	5.8	2.4	2.1	2.1
Sodium	12	13	16	14	12	8.9	11	1.6	12	10
Alkalinity-HCO3	169	164	182	252	248	231	294	138	209	213
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	16.2	20.6	23.9	11.8	10.8	4.06	7.59	2.37	8.32	7.34
Fluoride	0.15	0.16	0.23	0.3	0.33	0.46	0.36	.	0.16	0.19
Sulfate	12.9	12.8	12.9	95	80.7	85.4	88.1	5.52	17.6	14.8
Nitrate-N	0.9	0.93	0.96	0.31	.	0.41	0.19	0.91	0.7	0.71
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	1	1	1	1	1	1	1	3	1	1
Aluminum	0.76	0.74	1.2	0.039	0.31	0.2	0.36	0.62	0.12	0.16
Barium	0.05	0.048	0.054	0.062	0.076	0.085	0.083	0.027	0.091	0.099
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.023	0.042	0.03	0.1	0.13	0.19	0.15	0.055	0.11	0.086
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	0.0069	.	.	.	.	.	.	0.006	.
Iron	0.53	0.51	1.2	0.073	0.24	0.22	0.29	0.38	4.3	6.5
Lead (AAS)	.	.	.	.	.	.	.	.	0.021	.
Lead (PMS)	.	0.0011	0.0034	.	.	0.0011	0.00056	.	.	.
Lithium	0.01	0.012	0.011	0.0075	0.0091	0.016	0.0096	.	0.012	0.0098
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.091	0.03	0.066	0.11	0.18	0.44	0.21	0.018	0.038	0.037
Nickel	.	.	.	.	.	.	.	.	.	.
Silver	.	.	.	0.0068	.	.	TOT<DIS	0.0075	0.0072	.
Strontium	0.15	0.15	0.15	0.35	0.34	0.35	0.37	0.062	0.54	0.57
Uranium (PMS)	0.0015	0.0015	0.0016	0.4	0.37	0.2	0.47	.	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.0098	0.02	0.0097	0.0031	0.0082	0.0062	0.0054	0.0038	0.075	0.077
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	150	116	288	ND	2	ND	ND	3	95	78
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	140	110	270	.	.	.	.	.	81	68
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	5	FP2	10	.	.	.	.	.	7	FP2
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	1
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	5	5	8	.	2	.	.	2	4	5
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	1	.	.	.	.	.	1	3	4
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	3.37	500	271	278	447	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	96	57.9	58.4	108	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

4

Sampling Point	GW-171		GW-172	GW-191			GW-192			GW-193
Location	EXP-UV		EXP-UV	B4			B4			T2331
Date Sampled	02/29/96	06/18/96	03/11/96	02/24/96	05/22/96	11/06/96	03/04/96	05/23/96	11/13/96	11/04/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	911.04	913.1	911.08	1006.85	1006.77	1006.15	1003.26	1003.15	1003.7	925.11
Water in Well (ft)	23.69	25.75	122.03	60.25	60.17	59.55	14.76	14.65	15.2	12.4
TSS (mg/L)	47	.	.	.	2.5	.	130	11	6	.
pH (Field)	7	.	7.3	7.8	7.5	7.2	6.9	6.5	6.9	7.3
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-8	.	-4.1	0.5	1.2	-3.4	-0.5	3.9	-7.2	-3.1
Calcium	65	.	97	79	82	93	120	120	120	85
Magnesium	17	.	16	10	12	12	12	11	12	17
Potassium	7.3	.	2	3.5	10	2.6	1.5	1.8	1.7	6.4
Sodium	8.6	.	9.8	21	14	9.1	7.6	8	7.9	5.3
Alkalinity-HCO3	250	.	335	268	262	290	316	332	364	312
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	12.6	.	23.9	9.67	9.86	19.2	15.2	16.8	19.6	7.88
Fluoride	.	.	.	.	.	.	0.12	0.13	0.17	0.57
Sulfate	6.12	.	2.58	9.62	9.15	8.17	2.91	2.97	2.9	8.1
Nitrate-N	.	.	0.75	.	.	0.03	.	.	.	.
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	1	1	1	3	3	3	3	3	3	1
Aluminum	1.8	.	.	0.035	0.07	0.048	0.81	1.8	0.18	0.041
Barium	0.24	.	0.26	0.31	0.32	0.38	0.2	0.16	0.17	0.12
Beryllium	0.00038	.	.	.	.	.	.	.	.	.
Boron	0.082	.	0.054	0.034	0.022	.	0.0072	0.21	0.0099	0.09
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	0.0053	.	.	.	.	.	0.006	0.0063	.	.
Copper	0.0044	.	.	.	.	0.0059	.	.	.	.
Iron	9.7	.	1.3	0.018	0.091	0.097	12	5.7	3.6	0.2
Lead (AAS)	0.0053	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	.	.	0.0034	.	.	.	.
Lithium	0.0056	.	.	0.018	0.024	0.015	0.014	0.017	0.014	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	8.8	.	2.1	0.0027	0.012	0.08	2.1	1.7	2	0.62
Nickel	.	.	.	.	.	.	0.01	.	.	.
Silver	0.0097	.	0.0068	.	.	.	.	.	.	.
Strontium	0.11	.	0.15	0.45	0.48	0.47	0.2	0.18	0.21	0.44
Uranium (PMS)	.	.	.	0.00098	.	.	.	.	.	0.018
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.02	.	3.2	.	0.0042	0.0034	0.045	0.075	0.0025	.
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	23	30	ND	404
Benzene	.	.	.	.	.	.	.	.	.	270
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	.	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	21	25	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	48
Tetrachloroethene	.	.	.	.	.	.	.	2	.	.
Toluene	.	.	.	.	.	.	.	.	.	27
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	2	3	.	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	59
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	.	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	9.7
Gross Beta	<MDA	.	<MDA	<MDA	9.26	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

5

Sampling Point	GW-194			GW-195			GW-207			
Location	B4			B4			EXP-SR			
Date Sampled	02/23/96	05/22/96	11/07/96	03/04/96	05/22/96	11/07/96	02/20/96	05/29/96	09/10/96	11/20/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	988.96	989.11	989.11	995.78	995.6	995.01	898.36	898.36	898.36	898.36
Water in Well (ft)	9.09	9.24	9.24	18.58	18.4	17.81	113.35	113.35	113.35	113.35
TSS (mg/L)	5.5	71	18	246	192	166	.	.	.	.
pH (Field)	7.4	7.2	6.9	6.7	6.8	6.6	7.8	6.9	7.1	7.8
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-2.9	-0.4	-5.9	-2	2.5	1.1	-0.4	-5.4	-3.4	-0.8
Calcium	89	86	80	64	68	62	57	57	64	57
Magnesium	6.9	7.9	6.5	7.3	7.8	6.2	40	38	43	40
Potassium	1.5	2.3	1.6	2.1	3.4	1.1	3.3	2.7	2.7	3.1
Sodium	6.7	6.4	6.8	6.3	5.7	6	10	10	12	10
Alkalinity-HCO3	252	236	250	186	182	188	282	266	263	279
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	3.92	3.74	3.24	3.3	3.28	2.66	2.37	2.04	1.38	0.91
Fluoride	.	.	.	.	.	0.12	0.18	0.17	0.21	0.19
Sulfate	12.5	12.4	13.9	10.9	12.8	14.3	56.4	87.8	122	57.5
Nitrate-N	.	.	0.03	.	0.24	0.19	.	.	0.04	.
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	3	3	3	3	3	3	1	1	1	1
Aluminum	0.3	3.9	0.35	5.4	7.4	1.9	0.021	.	.	.
Barium	0.32	0.33	0.36	0.32	0.32	0.27	0.047	0.041	0.044	0.043
Beryllium	.	.	.	0.00035	.	.	.	0.00036	.	.
Boron	0.021	0.027	0.011	0.081	0.035	0.024	0.15	0.14	0.15	0.13
Cadmium	.	.	.	0.012	0.011	.	.	.	.	0.21
Chromium	.	.	.	0.0092	0.017	0.011	.	.	.	0.035
Cobalt	.	.	0.0074	0.022	0.017	0.011	.	.	.	0.79
Copper	0.29	4.5	0.51	9.2	10	3.4	0.23	0.22	0.27	0.79
Lead (AAS)	.	.	0.00081	.	.	0.0029	.	.	0.0016	.
Lead (PMS)	.	.	0.0099	0.016	0.016	0.012	0.033	0.03	0.032	0.03
Lithium	0.012	0.011	0.0099	0.016	0.016	0.012	0.033	0.03	0.032	0.03
Mercury (CVAA)	0.54	1.2	1.1	0.85	0.93	0.35	0.01	0.0099	0.01	0.025
Manganese	.	.	0.011	0.02	0.016	.	.	.	.	0.09
Nickel	.	.	0.011	0.02	0.016	.	.	.	.	0.09
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.18	0.17	0.16	0.13	0.14	0.13	0.5	0.54	0.61	0.51
Uranium (PMS)	0.003	.	0.00052	.	.	.	.	.	.	.
Vanadium	.	.	.	.	0.0072	.	.	.	.	.
Zinc	.	0.058	0.036	0.052	0.046	0.025	0.0046	0.0055	0.008	0.0028
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	.	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	10.1	23.9	9.74	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

6

Sampling Point	GW-208				GW-218	GW-220				GW-222
Location	EXP-SR				UOV	NHP				NHP
Date Sampled	02/21/96	05/30/96	09/11/96	11/21/96	06/07/96	03/20/96	06/13/96	08/26/96	11/20/96	03/19/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	897.72	897.72	897.72	897.72	923.03	900.02	911.64	900.17	901.56	902.72
Water in Well (ft)	416.14	416.14	416.14	416.14	17.76	32.48	44.1	32.63	34.02	18.9
TSS (mg/L)	.	2	6	.	.	14	297	.	45	.
pH (Field)	7.6	7.4	7.3	6.9	7.2	7.2	6.8	7.3	7.2	7.4
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-0.1	-2.9	-0.3	-2.5	-8.8	-2.2	-7.2	-4	-2.7	-3.7
Calcium	74	72	77	76	51	68	110	73	81	67
Magnesium	25	25	26	26	15	22	28	26	23	13
Potassium	3.1	2.7	2.8	3.4	3	3.4	4.5	2.7	3	3.6
Sodium	15	15	16	16	13	3.2	4.6	3.9	4.8	12
Alkalinity-HCO3	230	225	230	240	202	255	257	252	281	173
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	2.39	2.11	1.84	1.62	21.1	6.18	9.33	10.2	10.7	16.7
Fluoride	0.28	0.33	0.34	0.31	0.15	.	.	.	.	0.33
Sulfate	99.9	97.7	107	103	17.3	14.4	16	14.8	17.4	57.6
Nitrate-N	0.27	.	0.05	.	2.83	1.07	0.78	0.97	0.92	0.29
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	1	1	1	1	1	1	1	1	1	1
Aluminum	.	.	0.081	0.022	0.057	0.43	8.5	0.13	1.3	.
Barium	0.04	0.038	0.041	0.041	0.038	0.11	0.18	0.11	0.13	0.11
Beryllium	.	.	.	.	.	.	0.0011	.	.	.
Boron	0.26	0.22	0.27	0.23	0.043	0.027	0.052	0.034	0.027	0.047
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	0.011	0.2	.	0.024	.	.	.
Cobalt	.	.	.	.	0.011	.	0.0086	.	.	.
Copper	.	.	0.0048	.	0.0058	.	.	.	.	.
Iron	0.67	0.5	5.3	0.53	1.7	0.39	9.2	0.047	0.97	0.063
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	0.014	0.00072	.	.	.	.	0.0034	.
Lithium	0.031	0.031	0.025	0.03	0.006	.	0.012	0.0044	0.0065	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.015	0.015	0.05	0.014	0.093	0.022	0.3	0.0097	0.059	0.1
Nickel	.	.	.	.	0.11	.	0.015	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	1.4	1.4	1.5	1.4	0.067	0.39	0.52	0.44	0.44	0.28
Uranium (PMS)	.	.	.	.	0.0075	.	0.00052	.	.	0.28
Vanadium	.	.	.	.	.	.	0.011	.	.	.
Zinc	0.82	0.54	4.4	0.66	0.0067	0.013	0.032	.	0.0045	0.0055
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	4	463	272	435	434	28
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	410	230	370	350	3
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	21	13	19	24	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	4	.	.	2	2	9
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	32	24	37	49	13
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	5	7	9	3
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	95.8
Gross Beta	<MDA	<MDA	13	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	37.6

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

7

Sampling Point	GW-222			GW-223				GW-230		GW-232
Location	NHP			NHP				EXP-UV		EXP-UV
Date Sampled	06/12/96	08/22/96	11/18/96	03/14/96	06/11/96	08/21/96	11/18/96	03/11/96	06/18/96	03/12/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	903.07	902.34	902.66	902.5	903.19	902.3	902.4	909.26	909.63	901.79
Water in Well (ft)	19.25	18.52	18.84	84.03	84.72	83.83	83.93	396.09	396.46	383.97
TSS (mg/L)	2	.	.	.	1	17.5	.	2.5	11	.
pH (Field)	7.1	6.9	7.1	7.2	6.7	5	7	7.1	6.8	9.3
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-1.7	-1.4	-2	-3.2	-4	-0.3	-3.7	-3.4	-2.5	-1.1
Calcium	110	110	110	100	100	110	110	120	110	1.6
Magnesium	14	18	14	13	13	13	14	27	27	0.82
Potassium	3.2	5.8	3.4	1.6	1.8	3.2	1.4	4	4.3	2.5
Sodium	20	15	19	11	11	12	11	25	24	220
Alkalinity-HCO3	331	261	336	272	277	272	308	402	413	359
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	86
Chloride	35	17.9	36	29	30	29.7	31.9	77.2	83.9	9.85
Fluoride	0.24	0.32	0.24	0.11	0.11	0.1	0.11	.	.	2
Sulfate	9.71	108	12.8	39.4	35.3	43.4	31.5	1.16	.	34.2
Nitrate-N	.	.	.	.	.	0.03	.	.	.	.
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	1	1	1	1	1	1	1	1	1	10
Aluminum	0.16	0.048	0.066	.	.	0.11	0.023	.	0.036	.
Barium	0.21	0.24	0.23	0.26	0.26	0.29	0.3	0.36	0.32	0.0091
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.051	0.067	0.069	0.066	0.06	0.067	0.056	0.062	0.062	1.2
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	.	.	.	.	.	.	.	.
Iron	1.6	1.3	2.5	0.55	0.63	0.66	0.59	2.1	6	0.2
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	.	.	.	.	.	.	.
Lithium	.	0.0081	0.004	.	0.0042	0.0065	.	0.011	0.011	0.13
Mercury (CVAA)	0.00034	.	.	.	.	.	.	.	.	.
Manganese	0.93	0.84	0.97	0.64	0.64	0.71	0.72	0.8	0.74	0.0033
Nickel	.	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	.	0.0074	.	.
Strontium	0.3	0.41	0.3	0.25	0.27	0.29	0.28	0.59	0.57	0.32
Uranium (PMS)	0.078	0.083	0.045	0.012	0.017	0.02	0.014	.	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.02	0.011	0.011	0.003	0.0032	0.009	.	8.6	12	0.0065
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	50	27	175	400	245	252	619	5	20	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	4	1	14	28	16	16	29	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	5	5	.	FP2	11	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	8	7	18	36	24	29	49	.	13	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	31	16	110	280	170	170	420	.	.	.
Toluene	.	.	.	.	.	.	.	.	3	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	7	3	28	51	35	37	110	.	.	.
Vinyl chloride	.	.	.	.	.	.	.	5	4	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	24.7	19.7	18	<MDA	8.46	3.68	5.81	<MDA	<MDA	<MDA
Gross Beta	<MDA	10	14.8	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

8

Sampling Point	GW-240				GW-251			GW-253	GW-338	
Location	NHP				S2			S2	WC	
Date Sampled	03/19/96	06/13/96	08/26/96	11/19/96	02/21/96	05/23/96	11/07/96	06/10/96	03/04/96	05/22/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	902.25	904.18	901.38	902.59	991.3	985.7	980.95	1001.77	978.27	978.57
Water in Well (ft)	12.25	14.18	11.38	12.59	40.7	35.1	30.35	50.17	11.85	12.15
TSS (mg/L)	.	3.5	.	7.5	18	42	15	1.5	7	20
pH (Field)	7.6	7.3	7.3	7.6	6.6	6.1	6.6	5.1	7.4	7.5
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-1.6	-3.4	1.2	-3.1	-12.3	-3.6	3.9	-20.7	-3.8	3.7
Calcium	45	38	43	48	120	120	86	350	89	100
Magnesium	19	15	17	18	22	17	14	90	10	11
Potassium	3.7	2.2	5.9	1.3	4.6	4	3	5.7	1.9	2.6
Sodium	28	12	38	35	19	18	11	97	5.8	5.2
Alkalinity-HCO3	191	179	182	187	184	169	90	60	259	256
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	44.5	16.4	53.5	55	9.14	8.88	6.01	89.9	6.89	6.88
Fluoride	0.16	.	0.16	0.2	1.4	1.3	1.43	5.89	.	.
Sulfate	8.73	6.2	8.28	14.1	19.8	23	15.4	67.8	17.3	17.2
Nitrate-N	0.6	0.55	.	1.24	79.2	75.2	44.7	535	0.7	0.83
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	1	1	1	1	1	1	1	1	3	3
Aluminum	.	.	0.048	0.42	2.1	4.3	0.68	5.6	1.4	1.5
Barium	0.034	0.029	0.036	0.04	0.13	0.12	0.081	0.27	0.31	0.4
Beryllium	.	0.0016	.	.	0.00048	0.001	0.00038	0.01	.	.
Boron	0.018	0.03	0.047	0.018	0.028	0.052	0.0081	0.35	0.067	0.029
Cadmium	.	.	.	.	0.15	0.16	0.079	3.5	.	.
Chromium	.	0.012	.	0.016	.	.	.	.	.	.
Cobalt	.	.	.	.	0.025	0.035	0.011	0.33	.	.
Copper	.	.	0.0052	.	0.42	0.57	0.25	72	0.017	.
Iron	.	0.061	0.031	0.13	1.6	3.8	0.29	0.094	1.3	1.9
Lead (AAS)	.	.	.	.	.	.	.	0.045	.	.
Lead (PMS)	.	.	0.00056	0.00054	.	.	0.005	.	.	.
Lithium	0.013	0.012	0.02	0.012	0.0076	0.0076	0.0051	0.073	0.019	0.02
Mercury (CVAA)	.	.	.	.	.	.	.	0.0084	.	.
Manganese	0.0012	0.0037	0.0042	0.0075	4.7	4.8	2.1	41	0.11	0.29
Nickel	.	.	.	.	0.041	0.057	0.02	2.1	.	.
Silver	.	.	.	.	.	.	.	0.021	.	.
Strontium	0.049	0.048	0.059	0.059	0.22	0.22	0.16	0.87	0.25	0.28
Uranium (PMS)	0.0023	0.0015	0.0024	0.0021	0.006	0.0076	0.0043	0.009	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.0064	0.0058	0.0071	0.0078	0.058	0.11	0.039	5.1	0.013	0.013
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	10	4	9	20	255	284	310	1024	ND	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	10	4	9	17	5	5	.	18	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	3	9	8	FP2	30	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	5	5	.	140	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	160	190	130	510	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	76	76	40	310	.	.
Vinyl chloride	.	.	.	.	.	.	.	16	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	3.14	11	8.96	6.77	47.1	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	34.4	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	GW-338	GW-380				GW-383				GW-384
Location	WC	NHP				NHP				NHP
Date Sampled	11/11/96	03/19/96	06/12/96	08/22/96	11/19/96	03/21/96	06/17/96	08/26/96	11/20/96	01/23/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	978.95	904	904.64	903.45	903.4	899.63	899.53	899.12	900.85	897.72
Water in Well (ft)	12.53	5.84	6.48	5.29	5.24	17.23	17.13	16.72	18.45	48.04
TSS (mg/L)	7.5	4.5	89	26	10	.	.	.	.	.
pH (Field)	7.3	6.9	6.9	6.4	6.5	7.4	5.8	7.1	7.5	7.4
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	21	-0.5	-0.1	-0.6	-4.2	-2.1	-5.4	2.2	-0.1	0.5
Calcium	85	44	55	53	38	74	72	87	79	110
Magnesium	9.5	20	23	22	15	10	9.6	11	10	14
Potassium	2.2	1.7	1.5	2.5	1.3	2.8	2.4	3.4	2.9	3
Sodium	5.9	71	97	120	59	16	15	16	16	14
Alkalinity-HCO3	137	178	165	192	158	234	234	232	223	296
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	8.19	105	185	198	90.4	29.5	27.7	27.1	26.6	36.6
Fluoride	0.12	0.13	0.13	0.18	0.19	0.11	.	0.1	0.1	.
Sulfate	19.4	8.24	7.56	8.74	20.8	18.5	19.5	19.6	17.6	15.1
Nitrate-N	1.12	0.95	1.03	1.1	1.68	.	.	.	.	.
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	3	1	1	1	1	1	1	1	1	1
Aluminum	1.1	0.38	1.5	0.51	0.54	.	0.03	.	0.038	0.05
Barium	0.36	0.042	0.066	0.062	0.038	0.51	0.5	0.57	0.49	0.5
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.017	0.027	0.029	0.027	0.031	0.1	0.1	0.11	0.1	0.071
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	0.21	0.83	0.46	0.24	.	.	.	.	.
Cobalt	.	.	0.013	0.0074	0.014	.	.	.	.	.
Copper	0.0043	0.009	0.0099	0.014	0.0072	.	0.0054	.	.	.
Iron	0.91	1.5	4.8	2.7	5	0.67	1	0.68	0.64	1.4
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	0.0011	.	.	0.0012	0.00054	.	.	0.0014	.	.
Lithium	0.018	.	.	.	.	0.012	0.015	0.017	0.017	0.017
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.24	0.051	0.18	0.16	0.19	0.15	0.17	0.18	0.13	0.5
Nickel	.	0.18	0.3	0.48	0.8	.	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.24	0.048	0.063	0.062	0.042	0.37	0.39	0.42	0.39	0.52
Uranium (PMS)	0.00057	0.0013	0.0021	0.0021	0.0014	.	.	.	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.013	0.011	0.02	0.031	0.013	0.0042	0.0062	0.0072	0.0021	0.015
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	3	760	599	535	827	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	2	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	2	.	.	.	1	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	2	.
1,2-Dichloroethene	.	.	.	.	.	120	99	85	120	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	1	470	350	330	500	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	170	150	120	200	.
Vinyl chloride	.	.	.	.	.	.	.	.	2	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

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APPENDIX C.1
Screened Data Summary, 1996

10

Sampling Point	GW-384				GW-385				GW-603		
Location	NHP				NHP				EXP-J		
Date Sampled	05/08/96	09/25/96	11/21/96	01/22/96	05/08/96	09/18/96	11/19/96	03/25/96	05/31/96	09/12/96	
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	897.84	897.75	897.93	906.52	906.43	905.76	906.12	903.13	903.74	902.41	
Water in Well (ft)	48.16	48.07	48.25	179.35	179.26	178.59	178.95	18.92	19.53	18.2	
TSS (mg/L)	1.5	.	1	3	.	12.5	2.5	9	24	7	
pH (Field)	7.1	7.1	6.6	9.7	9.1	8.9	9.2	7.2	7	6.5	
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.	
CHARGE BALANCE (RPD)	-2.1	-4	-6.2	-0.3	3.1	5.2	-7.6	-3.3	-3.8	-1.5	
Calcium	110	98	97	1.1	2.8	1.2	1	79	79	83	
Magnesium	14	13	13	0.3	0.46	0.47	0.28	29	28	31	
Potassium	2.7	2.8	2.8	2.5	2.1	1.5	2.5	4.7	5.2	4.9	
Sodium	15	16	18	190	210	180	170	4.1	4.9	4.5	
Alkalinity-HCO3	313	310	318	341	350	324	356	318	311	320	
Alkalinity-CO3	.	.	.	50	54	48	56	.	.	.	
Chloride	33.9	29.2	34	3.13	2.93	1.96	2.18	9.28	11	9.27	
Fluoride	.	0.13	0.11	2.4	2.7	2.18	2.33	0.12	0.17	0.16	
Sulfate	15.8	15.2	14.5	19.1	19.1	16.3	15.9	18.1	14.8	15.6	
Nitrate-N	.	.	.	.	.	.	0.06	0.79	0.83	1.01	
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.	
CLUSTER DESIGNATION	1	1	1	10	10	10	10	1	1	1	
Aluminum	.	.	.	0.17	0.057	0.75	0.18	0.51	0.97	0.35	
Barium	0.49	0.47	0.46	0.047	0.052	0.053	0.045	0.12	0.13	0.14	
Beryllium	.	.	.	.	.	.	.	.	.	.	
Boron	0.09	0.078	0.086	0.88	0.86	0.86	0.83	0.014	0.044	0.037	
Cadmium	.	.	.	.	.	.	.	.	.	.	
Chromium	.	.	.	.	.	.	.	0.083	0.15	0.11	
Cobalt	.	.	.	.	.	.	.	.	0.005	.	
Copper	.	.	.	.	.	0.0048	.	.	0.0087	.	
Iron	1.8	1.3	1.4	0.2	0.15	0.76	0.2	0.84	1.7	0.85	
Lead (AAS)	.	.	.	.	.	.	.	.	.	.	
Lead (PMS)	.	0.0013	0.00067	.	.	0.0028	0.0011	.	.	0.0014	
Lithium	0.02	0.018	0.02	0.11	0.1	0.1	0.099	0.02	0.029	0.019	
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.	
Manganese	0.49	0.46	0.45	0.002	0.009	0.0068	0.0019	0.047	0.063	0.072	
Nickel	.	.	.	.	.	.	.	0.22	0.24	0.28	
Silver	.	.	.	.	.	.	.	.	.	.	
Strontium	0.61	0.51	0.5	0.086	0.099	0.09	0.083	0.099	0.13	0.11	
Uranium (PMS)	.	.	.	.	.	.	.	.	.	.	
Vanadium	.	.	.	.	.	.	.	.	.	.	
Zinc	0.0029	.	.	0.0089	0.003	0.0063	0.002	0.028	0.036	0.056	
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.	
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Benzene	.	.	.	.	.	.	.	.	.	.	
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.	
Chlorobenzene	.	.	.	.	.	.	.	.	.	.	
Chloroform	.	.	.	.	.	.	.	.	.	.	
Chloromethane	.	.	.	.	.	.	.	.	.	.	
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.	
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.	
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.	
Ethylbenzene	.	.	.	.	.	.	.	.	.	.	
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.	
Toluene	.	.	.	.	.	.	.	.	.	.	
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.	
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.	
Trichloroethene	.	.	.	.	.	.	.	.	.	.	
Vinyl chloride	.	.	.	.	.	.	.	.	.	.	
Xylenes	.	.	.	.	.	.	.	.	.	.	
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.	
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	17.9	<MDA	13.8	<MDA	<MDA	

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APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	GW-603	GW-604				GW-605				GW-606
Location	EXP-J	EXP-J				EXP-I				EXP-I
Date Sampled	11/25/96	03/25/96	06/04/96	09/12/96	11/26/96	02/15/96	06/08/96	09/19/96	10/31/96	02/22/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	903.32	902.28	902.62	901.42	904.21	907.98	907.78	907.88	907.93	906.44
Water in Well (ft)	19.11	55.15	55.49	54.29	57.08	30.91	30.71	30.81	30.86	160.46
TSS (mg/L)	.	.	.	.	.	.	.	.	.	.
pH (Field)	7	7.3	7	4.2	7	6.9	7.2	7.1	6.9	7.7
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-1.7	-5.2	-5.2	-0.1	-4.8	-2.2	-8.9	-0.1	-1.6	-4.3
Calcium	77	54	54	47	64	94	75	91	86	62
Magnesium	28	19	19	19	21	20	15	18	17	32
Potassium	6.1	2.1	1.5	0.8	1.9	4.4	3	2.5	3	2.7
Sodium	4.2	2.2	2.1	2	3	13	15	20	19	5
Alkalinity-HCO3	318	226	213	184	258	268	257	257	255	235
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	8.76	3.13	3.28	2.82	7.06	29.2	43.2	43.2	33.7	40.7
Fluoride	0.17	0.11	0.16	0.18	0.11	.	.	.	.	0.15
Sulfate	11.8	7.42	6.95	5.34	7.61	25.3	26.2	27.2	28.9	33.8
Nitrate-N	0.75	0.65	0.62	0.64	0.78	0.29	.	0.22	0.3	1.29
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	1	4	4	4	4	1	1	1	1	1
Aluminum	0.12	0.41	0.11	0.17	0.16	7.4	0.099	0.12	0.34	0.027
Barium	0.14	0.034	0.038	0.035	0.048	0.11	0.053	0.071	0.071	0.082
Beryllium	.	.	.	.	.	0.00033	.	.	TOT<DIS	.
Boron	0.025	0.0047	0.053	0.018	0.02	0.15	0.13	0.18	0.16	0.081
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	0.032	.	.	.	.	0.012	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	.	.	.	0.0099	0.0045	.	.	.
Iron	0.2	0.26	0.37	0.3	0.083	10	0.17	0.13	0.66	0.076
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	0.00064	.	.	0.0069	0.00087	.	.	0.00069	0.0012	.
Lithium	0.02	0.0084	0.011	0.0098	0.011	0.0085	.	.	.	0.0089
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.026	0.0046	0.017	0.0038	0.0063	0.44	0.5	0.55	0.53	0.011
Nickel	0.19	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.11	0.042	0.046	0.04	0.058	0.18	0.16	0.19	0.17	0.43
Uranium (PMS)	0.00073	.	.	.	.	0.14	0.23	0.2	0.23	0.0061
Vanadium	.	.	.	.	.	0.012	.	.	.	.
Zinc	0.035	0.026	0.016	0.034	0.025	0.047	.	0.012	0.0043	0.022
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	1	ND	1	ND	266	307	215	212	860
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	190	250	180	180	650
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	1	FP2	1	.	26	23	18	FP2	210
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	2	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	21	13	.	11	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	21	14	13	15	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	8	5	4	6	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	94.7	<MDA	132	103	8.7
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	34	36.4	39.2	53.9	<MDA

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APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	GW-606			GW-617			GW-618			GW-619
Location	EXP-I			EXP-E			EXP-E			FTF
Date Sampled	06/08/96	09/19/96	10/31/96	02/20/96	06/04/96	11/13/96	03/06/96	06/04/96	11/11/96	03/06/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	905.74	905.55	905.53	972.13	971.79	970.99	972.27	971.77	971.25	999.31
Water in Well (ft)	159.76	159.57	159.55	7.52	7.18	6.38	26.63	26.13	25.61	27.41
TSS (mg/L)	2	.	2.5	1	2	1	.	.	.	28
pH (Field)	7.7	7.5	7.4	6	5.6	5.8	6.5	6.1	6.6	10.2
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	0	-1.6	-5.6	-3.3	-1.8	-7.5	-3.2	-7.4	18.5	27.9
Calcium	67	69	66	24	24	22	94	89	92	40
Magnesium	34	36	33	5.6	5.6	5.5	9.1	8.7	8.7	1.4
Potassium	2.5	2.4	2.7	1.1	0.99	1.1	3.2	3.6	3.4	16
Sodium	4.5	5.3	4.6	5.9	6.2	5.7	16	17	16	2.8
Alkalinity-HCO3	233	237	248	42	43	74	279	269	148	60
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	38.5	39.7	45.4	9.47	5.87	11	18.2	21.7	24.9	2.24
Fluoride	0.14	0.15	0.17	.	.	.	0.25	0.3	0.32	.
Sulfate	36.5	38.4	39.1	35.8	34.4	19	22.6	24.3	23.3	4.94
Nitrate-N	1.02	0.78	0.78	2.57	2.28	0.46	1.69	2.65	1.43	0.72
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	1	1	1	1	1	1	1	1	1	3
Aluminum	.	0.037	.	0.064	.	TOT<DIS	0.04	.	0.19	1.3
Barium	0.086	0.098	0.089	0.033	0.035	0.045	0.054	0.051	0.062	0.0096
Beryllium	.	.	0.00047	.	.	.	.	.	.	.
Boron	0.045	0.054	0.03	0.35	0.41	0.23	0.17	0.12	0.14	0.033
Cadmium	.	.	.	.	.	.	0.02	0.021	0.021	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	0.0079	.	.	.	.
Copper	.	.	.	.	.	.	0.0068	0.0046	0.0088	.
Iron	0.013	0.02	0.056	0.063	0.12	1.6	0.23	0.11	0.15	0.29
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	0.00055	.	.	.	.	.	.	0.00055	.
Lithium	0.009	0.0068	0.0091	.	.	.	.	.	.	0.0049
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.011	0.013	0.013	0.064	0.088	2.7	1.6	1.6	1.6	0.049
Nickel	.	.	.	.	.	0.026	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.45	0.48	0.43	0.041	0.044	0.045	0.17	0.18	0.18	0.14
Uranium (PMS)	0.0072	0.0064	0.0067	0.00056	.	.	.	.	.	0.00057
Vanadium	.	.	.	.	.	.	.	.	.	0.0073
Zinc	0.0026	0.014	0.0027	.	0.0074	0.092	0.019	0.0083	0.015	0.0069
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	890	536	1102	ND	ND	13	48	72	82	59
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	670	380	850	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	220	150	240	.	.	.	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	1
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	21	27	52	15
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	6	12	.	.	7	10	22	9	33
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	6	17	23	21	10
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	7.35	4.56	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	7.48	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	18.8

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

13

Sampling Point	GW-619		GW-620		GW-690	GW-691	GW-692	GW-698	GW-700	
Location	FTF		FTF		CPT	CPT	CPT	B8110	B8110	
Date Sampled	06/04/96	11/13/96	03/07/96	06/04/96	11/13/96	06/08/96	06/08/96	06/08/96	06/09/96	06/08/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	992.55	991.59	995.72	991.4	990.54	956.8	955.94	955.02	942.21	941.03
Water in Well (ft)	20.65	19.69	57.92	53.6	52.74	41.89	7.85	43.47	47.12	14.25
TSS (mg/L)	36.4	48	26	89	49	439	269	21	6	393
pH (Field)	9.9	10	12	11.1	10.9	7.2	6.8	7.3	6.7	7.1
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	37.6	20	-28.8	27	27.6	-3.7	5.6	-7.3	-5.8	-14.5
Calcium	47	50	100	33	32	240	340	130	98	88
Magnesium	1.9	2	0.92	2.9	3.4	34	42	28	29	9.1
Potassium	20	17	17	11	10	7.2	8.9	5.9	2.8	5.9
Sodium	3	2.8	3	2.5	2.3	5.1	8.1	21	9.9	17
Alkalinity-HCO3	30	84	.	7	20	274	171	207	281	182
Alkalinity-CO3	22	.	24	22	24	.	.	.	.	.
Chloride	2.44	2.32	3.06	3.19	2.79	20.4	6.31	24.1	18.2	17.7
Fluoride	.	.	0.12	.	.	.	0.68	.	.	.
Sulfate	4.34	5.57	5.35	5.48	6.14	471	775	328	35.8	98.1
Nitrate-N	0.83	1.38	1.77	1.99	1.9	2.01	.	0.3	25.3	0.75
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	3	3	3	3	3	1	1	1	1	1
Aluminum	1.6	1.7	0.27	0.23	0.18	8.1	9.1	1.5	0.26	12
Barium	0.027	0.013	0.032	0.028	0.034	0.13	0.049	0.068	0.096	0.16
Beryllium	.	.	.	.	.	0.00031	0.0018	.	.	0.00079
Boron	0.025	0.014	0.033	0.031	0.036	0.027	0.2	0.061	0.022	0.14
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	0.017	0.014	.	.	0.02
Cobalt	.	.	.	.	.	0.008	0.021	0.0072	.	0.012
Copper	0.0057	.	.	0.0056	.	0.0079	0.018	0.0047	0.0054	0.015
Iron	0.018	0.081	0.16	0.18	0.15	9.3	9.1	1.5	0.3	13
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	.	.	.	.	.	.	.
Lithium	0.0059	.	0.0098	0.016	0.014	0.022	0.011	0.022	.	0.012
Mercury (CVAA)	.	.	.	.	.	.	.	0.0008	0.0054	.
Manganese	0.018	0.035	0.0019	0.0021	0.054	0.21	5.9	0.6	0.59	1.1
Nickel	.	.	.	.	.	0.012	0.043	.	.	0.016
Silver	.	.	.	.	.	.	.	0.0068	.	.
Strontium	0.21	0.18	0.37	0.2	0.2	0.35	0.54	0.31	0.2	0.13
Uranium (PMS)	.	.	.	.	.	0.00093	0.0016	0.00057	0.0021	0.00084
Vanadium	0.0068	0.0088	.	.	.	0.0088	0.01	0.0082	.	0.019
Zinc	0.0027	0.032	0.0077	0.0048	0.0034	0.029	0.041	0.017	0.0032	0.081
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	77	65	444	430	279	790	154	14	20	425
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	.	.	14	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	17	.	170	170	.	44	27	.	3	46
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	48	51	210	200	220	720	120	.	6	360
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	12	14	64	60	59	26	7	.	11	15
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	2.1	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	9.38	<MDA	15.1	<MDA	15.1	51.8	<MDA	<MDA	<MDA	15.9

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

14

Sampling Point	GW-733				GW-735				GW-744	
Location	EXP-J				EXP-J				GRIDK1	
Date Sampled	03/28/96	06/07/96	09/17/96	10/30/96	03/05/96	06/04/96	09/18/96	11/21/96	02/13/96	05/09/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	902.34	904.21	901.43	901.29	901.93	901.95	901.25	903.38	902.15	901.31
Water in Well (ft)	203.15	205.02	202.24	202.1	59.79	59.81	59.11	61.24	66.6	65.76
TSS (mg/L)	.	2	38	.	7.5	39.2	3	22	.	.
pH (Field)	7.8	7.7	7.9	7.6	6.9	6.6	5.7	6.9	7.7	7.3
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-3.7	-3	1	-2.1	0.4	-1.1	-1.3	-2.8	-1	0.2
Calcium	39	40	43	40	120	110	120	120	56	63
Magnesium	16	16	18	17	9.3	9.2	9.5	9.8	9.4	9.8
Potassium	1.8	1.4	2.5	1	3.2	3	2.3	3.7	3.1	3.1
Sodium	3.7	3.9	4.4	4.1	3	4.3	4.7	4.5	30	29
Alkalinity-HCO3	162	168	166	164	284	308	313	322	224	234
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	7.87	7.61	9.04	10.1	9.47	14.8	15.4	16	5.38	5.55
Fluoride	0.25	0.25	0.27	0.27	.	.	.	.	.	0.1
Sulfate	9.07	9.79	9.8	10.7	20.1	27.2	25	26.5	21.3	22.5
Nitrate-N	0.28	1.16	0.36	0.32	.	.	0.14	0.17	.	.
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	3	3	3	3	1	1	1	1	3	3
Aluminum	.	.	0.23	0.084	2	2.9	0.23	3.6	0.038	.
Barium	0.022	0.037	0.031	0.026	0.35	0.35	0.36	0.36	0.19	0.2
Beryllium	.	.	.	.	.	0.00034	.	.	.	.
Boron	0.01	0.031	0.028	0.026	0.074	0.038	0.048	0.031	0.1	0.053
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	.	.	.	0.0062	.	.	.	.
Iron	0.96	1.7	5	1.5	1.5	3.3	0.29	2.4	0.29	0.27
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	0.0027	0.0034	.	.	0.00083	0.0037	.	.
Lithium	.	0.0052	0.0063	0.0055	0.0047	0.006	0.0041	0.0077	0.026	0.024
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.024	0.033	0.032	0.025	0.54	0.31	0.26	0.3	0.19	0.18
Nickel	.	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.096	0.12	0.12	0.11	0.29	0.28	0.28	0.27	1.1	1.1
Uranium (PMS)	0.00053	0.00069	0.00063	0.00074	0.0054	.	.	.	.	.
Vanadium	.	.	0.006	.	.	.	.	.	.	.
Zinc	0.0034	0.0037	0.026	0.0024	0.0062	0.018	0.0062	0.0062	0.0097	.
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	31	53	26	47	ND	ND	ND	ND	ND	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	27	51	26	46	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	3	FP2	FP2	FP2	.	.	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	1	2	.	1	.	.	.	.	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	9.86	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

15

Sampling Point	GW-744		GW-745				GW-746			
Location	GRIDK1		GRIDK1				GRIDK1			
Date Sampled	09/03/96	11/13/96	02/13/96	05/09/96	09/04/96	11/13/96	02/13/96	05/09/96	09/04/96	11/13/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	900.04	900.65	902.06	899.91	900.72	900.54	903.36	901.68	900.06	901.23
Water in Well (ft)	64.49	65.1	30.58	28.43	29.24	29.06	14.3	12.62	11	12.17
TSS (mg/L)	.	.	.	.	.	.	.	.	.	2.5
pH (Field)	7	7.1	7.6	7.2	6.6	6.9	6.3	5.7	5	5.3
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-3.8	-9.3	-0.1	-0.5	-1.9	-7.9	0.1	2.7	-3.1	-7.5
Calcium	55	48	63	68	64	57	26	26	14	14
Magnesium	9.7	8.2	11	11	11	9.8	8.2	8.3	5.1	5
Potassium	3.1	3	3.8	2.9	3.1	2.6	1.8	1.7	2.4	2
Sodium	31	27	21	25	22	19	11	9.5	8.8	8.9
Alkalinity-HCO3	228	236	204	211	206	220	50	49	38	36
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	5.8	5.29	11.8	16.6	17.9	21	37.2	25.3	21.3	23
Fluoride	0.13	0.11	.	.	0.12	0.13	.	.	.	.
Sulfate	22.1	21.5	31.1	28.7	26.2	27.6	22.4	23.1	13.3	14.8
Nitrate-N	.	.	.	.	.	0.03	0.42	0.65	0.57	0.56
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	3	3	1	1	1	1	3	3	3	3
Aluminum	0.022	0.029	0.071	TOT<DIS	0.028	.	0.025	.	.	0.15
Barium	0.21	0.18	0.15	0.16	0.16	0.13	0.14	0.13	0.13	0.13
Beryllium	.	0.0003	.	.	.	.	.	.	.	.
Boron	0.057	0.057	0.18	0.075	0.051	0.05	0.054	0.04	0.033	0.035
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	0.018	.	.	.	0.042	0.046	0.044	0.037
Cobalt	.	.	.	.	.	.	0.0051	0.0055	.	.
Copper	.	.	.	.	.	.	.	.	.	0.0046
Iron	0.24	0.22	0.0062	0.086	0.2	0.14	0.19	0.37	0.3	0.26
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	0.0024	.	.	.	0.0019	.	.	.	0.00091	.
Lithium	0.025	0.024	0.025	0.026	0.023	0.024	.	.	.	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.18	0.15	0.026	0.37	0.67	0.5	0.031	0.065	0.033	0.034
Nickel	.	.	0.023	.	.	.	0.14	0.2	0.22	0.21
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	1.1	0.93	0.66	0.72	0.72	0.63	0.098	0.11	0.066	0.073
Uranium (PMS)	.	.	0.00056	.	0.0021	.	.	.	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.0037	0.0021	0.0053	.	0.0041	.	0.007	0.0038	0.012	0.012
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	.	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	2.18	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	6.72	<MDA	<MDA	<MDA	7.45	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

16

Sampling Point	GW-747				GW-748				GW-749	
Location	GRIDK2				GRIDK2				GRIDK2	
Date Sampled	02/14/96	05/20/96	09/05/96	11/13/96	02/14/96	05/20/96	09/05/96	11/14/96	02/14/96	05/20/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	917.14	915.59	914.02	916.1	915.92	914.39	913.53	914.94	916.68	915
Water in Well (ft)	78.41	76.86	75.29	77.37	24.23	22.7	21.84	23.25	14.39	12.71
TSS (mg/L)	.	1.5	.	.	.	7.5	2	7	.	1.5
pH (Field)	7.9	7.2	7.3	7.1	7.6	7.1	7.1	6.9	8.6	6.8
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-2.7	0.6	0.5	-9.8	-2.4	-0.5	-4	-10.2	-1.6	-3.8
Calcium	35	45	46	42	88	93	83	81	73	90
Magnesium	7.1	9.8	10	8.8	9.2	9.7	9	8.4	6.4	7.3
Potassium	2.3	2	1.8	1.9	1.1	1.1	0.9	0.82	2.5	2
Sodium	45	34	36	32	10	10	12	9.5	8.5	7.9
Alkalinity-HCO3	210	223	208	220	234	249	243	264	161	226
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	2.94	3.11	2.46	5.62	15.4	16	16.3	21.6	29	13.2
Fluoride	0.2	0.15	0.18	0.16	.	.	.	.	0.11	.
Sulfate	17.5	19.3	18.7	19.5	36.8	38.5	36.7	40.6	31	36.1
Nitrate-N	.	.	.	.	.	.	.	.	.	.
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	3	3	3	3	1	1	1	1	1	1
Aluminum	.	0.033	0.041	0.021	0.03	0.39	0.2	0.3	0.045	0.035
Barium	0.12	0.15	0.15	0.14	0.12	0.13	0.13	0.11	0.11	0.15
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.072	0.1	0.084	0.098	0.13	0.023	0.022	0.016	0.014	0.022
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	.	.	.	.	.	.	.	.
Iron	0.033	0.038	0.051	0.066	0.024	0.41	0.21	0.41	0.042	1.2
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	0.00056	.	.	.	0.00062	.	.	.
Lithium	0.021	0.014	0.017	0.018	0.0078	0.0081	0.005	0.0087	.	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.0074	0.011	0.012	0.011	0.0018	0.017	0.0082	0.027	0.25	3.1
Nickel	.	.	.	.	0.02	0.01	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.46	0.58	0.57	0.51	0.23	0.25	0.23	0.24	0.15	0.18
Uranium (PMS)	.	.	.	.	.	.	.	.	0.0027	0.00085
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.0048	0.0024	0.0037	.	0.01	0.005	0.0037	.	0.0064	.
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	.	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	GW-749		GW-750				GW-751		GW-752	
Location	GRIDK2		EXP-J				GRIDJ3		GRIDJ3	
Date Sampled	09/06/96	11/14/96	03/26/96	06/04/96	09/16/96	11/26/96	01/18/96	05/07/96	11/18/96	01/18/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	913.34	915.51	909.61	907.32	905.44	910.86	908.11	907.47	907.2	909.43
Water in Well (ft)	11.05	13.22	66.35	64.06	62.18	67.6	59.33	58.69	58.42	15.57
TSS (mg/L)	.	.	.	.	.	.	.	.	.	.
pH (Field)	6.6	6.3	7.4	7.3	6.8	7.2	7.9	7.5	7	6.2
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-3.3	-12.2	-5.3	-0.2	1.6	-4.9	2.1	-0.2	-12.9	0.3
Calcium	99	84	69	76	81	77	65	61	23	25
Magnesium	8.8	7.5	11	11	13	12	11	10	3.3	3.5
Potassium	2.7	2.2	5.3	4.6	4.7	5	3.6	2.9	1.8	1.4
Sodium	10	8	5.3	5.5	6.1	5.5	8.5	8.3	8.9	10
Alkalinity-HCO3	268	252	249	229	241	262	189	190	194	34
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	17.8	15.7	4.4	4.35	4.92	4.91	16.5	16.3	23.5	43.3
Fluoride	0.15	0.15	.	.	.	.	.	0.1	.	.
Sulfate	38.1	46.4	17.6	19.5	18.9	16.9	5.1	5.25	6.09	5.42
Nitrate-N	.	0.04	.	.	.	.	0.33	.	.	.
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	1	1	1	1	1	1	3	3	3	3
Aluminum	0.038	0.049	.	0.034	.	0.02	0.042	.	0.045	0.026
Barium	0.16	0.14	0.67	0.73	0.81	0.74	0.57	0.55	0.12	0.12
Beryllium	.	.	.	.	.	.	.	.	.	0.00031
Boron	0.26	0.032	0.08	0.11	0.11	0.098	0.025	0.029	0.013	0.0041
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	0.01	.
Cobalt	.	.	.	.	.	.	.	.	.	0.0067
Copper	.	.	.	.	.	.	0.035	.	.	.
Iron	1.6	0.41	0.24	0.26	0.3	0.28	0.66	0.23	0.21	0.14
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	0.00071	.	.	.	.	.	.	.	.	.
Lithium	.	.	0.0075	0.01	0.0068	0.0098	0.02	0.022	.	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	1.8	1.7	0.043	0.051	0.051	0.044	0.014	0.038	1.3	1.5
Nickel	.	.	.	.	.	.	.	.	0.024	0.029
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.22	0.19	0.65	0.74	0.77	0.69	0.45	0.52	0.073	0.069
Uranium (PMS)	0.00078	0.00086	.	.	.	.	.	.	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.0064	.	0.0057	0.0035	0.02	0.0073	0.037	0.0064	0.0048	0.033
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	.	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	6.86	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	GW-752		GW-763				GW-766		GW-767	
Location	GRIDJ3		GRIDJ3				GRID12		GRID12	
Date Sampled	05/07/96	11/18/96	03/06/96	06/10/96	08/20/96	11/14/96	01/10/96	05/09/96	10/09/96	01/10/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	909.16	908.68	905.3	906.34	904.91	905.03	937.9	936.57	936.09	937.61
Water in Well (ft)	15.3	14.82	9.92	10.96	9.53	9.65	40.83	39.5	39.02	10.44
TSS (mg/L)	3	.	45	25	46	47	9	.	4.5	8
pH (Field)	5.4	4.3	6.8	6.6	6.7	6.8	9.2	8.9	9.5	5.3
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-0.3	-10	-4	-4.3	-3.9	-4.7	-0.7	-1.1	-0.2	-4.1
Calcium	28	54	100	120	120	120	36	34	42	2.6
Magnesium	3.9	9.4	12	12	14	13	8.2	8	7.7	1.1
Potassium	1.5	3.1	0.98	1.1	2.2	0.88	3.3	3.5	3.6	0.67
Sodium	11	7.7	11	9.6	11	10	12	13	13	2.7
Alkalinity-HCO3	43	44	307	311	317	314	143	149	154	10
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	47.1	50.5	48.1	45.8	46.6	48.6	4.26	4.02	4.59	3.63
Fluoride	.	.	0.17	0.12	0.15	0.2	.	.	.	.
Sulfate	5.53	5.98	2.08	2.12	1.15	2.54	8.35	9.58	7.58	1.71
Nitrate-N	.	.	.	.	.	.	.	.	.	0.4
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	3	3	1	1	1	1	3	3	3	2
Aluminum	.	0.028	0.58	0.11	0.63	1.1	0.095	0.056	0.038	0.34
Barium	0.13	0.52	0.08	0.092	0.091	0.084	0.32	0.33	0.35	0.047
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.021	0.028	0.075	0.024	0.29	0.025	0.061	0.037	0.04	0.019
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	0.012	.	.	.	.	.	.	.	.	.
Cobalt	0.0066	.	.	.	.	.	.	.	.	.
Copper	.	.	0.0043	.	0.0045	.	.	.	.	.
Iron	0.29	0.24	20	17	19	16	0.04	0.046	0.036	0.52
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	.	0.00062	0.00093	.	.	.	.
Lithium	.	0.02	.	.	.	.	0.014	0.014	0.016	0.0042
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	1.7	TOT<DIS	1.4	1.2	1.4	1.1	0.01	0.0052	0.0072	0.059
Nickel	0.028	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.089	0.42	0.22	0.24	0.27	0.24	0.5	0.62	0.5	0.011
Uranium (PMS)	.	.	0.0015	.	.	.	.	.	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.01	.	0.092	0.046	0.045	0.0061	0.023	0.011	0.013	0.18
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	114	116	119	102	ND	ND	ND	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	.	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	1	.	.	.	.
1,1-Dichloroethene	.	.	2	2	2	4	.	.	.	.
1,2-Dichloroethene	.	.	76	75	78	.	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	18	21	22	59	.	.	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	5	6	5	12	.	.	.	.
Vinyl chloride	.	.	13	12	12	26	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	GW-767		GW-769			GW-770			GW-775	
Location	GRID12		GRIDG3			GRIDG3			GRIDH3	
Date Sampled	05/09/96	10/09/96	01/11/96	05/20/96	10/15/96	01/11/96	05/20/96	10/15/96	01/10/96	05/09/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	935.64	935.09	934.31	932.96	932.32	932.1	931.05	929.73	920.38	922.6
Water in Well (ft)	8.47	7.92	53.08	51.73	51.09	9.43	8.38	7.06	45.3	47.52
TSS (mg/L)	.	.	.	2	.	30.5	1	17	.	.
pH (Field)	5.3	4.8	7.5	7.3	7.3	7.1	7	6.7	7.5	7.6
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-3.8	7.1	-0.7	-0.3	-1.7	-0.7	-3.1	-2	1.2	-3
Calcium	4.3	4.5	73	73	71	60	57	68	85	82
Magnesium	1.4	1.9	11	11	10	5	4.9	5.4	7	7.1
Potassium	0.87	1.5	3.1	3	3.2	2.8	2.3	4.2	2.6	2.6
Sodium	2.9	3.8	6.6	6.7	6	5.3	5.2	5.3	4.3	4.5
Alkalinity-HCO3	9	12	204	214	206	155	150	169	176	180
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	3.77	5.71	15	16.2	17.8	4.66	4.66	7.1	29.4	31.8
Fluoride	.	.	.	.	.	0.19	0.18	0.22	.	.
Sulfate	4.1	2.58	16.3	18	17.4	24.2	26.5	25	29.3	31.2
Nitrate-N	.	.	0.37	.	0.09	0.84	0.76	0.85	0.76	0.56
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	2	2	1	1	1	3	3	3	3	3
Aluminum	0.11	0.41	0.085	0.15	.	1.6	0.099	2.9	0.031	0.025
Barium	0.12	0.089	0.45	0.44	0.43	0.074	0.066	0.096	0.18	0.18
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.028	0.017	0.05	0.066	0.12	0.069	0.099	0.061	0.033	0.037
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	.	.	.	.	.	0.0057	.	.
Iron	0.12	0.39	0.085	0.14	0.15	1.9	0.065	3.6	.	0.046
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	0.00085	.	.	.	.	.	0.0029	.	.
Lithium	.	0.0062	0.016	0.014	0.016	.	.	.	0.011	0.0095
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.075	0.064	0.014	0.014	0.014	0.086	0.0046	0.23	0.0021	0.052
Nickel	0.011	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	0.009	.	.	.	.	.
Strontium	0.025	0.019	0.43	0.43	0.41	0.082	0.092	0.091	0.22	0.22
Uranium (PMS)	.	.	.	.	.	0.0011	0.00075	0.00074	0.00052	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.42	0.18	0.0031	0.011	0.002	0.0099	0.012	0.012	0.0066	0.0059
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	17	18	8	8	6	ND	4	5
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	7	6	.	5	3	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	1	1	FP2	3	3	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	1	1	.	.	.	.	.	.
1,2-Dichloroethene	.	.	2	2	.	.	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	5	6	8	.	.	.	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	1	2	.	.	.	.	4	5
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	2.98	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	GW-775	GW-776			GW-779			GW-780		
Location	GRIDH3	GRIDH3			GRIDF2			GRIDF2		
Date Sampled	10/10/96	01/10/96	05/20/96	10/10/96	02/25/96	05/21/96	11/07/96	02/25/96	05/22/96	11/07/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	918.8	919.91	915.45	914.35	953.44	953.38	953.25	951.2	951.02	950.82
Water in Well (ft)	43.72	11.47	7.01	5.91	56.61	56.55	56.42	9.58	9.4	9.2
TSS (mg/L)	.	3.5	41	12	75	87	12	96	5	5.5
pH (Field)	7.2	7.3	7	7	8.9	8	8.2	7.2	7.1	6.7
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	9.4	2.4	-2.3	-2	3.7	0.1	-2.9	-1.7	2.1	-5.5
Calcium	85	100	110	100	10	9.1	7.8	120	130	130
Magnesium	7.3	5.1	6.7	5.4	2.8	2.9	2.3	16	19	19
Potassium	3.4	3.4	4.4	4.2	3.1	2.5	2.7	2.6	2.1	3.5
Sodium	4.5	13	14	13	95	90	85	16	18	20
Alkalinity-HCO3	182	190	198	203	203	204	200	283	265	266
Alkalinity-CO3	.	.	.	.	.	2	8	.	.	.
Chloride	15.5	34.8	46.5	46.9	3.65	3.8	3.58	84.5	104	158
Fluoride	.	.	.	.	0.52	0.5	0.56	.	.	.
Sulfate	15.3	39.9	45.1	42	9.05	8.82	10.1	14.1	12.3	10.8
Nitrate-N	0.56	1.5	1.57	1.48	0.22	.	0.05	.	.	.
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	3	1	1	1	10	10	10	1	1	1
Aluminum	0.027	0.11	3.2	1.3	2.2	1.7	0.68	0.19	0.23	0.048
Barium	0.19	0.085	0.11	0.097	0.27	0.27	0.26	0.52	0.52	0.59
Beryllium	.	.	.	.	0.00035	.	.	.	.	.
Boron	0.029	0.028	0.058	0.034	0.22	0.2	0.16	0.071	0.073	0.036
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	0.69	0.46	0.41	.	.	.	0.02	.	0.024
Cobalt	.	.	0.0088	0.0094	.	.	.	.	.	.
Copper	0.0052	.	0.0089	0.016	0.0094	.	0.0041	.	.	.
Iron	0.017	0.95	6.7	5	3.1	1.7	0.63	1.2	1.2	2.3
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	0.00052	.	.	0.0026	.	.	0.0021	.	.	.
Lithium	0.012	.	0.0053	0.0042	0.034	0.034	0.032	0.018	0.017	0.017
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.0024	0.014	0.2	0.099	0.032	0.036	0.016	1.4	1.5	1.2
Nickel	.	0.21	0.53	0.55	.	.	.	.	0.011	0.033
Silver	0.0081	.	.	.	.	.	.	.	.	.
Strontium	0.23	0.17	0.2	0.17	0.46	0.45	0.38	0.64	0.78	0.76
Uranium (PMS)	.	.	.	.	TOT<DIS	.	.	.	.	.
Vanadium	.	.	.	.	0.0057	.	.	.	.	.
Zinc	0.0046	0.0058	0.018	0.022	0.023	0.023	0.012	0.02	0.026	0.045
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	6	5	5	4	ND	ND	ND	18	ND	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	.	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	2	2	.	.	.	.	.	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	6	3	3	4	.	.	.	.	.	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

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APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	GW-781				GW-782			GW-783			GW-786
Location	GRIDE3				GRIDE3			GRIDE3			GRIDE2
Date Sampled	03/06/96	05/23/96	11/11/96	02/19/96	05/28/96	11/12/96	03/06/96	05/23/96	11/12/96	02/25/96	
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	940.44	939.15	939.73	938.04	939.61	938.23	939.63	937.95	937.96	980.55	
Water in Well (ft)	65.08	63.79	64.37	29.46	31.03	29.65	10.12	8.44	8.45	60.22	
TSS (mg/L)	101	1.5	23	.	.	2	13	19	10	34	
pH (Field)	8.2	7.9	8.2	7.8	7	7	7.4	7.1	7	7.7	
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-3.1	0.4	-6.4	0.5	2.3	-1.2	2.9	-7.7	-8.5	0	
Calcium	39	11	13	82	97	74	82	95	93	72	
Magnesium	7.7	3.5	3.5	16	14	13	6.6	7.1	8	14	
Potassium	6.5	4.3	4.8	4.9	4.2	4.8	1.8	1.7	2.5	2.6	
Sodium	74	82	75	11	10	13	21	18	14	9	
Alkalinity-HCO3	212	203	210	260	262	262	167	212	256	230	
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.	
Chloride	8.73	8.36	8.86	17	23.1	24.3	55.8	50.9	36.6	10.8	
Fluoride	.	.	.	.	.	.	0.1	.	0.12	.	
Sulfate	8.33	8.18	10.6	16.2	18.1	18.1	20.1	22	22.5	6.99	
Nitrate-N	.	.	.	.	0.39	0.32	1.26	1.19	0.85	.	
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.	
CLUSTER DESIGNATION	3	3	3	1	1	1	1	1	1	3	
Aluminum	2.7	0.049	1.2	0.028	.	0.083	0.15	0.19	0.14	1.5	
Barium	0.56	0.29	0.28	0.76	0.55	0.56	0.14	0.12	0.16	0.41	
Beryllium	.	.	.	.	.	.	.	.	.	.	
Boron	0.5	0.58	0.51	0.13	0.11	0.2	0.038	0.075	0.075	0.046	
Cadmium	.	.	.	.	.	.	.	.	.	.	
Chromium	.	.	.	.	.	.	0.37	1	0.61	.	
Cobalt	.	.	.	.	.	.	.	0.0073	0.01	.	
Copper	0.0045	.	0.0056	.	.	.	.	0.014	0.03	0.0098	
Iron	3.2	0.11	0.84	0.17	0.13	1.3	2.2	4.6	3.9	2.2	
Lead (AAS)	.	.	.	.	.	.	.	.	.	.	
Lead (PMS)	.	.	0.0023	.	.	.	.	.	.	.	
Lithium	0.059	0.061	0.057	0.021	0.018	0.019	0.005	.	0.005	0.018	
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.	
Manganese	0.078	0.01	0.026	0.019	0.018	0.03	0.023	0.062	0.15	0.03	
Nickel	.	.	.	0.011	.	.	0.21	0.69	0.58	.	
Silver	.	.	.	.	.	.	.	.	.	.	
Strontium	0.93	0.58	0.51	1.1	0.93	0.87	0.2	0.22	0.28	0.2	
Uranium (PMS)	.	.	.	0.0045	0.00097	0.0012	0.00088	0.0011	0.0012	.	
Vanadium	.	.	.	.	.	.	.	.	.	.	
Zinc	0.029	0.0069	0.015	.	0.0037	0.0051	0.0051	0.022	0.028	0.033	
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.	
SUMMED VOCs	ND	ND	ND	455	262	632	34	68	147	ND	
Benzene	.	.	.	.	3	6	.	.	.	.	
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.	
Chlorobenzene	.	.	.	.	.	2	.	.	.	.	
Chloroform	.	.	.	.	.	.	.	.	.	.	
Chloromethane	.	.	.	.	.	.	.	.	.	.	
1,1-Dichloroethane	.	.	.	120	68	170	6	10	22	.	
1,1-Dichloroethene	.	.	.	30	18	56	.	3	8	.	
1,2-Dichloroethene	.	.	.	19	15	33	11	18	35	.	
Ethylbenzene	.	.	.	.	.	.	.	.	.	.	
Tetrachloroethene	.	.	.	220	120	270	11	25	59	.	
Toluene	.	.	.	.	.	.	.	.	.	.	
1,1,1-Trichloroethane	.	.	.	3	11	21	.	1	.	.	
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.	
Trichloroethene	.	.	.	63	27	69	6	11	23	.	
Vinyl chloride	.	.	.	.	.	5	.	.	.	.	
Xylenes	.	.	.	.	.	.	.	.	.	.	
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.	
Gross Alpha	<MDA	<MDA	<MDA	52	30.1	26.2	<MDA	<MDA	<MDA	<MDA	
Gross Beta	<MDA	<MDA	<MDA	11	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	

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APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	GW-786		GW-787			GW-788			GW-789	
Location	GRIDE2		GRIDE2			GRIDF3			GRIDF3	
Date Sampled	05/21/96	11/07/96	02/25/96	05/21/96	11/07/96	03/04/96	05/22/96	11/11/96	03/04/96	05/22/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	979.48	976.69	974.65	972.88	970.5	936.4	936.07	930.07	933.35	933.38
Water in Well (ft)	59.15	56.36	7.94	6.17	3.79	70.36	70.03	64.03	22.78	22.81
TSS (mg/L)	23	.	2	5	.	34	32	79	74	55
pH (Field)	7.5	7	5.7	5.1	5	8.5	8.6	8.4	7.8	7.6
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-2	24.5	-20.1	-11.6	28.4	1.1	-2.2	-6.5	3.2	0.1
Calcium	72	68	2	1.6	1.6	14	14	9.4	72	70
Magnesium	13	13	1.1	1.2	1.2	4.2	4.2	2.7	10	9.5
Potassium	2	2.1	0.61	.	0.73	7.2	6.7	5.3	4.8	2.7
Sodium	8.4	8.7	3.1	3.1	3	130	120	110	6.6	5.9
Alkalinity-HCO3	247	124	14	11	8	281	253	272	175	180
Alkalinity-CO3	.	.	.	.	.	.	16	.	.	.
Chloride	8.83	11.8	3.73	3.3	3.15	8.15	12.8	10.7	6.23	6.35
Fluoride	.	0.13	.	.	.	1.37	1.3	1.35	.	.
Sulfate	7.38	7.76	1.55	1.36	1.01	22.8	20.9	25.1	18.6	19.3
Nitrate-N	.	0.04	0.46	0.43	0.42	0.39	0.33	0.63	0.86	1.04
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	3	3	2	2	2	1	1	1	3	3
Aluminum	1.2	.	0.093	0.074	0.13	6.4	6.9	2.4	4.3	1.2
Barium	0.39	0.36	0.044	0.035	0.091	0.19	0.18	0.12	0.31	0.28
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.035	0.0093	0.016	0.0073	.	1.5	1.3	1.3	0.08	0.075
Cadmium	.	.	.	.	.	.	.	.	.	0.0056
Chromium	.	.	.	.	.	0.011	0.014	.	0.018	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	0.0059	.	.	0.0058	0.02	0.016	0.0068	0.013	0.0076
Iron	1.4	0.13	0.13	0.097	0.14	6	5	1.6	5.2	1.8
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	.	0.0014	.	.	0.00085	.	.
Lithium	0.015	0.015	.	.	.	0.09	0.083	0.077	0.014	0.011
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.03	0.018	0.019	0.017	0.026	0.11	0.11	0.03	0.12	0.081
Nickel	.	.	.	.	.	.	.	.	0.021	.
Silver	.	.	.	.	.	.	.	0.019	.	0.014
Strontium	0.19	0.19	0.0096	0.0096	0.011	0.51	0.56	0.44	0.26	0.26
Uranium (PMS)	.	.	.	.	.	0.0014	0.0014	0.0008	.	.
Vanadium	.	.	.	.	.	0.0072	0.0079	.	.	.
Zinc	0.022	0.0081	0.16	0.053	0.24	0.039	0.06	0.0091	0.05	0.026
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	ND	3	1
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	.	.	.	1	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	2	1
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	9.77	<MDA	<MDA	<MDA	<MDA

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APPENDIX C.1
Screened Data Summary, 1996

23

Sampling Point	GW-789	GW-791				GW-792			GW-816	
Location	GRIDF3	GRIDD2				GRIDD2			EXP-SR	
Date Sampled	11/11/96	03/06/96	05/23/96	11/12/96	03/05/96	05/22/96	11/11/96	02/13/96	05/31/96	09/18/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	933.82	969.26	970.84	968.91	968.14	967.89	968.2	885.94	883.28	885.54
Water in Well (ft)	23.25	51.35	52.93	51	7.54	7.29	7.6	7.18	4.52	6.78
TSS (mg/L)	40	.	.	.	11	2.5	16	14	54	29
pH (Field)	7.5	7.4	7.2	7.2	6.6	6.2	6	6.9	6.6	6.3
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-4.7	3.5	1.1	-3.5	-13.1	1.1	-0.5	-3.4	-3.5	-1.5
Calcium	59	76	72	66	45	42	35	48	53	53
Magnesium	9.8	14	14	13	4.2	4	3.9	17	17	16
Potassium	4.2	2	1.8	2.3	1.3	0.84	1.7	4.4	4.5	6.9
Sodium	6.3	7	7.4	7.3	7.2	7.9	8.5	4.5	4.9	4.7
Alkalinity-HCO3	186	235	236	232	93	87	66	188	193	212
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	7.47	5.31	4.86	4.63	6.34	7.75	19.6	7.87	20.7	4.25
Fluoride	0.16	.	.	.	.	.	0.12	.	0.12	0.1
Sulfate	21.2	12.4	11.2	11.8	27.2	26.7	24.9	12.9	14.1	1.48
Nitrate-N	0.42	.	.	.	2.54	2.74	4.78	.	.	.
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	3	1	1	1	2	2	2	4	4	4
Aluminum	2.7	0.087	.	0.04	0.75	0.17	1.1	0.035	0.12	0.023
Barium	0.36	0.26	0.27	0.26	0.095	0.083	0.1	0.1	0.16	0.26
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.077	0.023	0.038	0.039	0.024	0.06	0.024	0.04	0.11	0.031
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	0.011	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	0.012	.	.	.	.	.	0.0075	.	.	.
Iron	2.1	0.22	0.14	0.16	1	0.25	1.7	10	27	24
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	0.015	.	.	.	.	.	0.0024	.	.	0.00061
Lithium	0.014	0.014	0.014	0.012	0.0091	0.0089	0.0085	.	.	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.11	0.015	0.019	0.02	0.087	0.032	0.16	0.85	0.8	1.3
Nickel	.	.	.	0.015	.	.	0.014	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.27	0.35	0.39	0.37	0.076	0.076	0.07	0.073	0.089	0.098
Uranium (PMS)	.	.	.	.	.	.	.	0.00091	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.015	0.0034	0.0085	0.0072	0.015	0.017	0.042	0.022	0.0038	0.0095
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	1200	1400	416	6	5	11	ND	ND	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	.	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	1200	1400	410	6	5	11	.	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	6	.	.	.	.	.	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

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APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	GW-816	GW-817				GW-832	LRSPW		NHPCEMSP	
Location	EXP-SR	GRIDK3				NHP	EXP-SW		EXP-SW	
Date Sampled	11/21/96	01/18/96	05/20/96	09/06/96	11/14/96	05/14/96	02/20/96	09/03/96	03/11/96	09/03/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	886.19	912	910.86	910.3	910.85	897.58	.	.	.	.
Water in Well (ft)	7.43	20.39	19.25	18.69	19.24	2.55	.	.	.	.
TSS (mg/L)	9	4	14	6.5	10	.	.	.	1.5	.
pH (Field)	6.4	8.4	7.4	7.3	7	6.9	7.8	7	.	7.3
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-3.6	1.3	-3.5	-2.5	-8.6	-0.8	-3.1	-1.9	0.1	-0.7
Calcium	55	65	69	63	49	110	62	59	39	43
Magnesium	18	7.2	7.6	7	5.4	28	9.6	12	8.1	9.9
Potassium	5.1	3.8	5.7	4.5	3.7	3.8	2.5	1.8	2.3	2.4
Sodium	4.1	26	22	15	13	13	13	9.2	11	9
Alkalinity-HCO3	222	205	225	212	194	183	170	153	101	111
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	8.4	4.31	3.26	4.3	3.76	20.1	22.4	11.9	21.6	13.9
Fluoride	0.12	0.13	0.12	0.15	0.14	0.51	0.28	0.36	0.21	0.51
Sulfate	7.63	32.9	20.8	13.6	17.4	31.7	24.6	22.9	22.2	20.1
Nitrate-N	.	0.39	.	0.03	0.04	2.98	2.59	1.63	1.51	0.74
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	3	3	3	3	1	3	3	3	3
Aluminum	0.026	0.47	1	0.65	0.59	3.5	0.15	.	0.14	0.055
Barium	0.13	0.17	0.16	0.22	0.23	0.18	0.05	0.054	0.082	0.1
Beryllium	.	.	.	.	0.01	0.00039	.	.	.	.
Boron	0.033	0.01	0.043	0.034	0.035	0.19	0.082	0.007	0.044	0.013
Cadmium	.	.	.	.	0.01	.	.	.	.	.
Chromium	.	.	.	.	0.016	0.011	.	.	.	.
Cobalt	.	.	.	.	0.011	.	.	.	.	.
Copper	.	.	.	.	0.015	0.0046	.	.	.	.
Iron	16	0.41	0.67	0.36	0.4	6.5	0.1	0.0066	0.48	0.55
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	0.0011	0.00051	.	.	.	.	.
Lithium	.	0.0073	0.007	0.0087	0.024	0.05	0.019	0.033	.	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.84	0.017	0.037	0.08	0.047	0.16	0.0015	0.0013	0.12	0.19
Nickel	.	.	.	.	0.012	.	.	.	.	.
Silver	.	.	.	.	0.012	.	.	.	.	.
Strontium	0.084	0.15	0.17	0.18	0.16	0.16	0.12	0.12	0.11	0.12
Uranium (PMS)	.	0.003	0.0022	0.001	0.00052	0.011	0.018	0.009	0.0051	0.0034
Vanadium	.	.	.	.	0.0084	.	.	.	.	.
Zinc	.	0.009	.	0.0072	0.011	0.058	0.024	0.027	0.0088	0.0093
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	33	24	19	ND	ND
Benzene	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	23	15	12	.	.
Chlorobenzene	.	.	.	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	3	2	3	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	6	6	4	.	.
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	1	1	.	.	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	2.65	<MDA	11	3.68	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	RGQWSP	SCR7.12-SW	SCR7.14-SP	SCR7.16-SP	SCR7.18SP		SCR7.1SP		SCR7.8SSP	
Location	EXP-UV	EXP-UV	EXP-UV	EXP-UV	EXP-UV		EXP-UV		EXP-UV	
Date Sampled	06/19/96	03/18/96	03/21/96	03/21/96	03/21/96	06/20/96	03/11/96	06/20/96	03/18/96	06/20/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	.	.	.	.	.	.	.	.	.	.
Water in Well (ft)	.	.	.	.	.	.	.	.	.	.
TSS (mg/L)	4	.	357	232	7	429	12	81	1	3
pH (Field)	7.5	7.7	6.5	7.6	7.6	6.8	.	6.6	7.4	6.5
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-1.1	-2.5	-12.3	-7.8	-1.6	1.1	2	-2.3	-0.8	-3.5
Calcium	47	59	140	110	76	88	72	76	35	32
Magnesium	10	12	42	22	6.9	14	6.5	7	21	19
Potassium	2	2	65	17	2.9	4.2	2.8	2.8	0.76	0.78
Sodium	1.8	4.6	96	17	3	17	2.7	2.7	1.5	1.4
Alkalinity-HCO3	154	184	872	358	211	270	210	219	169	172
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	1.51	6.47	138	26.3	4.14	27.9	4.5	.	3.38	1.78
Fluoride	0.13	.	0.1	0.14	.	.	.	.	.	.
Sulfate	20	23.5	1.86	32.6	17.6	30.3	15.8	16.9	3.36	3.09
Nitrate-N	.	0.51	.	.	0.89	.	1.03	0.81	0.44	0.41
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	1	3	1	1	1	1	1	1	1	1
Aluminum	0.11	0.14	1.1	8.2	0.49	0.96	0.58	0.62	0.22	0.16
Barium	0.053	0.059	0.55	0.28	0.045	0.077	0.045	0.049	0.026	0.024
Beryllium	.	.	.	0.00033	.	.	.	.	.	.
Boron	0.032	0.03	0.83	0.11	0.023	0.065	0.025	0.018	0.03	0.018
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	0.01	.	.	.	.	.	.
Cobalt	.	.	.	0.0063	.	.	.	.	.	.
Copper	0.0043	.	.	0.0088	.	.	.	0.0043	.	.
Iron	0.091	0.17	44	19	0.58	1.2	0.75	1.5	0.21	0.22
Lead (AAS)	.	.	.	0.01	.	.	.	.	.	.
Lead (PMS)	.	.	.	.	.	.	.	.	.	.
Lithium	.	.	0.0079	0.016	.	.	0.0046	.	.	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Manganese	0.0028	0.038	0.81	2.9	0.096	1.3	0.12	0.62	0.0086	0.011
Nickel	.	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	0.007	.	.	.
Strontium	0.14	0.13	0.78	0.32	0.16	0.26	0.15	0.14	0.021	0.02
Uranium (PMS)	.	.	.	0.0012	.	0.00078	.	.	.	0.0005
Vanadium	.	.	.	0.012	.	.	.	.	.	.
Zinc	TOT<DIS	0.0036	0.02	0.11	0.0065	0.006	0.0057	0.0054	0.0056	0.0021
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	16	ND	4	9	6	6	1	3
Benzene	.	.	7	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	4	.	3	4	.	.
Chlorobenzene	.	.	9	.	.	.	.	.	.	.
Chloroform	.	.	.	.	.	.	.	.	.	.
Chloromethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	3	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	2	.	.	.	.
Ethylbenzene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	1	.	.	2
Toluene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	2	.	.	1	1
1,1,2-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	2	2	2	.	.
Vinyl chloride	.	.	.	.	.	.	.	.	.	.
Xylenes	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	42.2	14.3	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

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Sampling Point	SCR7.9SW	UV8.2SW	UV8.5SP	UV8.6SP
Location	EXP-UV	EXP-UV	EXP-UV	EXP-UV
Date Sampled	03/18/96	03/14/96	06/19/96	07/17/96
MISCELLANEOUS	.	.	.	.
Water-Level Elevation	.	.	.	.
Water in Well (ft)	.	.	.	.
TSS (mg/L)	.	.	.	.
pH (Field)	8	6.9	.	.
MAJOR IONS (mg/L)	.	.	.	.
CHARGE BALANCE (RPD)	-4.2	-3.7	.	.
Calcium	36	36	.	.
Magnesium	15	10	.	.
Potassium	1.4	1.3	.	.
Sodium	3.1	1.3	.	.
Alkalinity-HCO3	153	132	.	.
Alkalinity-CO3	.	.	.	.
Chloride	5.32	2.12	.	.
Fluoride	.	.	.	.
Sulfate	8.54	7.98	.	.
Nitrate-N	0.55	.	.	.
METALS (mg/L)	.	.	.	.
CLUSTER DESIGNATION	1	3	.	.
Aluminum	0.21	0.49	.	.
Barium	0.038	0.045	.	.
Beryllium	.	.	.	.
Boron	0.026	0.02	.	.
Cadmium	.	.	.	.
Chromium	.	.	.	.
Cobalt	.	.	.	.
Copper	.	.	.	.
Iron	0.22	0.25	.	.
Lead (AAS)	.	.	.	.
Lead (PMS)	.	.	.	.
Lithium	.	.	.	.
Mercury (CVAA)	.	.	.	.
Manganese	0.025	0.004	.	.
Nickel	.	.	.	.
Silver	.	.	.	.
Strontium	0.048	0.058	.	.
Uranium (PMS)	.	.	.	.
Vanadium	.	.	.	.
Zinc	0.006	0.0045	.	.
ORGANICS (ug/L)	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND
Benzene	.	.	.	.
Carbon tetrachloride	.	.	.	.
Chlorobenzene	.	.	.	.
Chloroform	.	.	.	.
Chloromethane	.	.	.	.
1,1-Dichloroethane	.	.	.	.
1,1-Dichloroethene	.	.	.	.
1,2-Dichloroethene	.	.	.	.
Ethylbenzene	.	.	.	.
Tetrachloroethene	.	.	.	.
Toluene	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.
1,1,2-Trichloroethane	.	.	.	.
Trichloroethene	.	.	.	.
Vinyl chloride	.	.	.	.
Xylenes	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.
Gross Alpha	<MDA	<MDA	.	.
Gross Beta	<MDA	<MDA	.	.

APPENDIX C.2
Screened Isotopic Data Summary, CY 1996

1

Sampling Point	55-1A	55-1C	55-2B	55-2C	55-6A	GW-108	GW-115	GW-170	GW-193	GW-218
Location	GRIDB2	GRIDB2	GRIDB3	GRIDB3	GRIDC2	S3	S3	EXP-UV	T2331	UOV
Date Sampled	06/05/96	06/07/96	06/10/96	06/09/96	06/05/96	11/04/96	10/29/96	06/19/96	11/04/96	06/07/96
ACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	700	<MDA	<MDA	9.7	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	5690	<MDA	<MDA	<MDA	<MDA
Plutonium 238	.	.	.	.	.	<MDA	<MDA	.	0.65	.
Radium 223/224/226	.	.	.	.	.	39.4	<MDA	.	<MDA	.
Radium 228	.	.	.	.	.	.	.	.	.	.
Technetium 99	<MDA	<MDA	<MDA	<MDA	<MDA	8690	<MDA	<MDA	<MDA	<MDA
Thorium 234	.	.	.	.	.	.	.	.	.	.
Tritium	.	.	.	.	.	1340	<MDA	.	<MDA	.
Uranium 234	0.452	0.608	<MDA	<MDA	0.368	13.1	<MDA	<MDA	4.5	1.55
Uranium 235	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	0.319	<MDA
Uranium 238	<MDA	<MDA	<MDA	< CE	<MDA	6.22	<MDA	<MDA	6.93	2.98

(CONTINUED)

Sampling Point	GW-230	GW-253	GW-605	GW-606	GW-690	GW-691	GW-692	GW-698	GW-700	GW-733
Location	EXP-UV	S2	EXP-I	EXP-I	CPT	CPT	CPT	B8110	B8110	EXP-J
Date Sampled	06/18/96	06/10/96	10/31/96	10/31/96	06/08/96	06/08/96	06/08/96	06/09/96	06/08/96	10/30/96
ACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	47.1	103	4.56	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	34.4	53.9	<MDA	51.8	<MDA	<MDA	<MDA	15.9	<MDA
Plutonium 238	.	.	<MDA	<MDA	.	.	.	.	.	<MDA
Radium 223/224/226	.	.	<MDA	<MDA	.	.	.	.	.	<MDA
Radium 228	.	.	.	.	.	.	.	.	.	.
Technetium 99	<MDA	<MDA	<MDA	<MDA	21	28	<MDA	<MDA	< CE	<MDA
Thorium 234	.	.	.	.	.	.	.	.	.	.
Tritium	.	.	<MDA	<MDA	.	.	.	.	.	<MDA
Uranium 234	<MDA	15.1	74.4	3.76	0.436	1.26	<MDA	0.814	0.595	1.19
Uranium 235	<MDA	0.43	3.69	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Uranium 238	<MDA	4.53	73.5	1.78	0.551	1.28	<MDA	0.845	0.511	<MDA

(CONTINUED)

Sampling Point	NHPCEMSP	RGQWWSP	SCR7.18- SP	SCR7.1SP
Location	EXP-SW	EXP-UV	EXP-UV	EXP-UV
Date Sampled	09/03/96	06/19/96	06/20/96	06/20/96
ACTIVITY (pCi/L)	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA
Plutonium 238	<MDA	.	.	.
Radium 223/224/226	<MDA	.	.	.
Radium 228	2.26	.	.	.
Technetium 99	<MDA	<MDA	<MDA	<MDA
Thorium 234	1.1	.	.	.
Tritium	<MDA	.	.	.
Uranium 234	1.28	<MDA	0.52	<MDA
Uranium 235	<MDA	<MDA	<MDA	<MDA
Uranium 238	1.1	< CE	<MDA	<MDA

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