DOE/ID-10626
Revision 5
September 2004

U.S. Department of Energy
Idaho Operations Office

Groundwater Monitoring Plan for the Test Reactor Area Operable Unit 2-13

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Project No. 23361

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Prepared for the
U.S. Department of Energy
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ABSTRACT

The *Final Record of Decision for Test Reactor Area, Operable Unit 2-13* was signed in December 1997 and provides for groundwater monitoring to assess future contaminant concentrations at the Test Reactor Area at the Idaho National Engineering and Environmental Laboratory. Based upon recommendations provided in the *First Five-Year Review Report for the Test Reactor Area, Operable Unit 2-13, at the Idaho National Engineering and Environmental Laboratory*, the groundwater monitoring requirements have been modified, focusing on those contaminants of concern that warrant continued surveillance including chromium, tritium, strontium-90, and cobalt-60. This Groundwater Monitoring Plan describes the objectives, activities, and assessment procedures that will be performed to support the ongoing groundwater-monitoring requirements as stipulated in the Record of Decision and modified by the 5-year review.

SUMMARY

The *Final Record of Decision for Test Reactor Area, Operable Unit 2-13,* was signed in December 1997 and provided for groundwater monitoring to assess future contaminant concentrations at the Test Reactor Area at the Idaho National Engineering and Environmental Laboratory. Based on recommendations provided in the *First Five-Year Review Report for the Test Reactor Area, Operable Unit 2-13, at the Idaho National Engineering and Environmental Laboratory*, groundwater monitoring requirements have been modified focusing on those contaminants of concern that warrant continued surveillance including chromium, tritium, strontium-90, and cobalt-60. Diesel recurrence in Well PW-13 was also identified as an issue in the 5-year review. This Groundwater Monitoring Plan describes the objectives, activities, and assessment procedures that will be performed to support the ongoing groundwater monitoring requirements as stipulated in the 5-year review.

Monitoring activities have been designed to verify the contaminant concentration trends in the Snake River Plain Aquifer, predicted by the Operable Unit 2-12 computer model, and to evaluate the effects that discontinued discharge to the warm waste pond has on the underlying water bodies. In addition, the deep-perched water system will be monitored for potential contaminant migration driven by continued discharges to the Cold Waste Pond. To meet these objectives, groundwater monitoring will be performed on seven wells completed in the deep-perched water system (PW-11, PW-12, PW-14, USGS-53, USGS-54, USGS-55, and USGS-56) and seven wells completed in the Snake River Plain Aquifer (Hwy-3, TRA-06, TRA-07, TRA-08, USGS-58, USGS-65, and MIDDLE-1823).

Water samples will be collected semiannually from the above wells for the four contaminants of concern that warrant continued groundwater monitoring, including chromium, tritium, strontium-90, and cobalt-60. In addition, PW-13, TRA-1933, and TRA-1934 will be sampled for diesel-range organics and gasoline-range organics to address the occurrence of diesel at these locations.

In accordance with the requirements of the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, quality-assured data collected during groundwater monitoring will be submitted to the Agencies (i.e., U.S. Department of Energy Idaho Operations Office, Idaho Department of Environmental Quality, and U.S. Environmental Protection Agency) no later than 120 days from the time of collection. Data summary submittals and updates of information will be transmitted on the status of trending data in the form of an interim report. In addition, a second 5-year review will be prepared by December 21, 2007, that will describe the results of the ongoing groundwater monitoring efforts and the impact on the protectiveness of the selected remedy. This second 5-year review will discuss changes to the hydrogeologic setting over the 5 years leading up to the review; the measured contaminant concentrations versus the model-predicted concentrations, data trends, and future predicted concentrations; and recommendations for the next 5 years of groundwater monitoring.

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ACRONYMS

ARAR	applicable or relevant and appropriate requirement
ARDC	Administrative Records and Document Control
BBWI	Bechtel BWXT Idaho, LLC
BIC	Balance of INEEL Cleanup
bls	below land surface
BTEX	benzene, toluene, ethylbenzene, xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CSA	CERCLA storage area
CWSU	CERCLA waste storage unit
DOT	U.S. Department of Transportation
DQO	data quality objective
DR	decision rule
DRO	diesel range organics
DS	decision statement
EPA	U.S. Environmental Protection Agency
GDE	guide
GFPC	gas-flow proportional counting
GMP	Groundwater Monitoring Plan
GRO	gasoline range organic
HDPE	high-density polyethylene
Hwy	highway
ICP	Idaho Completion Project
ID	identification
IDAPA	Idaho Administrative Procedures Act
INEEL	Idaho National Engineering and Environmental Laboratory
MCP	Management Control Procedure

OU	operable unit
PPE	personal protective equipment
PQL	practical quantitation limit
PRD	program requirements document
PSQ	principal study question
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
QC	quality control
RI/BRA	remedial investigation/baseline risk assessment
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SRPA	Snake River Plain Aquifer
TRA	Test Reactor Area
USGS	United States Geological Survey
WAC	waste acceptance criteria
WAG	waste area group
WGS	Waste Generator Services

Groundwater Monitoring Plan for the Test Reactor Area Operable Unit 2-13

1. INTRODUCTION

In December 1997, the *Final Record of Decision for Test Reactor Area, Operable Unit 2-13,* was signed (DOE-ID 1997a). The comprehensive Record of Decision (ROD) presents the selected remedial actions and provides for groundwater monitoring to assess future contaminant concentrations at the Test Reactor Area (TRA) at the Idaho National Engineering and Environmental Laboratory (INEEL). This Groundwater Monitoring Plan (GMP) was originally developed to address the post-ROD monitoring requirements identified in the Operable Unit (OU) 2-13 ROD for the Snake River Plain Aquifer (SRPA) and the deep-perched water system at the TRA. Based on the *First Five-Year Review Report for the Test Reactor Area, Operable Unit 2-13, at the Idaho National Engineering and Environmental Laboratory* (DOE-ID 2003), it was recommended that the semiannual monitoring effort be focused on those contaminants of concern that warranted continued surveillance.

The recurrence of diesel in PW-13 was also noted during the 5-year review. An investigation into the recurrence of the diesel is currently ongoing. Additional sampling has been completed as part of the investigation. The sampling effort included the sampling of additional wells and additional analyses. The results of the investigation will be provided in a forthcoming report.

This GMP describes the objectives, activities, and assessment procedures that will be performed to support the groundwater quality-monitoring requirements as stipulated in the 5-year review. This plan has been prepared pursuant to 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," and is consistent with U.S. Environmental Protection Agency (EPA) guidance documents. This GMP is comprised of two parts: (1) the field sampling plan and (2) the Quality Assurance Project Plan (QAPjP). The field sampling plan describes the field-sampling activities that will be performed, while the QAPjP details the processes and programs that will be used to ensure that the data generated are suitable for their intended uses. The governing QAPjP for this sampling effort is the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* (DOE-ID 2004a). This document is incorporated herein by reference.

1.1 Regulatory Background

In December 1992, the ROD was issued for the OU 2-12 TRA perched water system (DOE-ID 1992). It was determined that no remedial action was necessary for the deep-perched water system to ensure protection of human health and the environment. That decision was based on the results of human health and ecological risk assessments, which determined that conditions at the site pose no unacceptable risks to human health or the environment for expected or future use of the SRPA beneath the deep-perched water system at the TRA. One of the assumptions for the no-remedial-action decision was that groundwater monitoring would be performed to verify that contaminant concentration trends follow those predicted by the OU 2-12 computer model. It was further stated in the *Record of Decision for the Test Reactor Area Perched Water System, Operable Unit 2-12* (DOE-ID 1992) that a statutory review of this decision would be conducted by the three agencies within 3 years to ensure that adequate protection of human health and the environment continues to be provided.

The results from the OU 2-12 groundwater monitoring are described in a series of three annual technical memoranda. Following 3 years of groundwater monitoring, the results from the entire OU 2-12 post-ROD monitoring were described in the *Post-Record of Decision Monitoring for the Test*

Reactor Area Perched Water System Operable Unit 2-12, Third Annual Technical Memorandum (Arnett, Meachum, and Jessmore 1996), which presented 3 years of post-ROD monitoring data and included an evaluation of hydrologic and groundwater contaminant conditions for the TRA deep-perched water system and the underlying SRPA. The results from this Technical Memorandum were then incorporated into the *Comprehensive Remedial Investigation/Feasibility Study for the Test Reactor Area Operable Unit 2-13 at the Idaho National Engineering and Environmental Laboratory* (DOE-ID 1997b).

In December 1997, the OU 2-13 ROD was issued (DOE-ID 1997a). According to this ROD, the objectives of the groundwater-monitoring program are to verify contaminant concentration trends in the SRPA, as predicted by computer modeling, and to evaluate the effect that discontinuing discharge to the warm waste pond has had on contaminant concentrations in the SRPA and the deep-perched water system. The *First Five-Year Review Report for the Test Reactor Area, Operable Unit 2-13, at the Idaho National Engineering and Environmental Laboratory* (DOE-ID 2003), recommended that only four contaminants of concern warranted continued semiannual groundwater monitoring, including chromium, tritium, strontium-90, and cobalt-60. During 2002/2003, a deep corehole was drilled south-southwest of the TRA facility and completed as a monitoring well. This well, MIDDLE-1823, has been added to the list of monitoring wells for Waste Area Group (WAG) 2.

The investigation into the recurrence of diesel in the PW-13 perched water well recommended that selected wells be monitored periodically to obtain sufficient organics data to identify contaminant trends, if possible. The perched water wells with the strongest presence of diesel—PW-13, TRA-1933, and TRA-1934—have been selected to be sampled for DRO and GRO.

1.2 Groundwater Monitoring Plan

The purpose of this GMP is to guide the collection and analysis of groundwater samples to support the OU 2-13 post-ROD monitoring at the TRA. Development of the GMP was based on the recommendations identified from the WAG-2 5-year review (DOE-ID 2003). The one-time collection and analysis of the free-phase diesel in the well also has been recommended. The analysis of the free-phase liquid sample will be collected when sufficient free-phase liquid is present. The liquid sample will be analyzed for GRO and DRO fractions. In addition, the DRO and GRO fractions will be subdivided to get a better idea of the composition of the residual product. For instance, the GRO could be divided by the number of carbon atoms into the C5 through C8 hydrocarbons and the DRO analysis could report C8 through C10, C10 through C15, and C15 through C25 hydrocarbons. The exact breakdown of DRO ranges will depend on lab capabilities.

This GMP includes:

- A description of the TRA site and a background discussion
- Development of sampling objectives and needs
- Determination of sample locations and frequency
- Specification of the sample designation to provide for unique identifiers for all samples collected
- Description of sampling procedures and equipment
- Documentation management and sample control requirements.

2. SITE DESCRIPTION AND BACKGROUND

INEEL is a government-owned reservation managed by the U.S. Department of Energy. The eastern boundary of the INEEL is located 52 km (32 mi) west of Idaho Falls, Idaho. The INEEL site occupies approximately 2,305 km^2 (890 mi^2) of the northwestern portion of the Eastern Snake River Plain in southeast Idaho. The TRA is located in the west-central portion of the INEEL, as shown in Figure 2-1.

The TRA was established in the early 1950s for studying the effects of radiation on materials, fuels, and equipment. Three major reactors have been built at the TRA: (1) the Materials Test Reactor, (2) the Engineering Test Reactor, and (3) the Advanced Test Reactor. Currently, the Advanced Test Reactor is the only operating reactor at the TRA. A detailed description of TRA is available in the OU 2-13 ROD (DOE-ID 1997a).

2.1 Source, Nature, and Extent of Contamination

Infiltration of wastewater from the pond system at TRA has caused the migration of contaminants to the deep-perched water system and ultimately to the SRPA. In addition, the TRA disposal well disposed of wastewater from the cold waste sampling pit (TRA-764) into the SRPA until 1982 when the well was taken out of service and turned into a monitoring well. This disposal well was the primary source of chromium contamination in the aquifer since the water in the cooling towers was treated with chromate to inhibit corrosion. The total amount of chromium discharged to the disposal well from January 1, 1964, through December 31, 1972, is approximately 14,121 kg (31,131 lb). According to the *Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL—Part A, RI/BRA Report (Final)* (DOE-ID 1997c), the amount of chromium and tritium discharged to the warm waste pond is estimated at 8,070 kg (17,791 lb) and 8,920 Ci, respectively.

According to the *Post Record of Decision Monitoring Plan for the Test Reactor Area Perched Water System Operable Unit 2-12* (Dames and Moore 1993), the key contaminants in the groundwater included five radioactive constituents (Am-241, Cs-137, Co-60, Sr-90, and tritium) and eight chemical constituents (arsenic, beryllium, cadmium, chromium, cobalt, fluoride, lead, and manganese). Monitoring for these contaminants was performed from 1993 through 1996.

Following this period of monitoring, the approach to groundwater monitoring at TRA was modified to incorporate results from the previous 3 years of monitoring, recommending changes to the monitoring frequency and analyte list, as identified in the Third Annual Technical Memorandum (Arnett, Meachum, and Jessmore 1996). Since January 1997, TRA groundwater monitoring involved semiannual sampling for chromium, cadmium, tritium, cobalt-60, and strontium-90 from the wells identified in the OU 2-12 Groundwater Monitoring Plan (Dames and Moore 1993). These changes to the TRA groundwater monitoring were approved by the Agencies in November 1996 in accordance with written correspondence.

With the completion of the WAG 2 5-Year Review (DOE-ID 2003), water quality results demonstrated little impact (most levels near detection limits) for Am-241, arsenic, beryllium, cadmium, cesium-137, fluoride, lead, manganese, and mercury. The contaminants of concern with higher concentrations included chromium, tritium, and strontium-90, with cobalt-60 concentrations being of a concern for the deep-perched water. Based upon the recommendations provided in the review, only these four contaminants of concern continue to warrant continued semiannual groundwater monitoring. The recurrence of diesel contamination in Well PW-13 was noted as an issue during the 5-year review. Sampling for the diesel investigation included sampling for selected inorganic, organics, and radiological contaminants at selected wells. Additionally, pH, temperature, and conductivity measurements were made and recorded during sampling. The results will be reported in a forthcoming report.

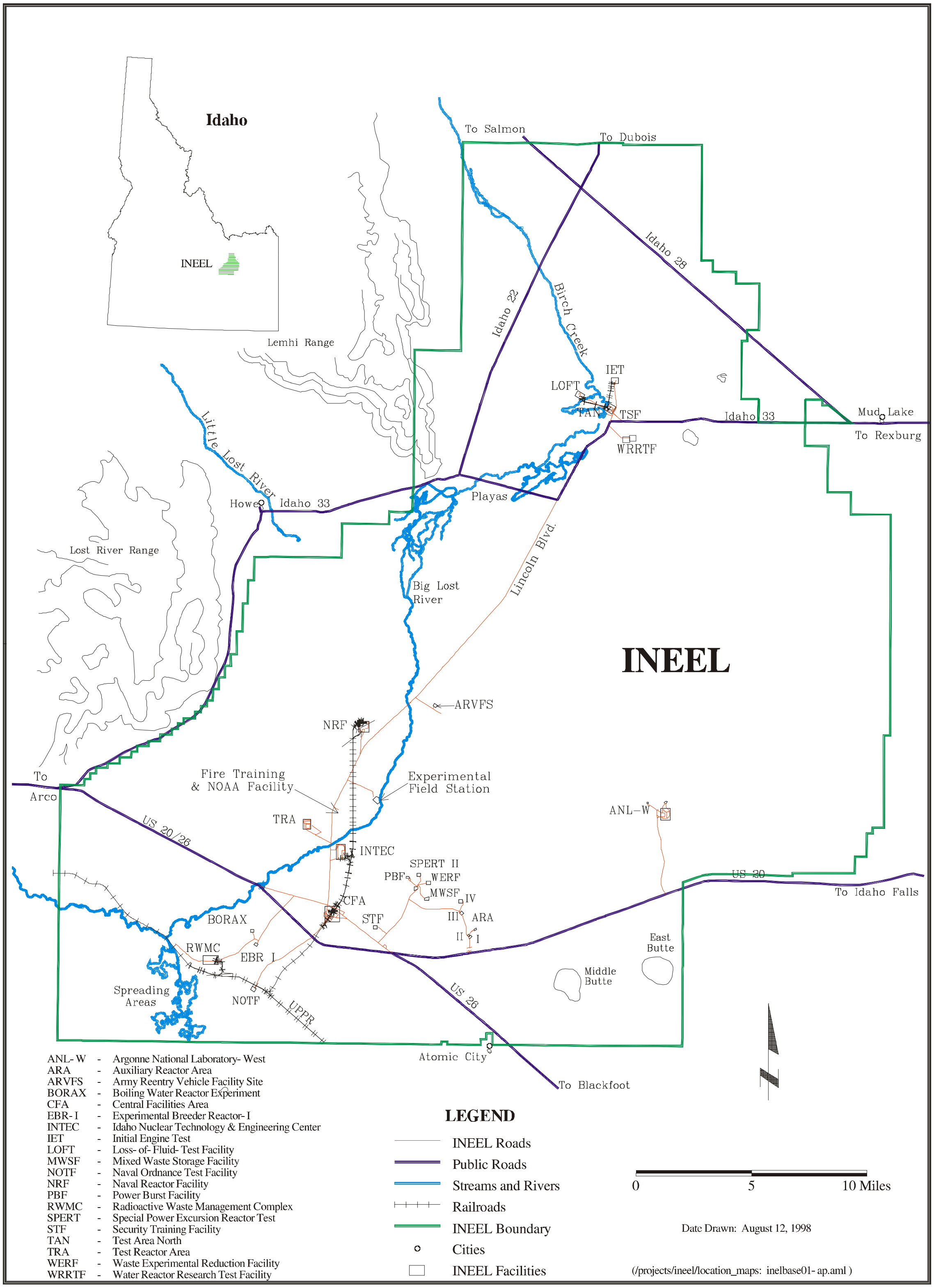

Figure 2-1. Map showing the location of the Idaho National Engineering and Environmental Laboratory.

3. SAMPLING OBJECTIVES

This section identifies the data needs required for conducting the proposed sampling in support of the WAG 2 groundwater monitoring activities. Data needs and data quality objectives (DQOs) are defined in the following subsections.

3.1 Data Needs

Data needs have been determined through the evaluation of existing data and the projection of data requirements anticipated for analysis of samples collected during WAG 2 groundwater monitoring. Groundwater monitoring was implemented as a component of the OU 2-12 and OU 2-13 RODs (DOE-ID 1992 and 1997a, respectively) to verify trends in the SRPA predicted by pre-ROD computer modeling and to ensure that the selected remedies remain protective of the groundwater. Based upon the data evaluation presented in the WAG 2 5-year review (DOE-ID 2003), it is recommended that biannual monitoring of the perched and aquifer groundwater continue for a reduced list of analytes.

3.1.1 Problem Statement

The objective of DQO Step 1 is to use relevant information to clearly and concisely state the problem to be resolved. There are two basic parts to the problem. First, groundwater-sampling results indicate that INEEL operations at TRA may have impacted the SRPA, causing contaminant concentrations in groundwater that exceed the EPA-defined regulatory levels. Second, it is important to assess the impact that continuing operations at TRA have on the groundwater.

Problem Statement 1—Contaminant Monitoring: Reduce the uncertainties associated with whether contaminant concentrations in the aquifer underlying TRA exceed the EPA-defined regulatory levels.

Problem Statement 2—Operations Impact: Assess the impact that continuing operations at TRA have on the groundwater through monitoring of the perched water systems underlying TRA.

3.1.2 Decision Identification

The goal of DQO Step 2 is to define the questions that the study will attempt to resolve and to identify the alternative actions that may be taken based on the outcome of the study. The defined questions and their corresponding alternative actions will then be joined to form decision statements (DSs). The principal study questions (PSQs) for WAG 2 groundwater monitoring are as follows:

- PSQ #1—Do the contaminant concentrations present in the SRPA underlying the TRA site exceed the EPA-defined regulatory levels and Idaho groundwater quality standards (EPA 2002; IDAPA 58.01.11.200)?

- PSQ #2—Do the trends of the contaminant concentrations present in the perched water underlying the TRA site indicate that continuing operations are having an adverse impact on groundwater?

- PSQ #3—Does the reoccurrence of diesel contamination in PW-13 represent residual product from the early 1980s or an additional source of diesel?

Alternative actions are those actions resulting from resolution of the stated PSQs. The types of alternative actions considered would depend on the answers to the PSQs. Given the PSQs developed for WAG 2 groundwater monitoring, the associated decision statements are as follows:

- DS #1—Determine whether contaminant concentrations present in the SRPA underlying the TRA site exceed the EPA-defined regulatory levels and Idaho groundwater quality standards (EPA 2002; IDAPA 58.01.11.200).

- DS #2—Determine whether the trends of contaminant concentrations in the perched water underlying the TRA site indicate that continuing operations are having an adverse impact on the groundwater.

- DS #3—Determine whether the trends of DRO and GRO contaminant concentrations in groundwater and the composition of the free product are consistent with residual diesel fuel from the early 1980s.

3.1.3 Identify Inputs to the Decision

The purpose of DQO Step 3 is to identify the type of data needed to resolve each of the decision statements identified in DQO Step 2. These data may already exist or may be derived from computational or surveying/sampling and analysis methods. Analytical performance requirements (e.g., practical quantitation limits [PQLs], precision, and accuracy) also are provided in this step for any new data that will be collected.

3.1.3.1 Information Required to Resolve Decision Statements. Table 3-1 specifies the information (data) required to resolve each of the decision statements identified in Section 3.1.2 and identifies whether these data already exist. For the data that are identified as existing, the source references for the data have been provided with a qualitative assessment as to whether the data are of sufficient quality to resolve the corresponding decision statement. The qualitative assessment of the existing data was based on the evaluation of the corresponding quality control (QC) data (e.g., spikes, duplicates, and blanks), detection limits, data collection methods, etc.

Table 3-1. Required information and reference sources.

DS #	Measurement Variable	Required Data	Do Data Exist?	Source Reference	Sufficient Quality?	Additional Information Required?
1	Radiochemical and chemical concentrations	Laboratory measurement of potential contaminants	Yes	5-Year Review*	No	Yes
2	Radiochemical and chemical concentrations	Laboratory measurement of potential contaminants	Yes	5-Year Review*	No	Yes
3	DRO and GRO	Laboratory measurement of potential contaminants	Yes	5-Year Review	No	Yes

DRO = diesel-range organics
DS = decision statement
GRO = gasoline-range organics
*5-Year Review (DOE-ID 2003)

3.1.3.2 Basis for Setting the Action Level. The action level is the threshold value that provides the criterion for choosing between alternative actions. For Decision Statements 1 and 2, the contaminants of concern as identified in the WAG 2 5-year review (DOE-ID 2003) are chromium, strontium-90, cobalt-60, and tritium. The bases for setting the action levels for the contaminants are the EPA-defined regulatory levels (e.g., drinking water standards) (EPA 2002) and the Idaho groundwater quality standards (IDAPA 58.01.11.200). The numerical values for the action levels are provided in DQO Step 5. For Decision Statement 3, an action level is not defined, but the action will depend on the determination of the source of the free product and concentration trends for DRO and GRO in the perched water.

3.1.3.3 Computational and Survey/Analytical Methods.

Table 3-2 identifies the decision statements where existing data either do not exist or are of insufficient quality to resolve the decision statements. For these decision statements, Table 3-2 presents computational and/or surveying/sampling methods that could be used to obtain the required data. For Decision Statements 1 and 2, analytical data will be collected to determine the concentrations of contaminants in the perched water and SRPA underlying WAG 2. For Decision Statement 2, the statistical trend of the contaminants will be determined to ascertain whether the potential exists for adversely affecting the SRPA in the future. For Decision Statement 3, analytical data will be collected to determine the source of diesel in the perched water and the trend of contaminants analyzed to evaluate potential impacts.

Table 3-2. Information required for resolution of decision statements.

DS #	Measurement Variable	Required Data	Computational Methods	Survey/Analytical Methods
1	Radiochemical and chemical	Radiochemical and chemical concentrations in the SRPA	Compare contaminant concentrations to regulatory levels	Analytical laboratory determination of contaminant concentrations in groundwater
2	Radiochemical and chemical	Radiochemical and chemical concentrations in the perched water	Obtain statistical trend of contaminant concentrations over time	Analytical laboratory determination of contaminant concentrations in groundwater
3	DRO and GRO	DRO and GRO concentrations in perched water and free product	Obtain statistical trend of contaminant concentrations over time	Analytical laboratory determination of contaminant concentrations in groundwater and free product

DRO = diesel-range organics
DS = decision statement
GRO = gasoline-range organics

3.1.3.4 Analytical Performance Requirements.

Table 3-3 defines the analytical performance requirements for the data that needs to be collected to resolve each of the decision statements. These performance requirements include the PQL, precision, and accuracy requirements for each of the potential contaminants.

Table 3-3. Analytical performance requirements.

DS #	Analyte List	Survey/ Analytical Method	Preliminary Action Level	Practical Quantitation Limit	Precision Requirement	Accuracy Requirement
1, 2	Chromium Strontium-90 Cobalt-60 Tritium	SW-846* GFPC Gamma spec. LSC	EPA and IDAPA regulatory levels	See QAPjP	± 20%	80–120

Table 3-3 (continued).

DS #	Analyte List	Survey/ Analytical Method	Preliminary Action Level	Practical Quantitation Limit	Precision Requirement	Accuracy Requirement
3	DRO and GRO	SW-846[a]	Not applicable	See QAPjP	Not applicable	Not applicable

a. See Reference EPA 1988.
DRO = diesel-range organics
DS = decision statement
EPA = U.S. Environmental Protection Agency
GFPC = gas-flow proportional counting
GRO = gasoline-range organics
IDAPA = Idaho Administrative Procedures Act
LSC = liquid scintillation counting
QAPjP = Quality Assurance Project Plan
*See Reference EPA 1998.

3.1.4 Study Boundaries

The primary objective of DQO Step 4 is to identify the population of interest, define the spatial and temporal boundaries that apply to each decision statement, define the scale of decision-making, and identify any practical constraints (hindrances or obstacles) that must be taken into consideration in the sampling design. Implementing this step ensures that the sampling design will result in the collection of data that accurately reflect the true condition of the site under investigation.

3.1.4.1 Geographic Boundaries. Limiting the geographic boundaries of the study area ensures that the investigation does not expand beyond the original scope of the task. This study will focus on the perched water and SRPA beneath TRA. Based on review of the hydraulic data and groundwater contour maps, the selected wells will allow for evaluation of the potential migration of groundwater contaminants.

3.1.4.2 Temporal Boundaries. The temporal boundary refers to the timeframe to which each decision statement applies (e.g., number of years) and when (e.g., season, time of day, and weather conditions) the data should optimally be collected. Temporal boundaries are important when contaminant concentration changes over time are significant. Though historical data collected at TRA and other sites at the INEEL indicate that contaminant concentrations are unaffected by seasonal factors, the WAG 2 groundwater-monitoring samples will be collected at approximately the same time of year (i.e., October and March timeframes). This will be done in an effort to assess any impact on the data collected from changes in groundwater levels because of snowmelt and run-off. Samples will be collected semiannually at least until the second 5-year review. At that time, groundwater monitoring data will be reviewed with the Agencies, and a determination will be made as to whether the data warrant continuation of the semiannual sampling, or if a change in the frequency or list of analytes is necessary. Given that sufficient data are collected to demonstrate that contaminant levels are constant or decreasing and that no other contaminants pose a potential threat to the groundwater, the monitoring requirements may be modified.

3.1.4.3 Scale of Decision-Making. The scale of decision-making is defined by joining the population of interest and the geographic and temporal boundaries of the area under investigation. For the WAG 2 groundwater monitoring, the scale of decision-making is the same as the geographic boundary defined in Section 3.1.4.1.

3.1.4.4 Practical Constraints. Practical constraints may include physical barriers, difficult sample matrices, high radiation areas, or any other condition that will need to be considered in the design and scheduling of the sampling program. For WAG 2 groundwater monitoring, the primary constraint to be considered is whether water is present in the selected perched water wells. Historically, a number of the perched wells listed have been dry. Given the reduced volumes of water being discharged into the Cold Waste Pond at TRA, the dry wells are anticipated to continue.

3.1.5 Develop a Decision Rule

The purpose of DQO Step 5 initially is to define the statistical parameter of interest (i.e., mean, 95% upper confidence level) that will be used for comparison against the action level. The two decision rules (DRs) corresponding to the two decision statements provided in Section 3.1.2 are as follows:

- DR #1—If the concentration for an SRPA well sample exceeds the defined regulatory level for a given contaminant, the appropriate notifications will be made to the Agencies with monitoring continuing until the second 5-year review.

- DR #2—If the statistical trend for a contaminant in any of the perched water wells indicates that concentrations are increasing, then monitoring may be continued after the second 5-year review, as determined by concurrence with the Agencies. At that time, it may be determined whether more aggressive action is necessary. Conversely, if the trend indicates that contaminant concentrations are decreasing, then the monitoring frequency for frequency and target analytes may be modified.

- DR #3—If DRO and GRO concentrations in groundwater from PW-13, TRA-1933, and TRA-1934 and the composition of the free product indicate that the free product is from a continuing leak, then additional investigation into the source will be necessary. If the data indicate that the free product is residual diesel, then the need for additional monitoring will be re-evaluated.

These decision rules summarize the attributes the decision-maker needs to know about the sample population and how this knowledge will guide the selection of a course of action to solve the problem.

3.1.6 Decision Error Limits

Because analytical data can only estimate the true condition of the site under investigation, decisions that are made based on measurement data could potentially be in error (i.e., decision error). For this reason, the primary objective of DQO Step 6 is to determine which decision statements (if any) require a statistically based sample design. The purpose of determining the decision error limits is to specify the decision-maker's tolerable limits on decision errors, which are used to establish performance goals for the data collection design.

Tolerable error limits assist in the development of sampling designs to ensure that the spatial variability and sampling frequency are within specified limits. However, the sampling design for the WAG 2 groundwater monitoring is determined by the current monitoring wells' locations. The selection of these wells is based on professional judgment rather than statistics. Therefore, error limits are not used to determine sampling locations or frequency.

For the decision statement to be resolved using a nonstatistical design (i.e., Decision Statement 1), there is no need to define the "gray region" or the tolerable limits on the decision error since these only apply to statistical designs. While a statistical sampling design is not applicable to trend analysis as required for resolution of Decision Statement 2, a level of significance needs to be established over which it can be determined whether a significant trend does exist. For WAG 2 groundwater monitoring, a 95% significance level will be used to determine whether a trend in the data exists. Given the level of significance, the following null hypothesis was developed:

Null Hypothesis—A significant positive trend in the data exists.

3.1.7 Optimize the Design

The objective of DQO Step 7 is to present alternative data collection designs that meet the minimum data quality requirements, as specified in DQO Steps 1 through 6. A selection process is then used to identify the most resource-effective data collection design that satisfies all of the data quality requirements.

The following subsections present the selected technology and sampling methods for resolving each decision statement, along with a summary of the proposed implementation design. The basis for the selected implementation design is also provided.

3.1.7.1 Groundwater Monitoring. Monitoring will be performed from groundwater-monitoring wells on a semiannual basis. Samples will be sent to off-Site laboratories for analysis with full quality assurance/quality control (QA/QC) protocols. Field measurements will be used to determine groundwater elevations. Monitoring will be continued as a minimum up to the time of the second 5-year review scheduled for the fall of 2007. The SAP tables will be generated prior to sampling.

3.1.7.2 Trend Analysis. Various statistical tests exist to determine whether a significant temporal trend exists in a given data set. For simple linear regression, the statistical test of whether the slope is significantly different from zero is equivalent to testing if the correlation coefficient is significantly different from zero. To perform the test, the correlation coefficient is first calculated (Equation 3-1). This correlation coefficient is then used to calculate the t-statistic (Equation 3-2), which is then compared to the critical value for $t_{1-\alpha/2}$ to determine whether there is a significant correlation between the two variables (in this case, an analyte's concentration versus time). Historical and current data sets will be combined to perform the trend analysis.

$$r = \frac{\sum_{i=1}^{n} X_i Y_i - \frac{\sum_{i=1}^{n} X_i \sum_{i=1}^{n} Y_i}{n}}{\left(\left(\sum_{i=1}^{n} X_i^2 - \frac{\left(\sum_{i=1}^{n} X_i \right)^2}{n} \right) \left(\sum_{i=1}^{n} Y_i^2 - \frac{\left(\sum_{i=1}^{n} Y_i \right)^2}{n} \right) \right)^{1/2}} \qquad (3\text{-}1)$$

where

r	=	correlation coefficient for a given analyte
X_i	=	the year of sample collection
Y_i	=	individual concentrations for a given analyte.

$$t = \frac{r}{\sqrt{\frac{1-r^2}{n-2}}} \qquad (3\text{-}2)$$

where

t = the calculated t-test statistic

r = correlation coefficient for a given analyte calculated in Equation 3-1

n = the number of data points.

If the calculated t is greater than $t_{n-2,\ 1-\alpha}$ as obtained from a table of statistical t-values, then the null hypothesis is rejected, and it can be concluded that there is no significant positive statistical trend in the data. Conversely, if the calculated t is less than $t_{n-2,\ 1-\alpha}$ as obtained from a table of statistical t-values, then the null hypothesis is not rejected, and it can be concluded that there is a significant positive statistical trend in the data.

3.2 Quality Assurance Objectives for Measurement

The quality assurance (QA) objectives for measurement will meet or surpass the minimum requirements for data quality indicators established in the QAPjP (DOE-ID 2004a). This reference provides minimum requirements for the following measurement quality indicators: precision, accuracy, representativeness, completeness, and comparability. Precision, accuracy, and completeness will be calculated per the QAPjP (DOE-ID 2004a).

3.2.1 Precision

Precision is a measure of the reproducibility of measurements under a given set of conditions. In the field, precision is affected by sample collection procedures and by the natural heterogeneity encountered in the environment. Overall precision (field and laboratory) can be evaluated by the use of duplicate samples collected in the field. Greater precision is typically required for analytes with very low action levels that are close to background concentrations.

Laboratory precision will be based upon the use of laboratory-generated duplicate samples or matrix spike/matrix spike duplicate samples. Evaluation of laboratory precision will be performed during the method data validation process.

Field precision will be based upon the analysis of collected field duplicate or split samples. For samples collected for laboratory analyses, a field duplicate will be collected at a minimum frequency of one in 20 environmental samples.

3.2.2 Accuracy

Accuracy is a measure of bias in a measurement system. Laboratory accuracy is demonstrated using laboratory control samples, blind QC samples, and matrix spikes. Evaluation of laboratory accuracy will be performed during the method data validation process. Sample handling, field contamination, and the sample matrix in the field affect overall accuracy. By evaluating results from field blanks, trip blanks, and equipment rinsates, false positive or high-biased sample results will be assessed.

Field accuracy will only be determined for samples collected for laboratory analysis. The field screening instrumentation can only analyze the soils and is not set up for the analysis of water samples. Therefore, accuracy of field instrumentation will be ensured through the use of appropriate calibration procedures and standards.

3.2.3 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which the sampling and analysis data accurately and precisely represent the characteristic of a population parameter being measured at a given sampling point or for a process or environmental condition. Representativeness will be evaluated by determining whether measurements are made and physical samples are collected in such a manner that the resulting data appropriately measure the media and phenomenon studied. The comparison of all field and laboratory analytical data sets obtained throughout this remedial action will be used to ensure representativeness.

3.2.4 Detection Limits

Detection limits will meet or exceed the risk-based or decision-based concentrations for the contaminants of concern. Detection limits will be as specified in the Sample and Analysis Management (formerly the Sample Management Office) Laboratory Master Task Agreement Statements of Work, Task Order Statements of Work, and as described in the QAPjP (DOE-ID 2004a).

3.2.5 Completeness

Completeness is a measure of the quantity of usable data collected during the field sampling activities. The QAPjP (DOE-ID 2004a) requires that an overall completeness goal of 90% be achieved for noncritical samples. If critical parameters or samples are identified, a 100% completeness goal is specified. Critical data points are those sample locations or parameters for which valid data must be obtained in order for the sampling event to be considered complete. Given that this is a monitoring project, all field screening and laboratory data will be considered noncritical with a completeness goal of 90%.

3.2.6 Comparability

Comparability is a qualitative characteristic that refers to the confidence with which one data set can be compared to another. At a minimum, comparable data must be obtained using unbiased sampling designs. If sampling designs are not unbiased, the reasons for selecting another design should be well documented. Data comparability will be assessed through the comparison of all data sets collected during this study for the following parameters:

- Data sets will contain the same variables of interest
- Units will be expressed in common metrics
- Similar analytical procedures and QA will be used to collect data
- Time of measurements of variables will be similar
- Measuring devices will have similar detection limits
- Samples within data sets will be selected in a similar manner
- The number of observations will be of the same order of magnitude.

3.2.7 Data Validation

Method data validation is the process whereby analytical data are reviewed against set criteria to ensure that the results conform to the requirements of the analytical method and any other specified requirements.

All laboratory-generated analytical data will be validated to Level "B" per INEEL Guide (GDE) -7003, "Levels of Analytical Method Data Validation." Field-generated data will not be validated. Quality of the field-generated data will be ensured through adherence to established operating procedures and use of equipment calibration, as appropriate.

4. SAMPLING LOCATION AND FREQUENCY

The material presented in this section is intended to support the DQOs summarized in Section 3.

4.1 Quality Assurance/Quality Control Samples

The QA samples will be included to satisfy QA requirements for the field operations per the QAPjP (DOE-ID 2004a). The duplicate, blank, and calibration QA/QC samples will be analyzed as outlined in Section 3.

4.2 Sampling Locations

The wells selected for the OU 2-13 post-ROD monitoring and the rationale for inclusion in the monitoring network are described in Section 3. Table 4-1 provides the necessary well construction information (e.g., date drilled, total depth, screen interval, casing diameter), and purge volume requirements for the wells to be monitored. Figure 4-1 shows the locations of wells relative to the TRA facility.

4.3 Sampling Frequency

Based on the recommendation provided in the *First Five-Year Review Report for the Test Reactor Area, Operable Unit 2-13, at the Idaho National Engineering and Environmental Laboratory* (DOE-ID 2003), only four contaminants of concern warrant continued semiannual groundwater monitoring including chromium, tritium, strontium-90, and cobalt-60. In order to address the PW-13 diesel issue identified in the five-year review, Wells PW-13, TRA-1933, and TRA-1934 will be sampled for DRO and GRO. Sampling will occur on a biannual basis for all analytes.

During recent sampling events, three of the United States Geological Survey (USGS) perched wells (USGS-53, USGS-55, and USGS-56) have not had any water present. In the event that these wells are dry, the following wells shall be sampled in their place:

- For USGS 53, substitute either PW-9 or USGS-73
- For USGS-55, substitute USGS-70
- For USGS-56, substitute USGS-68.

Table 4-1. Well construction information.

Well	Date Installed	Total Depth (ft)	Well Screen/ Open Hole	Screened Interval(s) (ft bls)	Pump	Casing Diameter (in.)	Depth to Water[a] (ft bls)	Estimated Purge Volume[b] (gal)
PW-11	1990	134.5	Stainless-steel well screen	109–129	Submersible	4[c]	104.4	59–98
PW-12	1990	133	Stainless-steel well screen	108–128	Submersible	4[c]	82.0	100–166
PW-13	1990	148.5	Stainless-steel well screen	57.5–87.5	None	4	69	36–60
PW-14	1990	126	Stainless-steel well screen	93–123	Submersible	4[c]	98.2	49–82
TRA-1933	2004	103	Stainless-steel well screen	60–90	None	4	70.1	39–65
TRA-1934	2004	100	Stainless-steel well screen	65–95	None	4	75.08	39–65
USGS-53	1960	90	Perforated steel casing	50–67 75–80	Submersible	4[c]	72.7	76–127
USGS-54	1960	91	Open hole	60–91	Submersible	6	75.0	71–118
USGS-55	1960	81	Open hole	45–80	Submersible	6	72.5	37–62
USGS-56	1960	80	Open hole	59–80	Submersible	6	71.5	37–62
Hwy-3	1967	750	Open hole	680–750	Submersible	8	538.8	1,644
TRA-06	1990	562	Stainless-steel well screen	528–558	Submersible	4[c]	470.1	180–300
TRA-07	1990	501	Stainless-steel well screen	463–493	Submersible	4[c]	474.3	52–87
TRA-08	1990	501.5	Stainless-steel well screen	471.5–501.5	Submersible	4[c]	478.9	44–74

Table 4-1. (continued).

Well	Date Installed	Total Depth (ft)	Well Screen/ Open Hole	Screened Interval(s) (ft bls)	Pump	Casing Diameter (in.)	Depth to Water[a] (ft bls)	Estimated Purge Volume[b] (gal)
USGS-58	1961	503	Open hole	218–473	Submersible	6	464.1	172–286
USGS-65	1960	498	Open hole	456–498	Submersible	6	468.9	128–214
MIDDLE-1823	2003	729.7	Stainless-steel well screen	680–720	Submersible	6	482.6	978–1,630

a. Water level measurement is from the Third Annual Technical Memorandum (Arnett, Meachum, and Jessmore 1996).
b. Purge volumes indicated on table include calculations for both three and five well-bore volumes.
c. Inside diameter
bls = below land surface
Hwy = highway
TRA = Test Reactor Area
USGS = United States Geological Survey

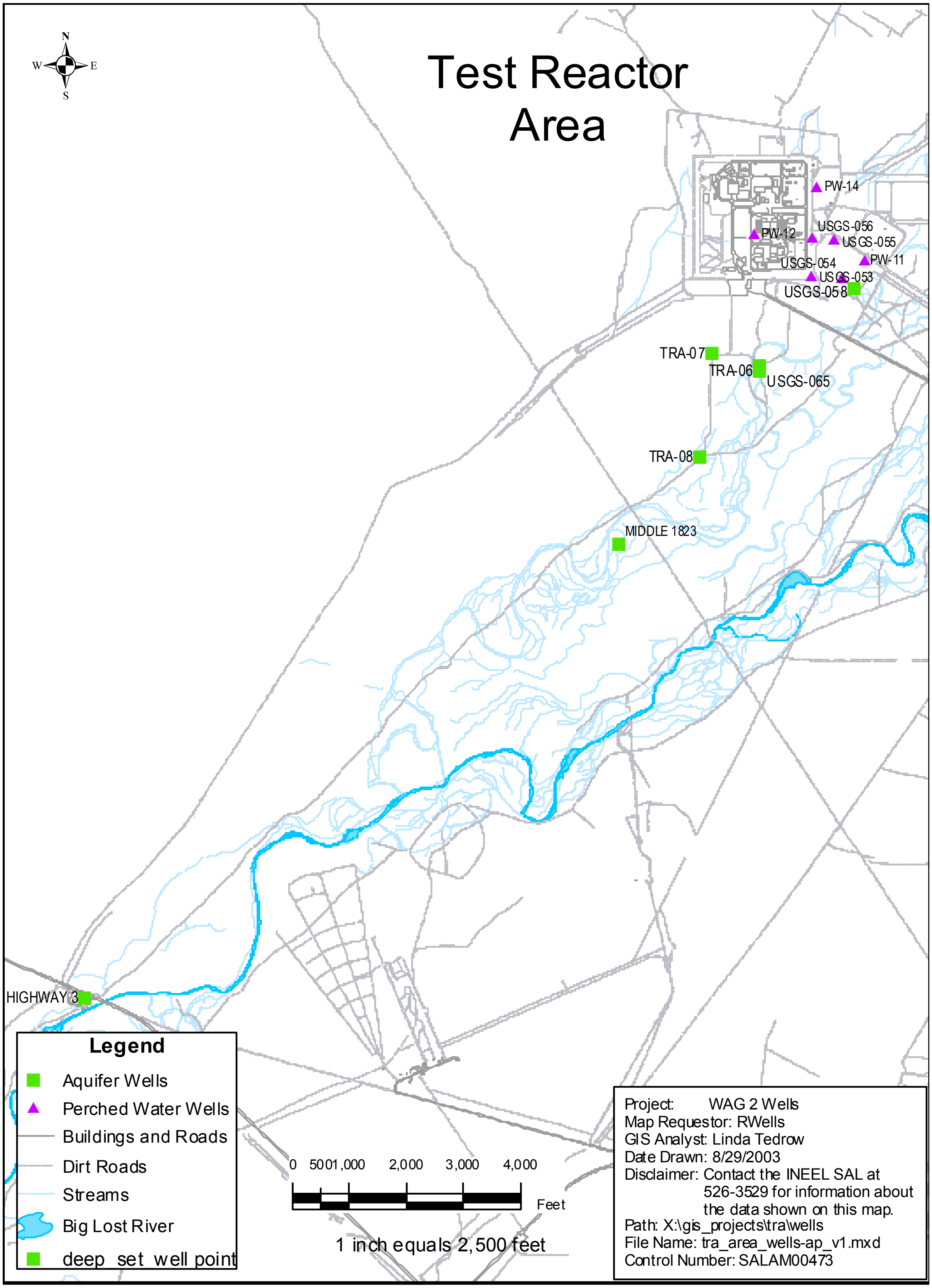

Figure 4-1. Map showing location of wells relative to the Test Reactor Area facility.

5. SAMPLING DESIGNATION

5.1 Sample Identification Code

A systematic character identification (ID) code will be used to uniquely identify all samples. Uniqueness is required for maintaining consistency and preventing the same ID code from being assigned to more than one sample.

The first three designators of the code (TRA) refer to the sample originating from the Test Reactor Area. The next three numbers designate the sequential sample number for the project. The seventh and eighth characters represent a two-character set (i.e., 01, 02) for designation of field duplicate samples. The last two characters refer to a particular analysis and bottle type. Refer to the Sampling and Analysis Plan (SAP) tables prepared prior to each sampling event for specific bottle code designations.

For example, a groundwater sample collected in support of the post-ROD monitoring might be designated as TRA00101R4, where (from left to right):

- TRA designates the sample as being collected from the Test Reactor Area
- 001 designates the sequential sample number
- 01 designates the type of sample (01 = original, 02 = field duplicate)
- R4 designates gamma spectrometric analysis.

A SAP table/database will be used to record all pertinent information (e.g., well designation, media, date) associated with each sample ID code.

5.2 Sampling and Analysis Plan Table/Database

5.2.1 Sampling and Analysis Plan Table

A SAP table format was developed to simplify the presentation of the sampling scheme for project personnel. The following sections describe the information recorded in the SAP table/database. A SAP table will be generated prior to each sampling event.

5.2.2 Sample Description

The sample description fields contain information relating to individual sample characteristics.

5.2.2.1 Sampling Activity. The sampling activity field contains the first six characters of the assigned sample number. The sample number in its entirety will be used to link information from other sources (e.g., field data, analytical data) to the information in the SAP table for data reporting, sample tracking, and completeness reporting. The analytical laboratory will also use the sample number to track and report analytical results.

5.2.2.2 Sample Type. Data in this field will be selected from the following:

REG for a regular sample

QC for a QC sample.

5.2.2.3 Media. Data in this field will be selected from the following:

GW for groundwater samples

WATER for QA/QC water samples.

5.2.2.4 Collection Type. Data in this field will be selected from the following:

GRAB for grab sample collection

RNST for rinsate QA/QC samples

DUP for field duplicate samples

FBLK for field blank QA/QC samples

TBLK for trip blank QA/QC samples.

5.2.2.5 Planned Date. This date is related to the planned sample collection start date.

5.2.3 Sample Location Fields

This group of fields pinpoints the exact location for the sample in three-dimensional space starting with the general AREA, narrowing the focus to an exact location geographically, and then specifying the DEPTH in the depth field.

5.2.3.1 Area. The AREA field identifies the general sample collection area. This field should contain the standard identifier for the INEEL area being sampled. For this investigation, samples are being collected from the Test Reactor Area (TRA), and the AREA field identifier will correspond to that site.

5.2.3.2 Location. The LOCATION field may contain geographical coordinates, x-y coordinates, building numbers, or other location-identifying details, as well as program-specific information such as borehole or well number. Data in this field will normally be subordinated to the AREA. This information is included on the labels generated by Sample and Analysis Management (formerly the Sample Management Office) to aid sampling personnel.

5.2.3.3 Type of Location. The TYPE OF LOCATION field supplies descriptive information concerning the exact sample location. Information in this field may overlap that in the location field, but it is intended to add detail to the location.

5.2.3.4 Depth. The DEPTH of a sample location is the distance in feet from surface level or a range in feet from the surface.

5.2.4 Analysis Types

5.2.4.1 AT1–AT20. These fields indicate analysis types (e.g., radiological, chemical, hydrological). Space is provided at the bottom of the form to clearly identify each type. A standard abbreviation will also be provided, if possible.

6. SAMPLING PROCEDURES AND EQUIPMENT

This section describes the sampling procedures and equipment to be used for the planned groundwater monitoring. A pre-sampling meeting will be held before commencement of any sampling activities to review the requirements of the GMP and the *Health and Safety Plan for the Environmental Restoration Long-Term Sitewide Groundwater Monitoring* (Gurney 2004), and to ensure that all supporting documentation has been completed.

6.1 Groundwater Monitoring

6.1.1 Groundwater Elevations

Groundwater elevations will be measured using either an electronic measuring tape (Solinst brand or equivalent) or a steel tape measure, as described in GDE-128, "Measuring Groundwater Levels." Measurement of all groundwater levels will be recorded to an accuracy of 0.01 ft. The use of automated data loggers for measuring groundwater levels will be implemented as funding becomes available.

Well PW-13 will be measured with an interface probe. The probe will be used to measure the elevation of the diesel and the water in order to determine the thickness of the diesel in the well. The probe will be used as directed by the manufacturer.

6.1.2 Well Purging

All wells, except Highway (Hwy) -3, will be purged before sample collection. During the purging operation, a Hydrolab (or equivalent) will be used to measure specific conductance, pH, and temperature. Well-purging procedures are provided in GDE-127, "Sampling Groundwater." A sample for water quality analysis can be collected after a minimum of three well-casing volumes of water has been purged from the well and when three consecutive water-quality parameters are within the following limits:

- pH: ± 0.1
- Temperature: ± 0.5°C
- Specific conductance: ± 10 μmhos/cm.

6.1.3 Groundwater Sampling

Before sampling, all nondedicated sampling equipment exposed to the water sample will be cleaned following the procedure outlined in GDE-162, "Decontaminating Sample Equipment." Following sampling, all nondedicated equipment that was exposed to the well water will be decontaminated in accordance with GDE-162 before storage. An exception to GDE-162 is that the isopropanol steps for decontamination will be omitted.

The water level in each well will be measured before purging. Then the well will be purged a minimum of three well-casing volumes until the pH, temperature, and specific conductance of the purge water have stabilized, or until a maximum of five well-casing volumes have been removed. If the well goes dry before purging three well-casing volumes, purging will be considered complete and samples collected thereafter. If parameters are still not stable after five volumes have been removed, samples will be collected and appropriate notations will be recorded in the logbook.

Groundwater samples will be collected for the analyses defined in Section 3. The requirements for containers, preservation methods, sample volumes, and holding times will be specified in the laboratory Statement of Work to be prepared prior to sampling.

Sample bottles for groundwater samples will be filled to approximately 90–95% of capacity to allow for content expansion or preservation. Samples to be analyzed for metals will be both unfiltered and filtered through a 0.45-μm filter. Samples requiring acidification will be acidified to a pH <2 using ultra pure nitric acid. The preferred order for sample collection is:

- Temperature, pH, specific conductance, and dissolved oxygen (during purging)
- Chromium (filtered and unfiltered)
- Radionuclides (unfiltered).

6.1.4 Shipping Screening

All samples destined for off-Site laboratory analysis will be submitted to the Radiation Measurements Laboratory located at TRA for a 20-minute gamma screen prior to shipment. Gamma screening can be performed using the same sample as that obtained for gamma spectroscopic analysis, provided that the sample is in the proper container. For those wells where the radionuclide contamination is fairly well characterized or nonexistent, radiological control screening methods will suffice for shipping.

6.2 Handling and Disposition of Remediation-Derived Waste

Remediation-derived Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) waste will be generated at OU 2-13 as a result of the groundwater-monitoring activities described herein. The disposition and handling of waste for this project will be completed in accordance with direction from Waste Generator Services (WGS). Samples will be handled in accordance with Program Requirements Document (PRD) -5030, “Environmental Requirements for Facilities, Processes, Materials, and Equipment,” and Management Control Procedure (MCP) -3480, “Environmental Instructions for Facilities, Processes, Materials, and Equipment,” and disposed of by the subcontracted laboratory following analysis. All waste streams generated from the sampling activity will be characterized in accordance with MCP-62, “Waste Generator Services – Low-Level Waste Management,” and will be handled, stored, and disposed of accordingly. Remediation-derived waste will be stored in a designated, controlled area inside the TRA facility. Solid waste will include material such as personal protective equipment (PPE), purged water, paper, packaging, and towels generated during sample preparation and packaging. The solid waste will be disposed of as low-level waste only.

Waste will be generated as a result of the sampling activities conducted during this project. Anticipated waste includes the following:

- Personal protective equipment
- Purge water
- Liquid decontamination residue
- Solid decontamination residue

- Plastic sheeting
- Unused/unaltered sample material
- Sample containers
- Miscellaneous wastes
- Contaminated equipment.

Waste may be hazardous. As sampling continues, additional waste streams may be identified. All new waste streams, as well as those identified above, are required to have the waste identified and characterized. A hazardous waste determination must be completed and presented to the appropriate waste management organization (e.g., WGS for approval by that organization at the time of generation.

The waste associated with the sampling activities will be managed in a manner that complies with the established applicable or relevant and appropriate requirements (ARARs), protects human health and the environment, and achieves minimization of remediation waste to the extent possible. The ARARs applicable to the storage of waste are defined in accordance with the ROD. The basic provisions of the ARARs provide for appropriate waste containerization and compliant storage of the remediation waste for an interim storage period. Protection of human health and the environment is achieved through implementation of the ARARs and through implementation of the waste management approach described herein.

6.2.1 Waste Minimization

Waste minimization techniques will be incorporated into planning and daily work practices to improve worker safety and efficiency. In addition, such techniques will aid in reducing the project environmental and financial liability. Specific waste minimization practices to be implemented during the project will include, but not be limited to, the following:

- Excluding materials that could become hazardous waste in the decontamination process (if any)
- Controlling transfer between clean and contaminated zones
- Designing containment such that contamination spread is minimized
- Collecting all samples necessary at one time, such that additional waste is not generated due to resampling.

The U.S. Department of Energy Idaho Operations Office *Idaho National Engineering and Environmental Laboratory Interim Pollution Prevention Plan* (DOE-ID 2000) addresses the efforts to be expended and the reports required to track waste generated by projects. This plan directs that the volume of waste generated by INEEL operations will be reduced as much as possible.

Industrial waste does not require segregation by type; therefore, containers will be identified as industrial waste and will be maintained outside the controlled area for separate collection. Contaminated waste has the potential to be hazardous. This waste will require segregation as either incinerable (e.g., wipes and PPE) or nonincinerable (e.g., polyvinyl tubing), in anticipation of subsequent waste management. Containers for collection of contaminated waste will be clearly labeled to identify waste type and will be maintained inside the controlled area as defined in the project Health and Safety Plan (Gurney 2004), until removal for subsequent management.

6.2.2 Laboratory Samples

All laboratory and sample waste will be managed in accordance with the Sample and Analysis Management (formerly the Sample Management Office) master task agreements as part of the contract for the subcontracted laboratory. The laboratory will dispose of any unused sample material. The laboratories are responsible for any waste generated as a result of analyzing the samples. In the event that unused sample material must be returned from the laboratory, only the unused, unaltered samples in the original sample containers will be accepted from the laboratory. These samples will be returned to the waste stream from which they originated. If the laboratory must return altered sample material (e.g., analytical residue), the laboratory will specifically define the types of chemical additives used in the analytical process and assist in making a hazardous waste determination. This information will be provided to the project field team leader and environmental compliance coordinator. Management of this waste will also require separation from the other unaltered samples being returned.

6.2.3 Packaging and Labeling

Containers used to store and transport hazardous waste must meet the requirements of 40 CFR 264, Subpart I, "Use and Management of Containers." The *Idaho National Engineering and Environmental Laboratory Waste Acceptance Criteria* (DOE-ID 2004b), hereinafter referred to as the INEEL Waste Acceptance Criteria (WAC), contains additional details concerning packaging and container conditions. Appropriate containers for CERCLA waste include 208-L (55-gal) drums and other suitable containers that meet U.S. Department of Transportation (DOT) regulations on packaging (49 CFR 171, 173, 178, and 179) or INEEL WAC Sections 4.4, 4.5, and 4.6 (DOE-ID 2004b). Waste Generator Services will be consulted to ensure that the packaging is acceptable to the receiving facility.

Waste containers will be labeled with standard hazardous waste labels. The following information will be included on the labels:

- Unique bar code serial number
- Name of generating facility
- Phone number of generator contact
- Listed or characteristic waste code(s)
- Waste package gross weight
- Maximum radiation level on contact and at 1 m (3 ft) in the air
- Waste stream or material identification number, as assigned by the receiving facility
- Prior to shipping, other labels and markings as required by Subparts D and E of 49 CFR 172, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements."

Any of the above information that is not known when the waste is labeled may be added when the information is known.

The WGS representative at TRA supplies the unique bar code serial number that is used for tracking. Tracking is accomplished in the Integrated Waste Tracking System.

Any waste shipped off the INEEL from WAG 2 must be labeled in accordance with applicable DOT labels and markings (49 CFR 172). In addition, waste labels must be visible, legibly printed or stenciled, and placed so that a full set of labels and markings are visible. See Sections 4.4, 4.5, or 4.6 of the INEEL WAC (DOE-ID 2004b) for additional labeling information.

6.2.4 Storage and Inspection

Waste may be stored in the CERCLA waste storage unit (CWSU), which is already established at TRA. Solid waste, segregated as potentially hazardous and/or mixed and placed in 208-L (55-gal) drums, will be stored in the CWSU. If required due to space limitations, a new CERCLA storage area (CSA) may need to be established as the sampling progresses. Determination of the CSA location will be coordinated with and approved by the appropriate TRA personnel. Waste placed in wooden storage boxes (1.2 × 1.2 × 2.4 m [4 × 4 × 8 ft] and 0.6 × 1.2 × 2.4 m [2 × 4 × 8 ft]), or other suitable containers, will be stored outside in a roped-off area that will be maintained as a CSA. Waste segregated as low-level radioactive only (e.g., soils) will be stored in a radioactive materials area near the CSA. The radioactive materials area will be established at the same time as the CSA.

To meet the substantive requirements of 40 CFR 264, Subpart I, "Use and Management of Containers," the Resource Conservation and Recovery Act ARARs inspection of the CWSU and/or CSA will be conducted as part of the weekly waste container inspection. The purpose of the weekly container inspection is to (1) look for containers that are leaking and/or that are deteriorating due to corrosion or other factors, (2) ensure that the containment system has not deteriorated due to corrosion, and (3) verify that labels are in place and legible. Inspections of the containers and the CWSU/CSA are conducted to meet the guidance contained in ICP-MCP-3475, "Temporary Storage of CERCLA-Generated Waste at the INEEL." The inspections will be documented on a weekly inspection form when completed. The checklists used to guide the inspection will be maintained in the CWSU/CSA.

6.2.5 Personal Protective Equipment

The PPE requiring disposal may include but not be limited to the following: gloves, respirator cartridges, shoe covers, and coveralls. The PPE will be disposed of in accordance with the requirements set forth in the INEEL WAC (DOE-ID 2004b) and direction from WGS.

6.2.6 Hazardous Waste Determinations

All waste generated will be characterized as required by 40 CFR 262.11, "Hazardous Waste Determination." Hazardous waste determinations will be prepared for all waste streams per the requirements set forth in MCP-62, "Waste Generator Services—Low-Level Waste Management." Completed hazardous waste determinations will be maintained for all waste streams as part of the project file held by WGS. The hazardous waste determinations may use two approaches to determine whether a waste is characteristic:

- Process knowledge may be used if there is sufficient existing information to characterize the waste. Process knowledge may include direct knowledge of the source of the contamination and/or existing validated analytical data.

- Analysis of representative samples of the waste stream may be performed by either specialized RCRA protocols or standard protocols for sampling and laboratory analysis that are not specialized

RCRA methods and other equivalent regulatory approved methods. In addition, process knowledge may influence the amount of sampling and analysis required in order to perform characterization.

Land disposal restrictions for hazardous waste are addressed in 40 CFR 268, "Land Disposal Restrictions." The INEEL-specific requirements for treatment, storage, and disposal are addressed in the INEEL WAC (DOE-ID 2004b). After the hazardous waste determinations are completed, the INEEL Interim Waste Tracking System profile number is assigned and the appropriate information entered into the tracking system.

6.2.7 Waste Disposition

At the conclusion of the investigations (or when deemed necessary), industrial waste will be disposed of in the INEEL landfill following the protocols and completing the forms identified by the INEEL WAC (DOE-ID 2004b). To achieve this waste management activity, industrial waste will be turned over to Central Facilities Area Operations personnel for management under existing facility waste streams and in accordance with standing facility procedures. When sufficient quantities of waste have been accumulated to ship to one of the INEEL waste management units, or off the INEEL to a commercial waste management facility, WGS will be contacted and the appropriate forms will be completed and submitted for approval as required. The waste generator interface will provide assistance in packaging and transporting the waste.

Waste that is determined to be RCRA-hazardous is not intended to be stored in a permitted treatment, storage, and disposal facility. However, if this becomes necessary, it will be labeled as CERCLA to facilitate eventual management in accordance with CERCLA treatment, storage, or disposal that may become available. Should further characterization of the contaminated waste be necessary, services will be requested from environmental monitoring and Sample and Analysis Management (formerly the Sample Management Office). Requesting these services requires completion of a form on website http://webhome4/SampAna/, "Sample and Analytical Service Authorization Form (SAF)" (INEEL 2004). For final disposition of RCRA-hazardous waste, WGS will be contacted to determine whether the waste qualifies for disposal under terms of the Master Task Agreement F98-180611 Hazardous Waste or its successor.

All low-level radioactive and mixed waste will be handled and disposed of in accordance with the requirements set forth in the INEEL WAC (DOE-ID 2004b). Care should be taken to ensure that all containers used to store waste or sampling equipment are in a "like new" condition. Following completion of sampling, the individual waste streams destined for disposal at the Radioactive Waste Management Complex will be approved and prepared for disposal in accordance with the requirements of the INEEL WAC (DOE-ID 2004b).

Management of contaminated waste, generated at a subcontract laboratory during analytical testing, will be the responsibility of the subcontract laboratory. However, overall management of the samples must be in accordance with the requirements of MCP-3480, "Environmental Instructions for Facilities, Processes, Materials and Equipment." Specifically, the MCP requires that the facility Environmental, Safety, and Health (ES&H) manager provide written approval prior to return of any media and that written documentation of sample disposition be developed and maintained. To initiate the return of these wastes to the INEEL, the subcontract laboratory will notify Bechtel BWXT Idaho, LLC, (BBWI) in the form of a written report identifying the known volume and characteristics of each waste type, including shipping and packaging details. Final authorization for the return of waste will be provided in writing from BBWI, LLC, to the subcontract laboratory. In the event that laboratory waste is returned, WGS will be contacted and they will determine the disposition of the waste.

6.2.8 Recordkeeping and Reporting

Records and reports related to waste management are required to be maintained as indicated by ICP-MCP-3475, "Temporary Storage of CERCLA-Generated Waste at the INEEL." Some of these may be completed by others, but must be available either at TRA or in the WAG 2 project files. These records will include but not be limited to the following:

- Hazardous waste determinations, characterization information, and statements of process knowledge (by others)
- CWSU and CSA inspection reports and log-in, log-out history
- Training records
- Documentation with respect to all spills.

6.3 Project-Specific Waste Streams

Several distinct waste stream types anticipated to be generated during this project have been identified. Some of these waste types will be clean, but many will be contaminated with radionuclides. Subsequent to generation, any or all of the waste may be reclassified; therefore, the intended waste management strategies for each are outlined below. The following sections describe the expected waste that will require compliant storage and/or disposal, including the intended management strategy from the time of generation until final disposition. Field and laboratory personnel will be responsible for segregating waste. The anticipated quantities have also been approximated; however, they are to be considered a rough order-of-magnitude because in some cases the type of contamination present cannot be determined before sampling and analysis. Estimated waste volumes are based on historical sampling activities conducted in support of other CERCLA actions conducted at the INEEL, in addition to calculated volumes based upon drawings and discussions with Balance of INEEL Cleanup (BIC) personnel.

6.3.1 Personal Protective Equipment

The PPE in the form of coveralls, leather and rubber gloves, and anticontamination clothing may be generated for the sampling activities. The anticipated quantity of PPE to be generated, and requiring disposal as a result of the sampling activities, is 0.76 m^3 (1 yd^3) classified as clean for each annual sampling event.

6.3.2 Purge Water

Liquid waste from groundwater sampling will consist of purge water from the deep-purged water system and SRPA that has been pumped from the wells. Purge water will be generated before sample collection in accordance with GDE-127, "Sampling Groundwater," to remove standing water from the well casing. This guide requires that three to five well volumes be removed from the well, and other water quality parameters must be met before samples are collected. The estimated amount of purge water generated from each well is provided in Table 4-1.

Purge water from all wells, except Hwy-3, TRA-06, and USGS-58, will be disposed of as directed by TRA WGS. Purge water from TRA-06 and USGS-58 will be discharged to the ground near the wellheads. Purging of the Hwy-3 well is not required, as the pump runs continuously. Water purged from Wells PW-13, TRA-1933, and TRA-1934 will require separate containment if diesel is present. Diesel contaminated water will be disposed of as directed by WGS.

6.3.3 Plastic Sheeting

Plastic sheeting may be used at the wells to act as an environmental barrier to contamination and to provide a lay-down site for staging equipment and tooling. Based upon historical use of plastic sheeting at environmental remediation sites, the anticipated volume to be generated and requiring disposal as a result of the sampling activities is 0.76 m^3 (1 yd^3), classified as clean, for each annual sampling event.

6.3.4 Unused/Unaltered Sample Material

Unused/unaltered sample material will be generated from the sampling activities in the form of water not required for sampling and analysis. In most cases, the analytical laboratory will be responsible for disposal of the unused/unaltered sample material and for any waste generated as a result of analyzing the samples. In the event that unused sample material must be returned from the laboratory, only the unused, unaltered samples in the original sample containers will be accepted from the laboratory. These samples will be consolidated and sent to a final disposal site.

6.3.5 Sample Containers

Sample containers will become a waste stream following analysis. As with unused/unaltered sample material, the analytical laboratory will be responsible for disposal of the sample containers. In the event that unused sample material must be returned from the laboratory, the samples will be consolidated for disposal and the sample containers, by virtue of the empty container rule, will be disposed of as clean waste.

6.3.6 Miscellaneous Waste

Miscellaneous waste such as trash, labels, rags, and other miscellaneous debris may be generated during the project. The anticipated quantity of miscellaneous waste to be generated and requiring disposal as a result of the sampling activities is 1.53 m^3 (2 yd^3), classified as clean. Clean miscellaneous waste will be removed to the Central Facilities Area landfill.

7. DOCUMENTATION MANAGEMENT AND SAMPLE CONTROL

Section 7.1 summarizes document management and sample control. Documentation includes field logbooks used to record field data and sampling procedures, chain-of-custody forms, and sample container labels. Section 7.2 outlines the sample handling and discusses chain-of-custody, radioactivity screening, and sample packaging for shipment to the analytical laboratories. The analytical results from these sampling efforts will be documented in a series of technical memoranda that are prepared on an annual basis.

7.1 Documentation

The field team leader will be responsible for controlling and maintaining all field documents and records, and for ensuring that all required documents will be submitted to the BIC Administrative Records and Document Control Center (ARDC). All entries will be made in permanent ink. All errors will be corrected by drawing a single line through the error and entering the correct information; all corrections will be initialed and dated.

7.1.1 Sample Container Labels

Waterproof, gummed labels generated from the SAP database will display information such as the sample ID number, the name of the project, sample location, and analysis type. In the field, labels will be completed and placed on the containers before collecting the sample. Information concerning sample date, time, preservative used, field measurements of hazards, and the sampler’s initials will be filled out during field sampling.

7.1.2 Field Guidance Forms

Field guidance forms, which are provided for each sample location, will be generated from the SAP database to ensure unique sample numbers.

These forms are used to facilitate sample container documentation and organization of field activities, and they contain information regarding the following:

- Media
- Sample ID numbers
- Sample location
- Aliquot ID
- Analysis type
- Container size and type
- Sample preservation.

7.1.3 Field Logbooks

In accordance with ARDC format, field logbooks will be used to record information necessary to interpret the analytical data. All field logbooks will be controlled and managed according to MCP-1194, "Logbook Practices for ER and D&D&D Projects."

7.1.3.1 Sample/Shipping Logbook. The field teams will use sample logbooks. Each sample logbook will contain information such as:

- Physical measurements (if applicable)
- All QC samples
- Shipping information (e.g., collection dates, shipping dates, cooler ID number, destination, chain-of-custody number, name of shipper)
- All team activities
- Problems encountered
- Visitor log
- List of site contracts.

This logbook will be signed and dated at the end of each day's sampling activities.

7.1.3.2 Field Instrument Calibration/Standardization Logbook. A logbook containing records of calibration data will be maintained for each piece of equipment requiring periodic calibration or standardization. This logbook will contain log sheets to record the date, time, method of calibration, and instrument ID number.

7.2 Sample Handling and Shipping

All samples will be handled in accordance with MCP-9228, "Environmental Sample Management." Qualified (Sampling and Analysis Management-approved) analytical and testing laboratories will be used to analyze the groundwater samples.

7.2.1 Sample Containers

Analytical samples for laboratory analyses will be collected in pre-cleaned bottles and packaged in accordance with Section 2.3.2.1, "Sample Containers," in the QAPjP (DOE-ID 2004a).

7.2.2 Sample Preservation

Preservation of water samples will be performed before sample collection. The temperature will be checked periodically before shipment to certify adequate preservation for those samples requiring temperatures at 4°C (39°F) for preservation. Ice chests (coolers) containing frozen reusable ice will be used to chill samples, if required, in the field after sample collection.

7.2.3 Chain-of-Custody Procedures

The chain-of-custody procedures will be followed in accordance with the requirements of PRD-5030, "Environmental Requirements for Facilities, Processes, Materials, and Equipment," MCP-3480, "Environmental Instructions for Facilities, Processes, Materials, and Equipment," MCP-1192, "Chain-of-Custody and Sample Labeling for ER and D&D&D Projects," and the QAPjP (DOE-ID 2004a). Sample bottles will be stored in a secured area, which is accessible only to the field team members.

7.2.4 Transportation of Samples

Samples will be shipped in accordance with the regulations issued by the DOT (49 CFR 171 through 178) and EPA sample handling, packaging, and shipping methods (40 CFR 261.4[d]). All samples will be packaged in accordance with the requirements set forth in MCP-3480 and PRD-5030.

7.2.4.1 Custody Seals. Custody seals will be placed on all shipping containers in such a way as to ensure that sample integrity is not compromised by tampering or unauthorized opening. Clear-plastic tape will be placed over the seals to ensure that the seals are not damaged during shipment.

7.2.4.2 On-Site and Off-Site Shipping. An on-Site shipment is any transfer of material within the perimeter of the INEEL. Site-specific requirements for transporting samples within Site boundaries and those required by the Shipping/Receiving Department will be followed. Shipment within the INEEL boundaries will conform to DOT requirements, as stated in 49 CFR, "Transportation." Off-Site sample shipment will be coordinated with Packaging and Transportation Department personnel, as necessary, and will conform to all applicable DOT requirements.

7.3 Document Revision Requests

Revisions to this document will follow MCP-135, "Creating, Modifying, and Canceling Procedures and Other DMCS-Controlled Documents."

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