Y/SUB/94-EAQ10C/4

Y-12

OAK RIDGE
Y-12
PLANT

MARTIN MARIETTA

SAMPLING AND ANALYSIS PLAN FOR GROUNDWATER AND SURFACE WATER MONITORING AT THE Y-12 PLANT DURING CALENDAR YEAR 1995

October 1994

Prepared by

HSW ENVIRONMENTAL CONSULTANTS, INC.
Under Purchase Order EAQ-10C

for the

Environmental Management Department
Health, Safety, Environment, and Accountability Organization
Oak Ridge Y-12 Plant
Oak Ridge, Tennessee 37831

Managed By
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract
No. DE-AC05-84OR21400

MANAGED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

Y/SUB/94-EAQ10C/4

SAMPLING AND ANALYSIS PLAN FOR GROUNDWATER AND SURFACE WATER MONITORING AT THE Y-12 PLANT DURING CALENDAR YEAR 1995

Prepared by

HSW ENVIRONMENTAL CONSULTANTS, INC.
Under Purchase Order EAQ-10C

October 1994

for the

Environmental Management Department
Health, Safety, Environment,
and Accountability Organization

Oak Ridge Y-12 Plant
Oak Ridge, Tennessee 37831
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract No. DE-AC05-84OR21400

TABLE OF CONTENTS

Section		Page
1.0	INTRODUCTION	1-1
2.0	MONITORING LOCATIONS	2-1
	2.1 Monitoring Wells	2-1
	2.2 Springs and Surface-Water Sampling Stations	2-1
3.0	ANALYTICAL PARAMETERS	3-1
4.0	SAMPLE COLLECTION	4-1
5.0	REFERENCES	5-1

Appendices

A Figures

B Tables

LIST OF FIGURES

Figure		Page
1	Hydrogeologic Regimes at the Y-12 Plant	A-1
2	Sampling Locations for Groundwater and Surface Water Monitoring in the Bear Creek Hydrogeologic Regime, 1995	A-2
3	Sampling Locations for Groundwater Monitoring in the Chestnut Ridge Hydrogeologic Regime, 1995	A-3
4	Sampling Locations for Groundwater and Surface Water Monitoring in the Upper East Fork Poplar Creek Hydrogeologic Regime, 1995	A-4

LIST OF TABLES

Table		Page
1	Analytical Parameters for Groundwater and Surface Water Monitoring at the Y-12 Plant During CY 1995	B-1
2	Administrative Parameter Groups for Monitoring at the Y-12 Plant	B-5
3	Sampling Sequence, Frequency, and Analytical Parameters for Groundwater and Surface Water Monitoring at the Y-12 Plant During CY 1995	B-6

1.0 INTRODUCTION

This plan provides a description of the groundwater and surface-water quality monitoring activities planned for calendar year (CY) 1995 at the Department of Energy Y-12 Plant. Included in this plan are the monitoring activities managed by the Y-12 Plant Health, Safety, Environment, and Accountability (HSEA) Organization through the Y-12 Plant Groundwater Protection Program (GWPP). Other groundwater and surface water monitoring activities (e.g. selected Environmental Restoration Program activities, National Pollution Discharge Elimination System (NPDES) monitoring) not managed through the Y-12 Plant GWPP are not addressed in this report.

Several monitoring programs will be implemented in three hydrogeologic regimes: the Bear Creek Hydrogeologic Regime (Bear Creek Regime), the Upper East Fork Poplar Creek Hydrogeologic Regime (East Fork Regime), and the Chestnut Ridge Hydrogeologic Regime (Chestnut Ridge Regime). The Bear Creek and East Fork regimes are located within Bear Creek Valley, and the Chestnut Ridge Regime is located south of the Y-12 Plant (Figure 1).

For various reasons, modifications to the 1995 monitoring programs may be necessary during implementation. For example, changes in regulatory requirements may alter the parameters specified for selected wells, or wells could be added to or deleted from the monitoring network. All modifications to the monitoring programs will be approved by the Y-12 Plant GWPP manager and documented as addenda to this sampling and analysis plan.

2.0 MONITORING LOCATIONS

Groundwater samples will be collected from monitoring wells located in each hydrogeologic regime. Samples of groundwater discharging from several springs will be collected in the Bear Creek and Chestnut Ridge regimes. Surface water samples will be collected at several locations in the Bear Creek and East Fork regimes.

2.1 Monitoring Wells

The locations of monitoring wells included in the 1995 groundwater monitoring network for the Bear Creek, Chestnut Ridge, and East Fork regimes are shown on Figures 2, 3, and 4, respectively. Monitoring wells included in the 1995 monitoring programs are those recommended in Part II of the 1993 Groundwater Quality Report prepared for each regime (HSW Environmental Consultants, Inc. 1994a, 1994b, and 1994c).

A total of 242 monitoring wells will be sampled during 1995; 82 wells in the Bear Creek Regime, 73 wells in the Chestnut Ridge Regime, and 87 wells in the East Fork Regime. Additional wells may be added during the year, particularly new wells currently being installed in the East Fork Regime.

2.2 Springs and Surface-Water Sampling Stations

Surface-water quality monitoring will be performed in each regime. Samples will be collected from four springs and six surface water stations in the Bear Creek Regime (Figure 2). The springs, located south of Bear Creek along the base of Chestnut Ridge, contribute significant year-round flow to Bear Creek. Surface water monitoring in the Bear Creek Regime includes four sampling stations along Bear Creek, located from about 0.6 to 12 kilometers upstream from the confluence of Bear Creek with East Fork Poplar Creek (BCK-00.63 to BCK-11.97), and two sampling stations on northern tributaries to Bear Creek (NT-01 and NT-02) (Figure 2). In the Chestnut Ridge Regime, samples will be collected from one spring (CBS-1) located south of the Construction/Demolition Landfill VII (Figure 3). In the East Fork Regime, samples will be collected at two surface water stations (LRS and LRSPW) located near Lake Reality (Figure 4).

3.0 ANALYTICAL PARAMETERS

The various monitoring programs for CY 1995 require an extensive list of analytical parameters (Table 1). All groundwater and surface water samples will be analyzed for the following standard suite of parameters: field measurements (water level, temperature, pH, specific conductance, dissolved oxygen, and oxidation-reduction potential); laboratory determinations of pH, specific conductance, turbidity, total suspended solids, and total dissolved solids; major anions; trace metals (total and dissolved concentrations); a target list of volatile organic compounds; and gross alpha and gross beta activity. Monitoring programs for several wells require other specific compounds or parameter groups in addition to the standard suite of parameters. For example, regulations governing groundwater monitoring at several sites in the Chestnut Ridge Regime require analyses for specialized parameters, or require replicate analyses for specific parameters.

Analytes commonly grouped for monitoring purposes are assembled into administrative parameter groups. Table 2 contains detailed listings of analytes included in each administrative parameter group.

The standard suite of parameters includes analysis of cadmium, chromium, and lead concentrations by the inductively coupled plasma method (ICP). If the ICP results consistently exceed the MCL for these metals (more than one quarterly or two consecutive semi-annual samples in a calendar year), then MET(2) (atomic absorbtion spectrometry) will be specified for that sampling point the following year. Conversely, if a sampling point has four quarterly or two consecutive semi-annual MET(2) results below respective MCLs, the MET(2) specification may be dropped for that sampling point, unless MET(2) is a regulatory requirement.

4.0 SAMPLE COLLECTION

Groundwater samples will be collected by personnel from the Sampling and Environmental Support Department (SESD) of the Oak Ridge K-25 Site Analytical Services Organization. Samples from surface water and spring sampling stations will be collected by personnel from the Y-12 Plant Compliance Monitoring Section of the HSEA Organization. Sample collection will follow the most recent version of the SESD Technical Procedure for Groundwater Sampling (SESD-TP-8204) approved by the Y-12 Plant GWPP Manager. Descriptions of the field methods and procedures used to collect the groundwater and surface water samples are contained in *Environmental Surveillance Procedures Quality Control Program, Martin Marietta Energy Systems, Inc.* (Kimbrough et al. 1990).

Monitoring wells located in the Bear Creek (BC), Chestnut Ridge (CR), and East Fork (EF) regimes will be sampled in the sequence shown on Table 3. The sampling sequence is generally from least contaminated wells to most contaminated wells within each sampling group. The sampling groups generally are arranged from hydraulically upgradient to downgradient areas in each regime. In some instances, sampling groups consist of wells that are widely scattered, but are grouped by monitoring requirements (eg. post-closure monitoring in BC-1). For surface water and springs along Bear Creek, sampling is from the furthest downstream locations to the upstream location closest to the S-3 Site (Table 3).

Groundwater samples will be collected quarterly from 154 of the monitoring wells (37 BC wells, 30 CR wells, and 87 EF wells); samples from the 72 remaining wells will be collected semiannually (29 BC wells and 43 CR wells). Furthermore, 26 older wells (16 BC wells and 10 EF wells) that have not been sampled in several years will be sampled once during CY 1995 to determine current contaminant concentrations. Samples from springs and surface water stations in each regime will be collected semiannually. Sampling of CBS-1 in the Chestnut Ridge regime will coincide with sampling of CR-12. Sampling of LRS and LRSPW will coincide with EF-6. Springs and surface water stations in the Bear Creek regime will coincide with BC-9.

In addition to the groundwater and surface water samples, equipment rinsate and field blank samples will be collected and analyzed for the parameters specified on Table 3. Equipment rinsate samples will be collected from each pump used in sampling groups that have inorganic analyses specified for the rinsate (MET(1), RAD(1), etc.). The rinsate sample will be collected at the last well sampled with each pump, immediately following the field cleaning procedure. Rinsate samples for volatile organics will be collected from a clean bailer before sampling the last well of each sampling group.

The identification for rinsate and field blank samples will include a two-letter identifier (ER or FB), the sampling group, and the well name where the sample was collected. For example, the equipment rinsate collected after the first sampling group in the Bear Creek Regime would be named "ER-BC1-GW-276". If more than one pump is used for a particular sampling group, each rinsate will have a unique name that associates the analytical results with a specific well.

Trip blank samples, field duplicate samples, and laboratory blank samples will be prepared and analyzed as specified in the *Oak Ridge Y-12 Plant Environmental Monitoring Section Quality Assurance Plan* (Energy Systems, 1990).

5.0 REFERENCES

HSW Environmental Consultants, Inc. 1994a. Calendar Year 1993 Groundwater Quality Report for the Bear Creek Hydrogeologic Regime, Y-12 Plant, Oak Ridge, Tennessee: 1993 Groundwater Quality Data Interpretations and Proposed Program Modifications. Prepared for Martin Marietta Energy Systems, Inc. (Y/SUB/94-EAQ10C/1/P2).

HSW Environmental Consultants, Inc. 1994b. Calendar Year 1993 Groundwater Quality Report for the Upper East Fork Poplar Creek Hydrogeologic Regime, Y-12 Plant, Oak Ridge, Tennessee: 1993 Groundwater Quality Data Interpretations and Proposed Program Modifications. Prepared for Martin Marietta Energy Systems, Inc. (Y/SUB/94-EAQ10C/2/P2).

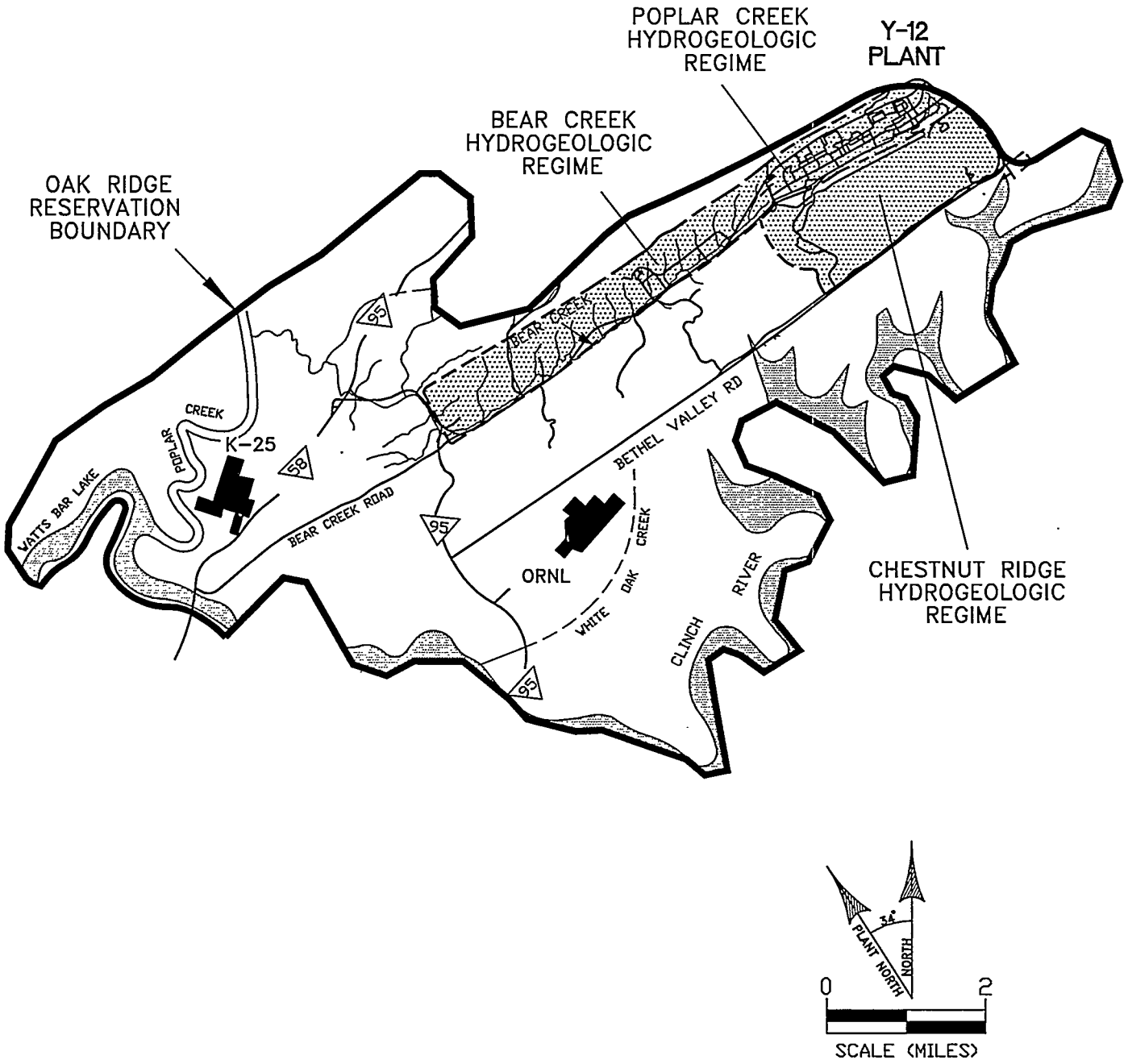
HSW Environmental Consultants, Inc. 1994c. Calendar Year 1993 Groundwater Quality Report for the Chestnut Ridge Hydrogeologic Regime, Y-12 Plant, Oak Ridge, Tennessee: 1993 Groundwater Quality Data Interpretations and Proposed Program Modifications. Prepared for Martin Marietta Energy Systems, Inc. (Y/SUB/94-EAQ10C/3/P2).

Kimbrough, C.W., L.W. Long, and L.W. McMahon (eds.). 1987. Environmental Surveillance Procedures Quality Control Program, Martin Marietta Energy Systems, Inc. Prepared by Advanced Sciences, Inc. for the Environmental and Safety Activities Organization, Martin Marietta Energy Systems, Inc. (ESH/SUB/87-21706/1 Revision 1; January 1990).

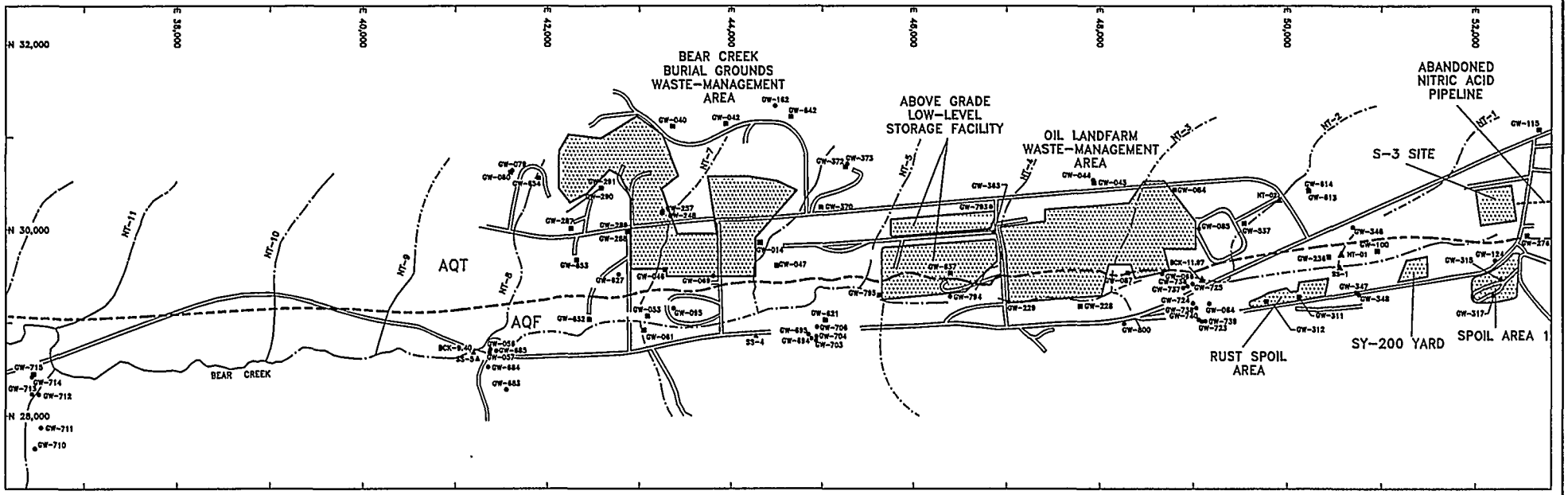
Martin Marietta Energy Systems, Inc., 1990. Oak Ridge Y-12 Plant Environmental Monitoring Section Quality Assurance Plan. (QAP-Y-89-HSEA-7016, June 30, 1990).

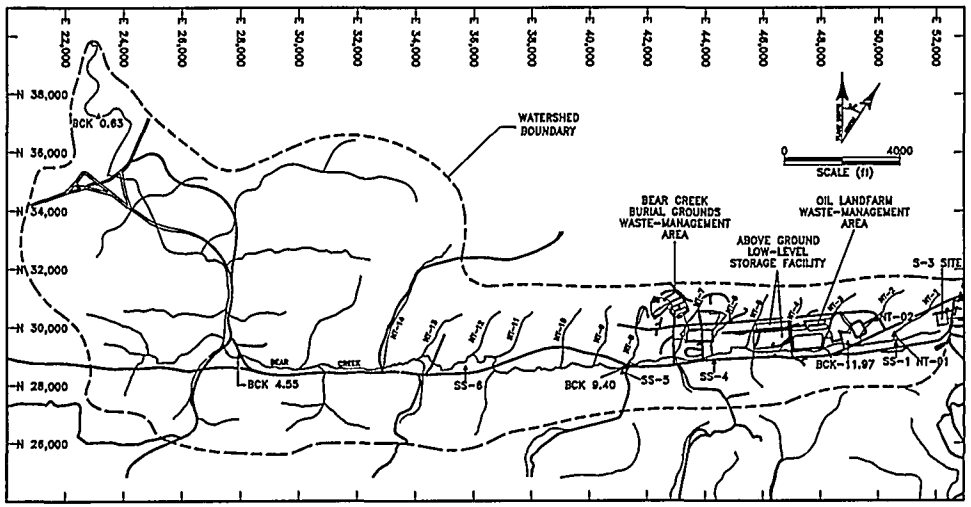
APPENDIX A

Figures



LOCATION:	Y-12 PLANT OAK RIDGE, TN.	FIGURE 1
DATE:	11-16-94	HYDROGEOLOGIC REGIMES AT THE Y-12 PLANT
DWG ID.:	OR321-HC	



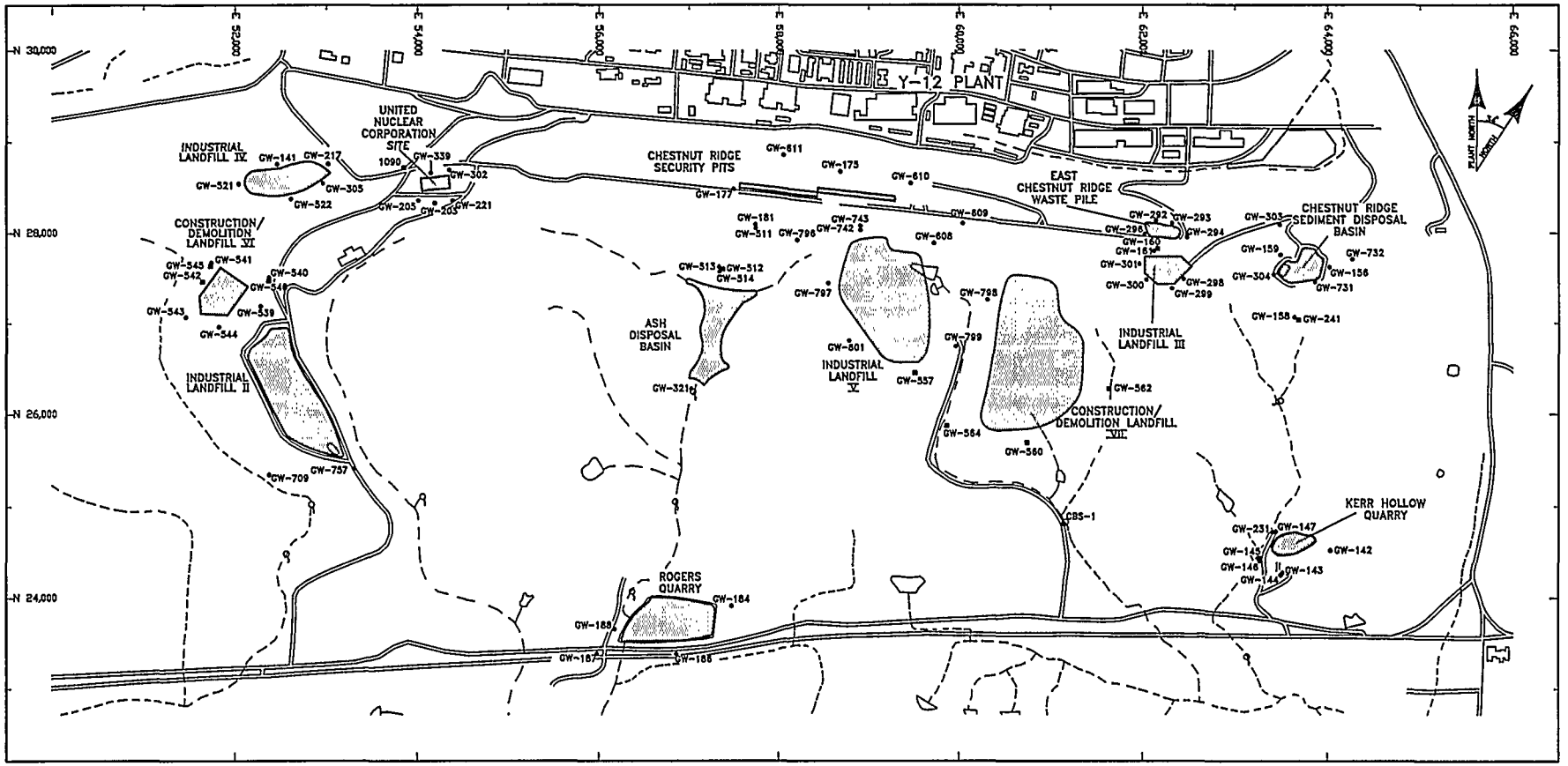


SPRINGS AND SURFACE-WATER SAMPLING STATIONS

EXPLANATION

- GW – ■ — Water Table Monitoring Well
- GW – • — Bedrock Monitoring Well
- SS – / BCK – / NT – ▲ — Spring (SS) or Surface-Water (BCK or NT) Sampling Station
- —·—·— — Surface Drainage Feature
- NT-5 — North Tributary
- AQT — Oak Ridge Reservation Aquitards
- — — — Approximate Nolichucky Shale\Maynardville Limestone Contact
- AQF — Knox Aquifer

LOCATION:	Y-12 PLANT OAK RIDGE, TN.	FIGURE 2
DATE:	11-16-94	SAMPLING LOCATIONS FOR GROUNDWATER AND SURFACE WATER MONITORING IN THE BEAR CREEK HYDROGEOLOGIC REGIME, 1995
DWG ID.:	OR442-HC	



EXPLANATION

GW-■ — WATER TABLE ZONE MONITORING WELL

GW-● — BEDROCK ZONE MONITORING WELL

——— — BOUNDARY OF SITE

– – – – — SURFACE DRAINAGE FEATURE

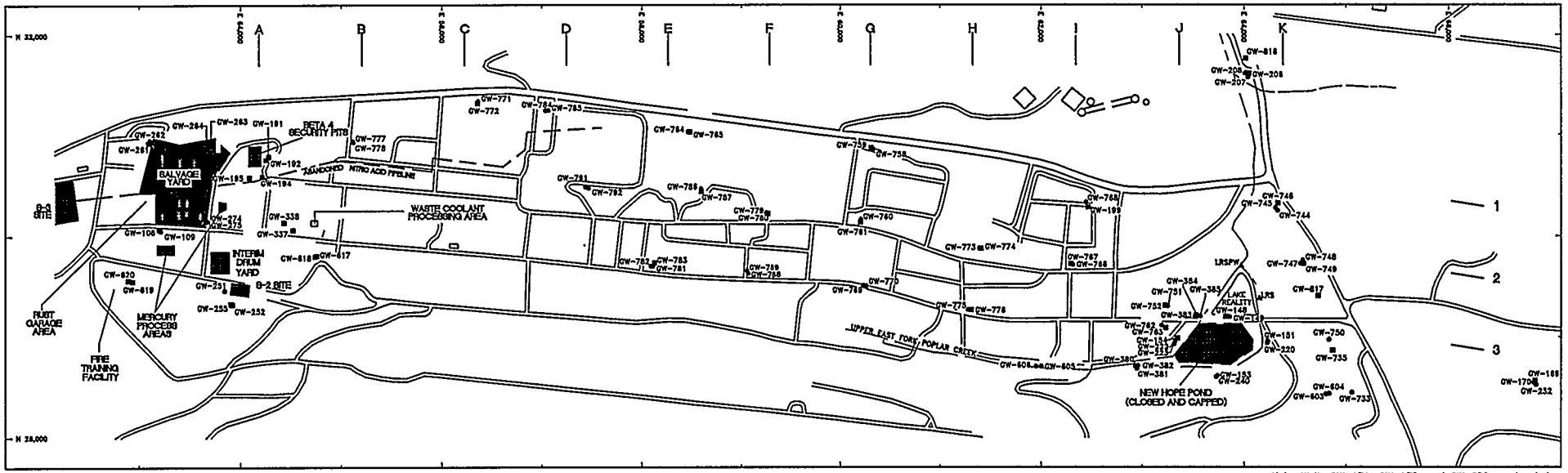
♀ — SPRING

CBS-1● — SPRING SAMPLING LOCATION

LOCATION:	Y-12 PLANT OAK RIDGE, TN.
DATE:	11-16-94
DWG ID.:	OR307-HC

FIGURE 3

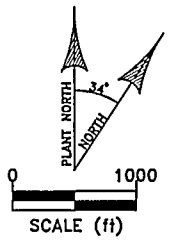
SAMPLING LOCATIONS FOR GROUNDWATER MONITORING IN THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME, 1995



Note: Wells GW-171, GW-172, and GW-230 are located about 2,500 feet east of well GW-169.

EXPLANATION

- GW-152 ■ — Water Table Zone Monitoring Well
- GW-240 ● — Bedrock Zone Monitoring Well
- ▲ — Surface Water Sampling Location
- LRSPW — Lake Reality Emergency Spillway
- LRS — Lake Reality Sump
- ——— Boundary of Site
- A ——— 1 — Comprehensive Groundwater Monitoring Grid



LOCATION:	Y-12 PLANT OAK RIDGE, TN.
DATE:	11-16-94
DWG ID.:	OR429-HC

FIGURE 4

SAMPLING LOCATIONS FOR GROUNDWATER AND SURFACE WATER MONITORING IN THE UPPER EAST FORK POPLAR CREEK HYDROGEOLOGIC REGIME, 1995

APPENDIX B

Tables

Table 1. Analytical Parameters for Groundwater and Surface Water Monitoring at the Y-12 Plant During CY 1995

FLD: FIELD MEASURMENTS

Depth to Water	Temperature	pH
Specific Conductance (COND)	Dissolved	Oxidation-Reduction Potential

CHEM: WET CHEMISTRY

Anions

Alkalinity - Carbonate	Chloride IC	Nitrate Nitrogen (N03)
Alkalinity - Bicarbonate	Fluoride SIE	Sulfate

Other Parameters

Total Suspended Solids	pH
Turbidity	COND
Total Dissolved Solids	

TRACE METALS (Filtered and Unfiltered

MET(1): Inductively Coupled Plasma (ICP), Fluorometric (FLUOR) Analeyses, and Cold Vapor Atomic Absorption (CVAA)

ICP

Aluminum	Cadmium	Magnesium	Silver
Antimony	Calcium	Manganese	Sodium
Arsenic	Chromium	Molybdenum	Strontium
Barium	Cobalt	Nickel	Thorium
Beryllium	Copper	Potassium	Vanadium
Boron	Iron	Selenium	Zinc

FLUOR

Uranium

CVAA

Mercury

MET(2): Atomic Absorption Spectrometry (AAS)

Cadmium	Chromium	Lead

MET(3):

Thallium

VOLATILE ORGANIC COMPOUNDS

VOC(1): Target Compound List

Acetone	1,2-Dichloropropane
Benzene	cis-1,3-Dichloropropene
Bromodichloromethane	trans-1,3-Dichloropropene
Bromoform	Ethylbenzene
Bromomethane	2-Hexanone
2-Butanone	4-Methyl-2-pentanone
Carbon disulfide	Methylene chloride
Carbon tetrachloride	Styrene
Chlorobenzene	1,1,2,2-Tetrachloroethane
Chlorodibromomethane	Tetrachloroethene
Chloroethane	Toluene
Chloroform	1,1,1-Trichloroethane
Chloromethane	1,1,2-Trichloroethane
1,1-Dichloroethane	Trichloroethene
1,2-Dichloroethane	Vinyl acetone
1,1-Dichloroethene	Vinyl chloride
1,2-Dichloroethene	Xylenes

VOC(2): Additional Organics

Acrolein	Ethanol
Acrylonitrile	Ethyl methacrylate
2-Chloroethyl vinyl ether	Iodomethane
Dibromomethane	Trichlorofluoromethane
1,4-Dichloro-2-butene	1,2,3-Trichloropropane
Dichlorodifluoromethane	

VOC(3): Other Organics (preserved)

Bromochloromethane	1,4-Dichlorobenzene - **BNA**
Dibromomethane - **VOC(2)**	Cis-1,2-Dichloroethene
1,2-Dibromo-3-chloropropane	Trans-1,2-Dichloroethene - **VOC(4)**
1,2-Dichlorobenzene - **BNA**	1,1,1,2-Tetrachloroethane

VOC(4):

Trans-1,2-Dichloroethene

BNA: **Base, Neutral, and Acid Extractable Organic Compounds**

Acenaphthene	Nitrobenzene
Acenaphthylene	Pentachlorophenol
Anthracene	Phenol
Benzo (A) Anthracene	Phenanthrene
Benzo (A) Pyrene	Pyrene
Benzo (B) Fluoranthene	4-Bromophenyl Phenyl Ether
Benzo (G,H,I) Perylene	2-Chloronaphthalene
Benzo (K) Fluoranthene	2-Chlorophenol
Benzoic Acid	4-Chlorophenyl Phenyl Ether
Benzyl Alcohol	4-Chloro-3-Methylphenol
Bis (2-Chloroethoxy) Methane	4-Chloroaniline
Bis (2-Chloroethyl) Ether	1,2-Dichlorobenzene
Bis (2-Chloroisopropyl) Ether	1,3-Dichlorobenzene
Bis (2-Ethylhexyl) Phthalate	1,4-Dichlorobenzene
Butyl Benzyl Phthalate	2,4-Dinitrotoluene
Chrysene	2,6-Dinitrotoluene
Dibenzofuran	2,4-Dichlorophenol
Dibenzo (A,H) Anthracene	2,4-Dimethylphenol
Diethylphthalate	2,4-Dinitrophenol
Dimethylphthalate	3,3-Dichlorobenzidine
Di-N-Butylphthalate	4,6-Dinitro-2-Methylphenol
Di-N-Octylphthalate	2-Methylnaphthalene
Fluoranthene	2-Methylphenol
Fluorene	4-Methylphenol
Hexachlorobenzene	2-Nitrophenol
Hexachlorobutadiene	2-Nitroaniline
Hexachlorocyclopentadiene	3-Nitroaniline
Hexachloroethane	4-Nitroaniline
Ideno(1,2,3-CD) Pyrene	4-Nitrophenol
Isophorone	1,2,4-Trichlorobenzene
N-Nitrosodi-N-Propylamine	2,4,5-Trichlorophenol
N-Nitrosodiphenylamine	2,4,6-Trichlorophenol
Naphthalene	

RADIOLOGICAL PARAMETERS

RAD(1): Gross Alpha Activity Gross Beta Activity

RAD(2): (X-10)
Technetium (^{99}Tc) Strontium Tritium

RAD(3): Uranium (^{234}U, ^{235}U, and ^{238}U)

RAD(4): (X-10)
Americium (^{241}Am) Iodine (^{129}I) Plutonium (^{239}Pu)
Neptunium (^{237}Np) Plutonium (^{238}Pu)

RAD(5): Radium

RAD(6): Gamma Activity (spectrum)

MISCELLANEOUS PARAMETERS

MISC(1): Total Organic Carbon (**TOC**) Total Organic Halides (**TOX**)

MISC(2): Chemical Oxygen Demand Cyanide

MISC(3): Ammonia

PHEN: Phenols

REP: 4 Replicate Samples
pH COND TOC TOX

TPH: Total Petroleum Hydrocarbons (Method is site-specific)

Table 2. Administrative Parameter Groups for Groundwater and Surface Water Monitoring at the Y-12 Plant

Parameter Group	Parameters Included[1]
Standard Parameter Suite:	
STD	FLD, CHEM, MET(1), VOC(1), RAD(1)
Baseline Parameter Suite for New Wells:	
BASE	STD, MET(2)
Compliance Monitoring:	
COMP	STD, MET(2), RAD(2,3,4,5)
Landfill Parameter Suites:	
LF1	STD, MET(2,3), VOC(2,3), MISC(1,2)
LF2	STD, MET(2), VOC(2), MISC(1,2)
LF3	STD, MET(2,3), VOC(3), RAD(3,6), MISC(1,2,3)
LF4	STD, MET(2,3), VOC(2,3), RAD(3,6), MISC(1,2,3)

Notes:

1 A complete listing of parameters and abbreviations is provided in Table 1.

Table 3. Sampling Sequence, Frequency, and Analytical Parameters for Groundwater and Surface Water Monitoring at the Y-12 Plant in CY 1995

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
		Bear Creek Hydrogeologic Regime		
BC-1	S3	GW-115	CMP	COMP, VOC(4)
(Q1, Q3)	S3	GW-613	CMP	COMP, VOC(4)
	S3	GW-614	CMP	COMP, VOC(4)
	EXP	GW-710	CMP	COMP, VOC(4)
	EXP	GW-711	CMP	COMP, VOC(4)
	EXP	GW-712	CMP	COMP, VOC(4)
	EXP	GW-713	CMP	COMP, VOC(4)
	EXP	GW-714	CMP	COMP, VOC(4)
	EXP	GW-715	CMP	COMP, VOC(4)
	S3	GW-276[a]	CMP	COMP, VOC(4)
		RINSATE SAMPLE(S)		VOC(1), MET(1), RAD(1,2,3,4,5), NO3
		FIELD BLANK		VOC(1), MET(1), RAD(1,2,3,4,5), NO3
BC-2	SPI	GW-317	SMP	STD
	S3	GW-347	SMP	STD
	S3	GW-348[a]	SMP	STD
	SPI	GW-315[a]	SMP	STD
		RINSATE SAMPLE(S)		VOC(1)
BC-3	OLF	GW-044	CMP	COMP
	OLF	GW-043	CMP	COMP
	OLF	GW-084	CMP	COMP
	OLF	GW-800	SMP	STD
	RS	GW-311[a]	AMP	STD
	RS	GW-312[a]	AMP	STD
	OLF	GW-064[a]	AMP	STD
	OLF	GW-085[a]	SMP	STD, RAD(2,3)

Table 3 (cont'd)

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
BC-3	OLF	GW-537[a]	SMP	STD, RAD(2,3)
(cont'd)		RINSATE SAMPLE(S)		VOC(1)
BC-4	EXP	GW-739[a]	EXP	STD
(Q1, Q3)	EXP	GW-740[a]	EXP	STD
	EXP	GW-723[a]	EXP	STD
	EXP	GW-738[a]	EXP	STD
	EXP	GW-724[a]	EXP	STD
	EXP	GW-725[a]	EXP	STD
	EXP	GW-736[a]	EXP	STD
	EXP	GW-737[a]	EXP	STD
		RINSATE SAMPLE(S)		VOC(1)
BC-5	BG	GW-040	CMP	COMP
	BG	GW-042	CMP	COMP
	BG	GW-162	CMP	COMP
	BG	GW-642	CMP	COMP
	BG	GW-372	CMP	COMP
	BG	GW-373	CMP	COMP
	BG	GW-370	SMP	STD
		RINSATE SAMPLE(S)		VOC(1)
BC-6	AGLLSF	GW-793	BMP	STD
	OLF	GW-363	SMP	STD
	OLF	GW-637	SMP	STD
	AGLLSF	GW-794	BMP	STD
	AGLLSF	GW-795	BMP	STD
	BG	GW-047[a]	SMP	STD
		RINSATE SAMPLE(S)		VOC(1)

Table 3 (cont'd)

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
BC-7	EXP	GW-621	SMP	STD, MET(2)
(Q1, Q3)	EXP	GW-695	EXP	STD
	EXP	GW-703[a]	EXP	STD
	EXP	GW-704[a]	EXP	STD
	EXP	GW-694[a]	EXP	STD, RAD(2)
	EXP	GW-706[a]	EXP	STD, RAD(2)
		RINSATE SAMPLE(S)		VOC(1), MET(1), RAD(1), NO3
BC-8	BG	GW-079	CMP	COMP
	BG	GW-080	CMP	COMP
	BG	GW-654	SMP	STD
	BG	GW-287	SMP	STD
	BG	GW-653	SMP	STD
	BG	GW-652	SMP	STD
	BG	GW-095	SMP	STD
	BG	GW-069	SMP	STD
	BG	GW-627[a]	SMP	STD
	BG	GW-053[a]	SMP	STD
	BG	GW-061[a]	SMP	STD, RAD(2)
		RINSATE SAMPLE(S)		VOC(1)
BC-9	EXP	GW-056	EXP	STD, MET(2)
(Q1, Q3)	EXP	GW-057	EXP	STD
	EXP	GW-685	EXP	STD
	EXP	GW-683[a]	EXP	STD
	EXP	GW-684[a]	EXP	STD
		RINSATE SAMPLE(S)		VOC(1)
BC-10	EXP	BCK-00.63	EXP	STD
(Q1, Q3)	EXP	BCK-04.55	EXP	STD

Table 3 (cont'd)

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
BC-10	EXP	SS-6	EXP	STD
(cont'd)	EXP	SS-5	EXP	STD
	EXP	BCK-09.40	EXP	STD, RAD(2)
	EXP	SS-4	EXP	STD, RAD(2)
	EXP	BCK-11.97	EXP	STD, MET(2), RAD(2)
	EXP	NT-02	EXP	STD, MET(2)
	EXP	SS-1	EXP	STD, MET(2), RAD(2)
	EXP	NT-01	EXP	STD, MET(2), RAD(2)
BC-11	S3	GW-100[a]	BMP	STD, MET(2)
(Q3)	S3	GW-346[a]	BMP	STD, MET(2)
	S3	GW-124[a]	BMP	STD, MET(2)
	S3	GW-236[a]	BMP	STD, MET(2)
	OLF	GW-066[a]	BMP	STD, MET(2)
	OLF	GW-229[a]	BMP	STD, MET(2)
	OLF	GW-228[a]	BMP	STD, MET(2)
	OLF	GW-087[a]	BMP	STD, MET(2)
		RINSATE SAMPLE(S)		VOC(1)
BC-12	BG	GW-290	BMP	STD, MET(2)
(Q3)	BG	GW-248[a]	BMP	STD, MET(2)
	BG	GW-257[a]	BMP	STD, MET(2)
	BG	GW-289[a]	BMP	STD, MET(2)
	BG	GW-291[a]	BMP	STD, MET(2)
	BG	GW-288[a]	BMP	STD, MET(2)
	BG	GW-014[a]	BMP	STD, MET(2)
	BG	GW-046[a]	BMP	STD, MET(2)
		RINSATE SAMPLE(S)		VOC

Table 3 (cont'd)

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
		Chestnut Ridge Hydrogeologic Regime		
CR-1	LIV	GW-217	SDM	LF1
(Q1,Q3)	LIV	GW-141	SDM	LF1
	LIV	GW-521	SDM	LF1, RAD(2,3,4,5)
	LIV	GW-522	SDM	LF1
	LIV	GW-305	SDM	LF1
		RINSATE SAMPLE(S)		VOC(1,2,3)
CR-2	UNCS	GW-203	BMP	STD, RAD(3,5)
(Q2,Q4)	UNCS	GW-205	BMP	STD, RAD(3,5)
	UNCS	GW-221	BMP	STD, RAD(3,5)
	UNCS	GW-339	BMP	STD, RAD(3,5)
	UNCS	GW-302	BMP	STD, RAD(3,5), MET(2)
	UNCS	1090	BMP	STD, RAD(3,5)
		RINSATE SAMPLE(S)		VOC(1)
CR-3	CRSP	GW-181	AMP	STD
	CRSP	GW-511	AMP	STD
	CRSP	GW-742	AMP	STD
	CRSP	GW-743	AMP	STD
	CRSP	GW-610	AMP	STD
	CRSP	GW-608[a]	AMP	STD
	CRSP	GW-177[a]	AMP	STD
	CRSP	GW-611[a]	AMP	STD
	CRSP	GW-175[a]	AMP	STD
	CRSP	GW-609[a]	AMP	STD
		RINSATE SAMPLE(S)		VOC(1), MET(1)

Table 3 (cont'd)

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
CR-4	ECRWP	GW-296	BMP	STD
(Q2,Q4)	ECRWP	GW-294	BMP	STD
	ECRWP	GW-293	BMP	STD
	ECRWP	GW-292	BMP	STD
		RINSATE SAMPLE(S)		VOC(1)
CR-5	LIII	GW-161	SDM	LF2
(Q2,Q4)	LIII	GW-160	SDM	LF2
	LIII	GW-301	SDM	LF2
	LIII	GW-300	SDM	LF2
	LIII	GW-299	SDM	LF2
	LIII	GW-298	SDM	LF2
		RINSATE SAMPLE(S)		VOC(1,2), MET(1)
CR-6	CRSDB	GW-159	RDM	STD, PHEN, REP
	CRSDB	GW-304	RDM	STD, PHEN, REP
	CRSDB	GW-731	RDM	STD, PHEN, REP
	CRSDB	GW-732	RDM	STD, PHEN, REP
	CRSDB	GW-156	RDM	STD, PHEN, REP
	CRSDB	GW-303	RDM	STD, PHEN, REP
	CRSDB	GW-241	RDM	STD, PHEN, REP
	CRSDB	GW-158	RDM	STD, PHEN, REP
		RINSATE SAMPLE(S)		VOC(1)
		FIELD BLANK		VOC(1)
CR-7	KHQ	GW-142	RDM	STD, PHEN, REP
	KHQ	GW-147	RDM	STD, PHEN, REP
	KHQ	GW-231	RDM	STD, PHEN, REP
	KHQ	GW-146	RDM	STD, PHEN, REP
	KHQ	GW-143	RDM	STD, PHEN, REP

Table 3 (cont'd)

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
CR-7	KHQ	GW-144	RDM	STD, PHEN, REP
(cont'd)	KHQ	GW-145	RDM	STD, PHEN, REP
		RINSATE SAMPLE(S)		VOC(1), MET(1)
CR-8	ADB	GW-321	BMP	STD, MISC(1)
(Q2, Q4)	ADB	GW-513	BMP	STD, MISC(1)
	ADB	GW-512	BMP	STD, MISC(1)
	ADB	GW-514	BMP	STD, MISC(1)
		RINSATE SAMPLE(S)		VOC(1)
CR-9	RQ	GW-184	BMP	STD
(Q2, Q4)	RQ	GW-188	BMP	STD
	RQ	GW-187	BMP	STD
	RQ	GW-186	BMP	STD
		RINSATE SAMPLE(S)		VOC(1)
CR-10	LII	GW-539	SDM	LF4
(Q1,Q3)	LII	GW-709	SDM	LF1
	LII	GW-757	SDM	LF1
		RINSATE SAMPLE(S)		VOC(1,2,3)
CR-11	CDLVI	GW-540	SDM	LF3
(Q2, Q4)	CDLVI	GW-546	SDM	LF3
	CDLVI	GW-541	SDM	LF3
	CDLVI	GW-545	SDM	LF3
	CDLVI	GW-542	SDM	LF3
	CDLVI	GW-543	SDM	LF3
	CDLVI	GW-544	SDM	LF3
		RINSATE SAMPLE(S)		VOC(1,3)
CR-12	CDLVII	GW-560	SDM	LF4, TPH
(Q2,Q4)	CDLVII	GW-562	SDM	LF4, TPH

Table 3 (cont'd)

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
CR-12	CDLVII	GW-564	SDM	LF4, TPH
(cont'd)	LV	GW-557	SDM	LF4
	LV	GW-799	SDM	LF4
	CDLVII	GW-798	SDM	LF4, TPH
	LV	GW-797	SDM	LF4
	LV	GW-796	SDM	LF4
	LV	GW-801	SDM	LF4
	LV	CBS-1	SDM	LF4, TPH
		RINSATE SAMPLE(S)		VOC(1,2,3), RAD(1)
	Upper East Fork Poplar Creek Hydrogeologic Regime			
EF-1	GRID A1	GW-261	GMP	STD
	GRID A1	GW-262	GMP	STD
	GRID A2	GW-263	GMP	STD, MET(2)
	GRID A2	GW-264	GMP	STD
	S2	GW-252	GMP	STD, MET(2)
	S2	GW-255	GMP	STD, MET(2)
	GRID B2	GW-777[a]	GMP	STD
	GRID B2	GW-778[a]	GMP	STD
		RINSATE SAMPLE(S)		VOC(1)
EF-2	B4	GW-191	GMP	STD
	B4	GW-194	GMP	STD
	B4	GW-195	GMP	STD
	WC	GW-338	GMP	STD
	B4	GW-192[a]	GMP	STD
	EXP	GW-617[a]	EXP	STD, MET(2)

Table 3 (cont'd)

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
EF-2	EXP	GW-618[a]	EXP	STD, MET(2)
(cont'd)	S2	GW-251[a]	GMP	STD, MET(2)
	FTF	GW-619[a]	GMP	STD
	FTF	GW-620[a]	GMP	STD
	WC	GW-337[a]	GMP	STD, MET(2)
		RINSATE SAMPLE(S)		VOC(1)
		FIELD BLANK		VOC(1)
EF-3	GRID C1	GW-771	GMP	STD
	GRID C1	GW-772	GMP	STD
	GRID E1	GW-764	GMP	STD
	GRID E1	GW-765	GMP	STD
	GRID G1	GW-758	GMP	STD
	GRID G1	GW-759	GMP	STD
	GRID G2	GW-761	GMP	STD
	GRID G2	GW-760	GMP	STD, MET(2)
	GRID G3	GW-770	GMP	STD
	GRID G3	GW-769[a]	GMP	STD
		RINSATE SAMPLE(S)		VOC(1)
EF-4	GRID D1	GW-784	GMP	BASE
	GRID D1	GW-785	GMP	BASE
	GRID E2	GW-786	GMP	BASE
	GRID E2	GW-787	GMP	BASE
	GRID F2	GW-779	GMP	BASE
	GRID F2	GW-780	GMP	BASE
	GRID F3	GW-788	GMP	BASE
	GRID F3	GW-789[a]	GMP	BASE
	GRID D2	GW-791[a]	GMP	BASE

Table 3 (cont'd)

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
EF-4	GRID D2	GW-792[a]	GMP	BASE
(cont'd)	GRID E3	GW-781[a]	GMP	BASE
	GRID E3	GW-782[a]	GMP	BASE
	GRID E3	GW-783[a]	GMP	BASE
		RINSATE SAMPLE(S)		VOC(1)
EF-5	GRID I1	GW-199	GMP	STD
	GRID I1	GW-768	GMP	STD
	GRID I2	GW-766	GMP	STD
	GRID I2	GW-767	GMP	STD
	GRID H2	GW-773	GMP	STD
	GRID H2	GW-774	GMP	STD
	GRID H3	GW-775	GMP	STD
	GRID H3	GW-776	GMP	STD, MET(2)
		RINSATE SAMPLE(S)		VOC(1)
EF-6	GRID JP	GW-762[a]	GMP	STD
	GRID JP	GW-763[a]	GMP	STD
	NHP	GW-148[a]	BMP	STD, MET(2)
	NHP	GW-149[a]	BMP	STD, MET(2)
	NHP	GW-153[a]	BMP	STD, MET(2)
	NHP	GW-223[a]	BMP	STD, MET(2)
	NHP	GW-222[a]	BMP	STD, MET(2)
	NHP	GW-154[a]	BMP	STD, MET(2)
	NHP	GW-380[a]	AMP	STD, MET(2)
	NHP	GW-240[a]	AMP	STD
	NHP	GW-220[a]	AMP	STD
	NHP	GW-151[a]	AMP	STD
	NHP	GW-383[a]	AMP	STD

Table 3 (cont'd)

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
EF-6	NHP	GW-382[a]	AMP	STD
(cont'd)	NHP	GW-381[a]	AMP	STD
		RINSATE SAMPLE(S)		VOC(1), MET(1)
EF-7	GRID J3	GW-751	GMP	STD
	GRID J3	GW-752	GMP	STD
	GRID K1	GW-744	GMP	STD
	GRID K1	GW-745	GMP	STD
	GRID K1	GW-746	GMP	STD, MET(2)
	GRID K2	GW-747	GMP	STD
	GRID K2	GW-748	GMP	STD
	GRID K2	GW-749	GMP	STD
	GRIDK3	GW-817[b]	GMP	BASE
	NHP	GW-385	AMP	STD
	NHP	GW-384	AMP	STD
		RINSATE SAMPLE(S)		VOC(1)
EF-8	EXP	GW-207	EXP	STD
	EXP	GW-208	EXP	STD
	EXP	GW-206	EXP	STD, MET(2)
	EXP	GW-603	EXP	STD
	EXP	GW-604	EXP	STD
	EXP	GW-735	EXP	STD
	EXP	GW-816[b]	EXP	BASE
	EXP	GW-750	EXP	STD
	EXP	GW-733[a]	EXP	STD
	EXP	GW-605[a]	EXP	STD
	EXP	GW-606[a]	EXP	STD
		RINSATE SAMPLE(S)		VOC(1)

Table 3 (cont'd)

Sample Group[1]	Location[2]	Sampling Point[3]	Monitoring Program[4]	Parameters[5]
EF-9	USGS	GW-171[c]	EXP	COMP, BNA
	USGS	GW-172[c]	EXP	COMP, BNA
	USGS	GW-230[c]	EXP	COMP, BNA
	USGS	GW-169[c]	EXP	COMP, BNA
	USGS	GW-232[c]	EXP	COMP, BNA
	USGS	GW-170[a,c]	EXP	COMP, BNA
		RINSATE SAMPLE(S)		VOC(1), MET(1), RAD(1,2,3,4,5), NO3
EF-10	NHP	LRS	EXP	STD, BNA, MET(2)
(Q1, Q3)	NHP	LRSPW	EXP	STD, BNA, MET(2)
EF-11	SY	GW-274[a]	BMP	STD, MET(2)
(Q2)	SY	GW-275[a]	BMP	STD, MET(2)
	SY	GW-108[a]	BMP	STD, MET(2)
	SY	GW-109[a]	BMP	STD, MET(2)
		RINSATE SAMPLE(S)		VOC(1)

Notes:

1 Samples will be collected quarterly unless specific sampling quarters are identified. Surface water samples in BC-10 will be collected on or about the same day as wells GW-683 and GW-684 in BC-9 are sampled. Samples collection for surface water locations in EF-10 will coincide with sampling of EF-6 monitoring wells.

2 **Bear Creek Regime**

AGLLSF - Above Grade Low Level Storage Facility
BG - Bear Creek Burial Grounds WMA
EXP - Exit Pathway (Maynardville Limestone and Bear Creek)
OLF - Oil Landfarm WMA
RS - Rust Spoil Area
S3 - S-3 Site
SPI - Spoil Area I

Notes (cont):

Chestnut Ridge Regime

ADB - Ash Disposal Basin
CDLVI - Construction/Demolition Landfill VI
CDLVII - Construction/Demolition Landfill VII
CRSDB - Chestnut Ridge Sediment Disposal Basin
CRSP - Chestnut Ridge Security Pits
ECRWP - East Chestnut Ridge Waste Pile
KHQ - Kerr Hollow Quarry (located in Bethel Valley)
LII - Industrial Landfill II
LIII - Industrial Landfill III
LIV - Industrial Landfill IV
LV - Industrial Landfill V
RQ - Rogers Quarry (located in Bethel Valley)
UNCS - United Nuclear Corporation Site

East Fork Regime

B4 - Beta-4 Security Pits
EXP - Exit-Pathway Monitoring Well
FTF - Fire Training Facility
GRID - Comprehensive Groundwater Monitoring Plan Grid Location
NHP - New Hope Pond
S2 - S-2 Site
SY - Y12 Salvage Yard
USGS - Offsite Wells installed by the U.S. Geological Survey
WC - Waste Coolant Processing Area

3 BCK - Bear Creek Kilometer (Surface-Water Sampling Station)
CBS - Spring Sampling Location: Chestnut Ridge Regime
ER - Equipment Rinsate Sample
GW - Groundwater Monitoring Well
LRS - Lake Reality Sump (Surface Water Sampling Station)
LRSPW - Lake Reality Emergency Spillway (Surface Water Sampling Station)
NT - North Tributary to Bear Creek
SS - Spring Sampling Location: Bear Creek Regime

4 AMP - RCRA Assessment Monitoring Program
BMP - Best-Management Practice Monitoring
CMP - RCRA Compliance Monitoring Program
EXP - Exit-Pathway Monitoring
GMP - Grid Well Monitoring Program
RDM - RCRA Detection Monitoring
SDM - SWDF Detection Monitoring
SMP - Surveillance and Maintenance Program

Table 3 (cont'd)

Notes (cont):

5 A list of administrative parameter groups (ie, STD, COMP) is provided in Table 2, and a complete listing of anaytical parameters in provided in Table 1.

a All purged groundwater will be contained.

b New well, groundwater will be contained pending evaluation of analytical results.

c Offsite well, located east of Scarboro Road in Union Valley.

DISTRIBUTION

DEPARTMENT OF ENERGY
G.W. Bodenstein
W.G. McMillan
P.J. Gross/L.L. Radcliffe

HEALTH, SAFETY, ENVIRONMENT, AND ACCOUNTABILITY ORGANIZATION
D.E. Bohrman
C.C. Hill
W.K. Jago
S.B. Jones
L.W. McMahon
J.E. Powell
E.B. Rundle
L.O. Vaughan
S.W. Wiley
GWPP-File

ENVIRONMENTAL RESTORATION PROGRAM
H. King (2)
C.S. Walker

UNIVERSITY OF TENNESSEE
B.W. McMaster

UNIVERSITY OF NEVADA, RENO
L.A. Shevenell

ORISE
S.M. Field

ENVIRONMENTAL SCIENCES DIVISION
R.B. Dreier
T.O. Early
D.D. Huff
C.T. Rightmire
R.R. Turner
D.B. Watson
S.L. Winters

WASTE MANAGEMENT ORGANIZATION
K.D. Delius
C.W. Hutzler
I.W. Jeter
J.E. Stone

ENGINEERING ORGANIZATION
W.E. Manrod

QUALITY AND TECHNICAL SERVICES
P. Buckley
L.P. Burnett

HSW ENVIRONMENTAL CONSULTANTS
J.R. Walker

H&R TECHNICAL ASSOCIATES
P.W. Ezell

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
S. Selecman/W.P. Kegley

Y-12 Central Files
A.K. Lee/DOE-OSTI (2)