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MARTIN MARIETTA

ENVIRONMENTAL RESTORATION PROGRAM

Groundwater Level Monitoring Sampling and Analysis Plan for Environmental Monitoring in Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee

MANAGED BY
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FOR THE UNITED STATES
DEPARTMENT OF ENERGY
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contributed to the preparation of this document and should not be considered an eligible contractor for its review.

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ORNL Environmental Restoration Program

Groundwater Level Monitoring Sampling and Analysis Plan for Environmental Monitoring in Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee

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Groundwater Level Monitoring Sampling and Analysis Plan for the Environmental Monitoring Plan in Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee

Approvals

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ABREVIATIONS

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CDM Federal	CDM Federal Programs Corporation
CLP	Contract Laboratory Program
COC	chemical of concern
DM	Data Manager
DOE	U.S. Department of Energy
DOS	disk operating system
DTW	depth to water
EMP	Environmental Monitoring Plan
Energy Systems	Martin Marietta Energy Systems, Inc.
EPA	U.S. Environmental Protection Agency
ESP	environmental surveillance procedure
FID	flame ionization detector
FOP	field operations procedure
FTM	Field Task Manager
GCO	Generator Certification Official
GW	groundwater
H&S	health and safety
HD	high density
HP	Health Physics Section
ID	identification
IDW	investigation-derived waste
IH	Industrial Hygiene Section
MS	matrix spike
MSD	matrix spike duplicate
OREIS	Oak Ridge Environmental Information System
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
PID	photoionization detector
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFD	request for disposal
SAP	sampling and analysis plan
SHSO	Site Health and Safety Officer
SLLW	solid low-level waste
SOP	standard operating procedure
STL	Sample Task Leader
SWSA	solid waste storage area
TBD	to be determined
VOC	volatile organic compound
WAG	waste area grouping
WMO	Waste Management Operations
WMP	waste management plan
WOL	White Oak Lake

EXECUTIVE SUMMARY

This Sampling and Analysis Plan addresses groundwater level monitoring activities that will be conducted in support of the Environmental Monitoring Plan for Waste Area Grouping (WAG) 6. WAG 6 is a shallow-burial land disposal facility for low-level radioactive waste at the Oak Ridge National Laboratory, a research facility owned by the U.S. Department of Energy and managed by Martin Marietta Energy Systems, Inc. Groundwater level monitoring will be conducted at 129 sites within the WAG. All of the sites will be manually monitored on a semiannual basis. Forty-five of the 128 wells, plus one site in White Oak Lake, will also be equipped with automatic water level monitoring equipment. The 46 sites are divided into three groups. One group will be equipped for continuous monitoring of water level, conductivity, and temperature. The other two groups will be equipped for continuous monitoring of water level only. The equipment will be rotated between the two groups. The data collected from the water level monitoring will be used to support determination of the contaminant flux at WAG 6.

1. INTRODUCTION

1.1 PROJECT OVERVIEW

This document is the Groundwater Level Monitoring Sampling and Analysis Plan (SAP) for Waste Area Grouping (WAG) 6 at Oak Ridge National Laboratory (ORNL). Note that this document is referred to as a SAP even though no sampling and analysis will be conducted. The term SAP is used for consistency. The procedures described herein are part of the Environmental Monitoring Plan (EMP) for WAG 6, which also includes monitoring tasks for seeps and springs, groundwater quality, surface water, and meteorological parameters. Separate SAPs are being issued concurrently to describe each of these monitoring programs.

This SAP has been written for the use of the field personnel responsible for implementation of the EMP, with the intent that the field personnel will be able to take these documents to the field and quickly find the appropriate steps required to complete a specific task. In many cases, Field Operations Procedures (FOPs) will define the steps required for an activity. The FOPs for the EMP are referenced and briefly described in the relevant sections of the SAPs, and are contained within the FOP Manual. Both these documents (the SAP and the FOP Manual) will be available to personnel in the field.

Information regarding the WAG 6 physical description, geology and hydrogeology, and waste disposal and regulatory history can be found in the *Resource Conservation and Recovery Act Facility Investigation Report for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee* (Energy Systems 1991), and a description of the purpose and scope of the EMP can be found in the *Environmental Monitoring Plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee* (DOE 1993a).

1.2 GROUNDWATER LEVEL MONITORING SAP OUTLINE AND OBJECTIVES

The purpose of the Groundwater Level Monitoring SAP is to provide field workers with information on conducting activities that are unique and essential to accomplishing the task of groundwater level monitoring. Some information that is important to field workers is contained in other project-level documents. To avoid duplication of this information [which includes project-level quality assurance/quality control (QA/QC) and health and safety (H&S) protocols], other documents have been referenced as appropriate. Table 1.1 displays the organization of this SAP and the relevant reference documents. All documents will be made available to the field workers before the initiation of field activities. Once field activities have begun, the field workers will carry the SAP and the FOP Manual to the field. The other reference documents will be available at the field office. Copies of these reference documents will be available to the field workers to carry into the field for direct reference as the need arises.

The objectives of the Groundwater Level Monitoring Program, as defined in the EMP, are to

- evaluate groundwater levels to define seasonal fluctuations in the water table;

Table 1.1. WAG 6 Groundwater Level Monitoring SAP and project-level document cross-reference

Groundwater Level Monitoring SAP section	Project-level reference document(s)
Section 1 - Introduction contains limited information on the EMP, summarizes project objectives, and summarizes the Groundwater Level Monitoring activities to be conducted.	DOE *Environmental Monitoring Plan*
Section 2 - Task Instructions identifies the specific tasks to be conducted, contains activity-specific instructions on the work to be performed, and lists the procedures to be used at various stages of the work.	DOE *Environmental Monitoring Plan*; *WAG 6 Field Operations Procedures Manual*
Section 3 - Quality Assurance/Quality Control Requirements contains information on the QA/QC requirements specific to groundwater level monitoring. This section also includes information on documentation as well as project organization and responsibilities.	DOE *Quality Assurance Project Plan for the Environmental Monitoring Program in Waste Area Grouping 6 at Oak Ridge National Laboratory*
Section 4 - Health and Safety Considerations briefly describes the health and safety aspects of the activity. Activity-specific instruction sheets (located in Appendix B) are referenced in this section and will address specific health and safety issues that are not covered by the Site Health and Safety Plan.	Energy Systems *Site Health and Safety Plan for Waste Area Grouping 6 at Oak Ridge National Laboratory*
Section 5 - Waste Management briefly describes the waste management associated with the groundwater level monitoring. The wastes associated with this activity will be restricted to personal protective equipment and very small quantities of decontamination fluids.	Energy Systems *Waste Management Plan*
Section 6 - Data Management describes the data collection and management activities that will be conducted in the field, and the procedures for collecting these data to ensure that accurate data are transferred into the database.	Energy Systems *Data Management Plan/ Functional Systems Design*

- evaluate trench water levels to determine the mechanisms for and extent of trench inundation;
- investigate trench, groundwater, and surface water interactions;
- refine the site conceptual model; and
- evaluate existing Interim Corrective Measures cap performance.

Field workers should keep these objectives in mind when carrying out the activities described in this SAP. An understanding of, and a constant adherence to, the objectives of the EMP will ensure the collection of data in quantities and at the quality level necessary to meet the objectives. The activities identified in Table 1.2 will be conducted to meet these groundwater level monitoring objectives.

Groundwater levels will be collected from selected trench and non-trench piezometers. The levels will be obtained using both in situ and manual methods. Data from these activities will be collected electronically, on various forms (see Appendix A), and in field logbooks.

Table 1.2. Groundwater Level Monitoring SAP activities, purposes, and quality control levels

Groundwater Level Monitoring SAP activity	Activity purpose and elements	EPA quality control levels[a]
1. Health and safety monitoring of site and uncapped well	• Ensure worker health and safety	Level I
2. Groundwater level measurements	• Data for groundwater model	Level I
3. Equipment decontamination	• Eliminate cross-contamination between wells	N/A[b]
4. Waste management	• Properly document and manage personal protective equipment and decontamination fluid	N/A
5. Data collection and management	• Properly record information in logbooks, field forms; and properly download data from electronic field instruments	N/A

[a] QC Levels I–IV in the EMP correspond to QC Levels A–D in the Quality Assurance Project Plan for this project (DOE 1993b).
[b] N/A = not applicable

1.3 MONITORING LOCATIONS AND FREQUENCIES

The EMP specifies that 128 groundwater monitoring wells and/or piezometers will be monitored using a combination of manual and automatic methods, and one location at White Oak Lake (WOL) using automatic methods. Automatic water levels will be monitored in 28 trench wells or piezometers and 17 non-trench wells or piezometers and at a location in WOL. This set of 45 wells and the WOL site is further divided into Group A, Group B, and Group C (Table 1.3). Wells having automatic water level monitoring equipment that will be rotated are split roughly in half (A and B), and grouped so that trench and non-trench wells in the same area are monitored at the same time. Group C consists of the wells and the WOL site having dedicated level, temperature, and conductivity monitoring equipment. The locations of these wells are provided in Fig. 1.1, together with other site features that are relevant to the specific activity of groundwater level monitoring. Manual water-level monitoring will be performed on 83 monitoring wells or piezometers located outside the trench areas as listed and shown in Fig. 1.2. In addition, Group A and Group B wells will be monitored manually when the automatic systems are not in place.

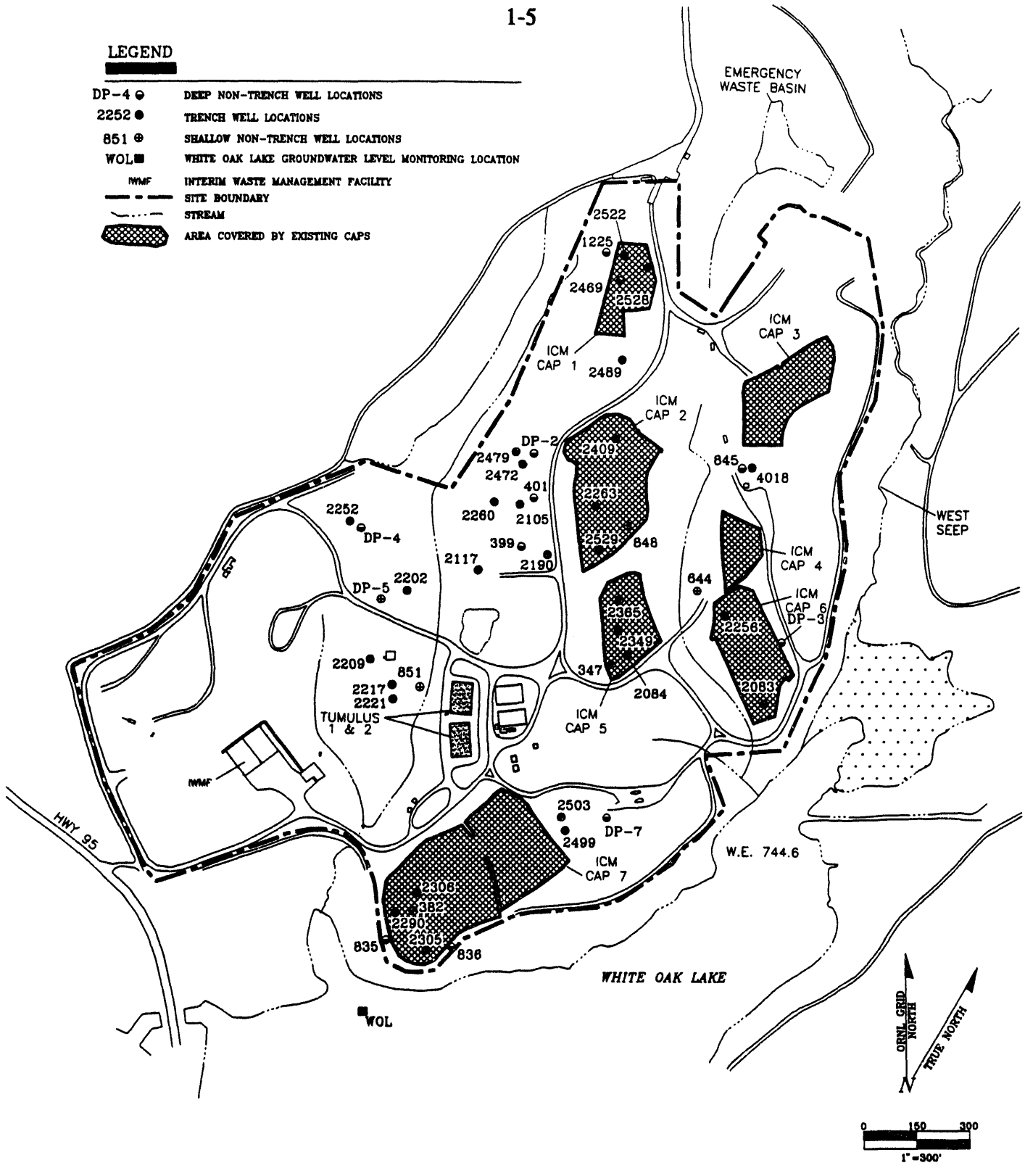
Table 1.3. Automatic water levels[a] location groupings

Group A	Group B	Group C
	Trench wells	
2209	2083	2409 (H)[b]
2217	2084	2202 (H)[b]
2221	2105	2528 (H)[b]
2252	2117	2365 (H)[b]
2290	2190	
2305	2256	
2306	2260	
2489	2263	
2499	2349	
2503	2472	
2522	2479	
4018	2529	
	Deep nontrench wells[c]	
845	401	2469 (H)[b]
1225	DP-2	
DP-4	DP-3	
DP-7	399	
	Shallow nontrench well[d]	
DP-5	644	347 (H)[b]
851		382 (H)[b]
835		848 (H)[b]
836		
	White Oak Lake Site[e]	
		WOL(H)[b]

[a] Telog level trackers installed unless otherwise noted.
[b](H) = HERMIT data logger installed.
[c] Deep wells require a 50-ft cable.
[d] Shallow wells require a 25-ft or 35-ft cable.
[e] The WOL site will require a 50-ft cable.

NOTE: Well casing elevations, total depths, and screened intervals are provided in Appendix C.

Nine locations selected in the WAG 6 interior and on the downgradient perimeter will be instrumented for continuous monitoring of water levels, temperature, and conductivity as shown in Table 1.3. Trench wells were selected for continuous monitoring from low-lying areas where perennial groundwater inundation of trenches currently exists.



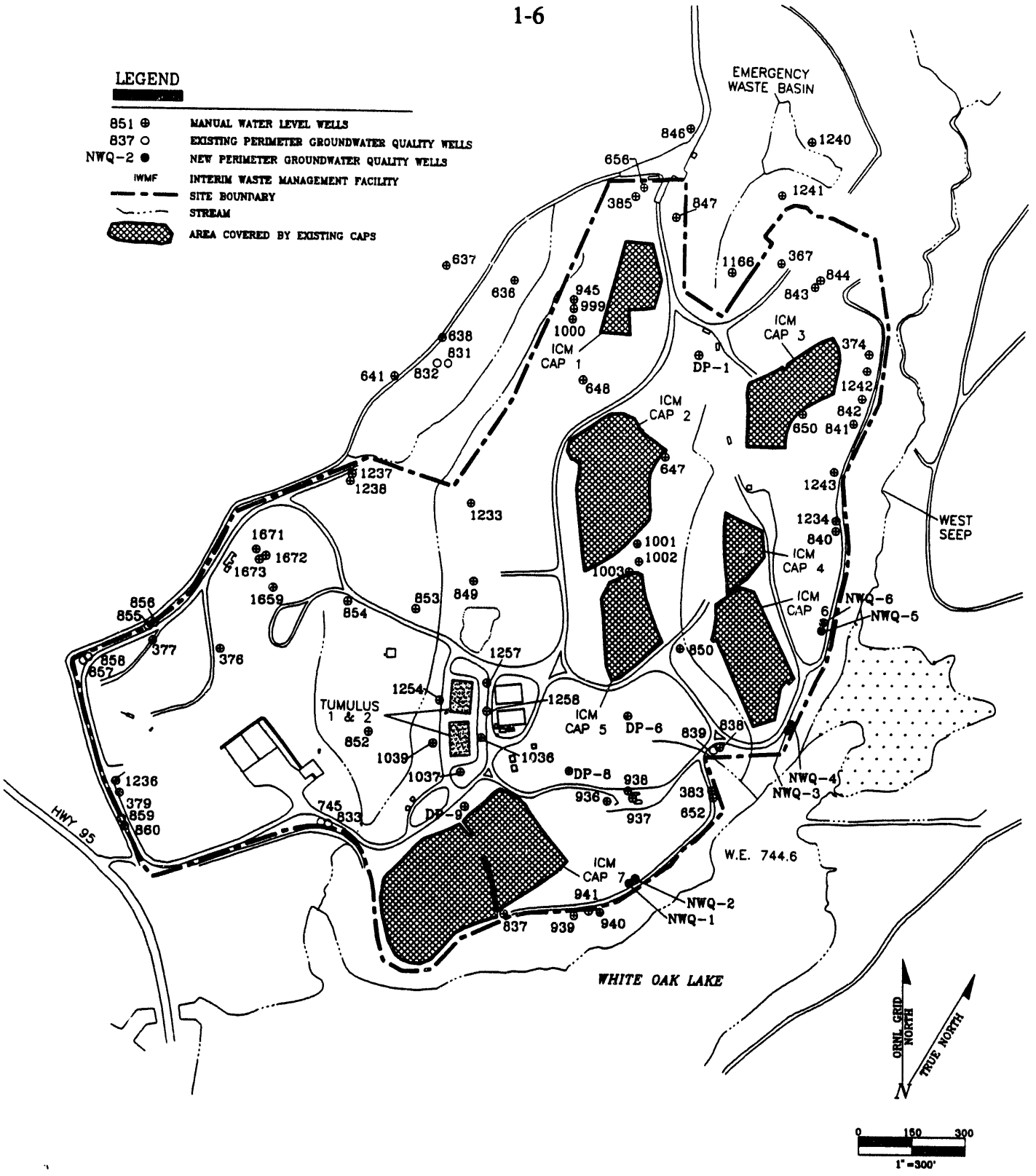
AUTOMATIC GROUNDWATER LEVEL MONITORING LOCATIONS

OAK RIDGE NATIONAL LABORATORY
ORNL WAG 6

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

FIGURE No. 1.1

A740/21DEC93/400



MANUAL WATER LEVEL MONITORING WELLS

OAK RIDGE NATIONAL LABORATORY
ORNL WAG 6

CDM FEDERAL PROGRAMS CORPORATION
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FIGURE No. 1.2

A740/21DEC93/400

Wells To Be Manually Monitored[a]

Well Numbers			
367	838	937	1241
374	839	938	1242
376	840	939	1243
377	841	940	1254
379	842	941	1257
383	843	945	1258
385	844	999	1659
636	846	1000	1671
637	847	1001	1672
638	849	1002	1673
641	850	1003	NWQ-1
647	852	1036	NWQ-2
648	853	1037	NWQ-3
650	854	1039	NWQ-4
652	855	1166	NWQ-5
656	856	1233	NWQ-6
745	857	1234	DP-1
831	858	1236	DP-6
832	859	1237	DP-8
833	860	1238	DP-9
837	936	1240	

[a] In addition to these wells, Group A or Group B wells will be monitored manually when the automatic water level systems are not in place.

Fig. 1.2 (continued)

2. TASK INSTRUCTIONS

This section identifies the specific groundwater-level-monitoring tasks to be performed to meet the objectives of the EMP. In all cases, fieldwork will be accomplished according to this SAP. Any deviations from this SAP will be documented on a WAG 6—Monitoring Variance Request Form (MV-01) and approved before implementation. If for any reason a task is not completed, the reason also will be documented on a WAG 6—Monitoring Variance Request Form (MV-01). Any problem or corrective action taken will be documented on the WAG 6—Groundwater Level Inspection and Record of Downloading Scan Form (GW-02) and in the field logbook.

Groundwater level monitoring is to be conducted at WAG 6 on 128 wells or piezometers and one location at WOL. Manual water level monitoring will be performed on 83 non-trench wells and those wells not currently being automatically monitored (group A or B wells) on a semiannual basis as described in Sect. 2.1. The semiannual monitoring will proceed during the first and third quarter. Automatic level monitoring will be performed at 28 trench wells, 17 non-trench wells, and one location at WOL on a rotational basis as described in Sect. 2.2.

A flowchart of the tasks to be conducted as part of this activity is displayed in Fig. 2.1. This flowchart graphically depicts the sequence in which the tasks will be conducted, the decision points associated with conducting the tasks, and when information will be recorded on the forms for data collection and management.

2.1 MANUAL WATER LEVEL MEASUREMENTS

2.1.1 Measurement Guidelines

Manual water level measurements will be obtained from the 83 wells shown in Fig. 1.2 on a semiannual basis, plus the Group A or Group B wells not currently equipped for automatic water level measurement. All wells will be visited to record water level manually or to confirm presence of automatic equipment. All measurements must be completed in a 24-h period. In order to obtain groundwater level measurements, the following equipment is required:

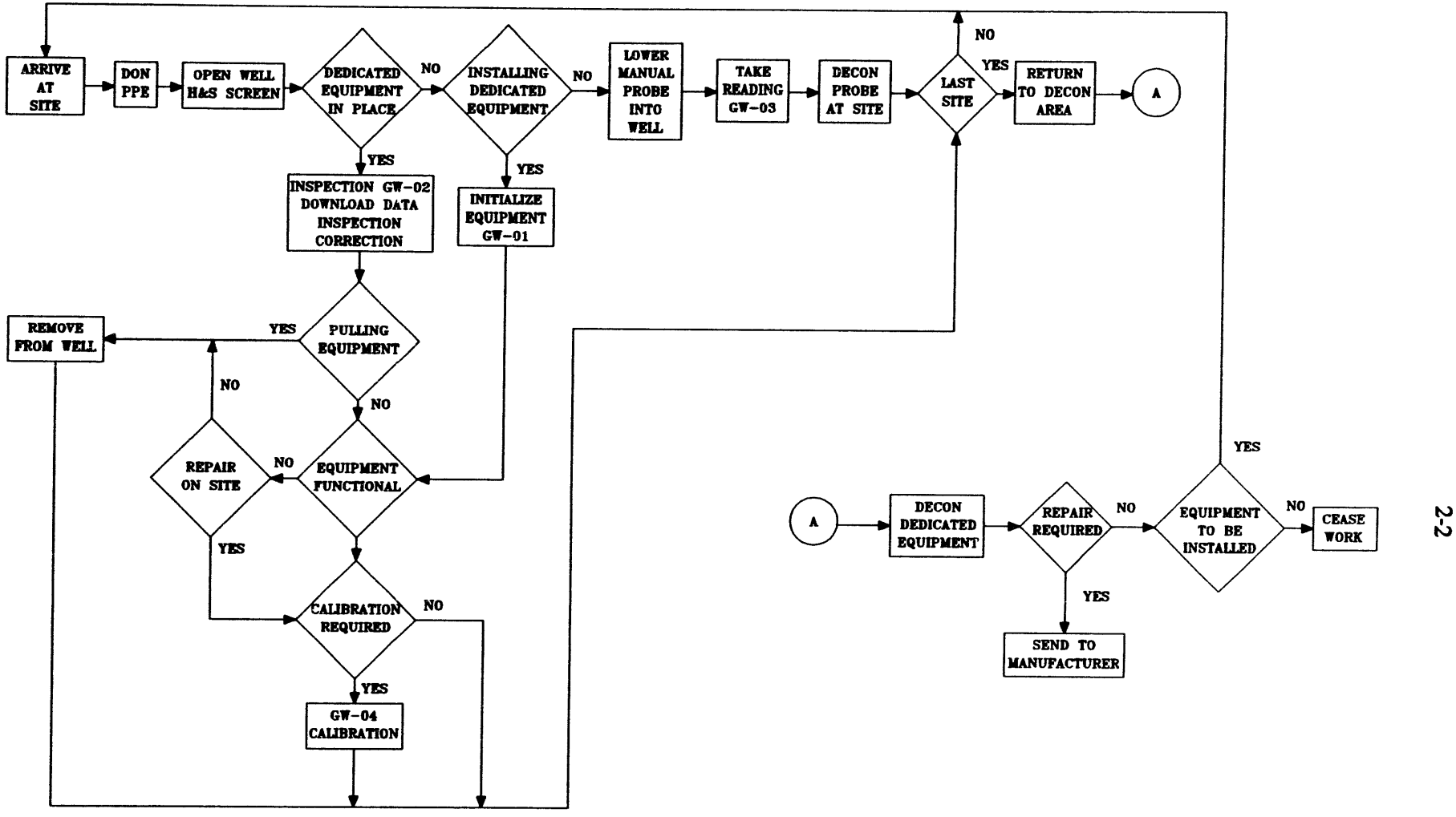
- personal protective equipment (PPE),
- water level indicator,
- field logbook, and
- WAG 6—Manual Water Level Measurements Form (GW-03).

The water levels will be measured to the nearest 0.01 ft using a water level indicator according to Environmental Surveillance Procedure (ESP)-302-001. The following guidelines shall be adhered to when obtaining water level measurements.

- Don PPE as specified by the Site H&S Officer (SHSO) and/or Site Health Physicist.

- Remove the cap from the well.

- Have H&S personnel check the atmosphere in the well casing and in the breathing zone with a photoionization detector (PID) or flame ionization detector (FID).



GROUNDWATER LEVEL MONITORING ACTIVITY FLOWCHART

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OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE

FIGURE No. 2.1

A739/210EC93/7913

- If the breathing zone atmosphere is not hazardous according to the H&S Plan, lower the water level indicator probe into the well casing. If the breathing zone is determined to be hazardous, then the site will be abandoned, the water level will not be measured, and a WAG 6—Monitoring Variance Request Form (MV-01) will be completed.

- When the alarm sounds and/or the indicator light on the side of the water level indicator reel illuminates, stop lowering the probe.

- Read the depth to water at the well casing survey mark and record it in the WAG 6—Manual Water Level Measurements Form (GW-03) and in the field logbook.

- Remove the water level indicator from the well.

2.1.2 Decontamination

The water level indicator must be decontaminated at the monitoring location before subsequent use according to ESP-900. The following guidelines shall be adhered to when decontaminating the water level indicator.

- Wipe the probe and the used portion of the water level indicator line with a paper towel moistened with distilled/deionized, organic-free water [American Society for Testing and Materials (ASTM) Type II] and laboratory detergent.

- Rinse the probe and the washed portion of the line with ASTM Type II water.

- Allow the probe and line to air dry, or wipe them dry with a paper towel.

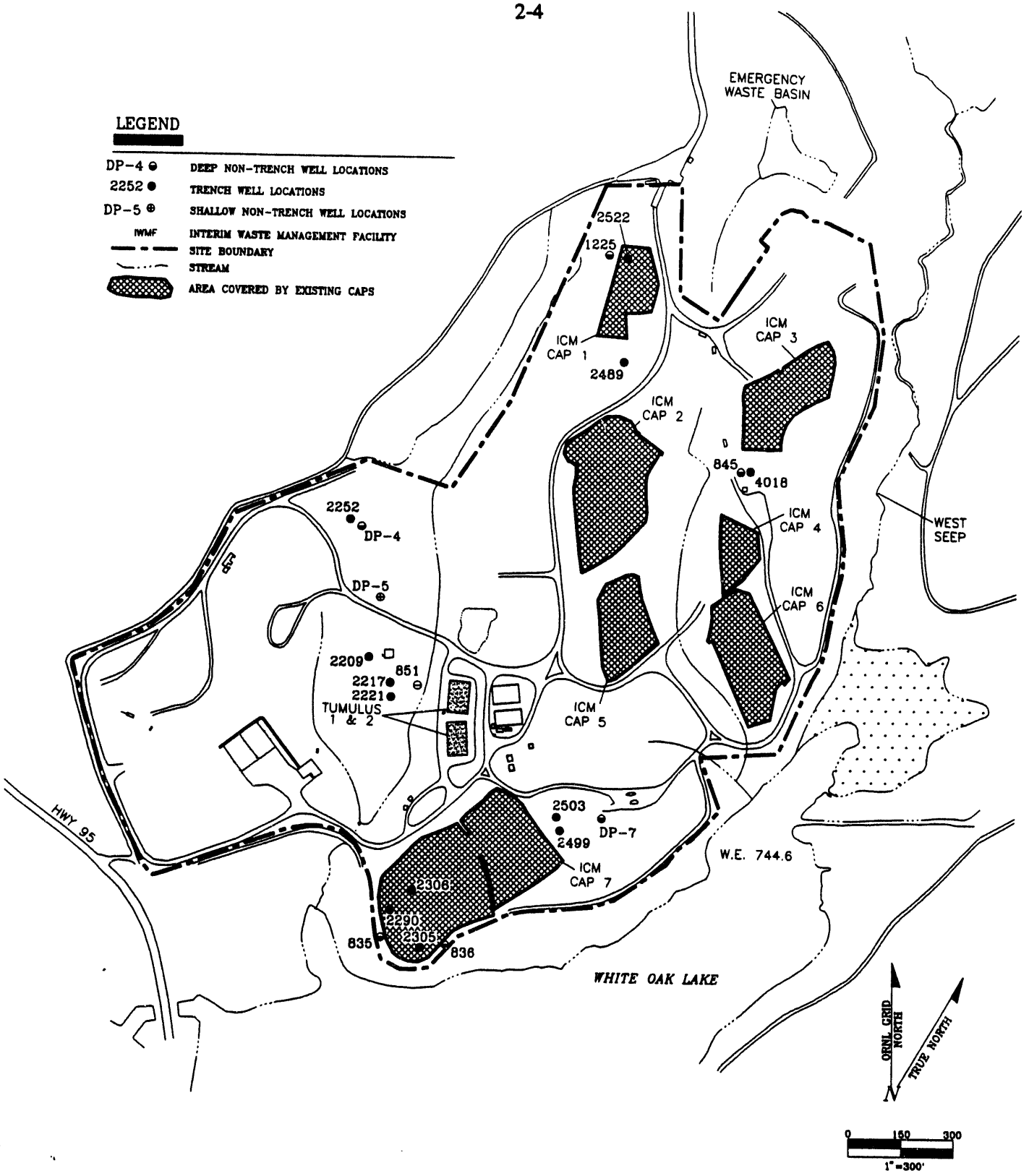
- Handle investigation-derived waste according to Sect. 5.3.

2.2 AUTOMATIC WATER LEVEL EQUIPMENT INSTALLATION AND OPERATION

Automatic water level measurements will be obtained from the wells listed in Table 1.3 on a rotational basis. Group A wells (Fig. 2.2) will have Telog Level Trackers installed at the beginning of the project. At the direction of the ORNL Groundwater Coordinator, the Telog Level Trackers will be removed from the Group A wells, decontaminated at the WAG 6 decontamination facility, and then installed in the Group B wells (Fig. 2.3).

Telog transducers initially installed in the Group A trench wells will be permanently marked as trench transducers so that they can be placed into the Group B trench wells when rotated. At no time will a trench well unit be placed in a non-trench well, because contaminant levels are historically higher in trench wells.

Group C wells (Fig. 2.4) will have HERMIT Data Loggers installed in all nine locations (Table 1.3). All these units are to be left in place during the entire 12-month baseline period. Wells equipped with HERMIT Data Loggers will monitor temperature and specific conductivity as well as water level.



GROUP A WELLS

OAK RIDGE NATIONAL LABORATORY
ORNL WAG 6

FIGURE No. 2.2

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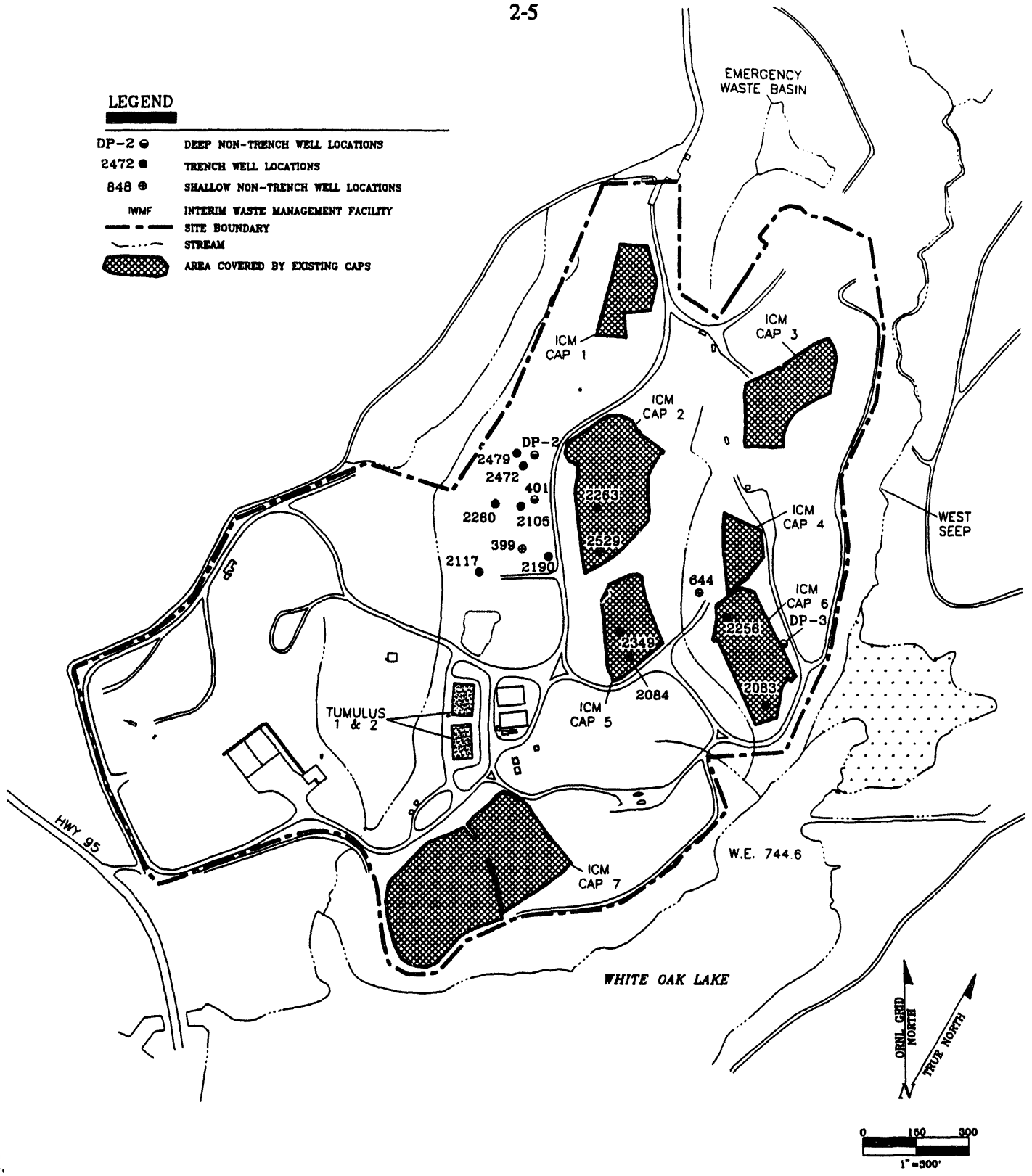
A741/21DEC93/400



GROUP B WELLS

OAK RIDGE NATIONAL LABORATORY
ORNL WAG 6

CDM FEDERAL PROGRAMS CORPORATION
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FIGURE No. 2.3

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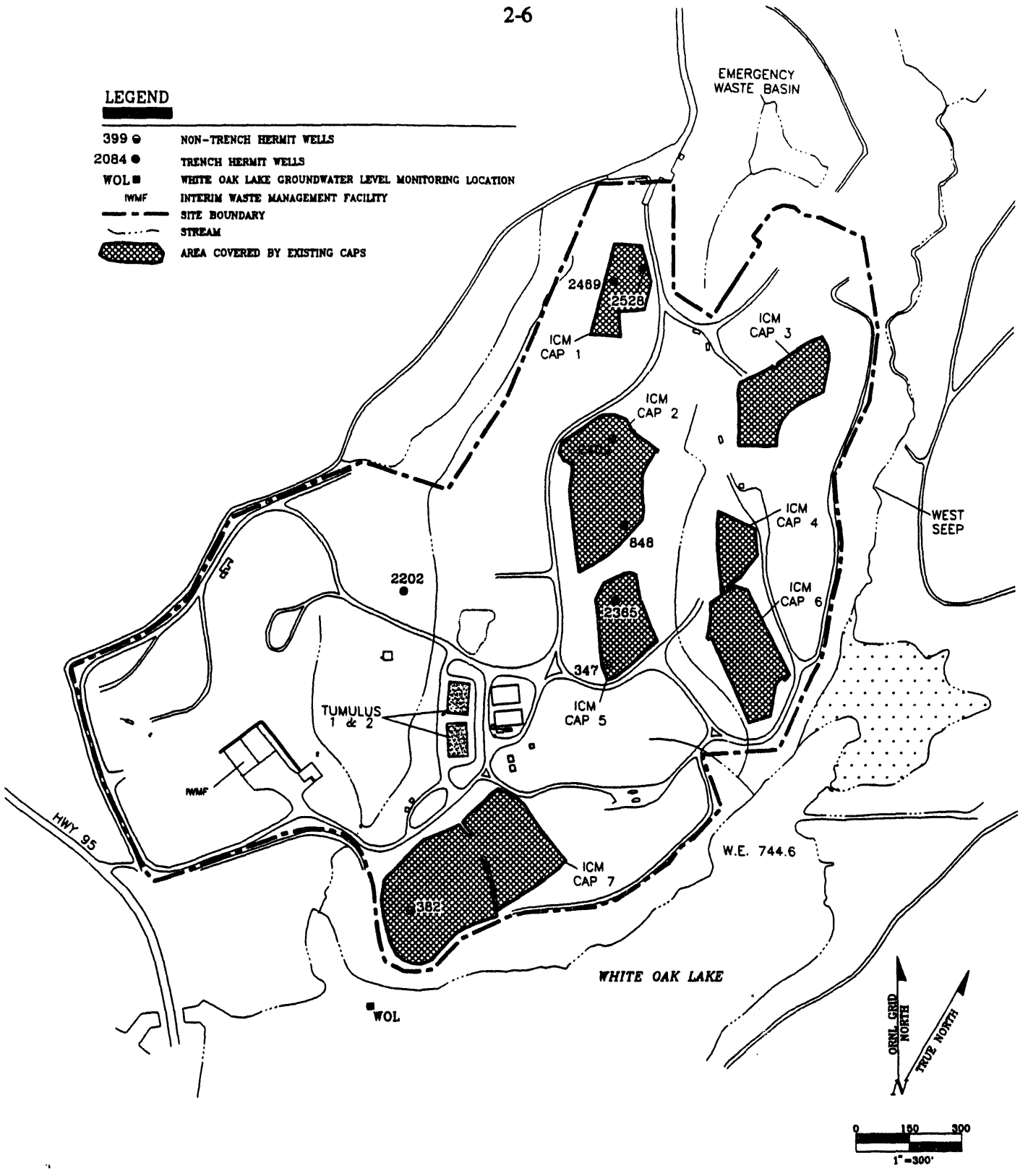

GROUP C GROUNDWATER LEVEL MONITORING LOCATIONS

OAK RIDGE NATIONAL LABORATORY
ORNL WAG 6

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FIGURE No. 2.4

A741/21DEC93/40G

2.2.1 Telog Water Level Tracker and HERMIT Data Logger Installation and Monitoring

Installation of the Telog and HERMIT systems for continuous water level monitoring will be conducted in accordance with the FOPs and with manufacturers' instructions. The equipment required for Telog installation and monitoring is specified in Table 2.1. Equipment required for HERMIT Data Logger installation and monitoring is specified in Table 2.2.

Table 2.1. Required equipment for Telog installation and monitoring

Spare quantity	In-service quantity	Item	Model
2	20	Telog Level Tracker	WLS-2109e
2	N/A[a]	Internal battery replacement	B-P1A
2	1	Data transfer cable	C-21ATC
N/A	1	Data transfer software	S-21PCX
1	1	Laptop personal computer	N/A
2	13	Druck sensor cable - 35 ft	PDCR 940-15-8
		and	
3	7	Druck sensor and cable - 50 ft	PDCR 940-15-15

[a] N/A = not applicable

Table 2.2. Required equipment for HERMIT installation and monitoring

Spare quantity	In-service quantity	Item	Model
1	9	HERMIT 1000C data logging system with RS232 interface cable	Model SE1000C
		Hi/Lo alarm cable	
		External power supply adaptors	
		Data transfer software	
1	9	Pressure transducer	Model PXD-260
1	9	Conductivity/temperature probe	Model CTS-100/DH
1	1	Laptop personal computer	N/A[a]

[a] N/A = not applicable

The following equipment will be needed in the field:

- surgical gloves and other appropriate PPE as specified by the SHSO and/or Site Health Physicist,
- Telog Level Tracker (Table 2.2) or HERMIT Data Logger Equipment (Table 2.2),
- field logbook,
- WAG 6—Water Level Monitoring Recorder Initialization/Removal Form (GW-01),
- WAG 6—Groundwater Level Inspection and Record of Downloading Scan Form (GW-02), and
- laptop computer (for downloading data).

The pressure transducers and conductivity probes of the HERMIT Data Loggers will be installed within the screened intervals of the wells. The transducers of the Telog Level Trackers will be installed below the current groundwater elevation. Refer to Appendix C for well data such as screened intervals and total well depths. Refer to the equipment installation manuals for detailed, step-by-step installation procedures for the Telog Level Tracker and HERMIT Data Logger. In general, the following steps for installation should be followed:

- Don PPE as specified by the SHSO and Site Health Physicist.
- If installing the equipment initially, carefully unpack the equipment and check for damages. Use the WAG 6—Groundwater Level Inspection and Record of Downloading Scan Form (GW-02), entering information in all the provided blanks. Label the equipment with supplied labels clearly indicating a unique tracking identification number for that specific Telog Level Tracker or HERMIT Data Logger.
- If the installation is part of a rotation sequence, carefully note in the field logbook the identification (ID) number of the equipment together with the well type (trench or non-trench) and well number from which the equipment is removed. Use the WAG 6—Water Level Monitoring Recorder Initialization/Removal Form (GW-01), entering information in all the provided blanks.
- Transport the equipment to the decontamination area and perform the decontamination of the equipment, using Environmental Surveillance Procedure (ESP)-900 where appropriate and following the general guidelines specified in Sect. 2.2. This applies to new equipment also.
- Remove the cap from the well at the installation location.
- Have H&S personnel check the atmosphere in the well casing and the breathing zone with a PID or FID.
- If contaminant levels in the breathing zone atmosphere are not above ambient levels, begin the process of installing the automatic water level monitoring equipment. If contaminant levels are above ambient levels, leave the site and prepare a Monitoring Variance Request Form (MV-02). Refer to the manufacturer's installation manuals for specific, step-by-step

procedures, and to WAG 6—FOP 11, "Pressure Transducer Deployment." Use the WAG 6—Water Level Monitoring Recorder Initialization/ Removal Form (GW-01), entering information in all provided blanks. Note that the "Recorder ID No." is for software reference. Record the computer date and time to verify logger synchronization.

- Carefully note in the field logbook the ID number of the specific equipment being installed and the type of well receiving the equipment. Check to see if the equipment is marked as a trench unit, and refer to Table 1.3 to ensure that equipment is consistently rotated between trench wells or piezometers and between non-trench wells or piezometers. **EQUIPMENT MUST NOT BE ROTATED FROM TRENCH TO NON-TRENCH LOCATIONS.**

- When installing the automatic water level equipment, also note the length of the transducer cables, and match long and short cables to deep and shallow wells (Table 1.3).

- Check to ensure that the equipment is functional, and check the calibration of the equipment using the WAG 6—Water Level Recorder Calibration Check Form (GW-04) entering information in all provided blanks.

A Hermit Data Logger and its associated equipment also will be installed at the WOL site. The pressure transducer and conductivity/temperature probe will be installed in a 4-in. well screen. The well screen will be situated horizontally in the lake and secured to the lake bottom using an anchor.

The data collected by the Telog Level Trackers and HERMIT Data Loggers will consist of records of water levels for every 15 min of operation. Temperature and conductivity also will be monitored every 15 min in wells fitted with HERMIT Data Loggers. Note that HERMIT Data Loggers in the Group C wells and the WOL site will not be rotated. The Group A wells will be monitored starting at month one.

Each HERMIT Data Logger and the associated accessories must be secured at each monitoring location to prevent tampering with the instruments. Appropriate security measures (e.g., field enclosures) will be determined by the FTM and must be indicative of the level of risk presented by site workers or trespassers. A calibration check of the pressure transducer of the Telog Level Tracker and the pressure transducer and conductivity probe of the HERMIT System will be performed according to the schedule listed in Table 2.3. The check of the pressure transducer calibration will be conducted according to WAG 6—FOP 12, "Pressure Transducer One-point Calibration Check." The calibration check of the conductivity/temperature probe will be conducted according to the procedures in Sect. 3.4.1.

2.2.2 Data Downloading Schedules and Procedures

At the commencement of continuous and rotational monitoring activities, Telog data will be downloaded for processing on a daily basis until the FTM has sufficient evidence to confirm proper functioning of each Telog Level Tracker. At that time, downloading of data will be conducted twice per week, then once per week, twice per month, and finally once per month. After obtaining sufficient evidence to confirm functioning of each Telog system, the FTM will determine when the frequency for downloading of data will change.

Table 2.3 Equipment calibration check schedule

Task	Equipment name	Check[a]	Schedule[b]	Location	Calibration procedure
Water level	Telog Level tracker	Monthly	Annually	Field	User's Manual; FOP 12[c]
	HERMIT 1000C system w/CT8-100/DH conductivity/ temperatuare probe w/PXD-260 pressure transducer	Monthly	Annually	Field	User's Manual; FOP 12[c]

[a] A calibration check also will be performed at the time of equipment initialization.
[b] Calibration can be performed more frequently if equipment checks reveal the necessity to do so.
[c] Procedures given in WAG 6—FOP 12 will be used to check the calibration of the pressure transducers. The calibration of the HERMIT system conductivity probe will be checked according to the procedure provided in Sect. 3.4.1.

At the commencement of continuous multiple-parameter monitoring activities, HERMIT data will be downloaded for processing on a daily basis until the FTM has sufficient evidence to confirm proper functioning of the HERMIT data logging system. At that time, downloading of data will be conducted twice per week, then once per week, twice per month, and finally once per month. After obtaining sufficient evidence to confirm functioning of each HERMIT data logging system, the FTM will determine when the frequency for downloading of data will change.

Downloading data obtained by Telog Level Trackers and HERMIT Data Loggers will be accomplished using a laptop computer according to manufacturer's instructions. Data from each of the data collectors may be downloaded using several different options depending on the quantity and chosen format of the data to be downloaded. In general, data obtained by Telog Level Trackers and HERMIT Data Loggers will be downloaded using the following guidance.

Telog Level Trackers

- Connect the recorder to the laptop computer using the C-21ATC cable.
- Turn on the laptop computer and press enter.
- Input or check the current date and time of the recorder. When completed, press enter.
- Select F1 from the menu in order to interrogate the 2100 Recorder.
- Select F1 from the main menu to analyze recorder data.
- Select F10: Return to analyze recorder menu.
- Select F4: Save recorder data to disk.
- Enter a file name of 8 characters or less using DOS naming conventions. This will save the data.

- Select F10 to return to the main menu.

HERMIT Data Loggers

- Connect the laptop computer to the RS232 Port of the data logger, turn on the laptop, and press any key to "wake up" the data logger.

- Beginning at the recorder status display, press enter and hold it down while pressing start.

- Select PORT from the system set up menu and press Stop/Next.

- Press the DATA key and select the appropriate test number by pressing ENTER (for the default) or scan to the desired test number and press ENTER.

- At the "Start Percentage" prompt, press ENTER for the default (0%), or scan to the desired start percentage and press ENTER.

- At the "End Percentage" prompt, press enter for the default (100%), or scan to the desired end percentage and press ENTER.

- Press ENTER to begin data transfer.

- Press STOP/NEXT to end.

After being downloaded, data will be edited and analyzed according to Sect. 6 and WAG 6—FOP 10.

2.3 EQUIPMENT MAINTENANCE AND SERVICING

Maintenance activities may be required to keep the on-site equipment in proper working order. If problems are encountered with any of the on-site equipment, servicing must be done immediately. To maintain the continuity of the equipment used, servicing should be done on-site. If on-site repair is not possible, the equipment must be replaced with a factory-calibrated alternate of the same brand and model number. The calibration of the equipment must be checked following replacement. If on-site repair is possible, the calibration of the equipment must be checked following servicing. All service equipment must be checked on the day immediately following its repair (or return to the site) to ensure that the problem has indeed been corrected. All equipment servicing or replacement must be completely documented in the WAG 6—Record of Repair Form (RF-01) and equipment logbook. Each equipment service entry into the documentation form must be initialed by the person performing the service. Groundwater level monitoring personnel are also referred to equipment instruction manuals for additional calibration and maintenance information.

3. QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

3.1 OVERVIEW

This section identifies QA/QC aspects of the *Quality Assurance Plan for Characterization and Monitoring Activities at Waste Area Grouping 6, Oak Ridge National Laboratory, Oak Ridge, Tennessee* (CDM Federal 1993) that are required to implement the EMP and this SAP. Subjects addressed in this section include, but are not limited to, monitoring program organization and personnel responsibilities, documentation procedures and protocols, monitoring QC requirements, decontamination procedures, and equipment calibration and maintenance. The QA/QC considerations presented in this section have been developed to ensure that the data generated during all phases of the EMP will be of known quality and legally defensible.

Work on this assignment will be performed in accordance with the following:

- *Environmental Restoration Quality Program Plan*, ES/ER/TM-4/R3 (Energy Systems 1993);
- *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80 (EPA 1983);
- *Quality Assurance Program Requirements for Nuclear Facilities*, ASME NQA-1 (ASME 1989);
- *Quality Assurance Project Plan for the Environmental Monitoring Program in Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/01-1193&D1 (DOE 1993b); and
- *WAG 6 Field Operations Procedures Manual.*

This SAP has been reviewed for QA/QC requirements by the Contract QA Manager, who will maintain QA oversight for the duration of the project. In addition, all deliverables will be subject to technical review by CDM Federal Programs Corporation (CDM Federal) technical specialists. All deliverables presenting measurement data will be reviewed by the CDM Federal QA staff. A description of the project Data Quality Objectives can be found in the EMP.

3.2 MONITORING PROGRAM ORGANIZATION

The EMP personnel comprise a sub-task team of the Monitoring and Laboratory Analysis Group. The principal groundwater level monitoring personnel assigned to conduct the WAG 6 EMP field activities are:

- Charles Callis (Project Manager)
- David Johnson (QA Specialist)
- Donnie McCurry (Field Task Manager)
- Richard Stout [Groundwater Level Monitoring Sample Task Leader (STL)]
- Michael Charko (Field Technician)
- Richard Stout (Field QC Coordinator)

Figure 3.1 shows the project organization, reporting relationships, and lines of authority for this project. General responsibilities of the field personnel are discussed in Table 3.1. Other personnel will be assigned as necessary.

3.3 FIELD DOCUMENTATION

EMP field documentation shall consist of:

- one master site logbook (to be maintained at field headquarters),
- an equipment maintenance and calibration logbook,
- an activity-specific field logbook for GWL,
- a telephone logbook,
- project number and activity-specific field forms (see Appendix A), and
- bar code labels.

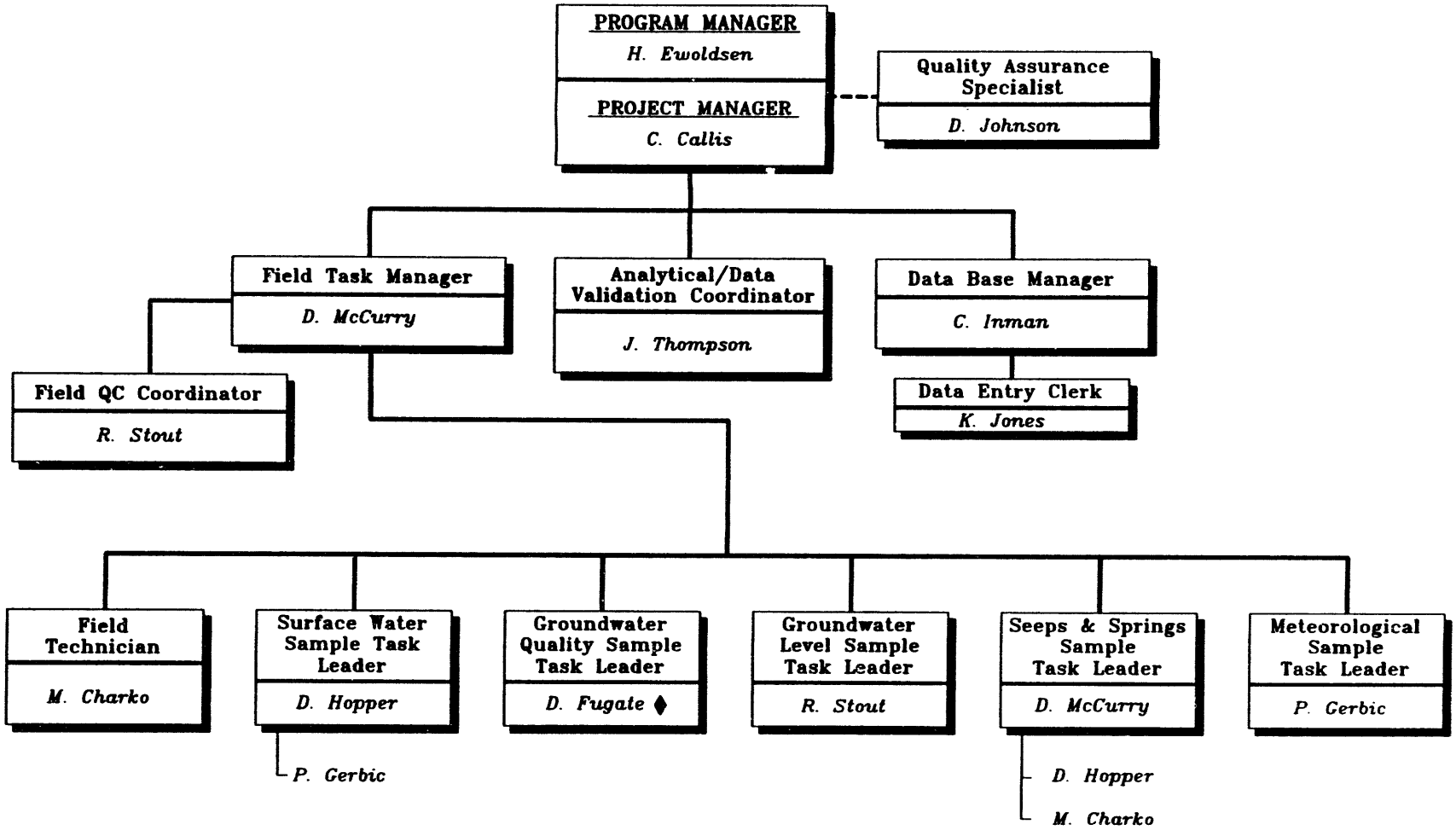
All documentation must be completed in waterproof black ink, and corrections must be marked through with a single line, dated, and initialed. Handwritten documents must be legible. Table 3.2 displays where, and what kind of, information must be recorded.

Field Documentation Forms

Field documentation forms will be the primary documentation of all EMP field activities. The following forms, which are located in Appendix A, are to be used for the specific activities addressed in this SAP:

- WAG 6 - Water Level Monitoring Recorder Initialization/Removal Form (GW-01),
- WAG 6 - Groundwater Level Inspection and Record of Downloading Scan Form (GW-02),
- WAG 6 - Manual Water Level Measurements Form (GW-03),
- WAG 6 - Water Level Recorder Calibration Check Form (GW-04),
- WAG 6 - Monitoring Variance Request Form (MV-01), and
- WAG 6 - Record of Repair Form (RF-01).

Any information pertinent to the current field activity or field condition that is not requested on the field documentation form should also be entered in the "Comments" section of the form and in the field logbook. The forms used at each site will be numbered sequentially, using bar codes. The bar code will be located at the bottom right of the form and also entered into the field logbook. In addition, any charts, oversize pages, and other printed material (e.g., data plots, sample times) pertinent to current field activities will be securely attached to the corresponding field documentation form. The form number of the corresponding field documentation form must be written somewhere on the attached material.



♦ Note that the sampling will be conducted by OECD ESP personnel and that D. Fugate will be responsible for documentation and sample management.

A505/160C83/7913

CDM FEDERAL PROGRAMS CORPORATION
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CDM FEDERAL WAG 6 ENVIRONMENTAL MONITORING PLAN IMPLEMENTATION ORGANIZATION CHART

OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE

FIGURE No. 3.1

Table 3.1. General responsibilities of WAG 6 EMP principal contractor personnel

Position	Responsibilities
Project Manager	• Approving the SAP and verifying that all appropriate QA requirements, as specified in the WAG 6 QA Plan and in this document, are met in all field monitoring activities; • consulting with the WAG 6 Program Manager and appropriate EMP QA authorities on all quality-related matters; • investigating field-related quality problems (e.g., out-of-control events), determining their root causes, proposing solutions, implementing corrective actions, and obtaining the concurrence of the WAG 6 Program Manager and QA authorities on the appropriateness of any corrective action; • submitting any proposed changes to the SAP, in the form of a Monitoring Variance Request Form (MV-01), to the WAG 6 Program Manager for approval; • maintaining custody of all original and copied EMP monitoring documentation; • reviewing all field data and documentation for completeness and adherence to QA protocols; • submitting all field data and documentation to the WAG 6 Program Manager for review; and • developing, gaining approval for, and implementing any cost-effective quality improvements.
Field Task Manager	• Implementing relevant requirements contained in the governing documents and plans; • ensuring and documenting that all field and laboratory personnel are properly informed and trained as specified in this SAP; • ensuring that there are adequate numbers of properly trained personnel for implementation of the groundwater monitoring activities; • ensuring that all equipment (including backup equipment) necessary for groundwater level monitoring is available for immediate use; • keeping well-informed of scheduled interim remedial action and site upgrade construction activities, especially when such activities may hamper groundwater level monitoring activities or affect data quality objectives and/or QA objectives; • initiating stop-work actions when the severity of conditions adverse to quality warrants immediate action; • managing or performing inspections and calibrations, and maintaining accurate documentation of all site equipment calibration and servicing activities; • managing or performing field monitoring activities, and ensuring that all such activities are performed and documented in accordance with QA protocols and approved procedures;

Table 3.1 (continued)

Position	Responsibilities
	• submitting all field documentation and electronic site data to the Project Manager for review; and
	• keeping the Project Manager informed of all site activities and quality-related problems.
QA Specialist	• Advising the contract Project Manager and team members of QA matters;
	• identifying project QA requirements and preparing QA procedures as required;
	• reviewing and approving the SAP and all subsequent changes to the SAP;
	• conducting or arranging scheduled audits or surveillances of task activities;
	• evaluating quality performance data from quality investigations, audits, and reviews;
	• preparing monthly QA summary reports for corporate management;
	• conducting or arranging QA training;
	• tracking the implementation of QA requirements in this plan and consulting periodically with the Project Manager;
	• tracking reports on conditions adverse to quality, reviewing corrective action, and tracking completion; and
	• initiating, reviewing, and following up on corrective actions as necessary.
Field QC Coordinator	• Implementation and documentation of training requirements,
	• QC review and verification of field forms and logbooks, and
	• verification of proper FOP usage.
Field Technician	• Maintenance and calibration of portable equipment,
	• inventory of supplies,
	• monitoring kit preparation,
	• waste management, and
	• proper documentation of all field activities.
Sample Task Leader	• Performance and documentation of all field activities,
	• installation and maintenance of all dedicated equipment, and
	• monitoring and data acquisition activities.

Table 3.2. Types of WAG 6 EMP field documentation and the information required for each

Field documentation	Information
Site Logbook	• A list of all field logbooks; • temperature, weather conditions, and names and titles of personnel present during field activities; • name, title, organization, and purpose of site visitors; • outline of daily field activities; • problems, their final resolution, and anticipated impact on the field investigation; and • field changes or variances.
Equipment Maintenance and Calibration Logbook	• Equipment name, serial number, and ID number, • date of each calibration event, • identity of person performing calibration, and • calibration settings and values.
Field Logbooks	• Date and time task started; weather conditions; and names, titles, and organizations of personnel performing the task; • a description of site activities in specific detail; • a description, in detail, of any field test(s) (and results); • a list of the time, equipment type and serial or identification number, and procedure followed for decontamination activities; • a list of equipment failures or breakdowns; and • a description of calibration activities in the field.
Site Telephone Logbook	• Date of call, • time of call, • whether incoming or outgoing, • participating parties, and • subject and pertinent information.

3.4 ACTIVITY-SPECIFIC QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

3.4.1 Automatic Monitoring

All forms to be completed for each Telog or HERMIT recorder installation are provided in Appendix A. All blanks must be completed. The "Recorder ID No." is for software reference.

Operation checks will be performed on all Telog Level Trackers and HERMIT Data Loggers whenever data are electronically downloaded. Calibration checks will be performed initially upon installing the equipment and on a monthly basis thereafter. Calibration checks of the pressure transducers will be performed according to WAG 6—FOP 12. Any differences greater than 0.1 ft will be cause for repeating the calibration check. If, after repeating the calibration check, the difference between the manual water level and that obtained by the data collecter is still greater than 0.1 ft, then the transducer will be removed from service. The WAG 6—Record of Repair Form (RF-01) will be used. All blanks on the form will be completed.

The calibration of the conductivity/temperature probe will be checked according to the following guidelines.

Temperature

- Ensure that the probe is properly connected to the data logger.
- Prepare a container filled with ice. Add water to the container until it is at the same level as the ice.
- Place the probe in the container until the sensors of the probe are immersed.
- Stir the probe in the iced water, allowing time for the temperature to stabilize (about 5 min).
- Check the temperature reading of the data logger and compare it to the temperature of the ice water (0°C).
- If the temperature reading is greater than 1°C, begin stirring the probe in the iced water again and repeat the calibration check.
- If the temperature reading is still greater than 1°C, remove the probe from service and complete a WAG 6—Record of Repair Form (RF-01).
- Replace the out-of-service probe and repeat the calibration check.

Conductivity

- Ensure that the probe is properly connected to the data logger.
- Place the probe in a solution of known conductivity until the sensors of the probe are immersed.
- Allow time for the probe to stabilize in the solution (about 5 min).

- Check the conductivity reading of the data logger and compare it to the known conductivity of the solution.

- If the difference between the conductivity reading and the known conductivity of the solution is greater than 1.0%, repeat the calibration check.

- If the difference between the reading and the known conductivity of the solution is still greater than 1.0%, remove the probe from service and complete a WAG 6—Record of Repair Form (RF-01).

- Replace the out-of-service probe and repeat the calibration check.

All pertinent information will be recorded in the field logbook and on appropriate worksheets, which include: WAG 6—Water Level Monitoring Recorder Initialization/Removal Forms (GW-01), WAG 6—Water Level Recorder Calibration Check Forms (GW-04), and WAG 6—Monitoring Variance Request Forms [MV-01 (see Appendix A)].

A WAG 6—Groundwater Level Inspection and Record of Downloading Scan Form (GW-02) must be used to document all downloading activities for data reduction. All blanks must be completed. The "Download Device" column is for recording the type and ID number of the device into which the data were downloaded.

3.4.2 Manual Monitoring

Measurement accuracy will be established by taking random multiple measurements. These multiple measurements will be documented in the field logbook. Variations in measurement data from a well that exceeds 0.1 ft will be cause for repeating the measurements. No calibrations will be performed by field personnel on manual water level measuring equipment. Electronic water level indicators for manual measurements are calibrated by the manufacturer before shipment. Currently, methods for checking the calibration of water level indicators are being explored. If an appropriate method is identified, then a WAG 6—Monitoring Variance Request Form (MV-01) will be completed, and the calibration of each water level indicator will be checked. If a sensor is damaged or suspect, it will be returned to the manufacturer for factory service and calibration.

4. HEALTH AND SAFETY CONSIDERATIONS

The provisions of the project H&S Plan are mandatory for all personnel assigned to the program. In no case may work be performed in a manner that is inconsistent with the intent and cautions expressed in the project H&S Plan. All field personnel will be properly trained in H&S regulations associated with handling hazardous materials and the safe operation of sampling equipment. All personnel will be trained as specified in the project H&S Plan.

In general, personnel will work in groups or pairs. However, personnel will perform some work activities independently of other members of the WAG 6 field team. At these times, personnel will abide by a "buddy system." Each member of the WAG 6 field team will be responsible for keeping track of personnel working independently. Before leaving any radioactive or muddy monitoring areas, all personnel and conveyed equipment will be checked with a beta-gamma meter for evidence of radiological contamination. Personnel will take precautions to help prevent contact with hazards identified in the project H&S Plan.

The SHSO and Site Health Physicist shall specify the PPE required for site activities, tasks, and work zones. This specification shall be based on possible site contaminants, Occupation Safety and Health Administration (OSHA) guidelines, and chemical and radiological hazards information. The SHSO and/or Site Health Physicist shall train all site personnel in PPE donning and doffing procedures before beginning any site activities. The task instructions in Appendix B address activity- and location-specific H&S issues.

5. WASTE MANAGEMENT

The WAG 6 EMP Waste Management Plan (WMP) states that CDM Federal, as waste generator, will perform waste segregation, packaging, labeling, and transportation as required during the project. [Waste Management Operations (WMO) will transport liquid waste from the temporary waste storage area to the appropriate facility.] CDM Federal is not responsible for final disposition of waste.

Anticipated wastes from groundwater level monitoring activities includes decontamination fluids, PPE, and various other trash items such as used paper towels and plastic sheeting. No soil or purge water waste will be generated during this activity.

5.1 ORGANIZATIONAL RESPONSIBILITIES

The following personnel will be responsible for various aspects of WAG 6 waste management.

Laboratory Certification Official

The Laboratory Certification Official has the following responsibilities:

- implementing and managing the ORNL Solid Low-Level Waste (SLLW) Certification program,
- reviewing and approving project WMPs and WMP checklists, and
- providing direction if an unforeseen waste situation is encountered.

Generator Certification Official

The Generator Certification Official has the following responsibilities:

- serving as interface between the project, the ORNL Laboratory Certification Official, and the ORNL WMO in addressing generator problems and waste certification requirements;
- initiating preparation of the Waste Pickup Request Form;
- certifying that the waste was packaged in accordance with ORNL waste acceptance criteria, the ORNL SLLW certification program, and SLLW QA Plan requirements;
- making arrangements with WMO for pickup and transfer of waste packages to the designated storage or treatment facility; and
- assuming other duties as specified in the WMP.

Field Task Manager

The FTM has the following responsibilities:

- ensuring that site personnel follow the WMP,
- coordinating with Health Physics (HP) and Industrial Hygiene (IH), and
- assuming responsibility for transportation of solid waste as required.

Sample Task Leader

As the waste generator, the STL has the following responsibilities:

- properly containerizing, packaging, and segregating all waste generated as part of the project;

- interfacing with the FTM to ensure that any issues pertaining to SLLW characterization are promptly brought to the attention of the responsible individuals and that any new certification requirements are promptly instituted;

- assisting the GCO with the preparation of the Waste Pickup Request Form and the Container Packing List; and

- assuming other duties as specified in the project WMP.

Health Physics and Industrial Hygiene Personnel

HP and IH personnel are responsible to conduct surveys as necessary to determine if waste contains Resource Conservation and Recovery Act- (RCRA-) regulated or radiologically contaminated materials.

5.2 GUIDANCE DOCUMENTS

The following documents will provide guidance for waste management activities conducted during the implementation of the WAG 6 EMP:

- WAG 6 Project WMP,
- "Waste Management" (ESP-1000),
- *Waste Acceptance Criteria for Radiological Solid Waste Disposal* (WMRA-WMPC-203),
- *ORNL Liquid Waste Treatment Systems Waste Acceptance Criteria* (WM-WMCO-201),
- Waste Item Description (UCN-2109) Form User Instructions,
- Container Packing List (TX-5749) Form User Instructions, and
- *Management of Investigation-derived Waste During Site Investigations* (EPA 1991).

5.3 WASTE CHARACTERIZATION/SEGREGATION

When waste is first generated, it will be containerized at the site. Table 5.1 shows the various categories into which waste will be segregated for this project, the criteria for segregation, and packaging requirements.

Table 5.1. WAG 6 Groundwater Level waste management

Type of waste	Category of waste[a]	Segregation requirements	Packaging requirements[b]	Accumulation/ staging area	Final disposal[b]
Miscellaneous trash (personal protective equipment, plastics, paper)	5	No α or β/γ; no volatiles	Plastic bags in garbage cans at site	Green dumpster adjacent to personnel trailers	Y-12 landfill
	8	Suspected α or β/γ but no volatiles	Package per Solid Waste Storage Area (SWSA) 6 Waste Area Criteria instructions (WMRA-WMPC-203)	GCO-designated area	Site designated by Waste Management Operations
	14	α or β/γ; no volatiles	Package per SWSA 6 Waste Area Criteria instruction (WMRA-WMPC-203)	GCO-designated area	SWSA 5-box compactor
Decontamination water	22	Based on procedure: solvent, acid, etc; α or β/γ	Arrange with LGWOD[c]	Carboy	Process waste treatment plant
	24	Based on procedure: solvent, acid, etc; no α or β/γ	Arrange with LGWOD	Carboy	Nonradiological waste treatment plant
	25	No hazardous substance used in decontamination; no α or β/γ	Arrange with LGWOD	Carboy	Storm sewer system

[a] Categories of waste as delineated by the Project WMP.
[b] According to Tables 3.2 and 3.3 in the Project WMP.
[c] Liquid and Gaseous Waste Operations Department

5.3.1 Solid Waste

As it is generated (when possible), or at the end of each day, HP personnel will use portable alpha and beta/gamma detectors to monitor the material removed for the presence of radioactivity. They will designate waste as being "Clean," "Very Low Activity," or "Low Level" Waste.

Because the STL and the other field personnel will be moving from well to well during the day when conducting some of the water level measurement activities, PPE and other waste generated at each nonradioactive area well will be placed in a plastic bag labeled to indicate this material was generated from the control zone only. This bag will be carried with the STL or left inside the controlled zone to be screened by the HP for disposal designation. Solid waste generated in radioactive areas will be controlled in the areas.

5.3.2 Liquid Waste

Liquid waste from decontamination activities will be accumulated in containers at the decontamination area. According to the project WMP, containers of liquid waste will be monitored for radioactivity, volatile organics, and pH. When a container is full, a sample will be taken following WMO procedures, and the Liquid Waste Laboratory Certification Official will be consulted regarding the analyses necessary for characterization. The same sample custody procedure used for other samples (ESP-500) will be followed. While analytical results are pending, a replacement accumulation container will be used.

5.4 WASTE PACKAGING

After waste has been characterized and segregated according to category, waste packets can be created. Waste is packaged by the STL according to guidance provided by the GCO. A Waste Item Description Form is filled out for each packet. One bar code label is placed on the waste packed, and the other is placed on the Waste Item Description Form associated with the specific packet. The bar code label number is then copied onto the Container Packing List. When the container is full, the GCO and the STL will complete a Waste Pickup Request Form to be submitted to WMO by the GCO. The Waste Managaement Plan, Waste Management forms, and their instructions for use, as well as the solid and liquid waste acceptance criteria, will be located on site in the WAG 6 project trailers.

5.5 WASTE TRANSPORTATION

When the liquid waste can be categorized, the original container site will be considered the temporary waste storage area and the drums will be transported by WMO. Energy Systems personnel will manage and conduct transportation of all wastes to locations outside WAG 6.

6. DATA MANAGEMENT

6.1 INTRODUCTION

The data management team will create "Blank Form Books" filled with previously bar coded forms to be used by the field teams. Each type of form will be stored in a separate book and will have the bar code pre-attached to the bottom right corner of the form. A copy of the appropriate form will be inserted on the outside cover of the "Blank Form Book," and the binder will signify the form number. The form bar code label will be scanned by the STL entering it into the bar code reader for uploading to the data base when using the form. If that form is not used after being taken to the field, the STL will return the blank form to the notebook for use on another day.

The form bar code numbers must be used in sequence for record keeping purposes. The form bar code numbers will serve as identifiers for location of the forms in the files. When the STL returns to the trailer at the end of the day, the forms will be forwarded to the FTM for review. The DM will receive all completed forms and the data diskette downloaded from the bar code reader on a daily basis. The electronic data diskettes downloaded from the monitoring equipment will be forwarded to the DM by the FTM on a monthly basis (and more frequently if necessary).

6.2 DATA DOWNLOADING

Field data collected during the WAG 6 Groundwater Level Monitoring Program will be obtained manually and electronically. A majority of the manual data will be entered into the WAG 6 data base using bar code equipment. However, field documentation forms also will be completed and used by the sampling team as a quality check against the data base. Electronic data will be collected by Telog and HERMIT data collectors and will be downloaded, edited, and analyzed by the sampling team.

6.2.1 Manual Data

Manual data generated for groundwater level monitoring will consist of manually measured water levels. A majority of the manual data will be entered into the WAG 6 data base using bar code equipment. However, field documentation forms also will be completed by the sampling team. These forms will be compared with the data base at a later time to ensure that all the information entered into the bar code reader was correct.

6.2.2 Electronic Data

Raw electronic data generated for groundwater level monitoring will consist of continuous records of water levels and some water quality data. Electronic data will be downloaded, edited, analyzed, and gathered into monthly site report files. Data files will be traced, from downloading to archiving and internal verification, on the Electronic Data File Management Form presented in the WAG 6 FOP Manual. The following guidelines should be followed when manipulating electronic data.

- Download water level data collected by the Telog and HERMIT data collectors according to manufacturer's instructions.

- A disk operating system (DOS) editing tool will be used to combine data sets.

- Copy the raw data to a working 3.5-in. high-density (HD) diskette and to the archival Bernoulli. Use the working diskette to "clean up" data. Attach the disk label to the archival Bernoulli and place in temporary storage. Attach a second label to the working diskette and begin processing.

- Use EXPORT, the FLOWLINK data translation module, to export the FLOWLINK-formatted data set to ASCII-formatted files.

- Use the EZ-BRK program, or similar validation software, to remove redundant data and to gather the data in monthly files and create monthly summary tables and charts.

- When all data have been processed for all sites for the month, assemble a transfer package of the archival Bernoulli and corresponding working diskettes. Record each on a Log Sheet and send all materials (i.e., transfer package and Log Sheets) to the Data Manager for uploading to the Oak Ridge Environmental Information System (OREIS).

6.3 PROCEDURES FOR COMPLETING GROUNDWATER LEVEL (GW) FORMS

The WAG 6 groundwater level monitoring team will be using a bar code reader in the field, when available, to record most of the information that will be tracked in the WAG 6 project data base.

GW-01: WAG 6 — WATER LEVEL MONITORING RECORDER INITIALIZATION/ REMOVAL FORM

Before leaving the trailer, the STL will pull one form GW-01 for each monitoring location to be visited that day. Upon arrival at the site, the STL will scan the project task code, monitoring location, STL's badge number, the field logbook number, form bar code label, and equipment bar code ID of each piece of equipment to be initialized at that location. The date and time will be captured in the reader. The reader will prompt the STL to specify the type of initialization (i.e., new or replacement). If replacement event is chosen, the STL will complete RF-01 in accordance with RF-01 form procedures. The "Comments" field is optional and will not be captured in the bar code reader. If there is anything concerning the event that the STL wants tracked in the data base, the STL will note that information in the "Comments" field of the form. The DM will manually enter the information once the form has been submitted and the field data have been added to the data base.

GW-02: WAG 6 — GROUNDWATER LEVEL INSPECTION AND RECORD OF DOWNLOADING SCAN FORM

Before leaving the trailer, the STL will pull one form GW-02 for each site to be inspected or downloaded. Upon arrival at the site, the STL will scan the project task code from a menu card, the monitoring location, sample team's badges by role, field logbook number, form bar code label, and equipment ID of each piece of equipment at the site. The "Comments" field is

optional and will not be captured in the reader. If there is anything concerning the event that the STL wants tracked in the data base, the STL will note that information in the "Comments" field of the form. The DM will manually enter the information once the form has been submitted and the field data have been added to the data base.

GW-03: WAG 6 — MANUAL WATER LEVEL MEASUREMENTS FORM

Before leaving the trailer, the STL will pull the necessary number of GW-03 forms to be used that day. All monitoring locations will be recorded on two or more forms, depending on the number of teams obtaining water levels. New forms must be started each day. Upon arrival at the site, the STL will scan the project task code from a menu card, his badge number, the field logbook number, the form bar code label, and the equipment bar code ID. The bar code reader will then enter a loop and ask for monitoring location to be scanned and depth to water to be manually entered. The "Comments" field is optional and will not be captured in the reader. If there is anything concerning the event that the STL wants tracked in the data base, the STL will note that information in the "Comments" field of the form. The DM will manually enter the information once the form has been submitted and the field data have been added to the data base.

GW-04: WAG 6 — WATER LEVEL RECORDER CALIBRATION CHECK FORM

Before leaving the trailer, the STL will pull the necessary number of GW-04 forms to be used that day. Upon arrival at the site, the STL will scan the project task code from a menu card, his badge number, the field logbook number, and the form bar code label. The reader will then enter a loop and the STL will then be given a menu choice of Recorder, Temperature, or Conductivity. If Recorder is chosen, the reader will ask for monitoring location and the equipment bar code ID to be scanned, the STL will enter the Tape Depth to Water (DTW), and Recorder DTW, and the reader will calculate the Delta DTW. The reader will prompt the STL to pass or fail the check. The STL will manually enter Y for Pass, N for Fail. If Temperature is chosen, the reader will ask for monitoring location and equipment bar code ID to be scanned, the STL will enter the 0°C as the tei erature of the calibration solution (ice and water) and the recorder temperature, and the reader \ ill calculate the delta (Δ) temperature. The reader will prompt the STL to pass or fail the check. The STL will manually enter Y for pass or N for fail. If Conductivity is chosen, the reader will ask for monitoring location and the equipment bar code ID to be scanned, the STL will enter the conductivity of the calibration solution and the recorder conductivity, and the reader will calculate the Delta Conductivity. The reader will prompt the STL to pass or fail the check. The STL will manually enter Y for Pass, N for Fail. If WOL Elevation is chosen, the reader will ask for monitoring location and equipment bar code ID to be scanned, the STL will enter the WOL Elevation and the Recorder Elevation, and the reader will calculate the Delta Conductivity. The reader will prompt the STL to pass or fail the check. The STL will manually enter Y for pass or N for fail. Upon completion of the task, the STL will exit the task program. The "Comments" field is optional and will not be captured in the reader. If there is anything concerning the event that the STL wants tracked in the data base, the STL will note that information in the "Comments" field of the form. The DM will manually enter the information once the form has been submitted and the field data have been added to the data base.

7. REFERENCES

ASME (American Society of Mechanical Engineers) 1989. *Quality Assurance Program Requirements for Nuclear Facilities*, ASME NQA-1, New York.

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APPENDIX A

FIELD FORMS

WAG 6 - WATER LEVEL MONITORING RECORDER INITIALIZATION/REMOVAL FORM (GW-01)

Monitoring Location: _____ Field Logbook Number: _____
STL Badge No.: _____ Date: _____
Weather: _____ Time: _____

Telog Water Level Tracker Initialization

New/Replacement Installation: _____ Recorder Bar Code ID: _____
Sample Rate: _____ Comments: _____
Recording Interval: _____ Old Recorder Bar Code ID: _____
Data Recorded (MAX, MIN, AVG): _____ Old Recorder Status: _____
Memory Capacity Selected (2K, 4K, 8K): _____ Comments: _____
DTW Data Scaling: Sensor Bar Code ID: _____
pt #1 0% of max = (-) _____ feet Comments: _____
pt #2 _____ % of max = 0 feet Old Sensor Bar Code ID: _____
Capacity: _____ Old Sensor Status: _____
Password (Y/N): ____ If Y, record here: _____ Comments: _____
Connections Verified (Y/N): _____

IN SITU HERMIT 1000 C Initializations

New/Replacement Installation: _____ New HERMIT Bar Code ID: _____
HERMIT Clock: _____ Old HERMIT Bar Code ID: _____
Old HERMIT Status: _____

Test Parameters

Sel: _____
Rate: _____
Inp.: _____
Type/Input 1: _____
2: _____

(C7K2) _____
Comments: _____

Connections Verified (Y/N): _____

Transducer Parameters (Input 1)

New Bar Code ID: _____
Old Bar Code ID: _____
Old Status: _____
Ref.: _____
Scale: _____
Offs: _____
Lin: _____
Delay: _____
DSP: _____
HI AL: Off
LO AL: Off

COEF.8: 0

Conductivity Parameters (Input 2)

New Bar Code ID: _____
Old Bar Code ID: _____
Old Status: _____
COEF.0: _____
COEF.1: _____
COEF.2: _____
COEF.3: _____
COEF.4: _____
COEF.5: _____
COEF.6: _____
COEF.7: _____

COEF.9: 0
I.D.: _____
HI AL: Off
LO AL: Off
Comments: _____

Sample Task Leader Signature/Date:

Data Entry Signature/Date:

Data Verification Signature/Date:

Form Bar Code Label

WAG 6 - GROUNDWATER LEVEL INSPECTION AND RECORD OF DOWNLOADING SCAN FORM (GW-02)

Monitoring Location: _____ Field Logbook Number: _____

STL Badge No.: _____ Date: _____ Time: _____

Comments: _____ Weather: _____

_____ _____

TELOG LEVEL TRACKER INSPECTION CHECKLIST

EQUIPMENT BAR CODE ID: _____

Inspection Item	Initials	Inspection Comments, Problems, Service Performed, etc.
Program and Configuration Clock synchronization Recording interval		
Pressure Transducer		
Dessicant Pack		
Tampering, Water Seepage, or Damage		
Other		

HERMIT ENVIRONMENTAL DATA LOGGER INSPECTION CHECKLIST

EQUIPMENT BAR CODE ID: _____

Inspection Form	Initials	Inspection Comments, Problems, Service Performed, etc.
Program and Configuration Clock synchronization Recording interval		
Pressure Transducer		
Conductivity/Temperature Probe		
Battery Voltage		
Tampering, Water Seepage, or Damage		
Other		

COLLECTION OF WATER LEVEL DATA

Device Bar Code ID:	
Path and filename to which all data were retrieved or appended:	
Device and procedure used to download data:	
Sample Task Leader:	Date:

Form Bar Code Label

Sample Task Leader Signature/Date: _____

Data Entry Signature/Date: _____

Data Verification Signature/Date: _____

WAG 6 - MANUAL WATER LEVEL MEASUREMENTS FORM (GW-03)

STL Badge No.: _____ Field Logbook Number: _____

Equipment Bar Code ID: _____

Weather: _____ Date: _____

Monitoring Location	Time	Depth to Water	Comments	Monitoring Location	Time	Depth to Water	Comments

Form Bar Code Label

Sample Task Leader Signature/Date: _____

Data Entry Signature/Date: _____

Data Verification Signature/Date: _____

WAG 6 - WATER LEVEL RECORDER CALIBRATION CHECK FORM
(GW-04)

STL Badge No.: _____ Field Logbook Number: _____

Weather: _____

Equipment Bar Code ID: _____ Calibration Check Status ____ Pass ____ Fail
Initial or Check (circle one)

Monitoring Location: _____

Date/Time: _____

Temperature of Ice Water _____ 0°C Recorder Temperature _____ °C Delta Temperature _____ °C

Conductivity of Solution _____ µS/cm Recorder Conductivity _____ µS/cm Delta Conductivity _____ µS/cm

Tape DTW _____ ft Recorder DTW _____ ft Delta DTW _____ ft

WOL Elevation _____ ft Recorder Elevation _____ ft Delta Elevation _____ ft

Comments: _____

Equipment Bar Code ID: _____ Calibration Check Status ____ Pass ____ Fail
Initial or Check (Circle one)

Monitoring Location: _____

Date/Time: _____

Temperature of Ice Water _____ 0°C Recorder Temperature _____ °C Delta Temperature _____ °C

Conductivity of Solution _____ µS/cm Recorder Conductivity _____ µS/cm Delta Conductivity _____ µS/cm

Tape DTW _____ ft Recorder DTW _____ ft Delta DTW _____ ft

WOL Elevation _____ ft Recorder Elevation _____ ft Delta Elevation _____ ft

Comments: _____

Equipment Bar Code ID: _____ Calibration Check Status ____ Pass ____ Fail
Initial or Check (circle one)

Monitoring Location: _____

Date/Time: _____

Temperature of Ice Water _____ 0°C Recorder Temperature _____ °C Delta Temperature _____ °C

Conductivity of Solution _____ µS/cm Recorder Conductivity _____ µS/cm Delta Conductivity _____ µS/cm

Tape DTW _____ ft Recorder DTW _____ ft Delta DTW _____ ft

WOL Elevation _____ ft Recorder Elevation _____ ft Delta Elevation _____ ft

Comments: _____

Form Bar Code Label

Sample Task Leader Signature/Date: _____

Data Entry Signature/Date: _____

Data Verification Signature/Date: _____

WAG 6 - MONITORING VARIANCE REQUEST FORM (MV-01)

(Once completed, insert this form into site notebook. If more than one site is affected, insert a copy of this form into all appropriate notebooks.)

Matrix:

ID of affected site(s):		
Name and title of person making request:		
Date:		
Document very specifically the variance being requested. Be sure to identify all pertinent Data Quality Objectives that are affected by this variance:		
Document the reasons for requesting the variance:		
Document the time scale of the variance. Include dates at which this variance will start and end (if applicable):		
Variance approval signature:	STL:	Date:
	FTM:	Date:
	WAG 6 Project Manager:	Date:

Form Bar Code Label

Data entry signature/date: _____

Data verification signature/date: _____

WAG 6 - RECORD OF REPAIR FORM (RF-01)

DATE: _____ EMPLOYEE BADGE NO.: _____

EQUIPMENT BAR CODE NO.: _____

EQUIPMENT STATUS: IN-USE AVAILABLE TEMPORARILY OUT-OF-SERVICE RETIRED
(circle one)

Disposition of unit: _____

Comments: _____

Was damage discovered during routine site inspection? Yes _____ No _____

If yes, list inspection form number or logbook number. _____

Nature of damage if known: _____ Date found: _____

Was unit repairable in situ? Yes _____ No _____

If yes, list repairs made and person making them. _____

_____

Did in situ repairs include replacing any parts/accessories? Yes _____ No _____

If yes, list and describe. _____

_____

Was equipment sent to offsite vendor for repair? Yes _____ No _____

If yes, list:

Vendor: _____ Address: _____

Airbill No. (if shipped): _____

Work Order No: _____

Date Sent: _____ Initial: _____

Date returned: _____ Received by: _____

Type of repair: _____

Was unit returned in good working condition? Yes / No

If no, please describe: _____

_____

Returned Equipment Status: _____

Form Bar Code Label

Sample Task Leader Signature/Date: _____

Data Entry Signature/Date: _____

Data Verification Signature/Date: _____

APPENDIX B

SITE-SPECIFIC HAZARD EVALUATION ADDENDUM FOR WAG 6 GROUNDWATER LEVEL MONITORING PLAN

SITE-SPECIFIC HAZARD EVALUATION ADDENDUM FOR WAG 6 GROUNDWATER LEVEL MONITORING

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S. D. Van Hoesen
ER WAG 6 Project Manager

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W. C. Hayes 2/18/94
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V. S. Abercrombie
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J. Sweeney
DOE ERD Project Manager

SITE-SPECIFIC HAZARD EVALUATION ADDENDUM FOR WAG 6 GROUNDWATER LEVEL MONITORING

This Site-Specific Hazard Evaluation Addendum is for the performance of Waste Area Grouping (WAG) 6 groundwater level monitoring. The work will be conducted by CDM Federal Programs Corporation (CDM Federal) and associated Oak Ridge National Laboratory (ORNL) environmental, safety, and health support groups. This activity will fall under the scope of 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER). The purpose of this document is to establish site-specific health and safety guidelines to be followed by all personnel involved in conducting work for this project. Work will be conducted in accordance with requirements as stipulated in the ORNL HAZWOPER Program Manual, WAG 6 Site Health and Safety Plan (HASP) and this addendum, and applicable ORNL, Martin Marietta Energy Systems, Inc. (Energy Systems), and U.S. Department of Energy (DOE) policies and procedures. The WAG 6 Site HASP and this addendum serve as an extension of the ORNL HAZWOPER Program Manual; combined, they fulfill the requirements of 29 CFR 1910.120.

The levels of protection and the procedures specified in this plan are based on the best information available from historical data and preliminary evaluations of the area. Therefore, these recommendations represent the minimum health and safety requirements to be observed by all personnel engaged in this project. Unforeseeable site conditions, changes in scope of work, or hazardous conditions not previously considered will warrant a reassessment of protection levels and controls stated. Minor changes, such as downgrade of personal protective equipment (PPE) or change in the model of a site instrument, may be justified and documented in the site logbook by the Site Safety and Health Officer (SSHO). Significant changes will require revision of the HASP and must have approval by the appropriate ORNL Environmental Restoration (ER) Program Environmental Safety and Health (ESH) Manager and the HAZWOPER Program Coordinator (HPC) before restart of site operations.

1. PROJECT AND SITE DESCRIPTION

1.1 PROJECT DESCRIPTION

The groundwater-level-monitoring activities involve recording groundwater levels at 129 wells. Both automatic and manual groundwater-level-monitoring techniques will be used for this task. The automatic level-monitoring system will be analyzed on a rotational basis, whereas manual techniques will be performed on a semiannual basis. Task description, well location, and task guidelines for the groundwater-level-monitoring plan are discussed in Sect. 2 of the Groundwater Level Monitoring Sampling and Analysis Plan.

Automatic water-level-measuring activities will include installation of automatic water-level and parameter-measurement equipment. Installation of the equipment will include donning the appropriate PPE, removing the well caps, and allowing Industrial Hygiene-Health Physics Personnel (IHHP) and/or SSHO to check the breathing zone. The probes will then be lowered into the well and secured. To collect automatic water-level measurements, don the appropriate PPE and download the data recorded on the HERMIT data logger or Telog Level Tracker. Collection of the manual water level measurements includes donning the appropriate PPE, removing well caps, and allowing the IHHP and/or SSHO to check the breathing zone with a calibrated photoionization detector (PID). The water-level-indicator probe will be lowered into the well and the groundwater-level reading will be recorded. After the probe is removed from the well, the equipment will be decontaminated according to ESP 900 and the well cap will be replaced.

1.2 SITE DESCRIPTION

Information regarding the WAG 6 site description can be found in the *Draft RCRA Facility Investigation Report for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, ES/ER-22/V2&D1 (Energy Systems 1991).

2. SITE ORGANIZATION AND COORDINATION

The work will be performed by CDM Federal. ORNL Industrial Hygiene (IH), Industrial Safety (IS), and Radiation Protection (RP) will provide appropriate health and safety services, including monitoring and oversight.

The following section details the organizational structure for this project. Key personnel and their project responsibilities are listed. An approved representative of the Measurement Applications and Development (MAD) Group will serve as the SSHO and alternate SSHO.

In the event of a health and safety emergency, field personnel will contact the SSHO and/or the WAG 6 Project Engineer.

2.1 SITE SAFETY AND HEALTH OFFICER

The SSHO is the primary on-site contact for safety and health during field activities, oversees the on-site execution of all field activities regarding safety and health procedures, and has the authority to stop all work if conditions are judged to be hazardous to on-site personnel or to the public. The SSHO will remain at the project site at all times while workers are performing site activities. Other specific responsibilities are the following.

1. Ensures that all on-site project personnel meet the required level of training, meet medical requirements including a respirator fit test (as required), attend a pre-entry briefing on potential and project site hazards, and review the Work Plan and HASP. Maintains copies of the former documentation at the project site and ensures that documentation is available for on-site review. Note: The ORNL Special Access Training Badge may be used as verification of training.

2. Requires personnel to obtain immediate medical attention in the case of a work-related injury or illness.

3. Denies access to all or any portion of the work area as warranted.

4. Orders work to cease, orders the evacuation of the work area by all personnel, and reestablishes safe working conditions, as needed.

5. Controls access to the site by visitors and unauthorized personnel. Advises visitors and unauthorized personnel of their responsibilities and ensures that they meet access requirements before their entry into the contamination reduction zone, exclusion zone, or controlled access areas is allowed.

6. Ensures the correct field execution of the Work Plan and HASP.

7. Ensures that this Work Plan and HASP are revised and approved if there are changes in site conditions or tasks.

8. Advises emergency response personnel in an emergency.

9. Coordinates with IH, IS, and RP to establish site work zones, levels of required personnel protection, monitoring, and other controls.

10. Coordinates and minimizes the number of personnel and amount of equipment in the work zones.

11. Coordinates accident prevention by oversight of field activities and by awareness of all site operations.

12. Ensures that needed work permits are obtained and made available on site.

13. Ensures that the ER Program ESH Manager, HPC, IH, IS, and RP are contacted before commencement of site work (1) to notify of intent to begin work, and (2) to schedule monitoring support, as needed.

14. Conducts daily inspection of the work site.

15. Provides the HPC and ER Program ESH Manager with a list of personnel participating in site activities to determine the need for inclusion in the hazardous-waste-worker medical surveillance program.

16. Ensures that appropriate fall protection measures are in place, as warranted.

17. Ensures that an approved hoisting and rigging plan is available, as warranted.

18. Ensures that appropriate measures have been taken to prevent spills.

19. Ensures that appropriate monitoring/sampling services are available.

20. Ensures that the appropriate chain of command is followed in reporting environmental safety and health issues.

21. Maintains site safety logbook.

2.2 FIELD PERSONNEL

Specific responsibilities are as follows.

1. Take all reasonable precautions to prevent injury to themselves and to their fellow employees; be alert to potentially harmful situations.

2. Perform only those tasks that they believe they can do safely, and immediately report any accidents and/or unsafe conditions to the SSHO.

3. Notify the SSHO of any special medical conditions (e.g., allergies, diabetes).

4. Prevent spills to the extent possible. If a spill occurs, contain the spill, notify the SSHO, and clean it up immediately using safe cleanup measures as directed by the SSHO. Note:

Do not engage in spill containment or cleanup if conditions are not safe and if the cleanup cannot be accomplished with supplies available at the site. Evacuate the area. All spills must be reported to the ORNL Environmental Interface (574-8770).

5. Avoid splashing materials to the extent possible.

6. Practice good housekeeping by keeping the work area neat, clean, and orderly to the extent possible.

7. Report all injuries, no matter how minor.

8. Comply with the Work Plan and with the HASP and Addendum, as well as with postings and rules at the project site.

9. Follow the appropriate chain of command for reporting and addressing safety and health issues.

2.3 RADIATION PROTECTION (Jim Ed Irwin)

ORNL Radiation Protection will be responsible for oversight and approval of personnel radiation-protection requirements. A representative from the Office of Radiation Protection will review and approve the Work Plan and HASP before commencement of field activities. ORNL Radiation Protection will be consulted before entry into any posted radiological area and will instruct field participants on requirements for that area, including the need for a Radiation Work Permit, appropriate monitoring, dosimetry, and PPE. The Radiation Protection representative will maintain an instrumentation and calibration log/file in association with the Instrumentation and Calibration Department. The Radiation Protection representative will be contacted for radiological concerns at the site that cannot be addressed by the SSHO or HP.

2.4 INDUSTRIAL HYGIENE (Teresa Presley)

The ORNL Industrial Hygiene Section and the HPC will be responsible for the oversight and approval of personnel protection related to industrial hygiene and the requirements of 29 CFR 1910.120 (HAZWOPER). The IH Divisional Representative and the HPC will review and approve the Work Plan and HASP before commencement of field activities. The IH representative and the HPC will provide guidance regarding PPE, as well as industrial hygiene monitoring and sampling requirements. The IH Section will be contacted for industrial hygiene and HAZWOPER concerns at the site that cannot be addressed by the SSHO or HP. Because the work will be conducted entirely by CDM Federal, the MAD Group SSHO will provide IH monitoring/sampling.

2.5 INDUSTRIAL SAFETY (Doug Miller)

The ORNL Industrial Safety Section will be responsible for oversight and approval of personnel protection requirements related to safety. A representative from IS will review and approve the Work Plan and HASP before commencement of field activities. IS will provide

guidance regarding potential safety hazards, PPE, and safety requirements. The IS Section representative will be contacted regarding safety concerns at the site that cannot be addressed by the SSHO or HP.

A complete organizational structure and description of responsibilities may be found in Sect. 3 of the WAG 6 HASP.

2.6 ENVIRONMENTAL RESTORATION PROGRAM ENVIRONMENTAL SAFETY AND HEALTH MANAGER (Charles Clark)

The ORNL ER Program ESH Manager is a designated Energy Systems employee who is responsible for the oversight of all ORNL ER Program activities. The responsibilities of the ORNL ER Program ESH Manager include, but are not limited to,

- reviewing and approving all site safety and health plans and all site safety and health evaluation addendums,
- reviewing all self-assessment and -surveillance reports,
- providing interface between ER projects and the HPC, and
- reviewing and approving the qualifications of the Site Safety and Health Managers and SSHOs.

The ER Program ESH Manager provides a direct interface between field personnel and the HPC for safety and health issues that cannot be resolved at the ER Program level or the SSHO level.

3. PROJECT HAZARD EVALUATION

Task: Groundwater level monitoring (manual and automatic).

3.1 PHYSICAL HAZARDS

(X) Heat stress	(X) Cold stress	( ) Noise
( ) Confined space	( ) Enclosed space	( ) Manual lifting
(X) Tripping/falling	( ) Ergonomic	( ) High pressure
( ) Oxygen deficient	( ) Explosives/flammables	( ) Vibration
( ) Oxygen enriched	( ) Water	

3.2 SAFETY/CONSTRUCTION HAZARDS

( ) Trenching	( ) Excavating	( ) Heavy equipment operation
( ) Demolition	( ) Elevated work	( ) Welding/cutting
( ) Hoisting/rigging	( ) Underground hazards	( ) Overhead hazards
( ) Personnel decon	(X) Equipment decon	( ) ISU
( ) Drilling	( ) Drum handling	( ) Work in water/boat
( ) Environmental sampling		

3.3 CHEMICAL HAZARDS

(X) Volatile organics	(X) Inorganics	(X) Carcinogens
( ) Corrosives	( ) Reproductive toxicants	( ) Metals
( ) Mutagens	( ) Asbestos	( ) PCBs
( ) OSHA specific	( ) Flammables/explosives	

3.4 IONIZING RADIOLOGICAL HAZARDS

( ) Internal exposure	(X) External exposure	(X) Contamination

3.5 NON-IONIZING RADIOLOGICAL HAZARDS

( ) UV	( ) RF	( ) Microwave
( ) Laser	( ) High voltage	

3.6 BIOLOGICAL/VECTOR HAZARDS

( ) Wildlife	(X) Plants	( ) Medical waste
( ) Bacteria	(X) Parasites	

3.7 DESCRIPTION OF HAZARDS AND CONTROLS

3.7.1 Physical Hazards

Temperature Extremes

Tasks: Setting up automatic groundwater level monitoring equipment and obtaining manual groundwater levels.

Temperature extremes are of concern in two primary tasks that include heat stress while working in Tyvek PPE during the summer and early autumn months and include hypothermia while performing equipment decontamination during the winter.

Work load:
(X) Light
( ) Moderate
( ) Heavy

Precautions (*specify*): Decrease work load during extremely hot or cold days. Increase water intake on extremely hot or cold days, and make frequent trips to either vehicles or trailers during cold days. The SSHO will adhere to the guidelines for temperature extremes that are listed in the American Conference of Government Industrial Hygienists publication, *Threshhold Level Values for Chemical Substances, Physical Agents, and Biological Exposure Indices.*

Cooling/heating equipment needed: N/A

Ergonomic Hazards

Task: Monitoring on RCRA caps

Heavy lifting ( ) Yes (X) No

Vibrating equipment ( ) Yes (X) No

Tripping/falling (X) Yes ( ) No

Controls/protective equipment: The buddy system will be employed to monitor field personnel safety. Protective controls to assist in prevention of tripping and falling include shoe covers (black rubber boots). In addition, care will be taken while monitoring wells on RCRA caps.

3.7.2 Chemical Hazards

Substance: Fisher Scientific Conductivity Standard
Use (for materials brought on site): Probe calibration
Location (for substances identified at the site): NA
TLV: NA PEL: NA IDLH: NA STEL: NA
Route of exposure: Ingestion
Target organs: Stomach and blood
LEL: NA UEL: NA FP: NA
Signs and symptoms of exposure: Irritation on skin or eyes; gastrointestinal irritation
Health effects: Large dose by mouth may cause gastrointestinal irritation and circulatory problems; may cause eye irritation.
Additional comments and controls: None

Substance: Deionized water
Use (for materials brought on site): Equipment decontamination
Location (for substances identified at the site): NA
TLV: NA PEL: NA IDLH: NA STEL: NA
Route of exposure: NA
Target organs: NA
LEL: NA UEL: NA FP: NA
Signs and symptoms of exposure: NA
Health effects: NA
Additional comments and controls: None

Substance: Liquinox
Use (for materials brought on site): Equipment decontamination
Location (for substances identified at the site): NA
TLV: NA PEL: NA IDLH: NA STEL: NA
Route of exposure: Absorption, ingestion
Target organs: Eyes, skin
LEL: NA UEL: NA FP: NA
Signs and symptoms of exposure: Redness or dryness in the skin or stomach; discomfort/nausea if ingested.
Health effects: NA
Additional comments and controls: None

More information regarding specific chemicals of concern at the site is provided in the tables located at the end of this section. See Sect. 5 for Industrial Hygiene monitoring/sampling requirements.

3.7.3 Ionizing Radiation

For ionizing radiological hazards identified in Sect. 3.4, the following information is provided. Available historical and site characterization data were used to complete this section. An Office of Radiation Protection representative was contacted to assist in completion of this section. Additional information concerning ionizing radiation can be found in the tables at the end of this section.

Any known contamination present (from prior scanning or history)? (X) Yes ( ) No

Primary contaminating isotope(s): See tables

Radiation type: Alpha/beta/gamma

Location on site: See tables

Radiation work permit required? ( ) Yes (X) No

Dose rate: (weekly) 100 mR

Worker dose limit: 20 mR/day

Contamination level	(removable):	Alpha	20 dpm
		Beta/gamma	200 dpm
	(fixed):	Alpha	200 dpm
		Beta/gamma	1000 dpm

Note: Dose rate, worker dose limit, and contamination levels are administrative guidelines.

Airborne contamination concentration: NA μCi/mL

Water contamination potential? (X) Yes ( ) No

Unrestricted airborne contamination release potential? ( ) Yes (X) No

Health Physics coverage: Continuous/Intermittent/Conditional

High volume sampling to be conducted?	( ) Yes	(X) No
Low volume sampling to be conducted?	( ) Yes	(X) No
Personal monitoring/sampling?	(X) Yes	( ) No

Additional controls/requirements: None

Instruments to be used and monitoring requirements are identified in Sect. 5.

3.7.4 Sanitation

Task: Groundwater level monitoring

A clean zone located on WAG 6 provides workers with an area for eating and drinking, toilet facilities, washing facilities (hand wash and emergency eye wash only), and a changing room.

Potable water required? Not permitted on work site

Nonpotable water used? None

Eating, drinking, chewing, use of tobacco permitted?
Location: As stated above.

Toilet facilities required?
Location and number: As stated above.

Washing facilities required?
Location: As stated above.

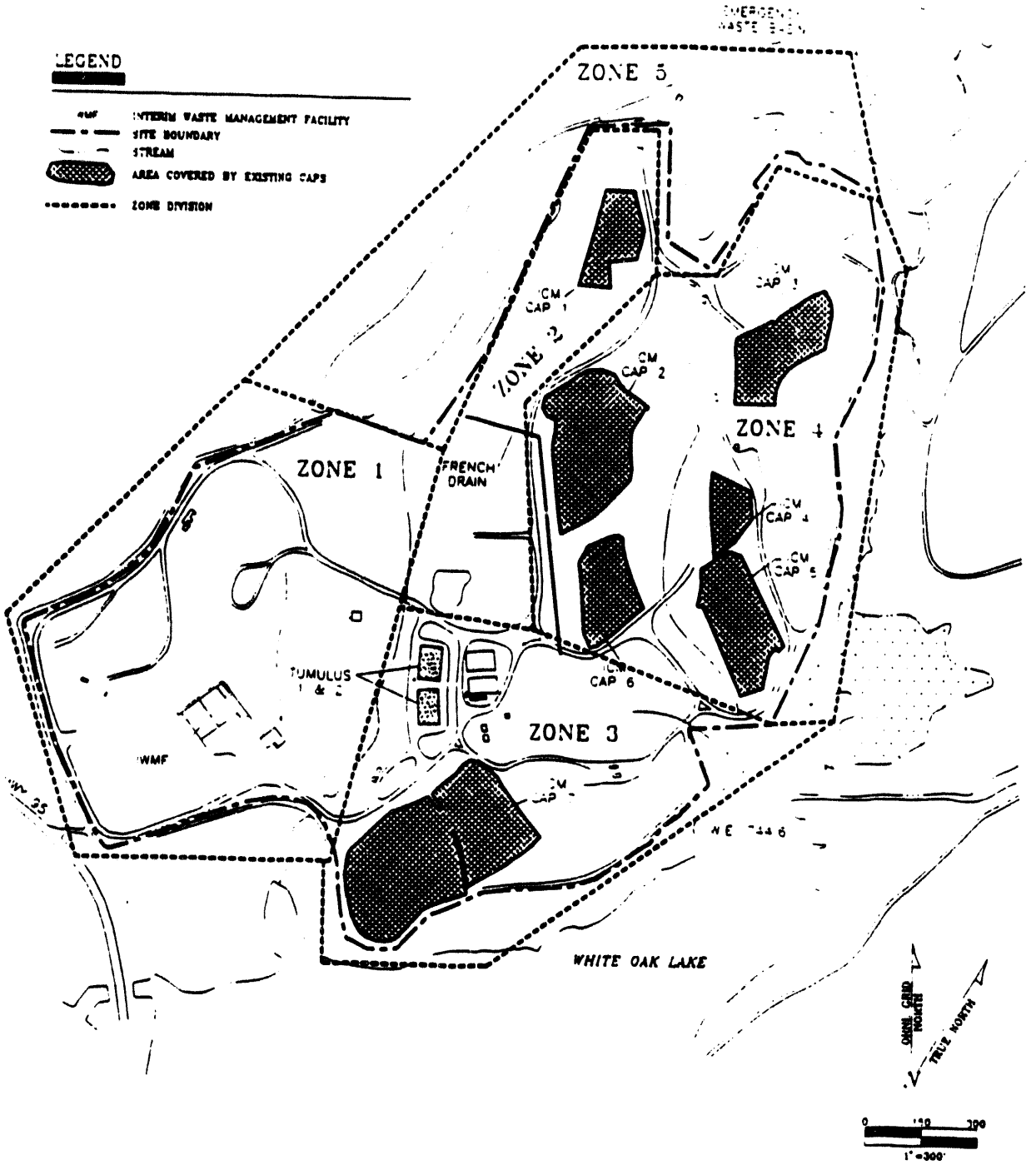
Change rooms required?
Specify: As stated above.

3.7.5 Illumination

Tasks: Groundwater level monitoring

Additional illumination needed? ( ) Yes (X) No ( ) NA

All field activities will be performed during daylight hours. No additional illumination will be required.

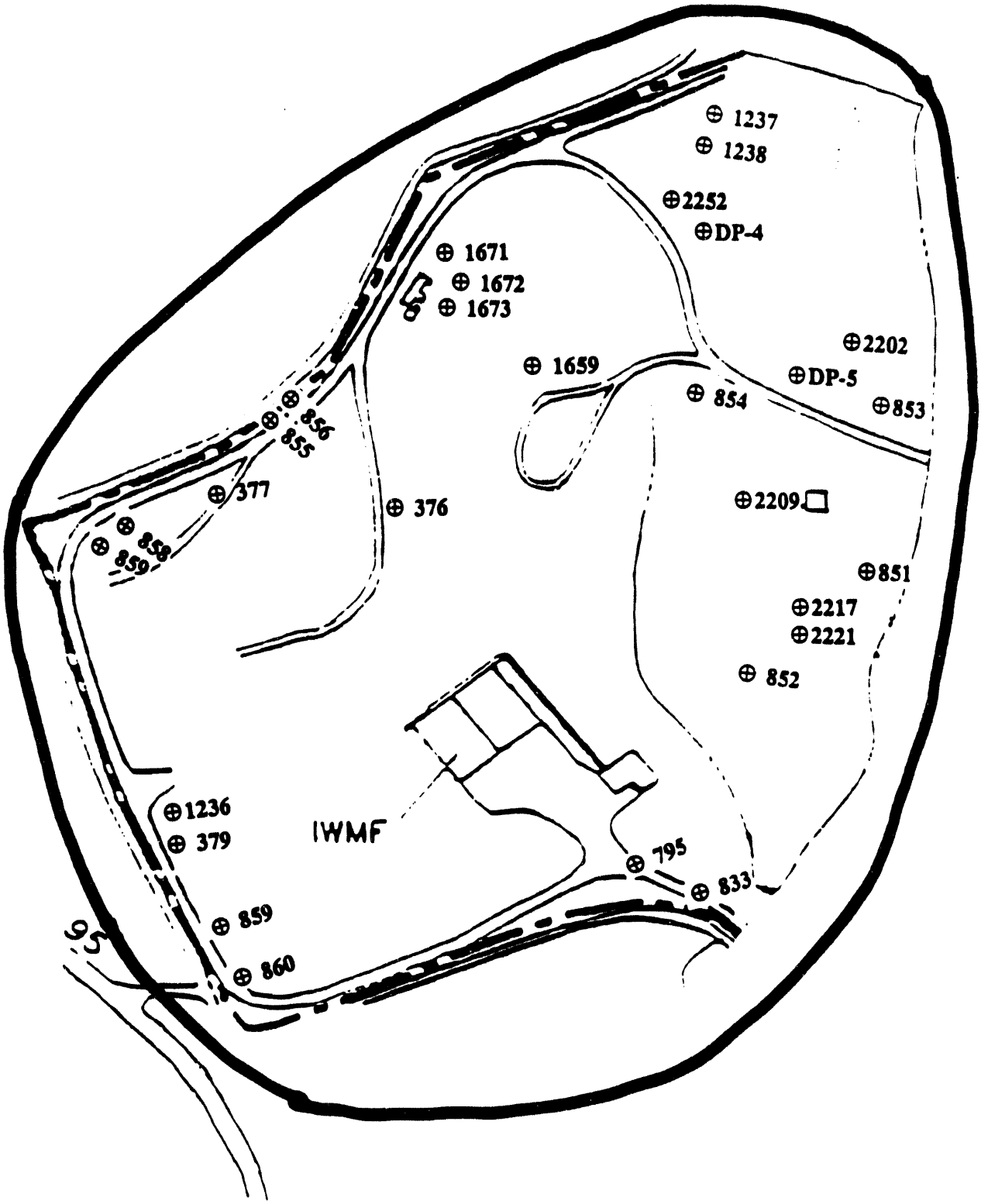


WAG 6 ZONE DIVISION

OAK RIDGE NATIONAL LABORATORY
ORNL WAG 6

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc

ZONE 1
Automatic & Manual Water Level Wells



Zone 1 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA	TLV-STEL/PEL-ST EL/ TLV-C or IDLH	Health effects/target organs	Chemical/physical properties
1,1-1 Trichloroethane Color: Colorless O known carcinogen ● suspect carcinogen	TLV: 350 ppm PEL: 350 ppm REL: NE DAC:	STEL: 450 ppm IDLH: 1000 ppm	CNS, CVS, eye, skin irritant, headaches, drowsiness, impaired judgement, can be absorbed through skin to heart	Liquid, mild chloroform like odor, Sol.0.1%; LEL:7.5%
Acetone Color: Colorless O known carcinogen O suspect carcinogen	TLV: 750 ppm PEL: 750 ppm REL: 250 ppm DAC:	STEL: 1000 ppm IDLH: 20,000 ppm	Eyes, nose, throat, skin	Liquid with mint like odor, LEL 2.5%
Americium-244 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC: 8E-8 µCi/mL	STEL: NE IDLH: NE	Respiratory, liver, skeleton	Variable
Cesium-137 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC: 7E-8 µCi/mL	STEL: NE IDLH: NE	GI, Lower large intestine	

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

* These Chemicals are not expected to present a health and safety hazard on the site because either (1) their toxicity in nature depends on the elements with which they are bonded or (2) the published exposure limits are based on occupational exposures to the chemicals that will not take place in the environment.

Zone 1 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA	TLV-STEL/PEL-STEL/ TLV-C or IDLH	Health effects/target organs	Chemical/physical properties
Ethyl benzene Color: colorless O known carcinogen O suspect carcinogen	TLV: 100 ppm PEL: 100 ppm REL: 100 ppm DAC:	STEL: 125 ppm IDLH: 2000 ppm	Eyes, upper respiratory system, skin, CNS	Liquid with an aromatic odor, Sol 0.01%, LEL:1.0%
Napthalene Color: Colorless to brown O known carcinogen O suspect carcinogen	TLV: 10 ppm	STEL: NE IDLH: NE	Eyes, kidney, liver blood, skin, RBC, CNS	Solid, odor of mothballs, VP 0.08 mm, MLT 176 F, UEL: 5.9%, LEL 0.9%
Strontium-90 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	STEL: NE IDLH: NE	Skeletal system, respiratory system	Variable
Tetrachloroethylene Color: Colorless ● known carcinogen O suspect carcinogen	TLV: 50 ppm PEL: 25 ppm REL: DAC:	STEL: 200 ppm IDLH: 500 ppm	Liver, kidneys, eyes, upper respiratory system, CNS; irritant flush face, vertigo	Liquid with odor like ether or chloroform

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

* These Chemicals are not expected to present a health and safety hazard on the site because either (1) their toxicity in nature depends on the elements with which they are bonded or (2) the published exposure limits are based on occupational exposures to the chemicals that will not take place in the environment.

Zone 1 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA		TLV-STEL/PEL-STEL/ TLV-C or IDLH		Health effects/target organs	Chemical/physical properties
Tetrachloroethylene Color: Colorless ● known carcinogen O suspect carcinogen	TLV:	50 ppm	STEL: IDLH:	200 ppm 500 ppm	Liver, kidneys, eyes, upper respiratory system, CNS; irritant flush face, vertigo	Liquid with odor like ether or chloroform; IP: 9.32; FP: 0; LFL: nonflammable; UFL: nonflammable
Toluene Color: Colorless O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	100 ppm 100 ppm 100 ppm	STEL: IDLH:	150 ppm 2000 ppm	CNS, liver, kidneys, skin	Liquid with sweet, pungent benzene like odor, LEL:1.2%
Trichloroethylene Color: Colorless ● known carcinogen O suspect carcinogen	TLV:	50 ppm	STEL: IDLH:	NE 1000 ppm	Respiratory, heart, skin; headaches, dermatitis, nausea, vomiting	Liquid with a chloroform odor
Xylene Color: Colorless O known carcinogen O suspect carcinogen	TLV:	100 ppm	STEL: IDLH:	NE 1000 ppm	CNS, GI tract, liver, kidneys, skin; dizziness, staggering gait, nausea, stomach pain	Liquid with aromatic odor

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

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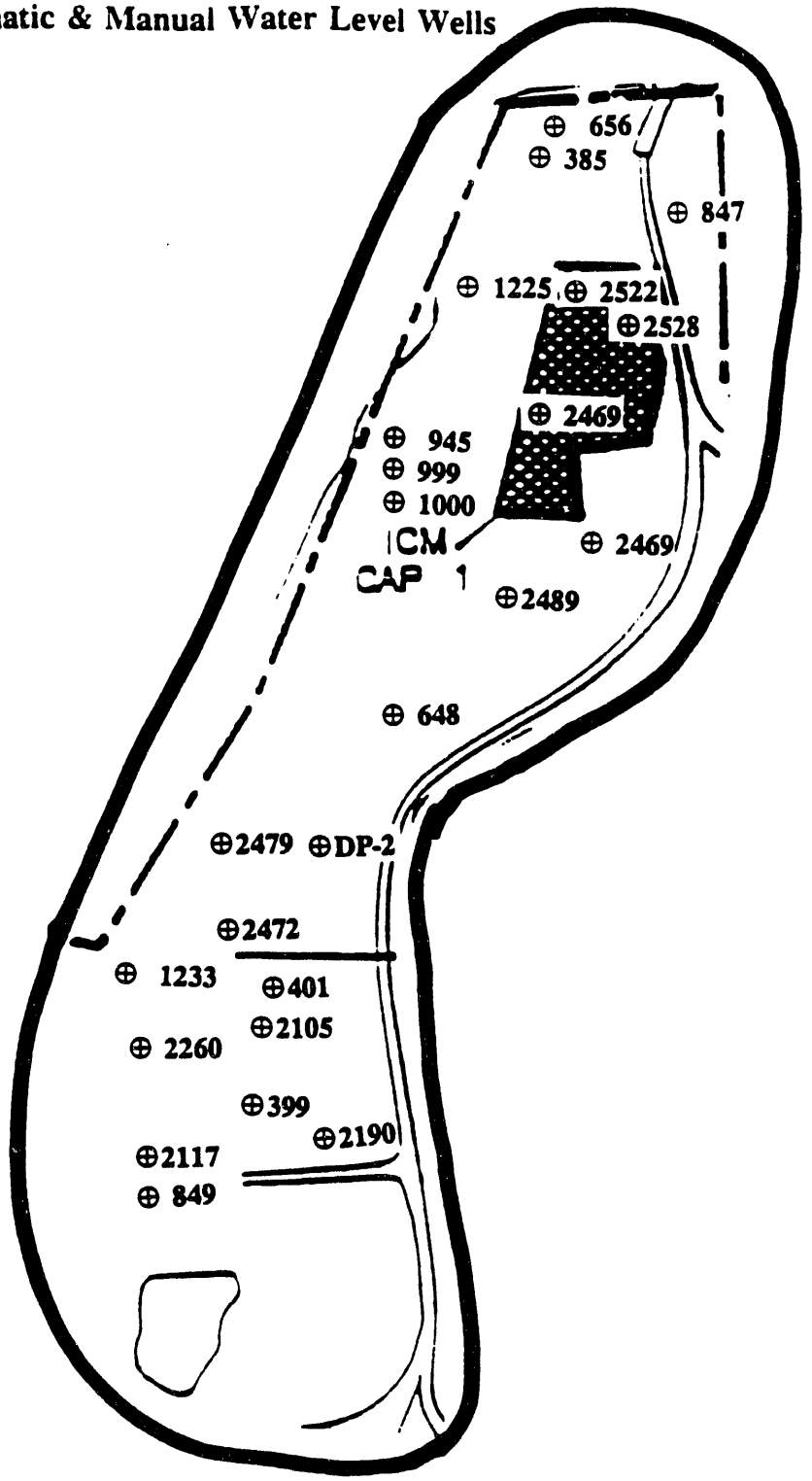
ZONE 2
Automatic & Manual Water Level Wells



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Zone 2 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA	TLV-STEL/PEL-STEL/ TLV-C or IDLH	Health effects/target organs	Chemical/physical properties
1,1-1 Trichloroethane Color: Colorless O known carcinogen ● suspect carcinogen	TLV: 350 ppm PEL: 350 ppm REL: NE DAC:	STEL: 450 ppm IDLH: 1000 ppm	CNS, CVS, eye, skin irritant, headaches, drowsiness, impaired judgement, can be absorbed through skin to heart	Liquid, mild chloroform like odor, Sol 0.4%, LEL:7.5%
1,2-dichloroethane Color: Colorless O known carcinogen O suspect carcinogen	TLV: 1000 ppm	STEL: IDLH: 4000 ppm	CNS, skin, liver, kidneys	Liquid with a chloroform like odor
Acetone Color: Colorless O known carcinogen O suspect carcinogen	TLV: 750 ppm PEL: 750 ppm REL: 250 ppm DAC:	STEL: 1000 ppm IDLH: 20,000 ppm	Eyes, nose, throat, skin	Liquid with mint like odor, LEL 2.5%
Americium-244 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC: 8E-8 µCi/mL	STEL: NE IDLH: NE	Respiratory, liver, skeleton	Variable

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

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Zone 2 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA		TLV-STEL/PEL-STEL/ TLV-C or IDLH		Heath effects/target organs	Chemical/physical properties
Bis(2-ethylhexl)phthalate Color: ● known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	5 mg/m3 5 mg/m3 5 mg/m3	STEL: IDLH:	10 mg/m3 NE	Mild irritant to eyes and skin; affects GI tract	When heated emits acrid smoke;insoluble
Carbon disulfide Color: Colorless to faint yellow O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	10 ppm	STEL: IDLH:	500 ppm	CNS, CVS, eyes, skin, liver, kidneys/dizz.,h.a.,ftg, ocular changes	Liquid with strong sweetish odor
Cesium-137 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	7E-8 µCi/mL	STEL: IDLH:	NE NE	GI, Lower large intestine	
Strontium-90 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:		STEL: IDLH:	NE NE	Skeletal system, respiratory system	Variable

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
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Zone 2 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA		TLV-STEL/PEL-STEL/ TLV-C or IDLH		Heath effects/target organs	Chemical/physical properties
Tetrachloroethylene Color: Colorless ● known carcinogen O suspect carcinogen	TLV:	50 ppm	STEL: IDLH:	200 ppm 500 ppm	Liver, kidneys, eyes, upper respiratory system, CNS; irritant flush face, vertigo	Liquid with odor like ether or chloroform, IP: 9.32; FP: 0; LFL: nonflammable; UFL: nonflammable
Toluene Color: Colorless O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	100 ppm 100 ppm 100 ppm	STEL: IDLH:	150 ppm 2000 ppm	CNS, liver, kidneys, skin	Liquid with sweet, pungent benzene like odor, LEL:1.2%
Trichloroethylene Color: Colorless ● known carcinogen O suspect carcinogen	TLV:	50 ppm	STEL: IDLH:	NE 1000 ppm	Respiratory, heart, skin; headaches, dermatitis, nausea, vomiting	Liquid with a chloroform odor
Xylene Color: Colorless O known carcinogen O suspect carcinogen	TLV:	100 ppm	STEL: IDLH:	NE 1000 ppm	CNS, GI tract, liver, kidneys, skin; dizziness, staggering gait, nausea, stomach pain	Liquid with aromatic odor

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

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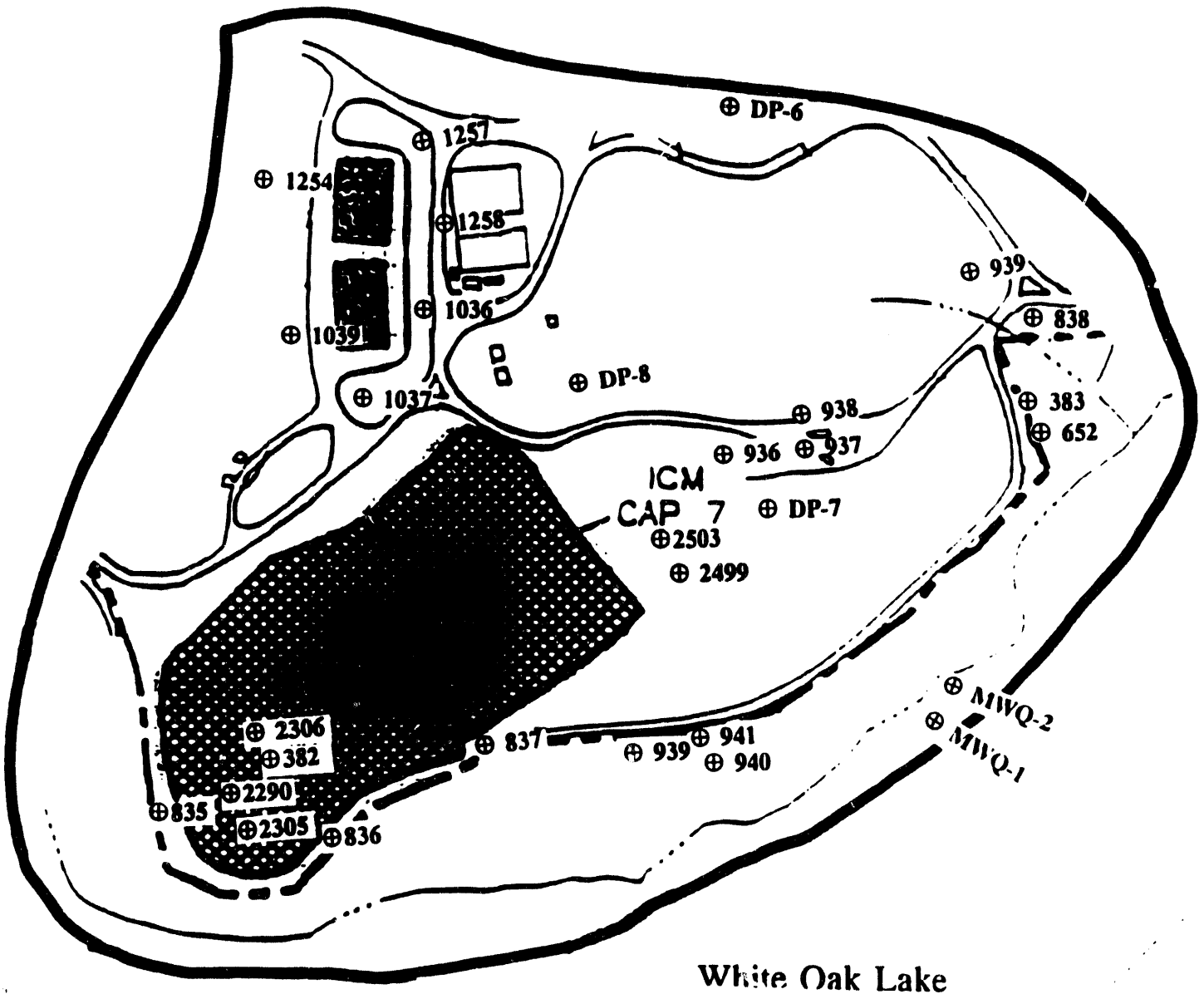
ZONE 3
Automatic & Manual Water Level Wells



Zone 3 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA		TLV-STEL/PEL-ST EL/ TLV-C or IDLH		Health effects/target organs	Chemical/physical properties
Acetone Color: Colorless O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	750 ppm 750 ppm 250 ppm	STEL: IDLH:	1000 ppm 20,000 ppm	Eyes, nose, throat, skin	Liquid with mint like odor,LEL:2.5%
Cesium-137 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	 7E-8 µCi/mL	STEL: IDLH:	NE NE	GI, Lower large intestine	
Chloroform Color: colorless ● known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	10 ppm	STEL: IDLH:		Liver, kidneys, heart, eyes, skin/ anesthesia, dizz, mental dullness, naus, h.a., fatigue, irr.	Liquid with pleasant sweet odor;sol.0.8%, not combustible
Isopropyl Alcohol Color: O known carcinogen O suspect carcinogen	TLV:	400 ppm	STEL: IDLH:	NE NE	Eyes, skin, respiratory	Liquid, odor of rubbing alcohol, BP: 181F; Sol: miscible; FLP: 53 F; VP: 33 mm; FRP PT: -127 F; UEL: 12.7%; LEL: 2.0%

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

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Zone 3 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA	TLV-STEL/PEL-STEL/ TLV-C or IDLH	Heath effects/target organs	Chemical/physical properties
Mercury Color: O known carcinogen O suspect carcinogen	TLV: 0.01 mg/m3 PEL: 0.01 mg/m3 REL: 0.01 mg/m3 DAC:	STEL: 0.03 mg/m3 IDLH: 10 mg/m3	CNS, kidney, skin, eyes, respiratory system, liver; tremors, cough, pneumonitis, headache, fatigue, emotional instability	Variable depending on alkyl compound
Strontium-90 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	STEL: NE IDLH: NE	Skeletal system, respiratory system	Variable
Thorium Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	STEL: NE IDLH: NE	Respiratory system	Variable
Trichloroethene Color: Colorless ● known carcinogen O suspect carcinogen	TLV: 50 ppm PEL: 50 ppm REL: 25 ppm DAC:	STEL: 200 ppm IDLH: 1000 ppm	Respiratory system, heart, liver, kidneys, CNS, skin	Liquid with chloroform like odor;Sol:0.1 at 77 F;FI.P: 90 F; I.EL:8% at 77 F

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

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Zone 3 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA	TLV-STEL/PEL-STEL/ TLV-C or IDLH	Heath effects/target organs	Chemical/physical properties
Uranium-235 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	STEL: IDLH: NE	Respiratory system, kidneys, GI; irritant	Variable

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
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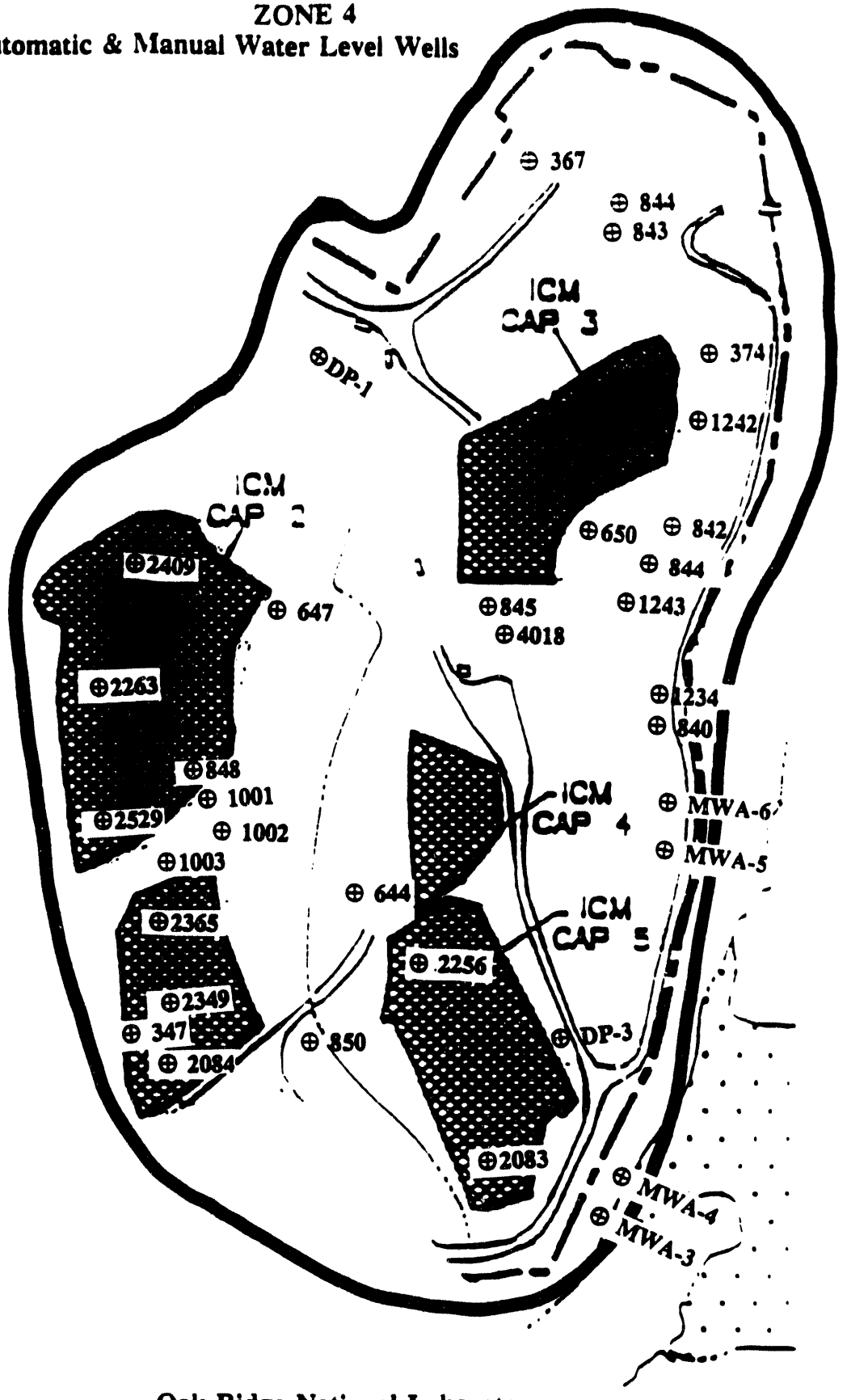
ZONE 4
Automatic & Manual Water Level Wells



Oak Ridge National Laboratory
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Zone 4 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA	TLV-STEL/PEL-STEL/ TLV-C or IDLH	Health effects/target organs	Chemical/physical properties
Bis(2-ethylhexl)phthalate Color: ● known carcinogen O suspect carcinogen	TLV: 5 mg/m3 PEL: 5 mg/m3 REL: 5 mg/m3 DAC:	STEL: 10 mg/m3 IDLH: NE	Mild irritant to eyes and skin, affects GI tract	When heated emits acrid smoke;insoluble
Methylene chloride Color: Colorless ● known carcinogen O suspect carcinogen	TLV: 50 ppm PEL: 500 ppm REL: NE DAC:	STEL: NE IDLH: 3000 ppm	Eyes, skin, liver, CVS, CNS irritant, numbness, tingling, vertigo, angina	Liquid with chloroform like odor; LEL:12%;Sol:2%
Strontium-90 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	STEL: NE IDLH: NE	Skeletal system, respiratory system	Variable
1,1-1 Trichloroethane Color: Colorless O known carcinogen ● suspect carcinogen	TLV: 350 ppm PEL: 350 ppm REL: NE DAC:	STEL: 450 ppm IDLH: 1000 ppm	CNS, CVS, eye, skin irritant, headaches, drowsiness, impaired judgement, can be absorbed through skin to heart	Liquid, mild chloroform like odor;Sol:0.4%. LEL:7.5%

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

• These Chemicals are not expected to present a health and safety hazard on the site because either (1) their toxicity in nature depends on the elements with which they are bonded or (2) the published exposure limits are based on occupational exposures to the chemicals that will not take place in the environment.

Zone 4 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA	TLV-STEL/PEL-ST EL/ TLV-C or IDLH	Heath effects/target organs	Chemical/physical properties
Acetone Color: Colorless O known carcinogen O suspect carcinogen	TLV: 750 ppm PEL: 750 ppm REL: 250 ppm DAC:	STEL: 1000 ppm IDLH: 20,000 ppm	Eyes, nose, throat, skin	Liquid with mint like odor, LEL 2.5%
Tetrachloroethylene Color: Colorless ● known carcinogen O suspect carcinogen	TLV: 50 ppm PEL: 25 ppm REL: DAC:	STEL: 200 ppm IDLH: 500 ppm	Liver, kidneys, eyes, upper respiratory system, CNS; irritant flush face, vertigo	Liquid with odor like ether or chloroform
Toluene Color: Colorless O known carcinogen O suspect carcinogen	TLV: 100 ppm PEL: 100 ppm REL: 100 ppm DAC:	STEL: 150 ppm IDLH: 2000 ppm	CNS, liver, kidneys, skin	Liquid with sweet, pungent benzene like odor, LEL:1.2%
Carbon disulfide Color: Colorless to faint yellow O known carcinogen O suspect carcinogen	TLV: 10 ppm PEL: REL: DAC:	STEL: IDLH: 500 ppm	CNS, CVS, eyes, skin, liver, kidneys/dizz.,h.a.,ftg, ocular changes	Liquid with strong sweetish odor

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

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Zone 4 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA		TLV-STEL/PEL-ST EL/ TLV-C or IDLH		Health effects/target organs	Chemical/physical properties
Chloroform Color: colorless ● known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	10 ppm	STEL: IDLH:		Liver, kidneys, heart, eyes, skin/ anesthesia, dizz, mental dullness, naus, h.a., fatigue, irr.	Liquid with pleasant sweet odor;sol 0.8%, not combustible
Americium-244 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	8E-8 µCi/mL	STEL: IDLH:	NE NE	Respiratory, liver, skeleton	Variable
Cobalt-60 Color: NA O known carcinogen O suspect carcinogen	DAC:	6e-8 µCi/mL	STEL: IDLH:	NE NE	Respiratory, liver, skeletal	Variable
1,2-dichloroethane Color: Colorless O known carcinogen O suspect carcinogen	TLV:	1000 ppm	STEL: * IDLH:	4000 ppm	CNS, skin, liver, kidneys	Liquid with a chloroform like odor

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

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Zone 4 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA	TLV-STEL/PEL-STEL/ TLV-C or IDLH	Health effects/target organs	Chemical/physical properties
Tetrachloroethylene Color: Colorless ● known carcinogen ○ suspect carcinogen	TLV: 50 ppm	STEL: 200 ppm IDLH: 500 ppm	Liver, kidneys, eyes, upper respiratory system, CNS; irritant flush face, vertigo	Liquid with odor like ether or chloroform; IP 9.32; FP: 0; LFL: nonflammable; UFL: nonflammable
Trichloroethylene Color: Colorless ● known carcinogen ○ suspect carcinogen	TLV: 50 ppm	STEL: NE IDLH: 1000 ppm	Respiratory, heart, skin; headaches, dermatitis, nausea, vomiting	Liquid with a chloroform odor
Xylene Color: Colorless ○ known carcinogen ○ suspect carcinogen	TLV: 100 ppm	STEL: NE IDLH: 1000 ppm	CNS, GI tract, liver, kidneys, skin; dizziness, staggering gait, nausea, stomach pain	Liquid with aromatic odor

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

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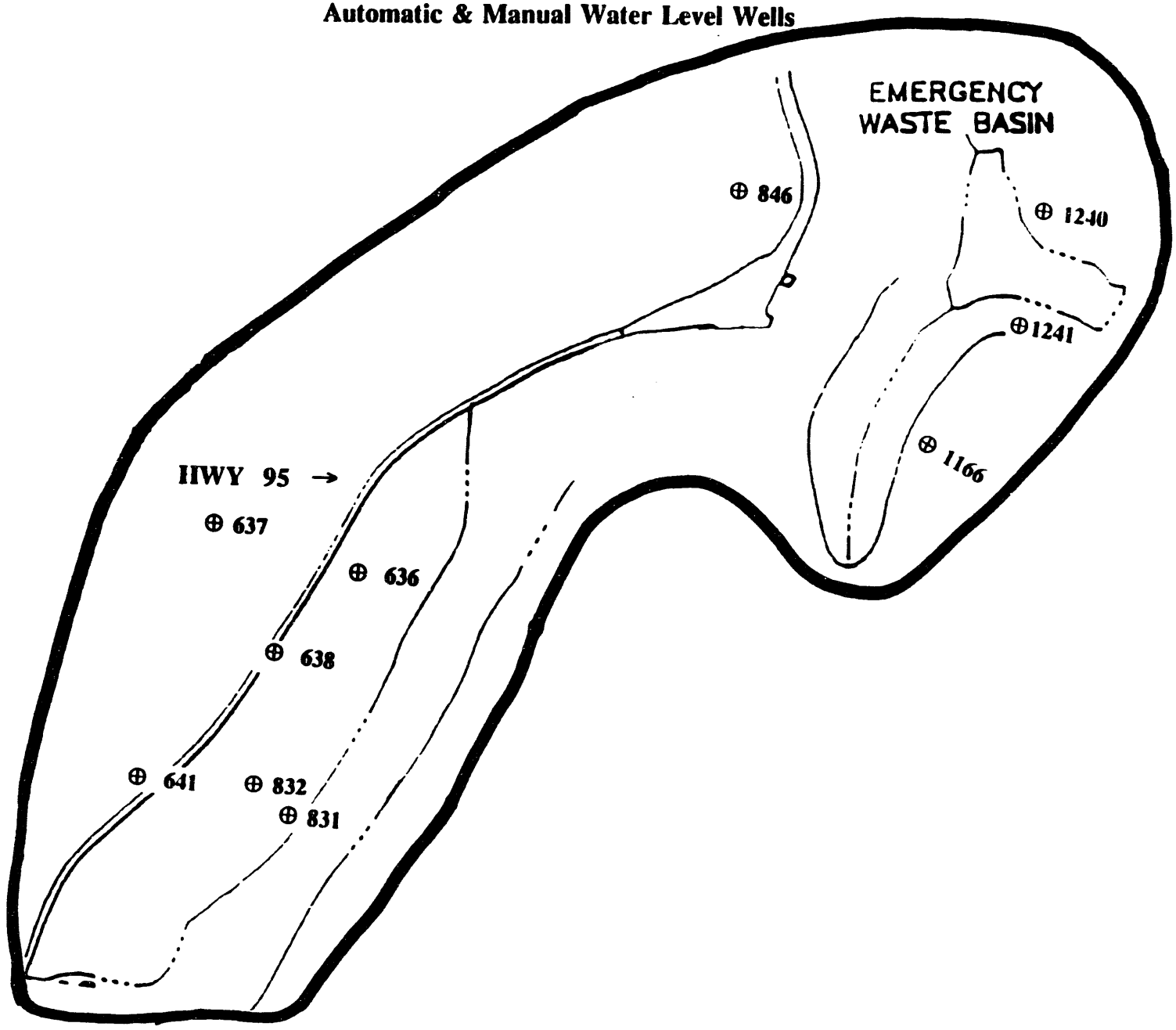
ZONE 5
Automatic & Manual Water Level Wells



Zone 5 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA	TLV-STEL/PEL-ST EL/ TLV-C or IDLH	Heath effects/target organs	Chemical/physical properties
1,1-1 Trichloroethane Color: Colorless ○ known carcinogen ● suspect carcinogen	TLV: 350 ppm PEL: 350 ppm REL: NE DAC:	STEL: 450 ppm IDLH: 1000 ppm	CNS, CVS, eye, skin irritant, headaches, drowsiness, impaired judgement, can be absorbed through skin to heart	Liquid, mild chloroform like odor;Sol:0.4%, LEL:7.5%
Acetone Color: Colorless ○ known carcinogen ○ suspect carcinogen	TLV: 750 ppm PEL: 750 ppm REL: 250 ppm DAC:	STEL: 1000 ppm IDLH: 20,000 ppm	Eyes, nose, throat, skin	Liquid with mint like odor;LEL:2.5%
Americium-244 Color: ○ known carcinogen ○ suspect carcinogen	TLV: PEL: REL: DAC: 8E-8 µCi/mL	STEL: NE IDLH: NE	Respiratory, liver, skeleton	Variable
Benzene Color: Colorless ○ known carcinogen ● suspect carcinogen	TLV: 10 ppm PEL: 1.0 ppm REL: 0.1 ppm DAC:	STEL: 5.0/1 ppm IDLH: 3000 ppm	Blood, CNS, skin, respiratory system, bone marrow, and eyes	Aromatic liquid; Sol:0.07%;LEL:1.3%

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

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Zone 5 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA		TLV-STEL/PEL-ST EL/ TLV-C or IDLH		Heath effects/target organs	Chemical/physical properties
Benzyl Alcohol Color: Colorless O known carcinogen O suspect carcinogen	TLV:	NE	STEL: IDLH:	NE NE	Skin, CNS, eyes, respiratory, kidneys, cardiovascular	Liquid, faint aromatic odor, BP: 204.7 C; MP: -15.19 C; FLP: 90 C
Bis(2-ethylhexl)phthalate Color: ● known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	5 mg/m3 5 mg/m3 5 mg/m3	STEL: IDLH:	10 mg/m3 NE	Mild irritant to eyes and skin; affects GI tract	When heated emits acrid smoke;insoluble
Carbon disulfide Color: Colorless to faint yellow O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	10 ppm	STEL: IDLH:	 500 ppm	CNS, CVS, eyes, skin, liver, kidneys/dizz.,h.a.,ftg, ocular changes	Liquid with strong sweetish odor
Cesium-137 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	 7E-8 µCi/mL	STEL: IDLH:	NE NE	GI, Lower large intestine	

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
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Zone 5 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA		TLV-STEL/PEL-ST EL/ TLV-C or IDLH		Heath effects/target organs	Chemical/physical properties
Chloroform Color: colorless ● known carcinogen ○ suspect carcinogen	TLV: PEL: REL: DAC:	10 ppm	STEL: IDLH:		Liver, kidneys, heart, eyes, skin/ anesthesia, dizz, mental dullness, naus, h.a , fatigue, irr.	Liquid with pleasant sweet odor;sol 0.8%, not combustible
Cobalt-60 Color: NA ○ known carcinogen ○ suspect carcinogen	DAC:	6e-8 µCi/mL	STEL: IDLH:	NE NE	Respiratory, liver, skeletal	Variable
Isopropyl Alcohol Color: ○ known carcinogen ○ suspect carcinogen	TLV:	400 ppm	STEL: IDLH:	NE NE	Eyes, skin, respiratory	Liquid, odor of rubbing alcohol, BP: 181F; Sol: miscible; FLP: 53 F; VP: 33 mm; FRP PT: -127 F; UEL: 12.7%; LEL: 2.0%
Methylene chloride Color: Colorless ● known carcinogen ○ suspect carcinogen	TLV: PEL: REL: DAC:	50 ppm 500 ppm NE	STEL: IDLH:	NE 3000 ppm	Eyes, skin, liver, CVS, CNS irritant, numbness, tingling, vertigo, angina	Liquid with choloform-like odor; LEL:12%;Sol:2%

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
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* These Chemicals are not expected to present a health and safety hazard on the site because either (1) their toxicity in nature depends on the elements with which they are bonded or (2) the published exposure limits are based on occupational exposures to the chemicals that will not take place in the environment.

Zone 5 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA		TLV-STEL/PEL-ST EL/ TLV-C or IDLH		Heath effects/target organs	Chemical/physical properties
Phenol Color: Colorless to pink O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	5 ppm 5 ppm 5 ppm	STEL: IDLH:	NE 250 ppm	Liver, kidneys, skin	Crystalline solid, sweet acrid odor, Sol:9%;LEL:1 8%
Strontium-90 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:		STEL: IDLH:	NE NE	Skeletal system, respiratory system	Variable
Tetrachloroethylene Color: Colorless ● known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	50 ppm 25 ppm	STEL: IDLH:	200 ppm 500 ppm	Liver, kidneys, eyes, upper respiratory system, CNS; irritant flush face, vertigo	Liquid with odor like ether or chloroform
Tetrachloroethylene Color: Colorless ● known carcinogen O suspect carcinogen	TLV:	50 ppm	STEL: IDLH:	200 ppm 500 ppm	Liver, kidneys, eyes, upper respiratory system, CNS; irritant flush face, vertigo	Liquid with odor like ether or chloroform; IP: 9.32; FP: 0; LFL: nonflammable; UFL: nonflammable

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

* These Chemicals are not expected to present a health and safety hazard on the site because either (1) their toxicity in nature depends on the elements with which they are bonded or (2) the published exposure limits are based on occupational exposures to the chemicals that will not take place in the environment.

Zone 5 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA	TLV-STEL/PEL-ST EL/ TLV-C or IDLH	Heath effects/target organs	Chemical/physical properties
Thorium Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	STEL: NE IDLH: NE	Respiratory system	Variable
Toluene Color: Colorless O known carcinogen O suspect carcinogen	TLV: 100 ppm PEL: 100 ppm REL: 100 ppm DAC:	STEL: 150 ppm IDLH: 2000 ppm	CNS, liver, kidneys, skin	Liquid with sweet, pungent benzene like odor, LEL:1.2%
Trichloroethylene Color: Colorless ● known carcinogen O suspect carcinogen	TLV: 50 ppm	STEL: NE IDLH: 1000 ppm	Respiratory, heart, skin; headaches, dermatitis, nausea, vomiting	Liquid with a chloroform odor
Uranium-235 Color: O known carcinogen O suspect carcinogen	TLV: PEL: REL: DAC:	STEL: NE IDLH: NE	Respiratory system, kidneys, GI; irritant	Variable

Legend:

C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

* These Chemicals are not expected to present a health and safety hazard on the site because either (1) their toxicity in nature depends on the elements with which they are bonded or (2) the published exposure limits are based on occupational exposures to the chemicals that will not take place in the environment.

Zone 5 Contaminant List

Contaminant	TLV-TWA/PEL-TWA or REL-TWA	TLV-STEL/PEL-ST EL/ TLV-C or IDLH	Health effects/target organs	Chemical/physical properties
Xylene Color: Colorless	TLV: 100 ppm	STEL: NE IDLH: 1000 ppm	CNS, GI tract, liver, kidneys, skin; dizziness, staggering gait, nausea, stomach pain	Liquid with aromatic odor

O known carcinogen
O suspect carcinogen

Legend:
C: ceiling
CNS: central nervous system
GI: gastrointestinal
IDLH: immediately dangerous to life and health
MW: molecular weight
PEL: permissible exposure limit
REL: recommended exposure limit
SG: specific gravity
STEL: short-term exposure limit
TLV: threshold limit value
VP: vapor pressure
IP: ionization potential
NF: nonflammable

* These Chemicals are not expected to present a health and safety hazard on the site because either (1) their toxicity in nature depends on the elements with which they are bonded or (2) the published exposure limits are based on occupational exposures to the chemicals that will not take place in the environment.

4. TASK BREAKDOWN

WAG 6 groundwater level monitoring includes two primary tasks—manual piezometric readings and automatic piezometric readings—that require identical controls.

4.1 TASK DESCRIPTION

Task: Manual and automatic piezometric readings

Type of Work: ( ) Intrusive (X) Nonintrusive

Engineering Controls: N/A

Administrative Controls: Training administrative controls required for groundwater level monitoring can be found in the WAG 6 Training Program (X-OE-703, Rev. 0) and the WAG 6 HASP.

4.2 INITIAL LEVEL OF PERSONAL PROTECTIVE EQUIPMENT

Level of Protection: ( ) A ( ) B ( ) C (X) D (X) Modified

Respirator: ( ) SCBA ( ) Full-face ( ) Half-face respirator
( ) PAPR ( ) Other
Cartridge: _____

Protective Clothing:
( ) Encapsulating suit
( ) Saranex
( ) C-zone
( ) Other
(X) Tyvek (if upgraded by the SSHO; see action levels in Sect. 5)
( ) Splash suit
(X) Company clothing (khakis)

Head/eye/ear:
( ) Hard hat
(X) Splash shield
( ) Other
(X) Safety glasses
( ) Ear plugs
( ) Goggles
( ) Ear muffs

Gloves:
( ) Nitrile
(X) Latex
( ) Other
( ) Neoprene
( ) Vinyl
( ) PVC
( ) Leather

Footwear:
(X) Steel-toed leather
( ) Steel-toed rubber
(X) Chemical overboots
( ) Other

Note: Company-issued shoes/boots are required for PPE dress-out if potential radiological contamination exists.

Describe the donning/doffing steps: Donning and doffing procedures for PPE can be found here and in Sect. 5 of the WAG 6 HASP.

DONNING LEVEL D (Modified)

1. Don inner plastic boots.
2. Don cotton liners.
3. Don rubber gloves.
4. Don outer rubber boots.
5. Tape over outside pants cuffs.

DOFFING LEVEL D (Modified)

1. Remove outer tape.
2. Remove outer rubber boots (upon exiting the controlled access zone).
3. Remove rubber gloves.
4. Remove plastic boots (upon exiting the controlled access zone).
5. Remove cotton liners.
6. Perform whole-body frisk.

DONNING LEVEL C

1. Tear and tab tape (5 pieces for wrists, ankles, and front seam of Tyvek).
2. Don Energy Systems- or contractor-furnished clothing and Tyvek; button to the neck.
3. Check for proper badging and dosimetry.
4. Tape front seam; place tab at the top for each access.
5. Check shoe covers (black rubber boots) for holes and tears.
6. Don shoe covers.
7. Tuck contractor-furnished clothing or Tyvek into shoe covers (black rubber boots) and tape seams.
8. Don coveralls and tape front seams (if applicable).
9. Tape coveralls to the outside (over) shoe covers (black rubber boots).
10. Don cotton glove liners and tuck under sleeves.
11. Check rubber outer gloves (magenta/red) for leaks.
12. Don rubber gloves and tape seams over Tyvek sleeves.

DOFFING LEVEL C

1. Remove exposed tape
   a. from rubber gloves,
   b. from front seam of coveralls,
   c. from shoe covers (black rubber boots).
2. Remove rubber gloves (pull inside out).
3. Remove Tyvek, inside outward, touching inside only.
4. Remove tape from shoe covers (black rubber boots) and contractor-furnished clothing.
5. Remove shoe cover (black rubber boot) and place each foot across the step-off pad one at a time.
6. Perform personnel frisking before exiting the controlled access zone.

Modifications allowed: All upgrades of PPE must be approved by the SSHO and by the appropriate safety and health representative. Downgrades in PPE will be justified and documented in the site logbook by the SSHO.

Additional PPE information may be found in Sect. 5 of the HASP.

5. MONITORING REQUIREMENTS

A baseline exposure rate for the work site will be measured by Site HP before commencement of work activities. Site exposure rates will be updated on a 6-month cycle

5.1 DIRECT READING INSTRUMENTS

	Task(s)	Monitoring Frequency	Action Levels	Action Guidelines
LEL meter	NA		10%LEL	
O_2 meter	NA		>22% O_2	
Colorimetric indicator tubes	NA		1/2 PEL	
Photoionization detector (PID)	IH	Initial well cap removal	5 ppm*	Halt work; contact IH
Flame ionization detector (FID)	NA		5 ppm*	
Alpha meter	HP		See HASP Table 3	
Beta/gamma meter	HP/worker	Upon exiting	See HASP Table 3	Contact HP
Area radiation monitors	NA			
Noise meter	NA		85 dBA	
Other (Specify)	NA			

*Action levels are ppm above background per 5 min. All personnel are to frisk themselves and sampling equipment before exiting each sampling area.

5.2 PERSONAL MONITORING

	Task(s)	Monitoring Frequency	Action Guidelines
Whole-body dosimetry	GWL		Contact HP
Extremity dosimetry	NA		
Whole-body count	GWL	Yearly	Contact HP
Urinalysis/bioassay	GWL	6 months	Contact HP
Chemical air sampling	NA		
Radiation air sampling	NA		
Personal sampling pumps	NA		

Instruments used by IH representative will be calibrated and maintained in accordance with IH Standard Operating Procedures. Instruments used by the Office of Radiation Protection are calibrated and source-checked in accordance with established Health Physics procedures. Instruments used by MAD representatives will be calibrated and maintained in accordance with MAD procedures.

Site monitoring requirements may change based on site conditions. All changes must be documented in the site logbook.

6. SITE CONTROL

Site work zones are required to reduce the accidental spread of hazardous substances from contaminated areas to clean areas. Therefore, a controlled access zone will be established. The identification of the zone will provide for control of operations and flow of personnel. The HPC will provide signs to be posted at the site for HAZWOPER requirements. The HP will determine radiological postings. Should additional barriers (e.g., rope, tape) or signs be required, HP, IH, and IS will be consulted. The HPC may modify the zones for short-term, transient-type projects. The modification would include use of the HAZWOPER barrier tape and A-frame sign, if material is in stock. Additional information regarding site control may be found in Sect. 7 of the ORNL HAZWOPER Program Manual.

Personnel accessing the zone must meet access requirements as stated in the WAG 6 HASP and this plan, and at the entrance of the zone. Entrance and exit points for the zone will be clearly marked. Perimeter monitoring of the zone will be conducted periodically to ensure correct placement of the zone. The SSHO is responsible for ensuring that all workers and visitors meet site access requirements. Section 9 is a record of site access requirements and personnel qualifications.

A site map is provided at the end of this section that contains the location of the emergency assembly area and the emergency evacuation routes.

7. DECONTAMINATION

The purpose of decontamination is to prevent contaminants that may be present on protective clothing and equipment from coming into contact with personnel as they doff PPE. Also, decontamination protects workers from hazardous substances that may contaminate and eventually permeate the PPE used on site; it protects personnel by minimizing the transfer of harmful materials into clean areas. Combining decontamination with the correct sequential method of removing PPE will prevent exposure to personnel leaving the work areas as well as offsite migration of contaminants. Generally, decontamination is accomplished by starting with the most heavily contaminated item and progressing to the least contaminated item.

Personnel will remove any disposable PPE and dispose of it in provided containers before leaving the controlled access zone. The steps for doffing and disposal of PPE can be found in Sect. 5 of the WAG 6 HASP.

Equipment decontamination procedures can be found in Sect. 2 of the Groundwater Level Monitoring Sampling and Analysis Plan.

Materials needed for decontamination for this project include (1) liquinox and (2) deionized water.

8. EMERGENCY PREPAREDNESS

The responsibility for day-to-day implementation of this information lies primarily with the SSHO. During an actual emergency response situation, the SSHO will serve as the Emergency Coordinator until the Laboratory Shift Superintendent (LSS) or emergency response team arrives.

Medical assistance will be provided by the Health Division, which is located at Building 4500N. In the event of an emergency, diall 911 to reach ORNL Emergency Response. The LSS will provide emergency response personnel and coordinate emergency assistance. The radio number for the LSS is Station 295. The telephone number for the LSS is 574-6606. The nearest telephone and fire alarm box is located at the tumulus site. If the LSS is not available, emergency services may be reached at the telephone numbers shown below.

The SSHO will perform the following pre-emergency tasks before starting field activities and will coordinate emergency response with the LSS.

1. Locate nearest telephone and alarm station.
2. Confirm and post emergency telephone numbers.
3. Post site map of work areas marked with evacuation routes.
4. Inventory and check out on-site emergency equipment and supplies, as warranted.

In the event of an emergency, a fire extinguisher, medical kit, and emergency eye wash kit are located in the CDM Federal vehicles and in the clean zone. In addition, spill control kits may be found in the permanent decontamination area located outside the clean zone.

In the event of an emergency that requires evacuation of the site, a verbal instruction will be given by the SSHO to evacuate the area. Personnel will exit to a predesignated support area. At this point, the SSHO will account for all personnel, ascertain information about the emergency, and give further instructions to the on-site personnel. In all situations that require evacuation, personnel shall not reenter the work area until the conditions causing the emergency have been corrected; the hazard reassessed; the Work Plan and HASP revised, approved, and reviewed with on-site personnel; and instructions given for reentry.

Emergency Personnel	Phone	Radio #
ORNL Emergency Response	911	
Laboratory Shift Superintendent	574-6606	295
Fire Department	574-5678	
Medical Center	574-7431	
Security	574-7199	
Industrial Hygiene	576-7059	
Industrial Safety	574-6679	
Radiation Protection	599-1338	
Environmental Compliance	574-7294	
Emergency Communication Center	574-6646	295
Facility Manager (K. Wilson)	576-5290	
Project Manager (D. McCurry)	421-4724	
ORNL ER and Environmental Health and Safety Manager (C. Clark)	574-8268	
Project Engineer (R. Williams)	241-4722	

The SSHO will brief workers on emergency response procedures and the evacuation route in the pre-entry briefing.

9. TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

List applicable training/medical requirements for this project. Site workers requiring access to the work zones (contamination reduction zone, exclusion zone, or controlled access area) will be required to meet these access requirements. However, for occasional workers or visitors, some of the site access requirements may be waived upon consultation with the ER Program ESH Manager in conjunction with the HPC.

9.1 PROJECT TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

Training

__X__ General Employee Training
_____ 24/40-h HAZWOPER (SARA/OSHA) training
__X__ 40-h HAZWOPER (SARA/OSHA) training
__X__ Current HAZWOPER 8-h Annual Refresher (as applicable)
__X__ 8-h HAZWOPER Supervisor training
__NA__ Radiation Worker Training
__X__ Radiation Worker Training II
__X__ Respirator fit test/training
__NA__ Confined space entrant
__NA__ Confined space attendant
_____ Other (list)

Twenty-four-hour HAZWOPER training is applicable for individuals not requiring the use of respiratory protection.

Medical Surveillance

The ORNL Hazardous Waste Worker Medical Surveillance Program is applicable for individuals meeting criteria as specified in Sect. 9 of the ORNL HAZWOPER Program Manual. Subcontracted personnel are enrolled in a medical surveillance program comparable with the ORNL Medical Surveillance Program.

Note: If site conditions change, or if other hazards are detected, the training and access requirements will be revised accordingly.

9.2 SITE PERSONNEL QUALIFICATIONS

Name: Richard Stout Badge number: 626015
Assigned tasks: Groundwater level monitoring

	YES	NO	DATE
General Employee Training:	(X)	( )	9/93
24-h training:	( )	( )	NA
40-h training:	(X)	( )	6/88

	YES	NO	DATE
Annual Refresher Training:	(X)	( )	10/93
Supervisor Training:	(X)	( )	2/92
Radiation Worker Training:	( )	( )	NA
Radiation Worker Training II:	(X)	( )	10/93
Respirator fit tested/trained:	(X)	( )	8/93
Confined Space Entry Training:	( )	( )	NA
Medical Surveillance Program:	(X)	( )	8/93
Whole Body Count (in vitro):	(X)	( )	9/94
Bioassay (in vitro):	(X)	( )	9/94
Specialized Equipment Training:	( )	(X)	N/A
First Aid/CPR:	(X)	( )	9/93

Other training: Satellite Accumulation, RCRA Cap Access, Waste Generator, Hazardous Waste Characterization

APPENDIX C

WELL DATA

Table C-1. Well data

Well number	Elevation TOC[a, b]	Total depth[a]	Screened interval below ground surface
347	778.7	12.60	*[c]
382	765.70	21.00	11.00 - 21.00
399	800.12	28.57	23.57 - 28.57
401	801.52	28.87	23.87 - 28.87
644	776.21	17.00	7.00 - 17.00
835	762.08	27.50	5.50 - 26.90
836	766.26	28.50	7.00 - 28.20
845	807.33	41.00	19.20 - 39.90
848	801.44	32.00	9.80 - 31.50
851	769.15	21.60	4.00 - 20.00
1225	831.89	24.00	7.06 - 22.06
2083	763.90	10.93	5.93 - 10.93
2084	780.99	10.10	5.10 - 10.10
2105	806.78	14.01	9.01 - 14.01
2117	791.31	12.31	7.31 - 12.31
2190	799.32	10.33	5.33 - 10.33
2202	797.80	15.09	10.09 - 15.09
2217	779.30	8.37	*
2221	775.90	6.97	*
2252	804.60	19.20	*
2256	777.54	9.90	4.90 - 9.90
2260	804.23	12.34	7.34 - 12.34
2263	803.37	12.40	7.40 - 12.40
2290	*	16.85	*
2305	763.13	11.38	6.38 - 11.38
2306	763.88	14.60	9.60-14.60
2349	784.16	10.50	5.50 - 10.50
2365	790.12	11.15	6.15 - 11.15
2409	824.80	17.40	*
2469	829.21	45.30	30.30 - 45.30
2472	*	17.50	*
2479	*	23.00	*

Table C-1 (continued)

Well number	Elevation TOC [a, b]	Total depth [a]	Screened interval below ground surface
2489	*	20.00	*
2499	807.03	25.00	*
2503	*	22.76	*
2522	832.50	13.19	8.19 - 13.19
2528	837.47	13.28	8.30 - 13.29
2529	798.26	10.37	5.37 - 10.37
4018	*	22.75	*
DP-2	—[d]	30	—
DP-3	—	37	—
DP-4	—	25	—
DP-5	—	12	—
DP-7	—	35	—

[a] All measurements are in feet.
[b] Elevations are referenced to mean sea level.
[c] * = data not available.
[d] — = well not yet installed. Total depth is estimated.

Sources: Energy Systems 1991. *Resource Conservation and Recovery Act Facility Investigation Report for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, IRA #910930.2015, ES/ER-22/V1&D1, ORNL/ER/SUB-87/99053/5/V1.

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