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Revision 0

Post-Record of Decision Groundwater Monitoring and Field Sampling Plan for Operable Unit 10-08

August 2010

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Project No. 23368

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Prepared for the
U.S. Department of Energy
DOE Idaho Operations Office

ABSTRACT

This monitoring and field sampling plan describes groundwater sampling that will be conducted for Operable Unit 10-08 monitoring of the Snake River Plain Aquifer at the Idaho National Laboratory Site. Monitoring will be done to evaluate contaminants leaving the Idaho National Laboratory Site at the southern boundary of the Site and to evaluate commingling plumes. Sampling and monitoring locations were selected to meet the objectives of the Operable Unit 10-08 Record of Decision. Data for the Snake River Plain Aquifer obtained under this plan will be evaluated in monitoring reports for each sampling event and in 5-year reviews.

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ACRONYMS

DEQ	Idaho Department of Environmental Quality
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
FY	fiscal year
ICP	Idaho Cleanup Project
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
OU	operable unit
PPE	personal protective equipment
QA	quality assurance
QAPjP	quality assurance project plan
QC	quality control
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RWMC	Radioactive Waste Management Complex
SRPA	Snake River Plain Aquifer
USGS	U.S. Geological Survey
VOC	volatile organic compound
WAG	waste area group

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1. INTRODUCTION

Operable Unit (OU) 10-08 in Waste Area Group (WAG) 10 consists of Site-wide groundwater, miscellaneous sites, and future sites located on the Idaho National Laboratory (INL) Site in southeastern Idaho. The Agencies (i.e., U.S. Department of Energy Idaho Operations Office, U.S. Environmental Protection Agency [EPA], and Idaho Department of Environmental Quality [DEQ]) created OU 10-08 to address additional miscellaneous sites and potential commingling of groundwater plumes from two or more WAGs. A number of radioactive and hazardous contaminants have been found in the Snake River Plain Aquifer (SRPA) beneath the INL Site. Many of these contaminants are the result of INL Site operations conducted over the past 50 years. Potential impacts to groundwater from these INL Site activities were investigated in the OU 10-08 Remedial Investigation/Baseline Risk Assessment (DOE-ID 2008a). The assessment concluded that there was no unacceptable risk to INL Site-wide groundwater.

The Agencies determined that, for OU 10-08 INL Site-wide groundwater, no action with monitoring was appropriate, and no additional action was necessary for INL Site-wide groundwater to ensure protection of human health and the environment, as documented in the OU 10-08 Record of Decision (ROD) (DOE-ID 2009a). The U.S. Department of Energy Idaho Operations Office was the lead agency for the OU 10-08 ROD. Both EPA and DEQ participated in the evaluation and the no action determination for OU 10-08 Site-wide groundwater. EPA and DEQ concurred with the decision presented in the OU 10-08 ROD.

1.1 Purpose and Scope

The purpose of this plan is to outline monitoring of SRPA, to be performed for INL Site-wide groundwater, to confirm that there is no unacceptable threat to human health or the environment from commingled plumes or from the plume along the southern INL Site boundary. Groundwater monitoring for OU 10-08 will rely on the network of monitoring wells that currently exists and on data from other WAGs.

Institutional controls required to prevent exposures to contaminated groundwater within the individual contaminant plumes are already required by existing RODs and are established in the INL Site-Wide Institutional Controls Plan (DOE-ID 2009b). No institutional controls are required for groundwater for this plan because there is no unacceptable risk of exposures from commingled plumes.

1.2 Regulatory Background

On July 14, 1989, EPA proposed placing the Idaho National Engineering and Environmental Laboratory (INEEL) (now the INL) on the National Priorities List of the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300). EPA Region 10 (with public participation during a 60-day comment period following the proposed listing) issued a final rule on November 21, 1989, that listed the INL Site on the National Priorities List (54 FR 48184). The Comprehensive Environmental Response, Compensation, and Liability Act (42 USC 9601 et seq.) identification number for the INL Site is 1000305. The U.S. Department of Energy Idaho Operations Office is the lead agency for remedy decisions, and EPA Region 10 and DEQ approve those decisions.

The Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991) divided the INL Site into 10 WAGs to facilitate environmental remediation efforts. WAGs 1 through 9 generally correspond to facility areas (Figure 1). WAG 10 encompasses miscellaneous surface contamination sites and liquid disposal areas that are outside the boundaries of the INL Site's other nine WAGs (Figure 1). The FFA/CO defines WAG 10 as the INL Site boundary or beyond, as necessary, to encompass any real or potential impact from INL Site activities and any areas within the INL Site not covered by other WAGs (DOE-ID 1991). The FFA/CO Action Plan identifies WAG 10 as follows:

> …includes regional Snake River Plain Aquifer concerns related to INEL that cannot be addressed on a WAG-specific basis… The critical importance of the SRPA to the residents of eastern Idaho has been recognized by the U.S. Environmental Protection Agency (EPA) with the SRPA's designation as a sole-source aquifer. The boundary of WAG 10 is the INEL boundary, or beyond as necessary to encompass real or potential impact from INEL activities, and any areas within the INEL not covered by other WAGs. (DOE-ID 1991)

Additionally, WAG 10 is defined as the INL Site boundary minus WAGs 1 through 5, WAGs 7 through 9, and the Jefferson County landfill. OU 10-08 encompasses surface sites transferred from other OUs, new sites that may be identified, and INL Site-wide groundwater.

2. SITE DESCRIPTION AND BACKGROUND

The INL Site is a U.S. Government-owned facility managed by the U.S. Department of Energy. The INL Site occupies approximately 890 mi^2 of the northwestern portion of the eastern Snake River Plain in southeastern Idaho (Figure 1). The eastern boundary of the INL Site is located 32 mi west of Idaho Falls, Idaho. Depth-to-water varies from approximately 222 ft in the northeastern corner of the INL Site to 780 ft in the southeastern corner. Regional groundwater flows to the south-southwest. Locally, however, the direction of groundwater flow is affected by recharge from rivers, surface water spreading areas, pumpage, and heterogeneity in the aquifer. Across the southern INL Site, the average gradient of the water table is approximately 5 ft/mi.

2.1 Previous Operable Unit 10-08 Groundwater Sampling

Results of previous groundwater sampling events conducted in support of the WAG 10 remedial investigation/feasibility study (RI/FS) are provided in the following documents:

- Fiscal Year (1) 2003 OU 10-08 RI/FS Annual Report (DOE-ID 2004a)
- FY 2003 OU 10-08 RI/FS Supplemental Annual Report (DOE-ID 2004b)
- FY 2004 OU 10-08 RI/FS Annual Report (DOE-ID 2005)
- FY 2005 OU 10-08 RI/FS Annual Report (DOE-ID 2006)
- FY 2006 OU 10-08 RI/FS Annual Report (DOE-ID 2007)
- FY 2007 OU 10-08 Annual Report (DOE-ID 2008b)
- FY 2008 OU 10-08 Annual Report (DOE-ID 2009c).

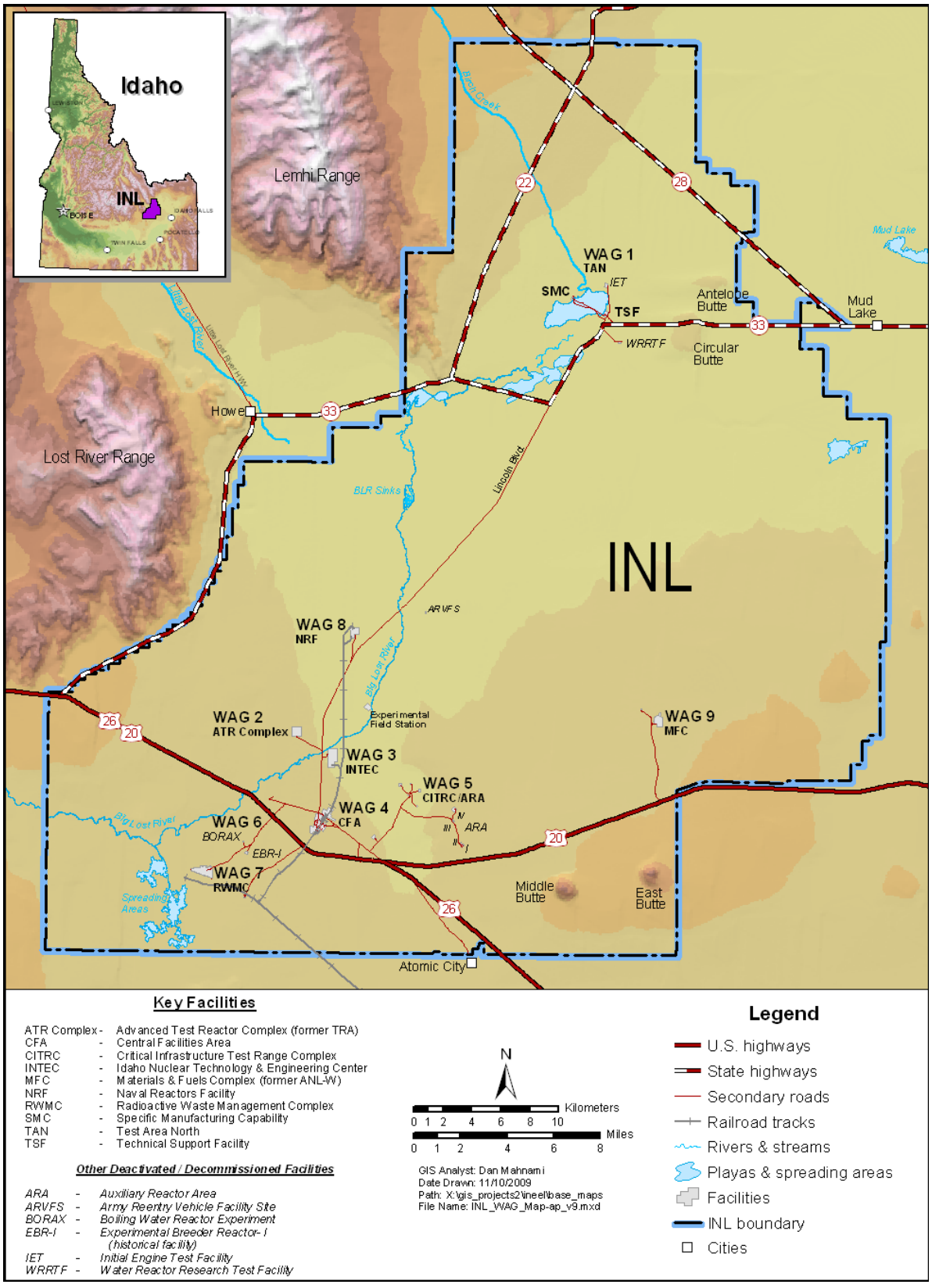

Figure 1. Idaho National Laboratory Site map showing waste area group locations.

2.2 Other Data Sources Relevant to Operable Unit 10-08

Currently, the Idaho Cleanup Project (ICP) and the U.S. Geological Survey (USGS) conduct monitoring to satisfy various WAG-specific program objectives. Groundwater contaminated above MCLs at the INL Site has been detected at Test Area North, the Advanced Test Reactor Complex, the Central Facilities Area, the Idaho Nuclear Technology and Engineering Center (INTEC), and the Radioactive Waste Management Complex (RWMC) (Figure 1). Groundwater data collected by WAGs 2, 3, 4, and 7 may be used to assess the potential for plumes to increase or decrease in size and to commingle. WAG 1 was not included in the list of plumes to be evaluated for commingling because the WAG 1 plume is not expected to commingle with plumes from the other facilities. Historical data from the Environmental Data Warehouse[a] will also be used to evaluate plume patterns and trends for commingling plumes.

USGS conducts sampling at many wells on the INL Site. Data collected may be used to fill in data gaps if the data are relevant to OU 10-08 monitoring. In addition to studies within and just south of the INL Site boundary, USGS has conducted sampling farther south—in the Magic Valley area—to evaluate potential impacts from INL Site activities. Data from these activities may also be used if needed.

3. FIELD SAMPLING PLAN OBJECTIVES

The data quality objective (DQO) summary in Table 1 is based on objectives indentified in the OU 10-08 ROD. DQOs for groundwater monitoring reflect the need to collect data that can be used to determine contaminant concentrations that are migrating past the southern boundary and ascertain the significance of commingling plumes.

EPA developed the DQO process as a means to "…improve the effectiveness, efficiency, and defensibility of decisions…" used in the development of data collection designs (EPA 2000). The DQO process is a systematic procedure for defining data collection criteria based on the scientific method. This process consists of seven iterative steps that yield a set of principal study questions and decision statements that must be answered to address a primary problem statement. The seven steps of the DQO process are as follows:

- Step 1: State the problem
- Step 2: Identify the principal study questions
- Step 3: Identify the inputs to the decision
- Step 4: Define the study boundaries
- Step 5: Develop decision rules
- Step 6: Specify tolerable limits on the decision
- Step 7: Optimize the design for obtaining data.

DQOs for groundwater monitoring associated with OU 10-08 post-ROD monitoring are shown in Table 1.

a. The *Environmental Data Warehouse* (ICP 2010), under the auspices of ICP, has been designated as the official warehouse for long-term management and storage of environmental data collected in support of ICP and INL programs.

Table 1. Data quality objectives for post-Record of Decision Operable Unit 10-08 groundwater monitoring.

1. Problem Statement:	2. Principal Study Questions:	3. Inputs to the Decision:	4. Define the Study Boundaries:	5. Develop a Decision Rule:	6. Specify Tolerable Limits on Decision Errors:	7. Optimize the Design:
1. What data are required to assess current and future contaminant conditions at the downgradient (southern) INL Site boundary?	PSQ-1. Are contaminant concentrations at the southern boundary increasing, decreasing, or holding steady?	Inputs to PSQ-1: • Results from monitoring activities performed under OU 10-08 • Data collected by USGS at the southern boundary.	This monitoring plan focuses on the transport of COPCs in the groundwater from facilities within the INL Site to its boundary and beyond. Geographical boundaries for WAG 10 include all areas within the INL Site that are not included in routine sampling programs for other WAGs (principally WAGs 1, 2, 3, 4, 7, and 8) (see Figure 1). Temporal boundaries are the timeframe from the present until it is agreed by the Agencies that monitoring may be stopped.	DR-1. If groundwater sampling data collected along the southern boundary indicate that concentrations of COPCs in SRPA are holding steady or decreasing, then it can be concluded that remedial measures are not needed. If contaminant concentrations are increasing over a 5-year period, then an assessment will be performed to determine whether any action is needed. Data will be evaluated, depending on the amount of data available for each location (large historical database for some wells and only a few years of data for others). Data will be evaluated for long-term and intermediate-term trends using various statistical measures; however, visual (empirical observation) will be used in addition to statistical measures, because of the variation in the amount of available data.	Limits on decision errors will be that multiple lines of evidence will be used to make decisions rather than relying on a single data point. Tolerance limits for data are those applied to laboratory analytical results.	WAG 10 sampling and monitoring activities will include the following: • Sampling of 12 wells in FY 2011 and every 2 years thereafter (e.g., FY 2013, FY 2015). • Two intervals from Westbay Wells USGS-103, -105, and -108 will be sampled. The two intervals to be sampled in USGS-105 and -108 will be proposed after USGS sampling results are available; however, based on packer sampling done as part of the previous OU 10-08 sampling, the water table interval and one deeper interval will be proposed for each well. • Sampling will continue at this frequency until agreed to by the Agencies that monitoring may be reduced or eliminated, based on plume trends.
2. What data are required to verify that contaminant plumes are not commingling to a degree that would change the interpretation in the remedial investigation report that commingling is not a significant issue?	PSQ-2. Are contaminant plumes within the INL Site holding steady, contracting, or expanding?	Inputs to PSQ-2 may include the following: Inputs established under PSQ-1 Groundwater data collected by WAGs 4 and 7 for commingled areas identified in the OU 10-08 RI/FS Groundwater data collected by USGS at the southern boundary and from other areas, as needed.		DR-2. If monitoring data indicate that plumes affecting commingled areas are not holding steady or are contracting as expected, then implementation of remedial measures will be evaluated.		

COPC contaminant of potential concern
DR decision rule
FY fiscal year
INL Idaho National Laboratory
OU operable unit
PSQ principal study question
RI/FS remedial investigation/feasibility study
SRPA Snake River Plain Aquifer
USGS U.S. Geological survey
WAG waste area group

4. FIELD ACTIVITIES

This section describes field activities that are part of monitoring designed to meet DQOs discussed in Section 3. Before beginning any sampling activities, a pre-job briefing will be held with all worksite personnel to review requirements of this plan, the "Environmental Restoration Project Health and Safety Plan" (PLN-2128), and other work control documents and to verify that all supporting documentation has been completed. Additionally, a post-job review will be conducted at the end of the sampling and instrument installation activities. Pre- and post-job briefings will be conducted in accordance with applicable procedures. The field team leader (and other project personnel) will ensure that fieldwork is being performed using the most current and applicable procedures.

4.1 Sampling Locations

OU 10-08 sampling will sample boundary wells and wells just upgradient of the boundary because those wells are considered the most important for evaluating contaminants leaving the INL Site and for evaluating commingling (Figure 2). Table 2 lists well identifiers, well names, and other information about wells in the OU 10-08 monitoring network.

Wells USGS-104, -106, -107, and -132 will be used to evaluate whether plumes are contracting, holding steady, or expanding. USGS-104 and -106 will be used to evaluate downgradient INTEC plume dynamics. USGS-132, south of RWMC, will be used to evaluate whether volatile organic compound (VOC) plumes originating from RWMC are contracting or expanding. USGS-009, -105, and -109 will be used to monitor for contaminants migrating south of RWMC. USGS-103, -105, and -108 will be used to monitor whether COPCs originating from INTEC leave the site. USGS-103 and -104 and perhaps USGS-107 may potentially be on a flow path to intercept nitrates migrating from the Central Facilities Area.

Data from USGS-001, -100, -103, and -110 will also be used to track agricultural-related contamination across the INL Site and to evaluate the possibility of the agriculture plume eventually commingling with other INL Site plumes.

Sampling will be conducted at Westbay Wells USGS-103, -105, -108, and -132. Ports to be sampled should be sufficient to capture the zones of interest. In USGS-132, only the water table port at 646.7 ft bgs will be sampled. This well will be sampled to monitor migration out of the RWMC area. Only the 646.7-ft-bgs interval in USGS-132 has shown consistent contamination from RWMC. Two intervals each from USGS-103, -105, and -108 will be sampled. The 681.9- and 1,269.4-ft-bgs sampling ports from USGS-103 will be sampled because the water level interval (681.9 ft bgs) might show influence from INL Site facilities, and tritium was detected at the 1,269.4-ft-bgs interval; this is probably contamination from the INTEC tritium plume. The two intervals to be sampled in USGS-105 are the water table interval and an interval that will be determined after USGS has sampled all intervals in the new Westbay well. The water table level was selected because the OU 10-08 packer sampling showed some evidence of migration from RWMC in the water table interval (DOE-ID 2007). Similarly, the two intervals to be sampled for USGS-108 are the water table port and an interval that will be determined after USGS has sampled all intervals at the new Westbay well. In addition to possibly showing impacts from INL Site facilities (DOE-ID 2008b), the water table intervals of USGS-103, -105, and -108 will be sampled because these intervals may be utilized by off-Site users. Intervals selected for sampling at USGS-105 and -108 will be agreed to by the Agencies before sampling is performed in FY 2011.

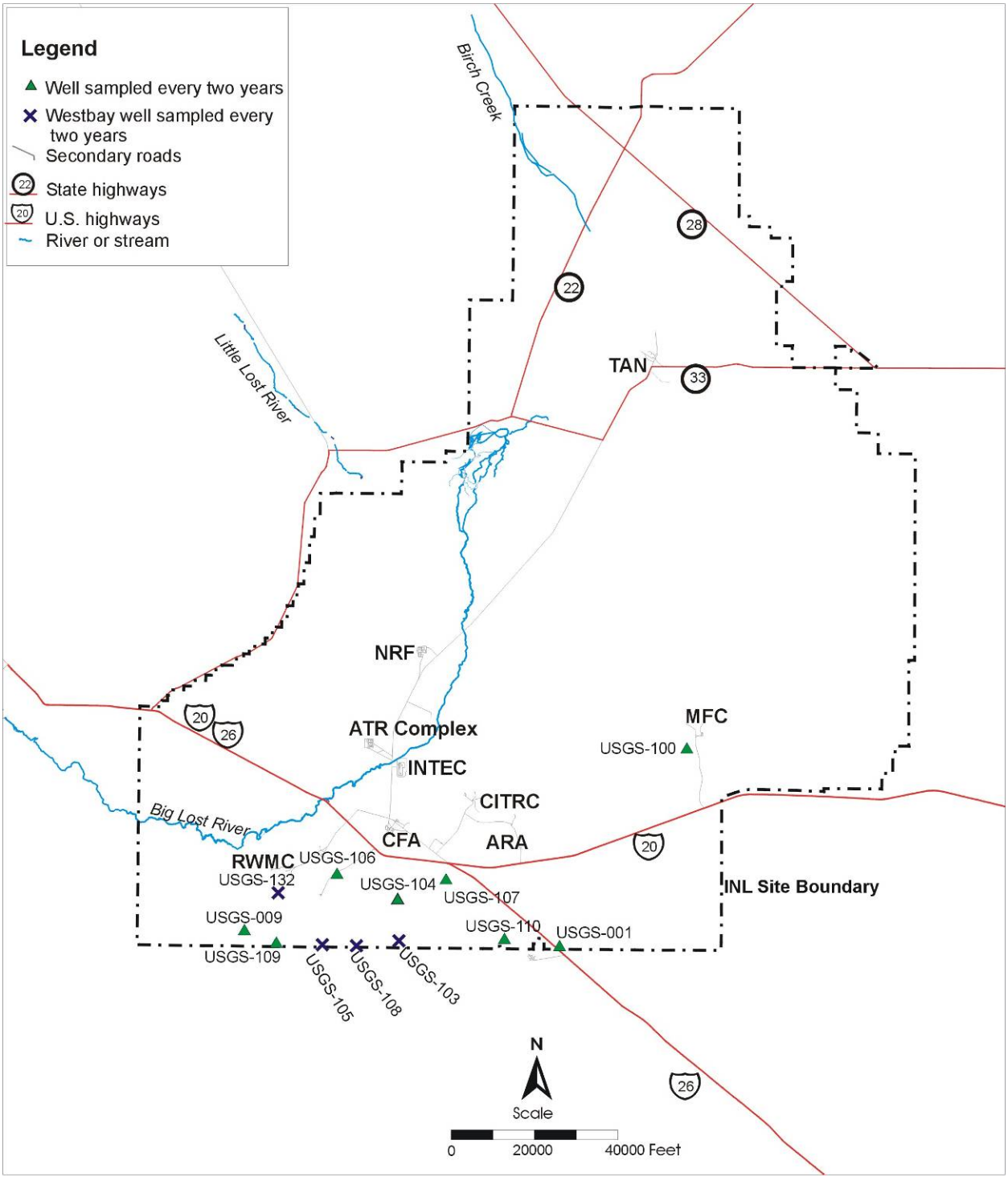

Figure 2. Locations and sampling frequency for wells to be sampled for Operable Unit 10-08 post-Record of Decision monitoring.

Table 2. Operable Unit 10-08 monitoring well information.

Well Identifier[a]	Well Name	Screened or Open Hole (ft bgs)	Pump Depth [b] (ft bgs)	Approximate Depth to Water [c] (ft bgs)
Monitoring wells				
450	USGS-001	600–630 perforated	612	588
458	USGS-009	620–650 perforated	635	607
558	USGS-109	600–800 open hole	656	621
559	USGS-110	580–780 open hole	612	566
549	USGS-100	662–750 open hole	703	686
553	USGS-104	550–700 open hole	592	555
555	USGS-106	605–760 open hole	609	584
556	USGS-107	270–690 open hole	531	477
Westbay wells				
552	USGS-103	Sampling port–681.9	NA	NA
552	USGS-103	Sampling port–1,269.4	NA	NA
2029	USGS-132	Sampling port–646.7	NA	NA
554	USGS-105	Sampling port–TBD	NA	NA
554	USGS-105	Sampling port–TBD	NA	NA
557	USGS-108	Sampling port–TBD	NA	NA
557	USGS-108	Sampling port–TBD	NA	NA

a. Well identifier is from the *Environmental Data Warehouse* (ICP 2010).
b. Depth to the top of the pump.
c. Measurement taken in October 2004.

NA not applicable
TBD to be determined

4.2 Analytes for Operable Unit 10-08 Post-Record of Decision Monitoring

The list of analytes for OU 10-08 monitoring is based on identified contaminants of concern in individual WAG RODs (DOE-ID 2007). Except for the sample from Well USGS-100, groundwater samples will be analyzed for metals, including uranium (filtered); anions (includes chloride, sulfate, bromide, and fluoride); nitrate/nitrite as nitrogen; VOCs (Contract Laboratory Program list); tritium; I-129; gross alpha; Tc-99; and Sr-90 (Table 3). USGS-100 will be sampled for metals, including uranium (filtered); anions (includes chloride, sulfate, bromide, and fluoride); nitrate/nitrite as nitrogen; and tritium. The VOC Contract Laboratory Program list is being analyzed because VOCs that are contaminants of concern at upgradient facilities (e.g., carbon tetrachloride, trichloroethene, and tetrachloroethene) are included in the Contract Laboratory Program VOC analysis. Table 3 shows detection limits for select analytes.

Table 3. Operable Unit 10-08 analytes and required quantitation levels.

Analysis	Wells to Be Sampled	Practical Quantitation Limit or Level Required
VOCs	All, except USGS-100	(at least half MCL)
Metals (Contract Laboratory Program metals plus uranium)	All wells	(at least half MCL)
Nitrate (as nitrogen)	All wells	0.5 mg/L
Chloride	All wells	0.5 mg/L
Fluoride	All wells	0.5 mg/L
Sulfate	All wells	1 mg/L
Gross alpha	All wells	2 pCi/L
I-129	All, except USGS-100	0.2 pCi/L
Sr-90	All, except USGS-100	0.5 pCi/L
Tc-99	All, except USGS-100	10 pCi/L
H-3	All, except USGS-100	400 pCi/L

MCL maximum contaminant level
VOC volatile organic compound

4.3 Schedule and Duration of Operable Unit 10-08 Sampling

OU 10-08 post-ROD groundwater monitoring is scheduled to be performed every other year, beginning in FY 2011, and continuing until the Agencies determine that monitoring may stop.

Criteria to be used to determine when monitoring may be stopped will include evaluation of plume dynamics and the potential for commingling plume concentrations to increase. Plumes from various facilities will be evaluated in the first 5-year review following the ROD (FY 2015), and recommendations will be made on future monitoring at that time.

4.4 Data Management

Analytical data that result from groundwater sampling will be managed and maintained by the Sample and Analysis Management group and the Environmental Data Warehouse. These data will be managed according to requirements specified in the *Data Management Plan for the Idaho National Engineering Laboratory Environmental Restoration Program* (INEL 1995). The ICP Electronic Document Management System is an internal document management system that will serve as a library of published documents (e.g., groundwater monitoring reports).

5. GROUNDWATER SAMPLING PROCEDURES AND EQUIPMENT

This section describes procedures and equipment to be used for routine OU 10-08 sampling and monitoring. A pre-sampling meeting will be held before any sampling activities commence to review requirements of this groundwater monitoring plan, any applicable company policies and procedures, and the latest revision of the Environmental Restoration Project Health and Safety Plan (PLN-2128) and to ensure that all supporting documentation has been completed. PLN-2128 governs all work that is performed by ICP personnel and ICP subcontractors or employees of other companies in support of OU 10-08. Figure 2 shows the wells to be sampled as part of OU 10-08 sampling.

5.1 Groundwater Elevations

Before purging, all groundwater elevations will be measured using either an electronic measuring tape or a steel tape measure, as described in the latest ICP standard operating procedure. Measurement of all water levels will be recorded to the nearest 0.01 ft. If monitoring wells are added that are not open to the atmosphere, then those wells will be opened to equilibrate to atmospheric pressure before water-level measurements are taken.

5.2 Well Purging

The Westbay wells will be sampled according to the manufacturer's recommendations, which usually do not include purging. Westbay wells will not be purged prior to sampling. Wells with pumps will follow the latest ICP procedure for purging. All wells that have sufficient water will be purged before sample collection. During the purging operation, a Hydrolab (or equivalent) will be used to measure specific conductance, pH, and temperature. Samples for water quality analysis can be collected after a minimum of one well-casing volume of water has been purged from the well and when three consecutive water-quality-parameter measurements are within the following limits:

- pH is ±0.2
- Temperature is ±0.5^{o}C
- Specific conductance is ±5% of value.

If pH, temperature, and specific conductance fail to stabilize within the above limits, purging will continue until three well-casing volumes of water have been purged from the well, at which point sampling will commence, regardless of stabilization. Some wells may provide yields inadequate to supply sufficient purge volume. In such cases, the well should be purged to dryness and sampled the next working day.

5.3 Groundwater Sampling

Wells will be purged, if required. Before sampling, all nondedicated sampling equipment that will come in contact with the water sample will be cleaned using the latest ICP procedure for decontamination of field sampling equipment. Groundwater samples will be collected in accordance with the latest ICP procedure for groundwater sampling. The Westbay systems will be sampled according to the latest ICP standard operating procedure for sampling those wells. After sampling, all nondedicated equipment that came in contact with the well water will be decontaminated before storage, before sampling different depths, and between different groundwater monitoring wells, in accordance with the latest ICP procedure.

Groundwater samples will be collected for the analytes listed in Table 3. Requirements for containers, preservation methods, sample volumes, holding times, and analytical methods will be included on field guidance forms prepared before the sampling event.

Except for vials containing volatile organic analytes that must be filled completely, sample bottles will be filled to 90 to 95% of capacity to allow for content expansion or preservation. Samples to be analyzed for metals will be filtered through a 0.45-µm filter in the field before acidification. Samples requiring acidification will be acidified to a pH < 2 in the field.

5.4 Personal Protective Equipment

Personal protective equipment (PPE) required for this sampling effort is discussed in PLN-2128. Before disposal, all PPE will be characterized for disposal or decontamination based on groundwater and field screening results. A hazardous waste determination for all PPE will be made using applicable company policies and procedures.

6. SAMPLE CONTROL

Strict sample control is required for any project. Sample control ensures that unique sample identifiers are used for separate samples. It also covers documentation of sample-collection information so that a sampling event can be reconstructed at a later date.

The ICP Sample and Analysis Management group will use a systematic character identification code to uniquely identify the samples. A sampling and analysis plan table and database will be generated for each sampling event to record pertinent information associated with each sample identification code (e.g., well designation, sample medium, and date). The Quality Assurance Project Plan (QAPjP) (DOE-ID [2009d], or subsequent revision) outlines requirements and procedures for sample handling, chain-of-custody, sample preservation, sample packaging, radiological screening of samples, and shipment of samples to the laboratory.

7. QUALITY ASSURANCE AND QUALITY CONTROL

This section details field elements of the QAPjP (DOE-ID 2009d) to support field operations during implementation of this field sampling plan. The QAPjP pertains to all environmental and radiological testing, analysis, and data review.

7.1 Project Quality Objectives

Quality assurance (QA) objectives specify measurements that must be met to produce acceptable data for a project. Technical and statistical qualities of those measurements must be properly documented. Precision, accuracy, and completeness are quantitative parameters that must be specified for physical and chemical measurements. Comparability and representativeness are qualitative parameters.

QA objectives for this project will be met through a combination of field and laboratory checks. Field checks will consist of collecting field duplicates, equipment blanks, and field blanks. Laboratory checks consist of initial and continuing calibration samples, laboratory control samples, matrix spikes, and matrix spike duplicates. Laboratory QA is detailed in the QAPjP and is beyond the scope of this plan.

7.1.1 Field Precision

Field precision is a measure of the variability not attributed to laboratory or analytical methods. The three types of field variability or heterogeneity are spatially within a data population, between individual samples, and within an individual sample. Although heterogeneity between and within samples can be evaluated using duplicate or sample splits, overall field precision will be calculated as the relative percent difference between two measurements or the relative standard deviation between three or more measurements. The relative percent difference or relative standard deviation will be calculated as indicated in the QAPjP for duplicate samples during the data validation process. Precision goals have been established for inorganic Contract Laboratory Program methods by EPA (EPA 1993) and for radiological analyses in applicable Sample and Analysis Management procedures.

Duplicate samples used to assess precision will be collected by field personnel at a minimum frequency of one duplicate for every 20 samples, with the location of QA and quality control (QC) samples being rotated between sampling events.

7.1.2 Field Accuracy

Cross contamination of the samples during collection or shipping could yield incorrect analytical results. To assess the occurrence of any cross contamination, equipment blanks and field blanks will be collected. The goal of the sampling program is to eliminate any cross contamination associated with sample collection or shipping. Analytical results for these samples will be evaluated during the data validation process by the sample delivery group. If necessary, the data will be blank-qualified to indicate the absence or presence of cross contamination.

Field personnel will collect field blanks, trip blanks (VOCs only), and rinsate and equipment blanks, if necessary, during the course of the project. The field blanks will be collected at a frequency of one every 20 samples or once for every sample day, whichever is less (DOE-ID 2009c). If activities that could contaminate the samples are identified during sampling, additional blank samples (e.g., rinsate and equipment blanks) can be collected at the discretion of the field team leader.

7.1.3 Representativeness

Representativeness is evaluated by assessing the accuracy and precision of the sampling program and expressing the degree to which samples represent actual site conditions. In essence, representativeness is a qualitative parameter that addresses whether the sampling program was properly designed to meet the DQOs identified in Section 3 of this plan. The representativeness criterion is best satisfied by confirming that a sufficient number of samples are collected to meet requirements stated in the DQOs.

7.1.4 Comparability

Comparability is a qualitative measure of the confidence with which one data set can be compared to another. These data sets include data generated by different laboratories performing this work, data generated by laboratories in previous studies, data generated by the same laboratory over a period of several years, or data obtained using differing sampling techniques or analytical protocols. For field aspects of this program, data comparability will be achieved using standard methods of sample collection and handling. Procedures identified to standardize sample collection and handling are included in applicable company policies and procedures.

7.1.5 Completeness

Completeness will be assessed by comparing the number of samples collected to the number of samples planned. Sampling completeness is affected by such factors as equipment and instrument malfunctions and insufficient sample recovery. Completeness can be assessed after data validation and reduction. The completeness goal for this project is 100%, but exceptions will be made for wells that are not accessible because of construction activities or access restrictions.

7.2 Data Validation

All laboratory-generated data will be validated to Level B; however, a Level A data package will be requested from the laboratory. Data will be validated in accordance with company procedures. Field-generated data (e.g., conductivity, temperature, dissolved oxygen, and pH) will not be validated.

7.3 Quality Assurance Objectives for Measurement

QA objectives are specifications that monitoring and sampling measurements identified in the QAPjP (DOE-ID 2009d) must meet to produce acceptable data for the project. The technical and statistical quality of these measurements must be properly documented. Precision, accuracy, method detection limits, and completeness must be specified for chemical measurements. QA objectives are specified in the QAPjP.

7.4 Sampling Quality Assurance and Quality Control

The QAPjP requires QA/QC samples from the SRPA samples. Laboratories on the ICP qualified suppliers list will be used to analyze all such samples. QA/QC samples will be collected at the frequency recommended in the QAPjP. QA/QC samples for groundwater sampling will include duplicates and could include rinsate samples. Duplicate samples will be collected at a frequency of 1 per 20 samples.

7.5 Performance Evaluation Samples

Performance evaluation samples may be sent to the laboratory(ies) during the sampling event. Performance evaluation samples might be spiked with a single analyte or multiple analytes. Performance evaluation samples will be collected in accordance with the QAPjP.

8. WASTE MANAGEMENT

The OU 10-08 Project, in coordination with Waste Generator Services personnel, will perform the waste determination and will determine disposal requirements.

Investigation-derived waste produced during sampling will include spent and unused sample material, PPE, miscellaneous sampling supplies, decontamination water, purge water, and samples. Before sampling begins, Waste Generator Services will provide a determination for the disposition of all waste, including purge water, based on a waste determination and disposition form. That form describes the required disposal option for purge water. Purge water from most wells to be sampled under this plan is anticipated to be eligible for release to the ground surface. The disposition of purge water will be on the specific Waste Determination and Disposal Form(s) for the project. Waste generated during sampling activities will be managed in a manner that complies with the established applicable or relevant and appropriate requirements, protects human health and the environment, and minimizes remediation waste to the extent possible. Comprehensive Environmental Response, Compensation, and Liability Act waste

will be managed in accordance with ICP waste management procedures and the waste management section of the OU 10-08 Remedial Design/Remedial Action Work Plan (DOE-ID 2010).

9. DOCUMENT MANAGEMENT

This section summarizes document management and sample control activities that will be performed during this project. Documentation includes chain-of-custody forms, sample container labels, and field logbooks used to record field data and sampling procedures. The analytical results from this field investigation will be documented in reports and used as input for refining current conditions for the computer model.

9.1 Documentation

The field team leader will be responsible for controlling and maintaining all field documents and records and for verifying that all required documents submitted to ICP Sample and Analysis Management are maintained in good condition. All entries will be made in indelible, black ink. Errors will be corrected by drawing a single line through the error and entering the correct information. All corrections will be initialed and dated by the person making the correction.

9.1.1 Sample Container Labels

Waterproof, gummed labels generated from the sampling and analysis database will display information such as the unique sample identification number, the name of the project, the sample location, and the analysis type. Labels will be completed and placed on the containers in the field before samples are collected. Sample team members will provide information needed to complete the label. Such information may include the date and time the sample was collected, the preservative used, field measurements of hazards, and the sampler's initials.

9.1.2 Field Guidance Form

Field guidance forms verifying unique sample numbers provided for each sample location can be generated from the sampling and analysis database. These forms contain the following information:

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

9.1.3 Field Logbooks

Field logbooks will be used to record information necessary to interpret the analytical data. The logbooks will be controlled and managed in accordance with company policies and procedures.

9.1.3.1 Field Team Leader Daily Logbook. A project logbook, maintained by the field team leader, will contain a daily summary of the following:

- All field team activities necessary to reconstruct events and methods used to accomplish the objectives of this field sampling plan
- Visitor log (a site visitor logbook can be assigned to record this information)
- List of site contacts
- Problems encountered
- Corrective actions taken as a result of field audits.

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

9.1.3.2 Sample Logbooks. Sample logbooks will be used by the sample team(s). Each sample logbook will contain information such as:

- Physical measurements (i.e., groundwater water level data and method of water level measurement; groundwater purge volumes, times, and rate of pumping prior to and while sampling groundwater; and the time and value measured for each field parameter prior to sample collection)
- Identification of quality control samples
- Sample information (i.e., sample location, sample collection information, analyses requested for each sample, and sample matrix)
- Shipping information (i.e., collection dates, shipping dates, cooler identification number, destination, chain-of-custody number, and name of shipper).

9.1.3.3 Field Instrument Calibration/Standardization Logbook. A logbook containing records of calibration data will be maintained for each piece of equipment that requires periodic calibration or standardization. This logbook will contain logsheets to record the date and time of calibration, the method of calibration, and the instrument identification number.

9.2 Document Revision Requests

Revision of this document may be needed to add or delete wells and analytes, depending on the results and interpretation of data collected under this plan or the results of groundwater monitoring by other WAGs or agencies. Revisions of this document will follow company policies and procedures. Final changes must be approved through the Agencies because this is a support FFA/CO document.

9.3 Reporting and Review

The OU 10-08 monitoring activities will be reported as set forth in the FFA/CO (DOE-ID 1991), the OU 10-08 ROD (DOE-ID 2009a), and this document. Quality-assured data collected during monitoring will be submitted to the Agencies no later than 120 days from the end of the sampling event. Any other data collected, which require no QA (e.g., groundwater elevations and field-measured parameters), will be submitted as part of the monitoring report associated with each sampling event.

The monitoring report for each sampling round will summarize the groundwater monitoring results. The report also will include conclusions and recommendations for WAG 10 groundwater monitoring. Table 4 contains the schedule for groundwater monitoring as well as the reporting and review schedule for OU 10-08 groundwater monitoring. The schedule will continue as shown in Table 4 until modified by the Agencies.

Table 4. Monitoring schedule for Operable Unit 10-08 groundwater.

Activity	Schedule
Groundwater sampling	FY 2011, and every 2 years thereafter
Data submission to Agencies	120 days after completion of groundwater sampling
Monitoring report	~4 months after data submission to Agencies
5-year review	FY 2015, FY 2020, and every 5 years thereafter

FY fiscal year

10. REFERENCES

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