

# **NOTICE**

**All drawings located at the end of the document.**

FINAL

SAMPLING AND ANALYSIS PLAN FOR  
OPERATION AND MAINTENANCE OF THE  
FIELD TREATABILITY UNIT FOR  
OPERABLE UNIT NO. 2

ROCKY FLATS PLANT

U.S. DEPARTMENT OF ENERGY  
FLATS PLANT  
GOLDEN, COLORADO

ENVIRONMENTAL RESORATION PROGRAM

JUNE 1993

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ROCKY FLATS PLANT  
Sampling and Analysis Plan for O&M  
of the Field Treatability Unit for OU 2

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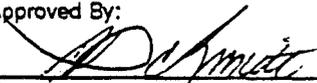
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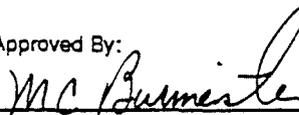


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## SAMPLING AND ANALYSIS PLAN

### 1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) describes the sampling and analysis activities for determining and monitoring the performance of the South Walnut Creek Basin Surface Water Interim Measure/Interim Remedial Action (IM/IRA) Field Treatability Unit at Operable Unit 2 (OU2).

The Field Treatability Unit Plot Plan in Figure 1-1 presents the location of the South Walnut Creek Basin Field Treatability Unit (FTU) and collection system. The FTU consists of catch basins to collect surface water and pump it to a 10,000 gallon Equalization tank, chemical precipitation units, a microfiltration system and granular activated carbon (GAC) units. A process flow diagram is shown in Figure 1-2.

Surface water collection systems CS-59, CS-61, and CS-132 serve to divert and transfer design flows from SW-59, SW-61 and SW-132, respectively. Surface water flows at each station in excess of the collection system design flows may be permitted to overflow the collection system and continue downstream along the pre-IM/IRA flow path. Each collection system includes a precast reinforced concrete catch basin with a stainless steel submersible pump.

Each pump is located inside a catch basin with operation controlled by a float switch. The raw water is pumped from the catch basins to a flow Equalization tank through double-wall polyethylene piping. The piping is wrapped with heat tape and insulation to protect against freezing during the winter months.

The Equalization tank has a capacity of 10,000 gallons and is fabricated of cross-linked polyethylene. Surface water influent levels in the tank are continuously monitored and displayed. Level indication includes low, high, and overflow visual and audible alarms at 5, 90, and 95 percent of tank capacity, respectively. At peak flow (60 GPM) the tank can provide nearly 3 hours of equalization time.

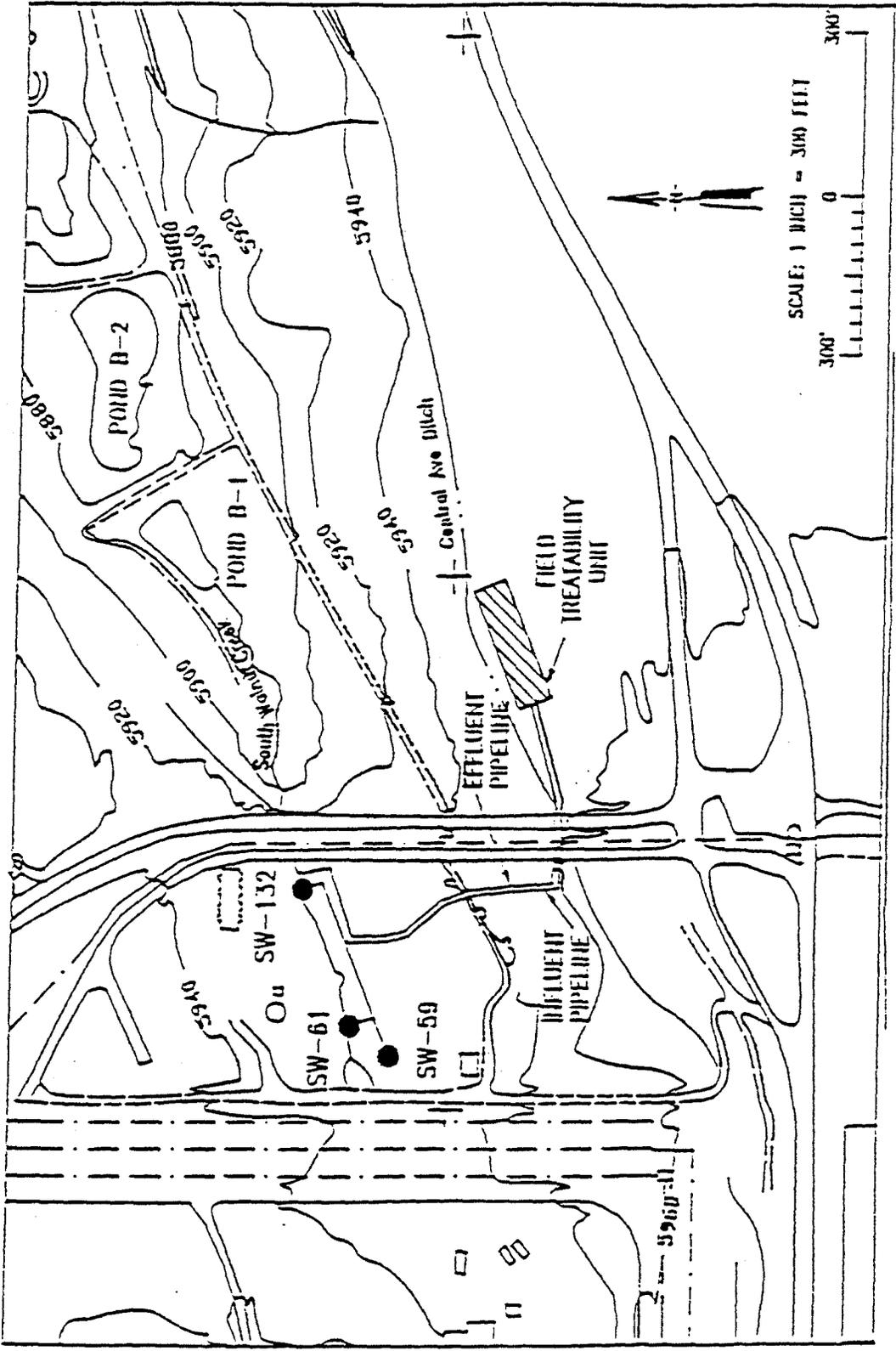


Figure 1-1 Field Treatability Unit Plot Plan

Water from the Equalization tank is pumped into Reaction Tank No. 1 and the pH is lowered to approximately 4.5 with sulfuric acid to avoid carbonate complexation of uranium and to neutralize total alkalinity. Ferric sulfate is then added as a coagulant and co-precipitating agent. Surface water overflows from Reaction Tank No. 1 to Reaction Tank No. 2 and lime is added to raise the pH above 9.5, which causes the precipitation of iron and dissolved heavy metals as metal hydroxides. Radionuclides and metals adsorb to the particulates and are entrained in the floc. Auxiliary chemicals such as biological inhibitors and coagulant aids may be added to enhance the overall effectiveness of the process.

The concentration and microfiltration system in Trailer No. 2 physically separates the floc formed in Reaction Tank No. 2. Surface water from Reaction Tank No. 2 gravity flows to the concentration tank (3,000 gallons), which is constructed of fiberglass reinforced plastic and is equipped with baffles, level controls and a recirculation pump. The process stream is pumped from the concentration tank to a microfiltration system. The membrane filter is a shell and tube configuration with a fluorocarbon polymer membrane (0.1 micron nominal rating) on the inside of the tubes. The permeate passes through the tubes perpendicular to the main flow at a relatively low operating pressure. Manifolds are provided to collect the filtrate and direct it by gravity to the neutralization tank.

Filtered solids are returned to the concentration tank. Solids in the concentration tank are periodically pumped to the solids holding tank in Trailer No. 1. Overflow from the solids holding tank is recycled to the concentration tank. The solids removal rate from the concentration tank is adjusted manually to maintain the desired solids concentration in the filtration modules.

A solids dewatering system is used to process the solids in the solids holding tank. This system includes an air operated slurry pump to transfer concentrated solids from the solids holding tank to the filter press. The filter press removes water from the solids and creates a filter cake that is 35 to 50 percent solids by weight. The filtrate produced by the filter press is recycled to the concentration tank. The filter cake is transferred into drums placed beneath the elevated filter press.

A neutralization system uses sulfuric acid to adjust the membrane filtrate pH to the conditions required for discharge or recycle. After neutralization, the process water is pumped through two carbon columns. Each carbon column is 60 inches in diameter and 87 inches high and contains 2000 pounds of carbon. The carbon columns are configured in series in Trailer No. 3. Each carbon column is 60 inches in diameter and 87 inches high. The GAC units are skid-mounted and are connected to the process piping via stainless steel, quick connect couplings.

Following carbon treatment, the water is continuously discharged to South Walnut Creek just downgradient of the surface water collection systems.

The objectives for sampling during system operation are to determine the treatment system's continuing ability to meet treatment goals and to confirm that the treated effluent meets the requirements for discharge.

Section 2.0 of the SAP describes the specific data quality objectives (DQOs) for the IM/IRA FTU for assessing the performance and continued operation of the treatment system. The following criteria will be used to determine which parameters will be sampled and analyzed:

- Contaminant which is difficult to remove;
- Contaminant which is an indicator of other parameters; or
- Contaminant which has the potential to exceed treatment goals as identified in previous testing.

Sections 3.0 and 4.0 describe appropriate sampling and analysis protocols and procedures for the before-and after-treatment concentrations of the contaminants of concern. Standard operating procedures (SOPs) are referenced, where available and applicable, for bias-free collection of data.

Section 4.0 references the appropriate SOPs for personnel protection, sampling equipment decontamination, proper containers and preservatives, sample identification, sample custody, and sample shipping.

## 2.0 DATA QUALITY OBJECTIVES AND SAMPLING STRATEGY

DQO statements describe the quality and quantity of data required for the IM/IRA systems operation and testing. The following three-stage process is necessary for developing DQOs:

- Stage 1—Identify decision types
- Stage 2—Identify data uses/needs
- Stage 3—Design a data collection program

Stage 1 has already been completed as part of *FINAL SURFACE WATER INTERIM MEASURES/INTERIM REMEDIAL ACTION PLAN/ENVIRONMENTAL ASSESSMENT AND DECISION DOCUMENT - SOUTH WALNUT CREEK BASIN - OPERABLE UNIT 2, DOE EA - 0496, 8 March 1991*. This SAP is based upon the *FINAL FIELD TREATABILITY STUDY FIELD SAMPLING PLAN, PHASE II - SOUTH WALNUT CREEK BASIN SURFACE WATER INTERIM MEASURES/INTERIM REMEDIAL ACTION - OPERABLE UNIT 2, DOE, 22 January 1993* and addresses Stages 2 and 3 of the DQO process and presents the best approach to fulfill the primary and secondary objectives of the systems testing. The three stages and the sampling strategy are addressed in the following subsections.

### 2.1 Stage 1—Identify Decision Types

The IM/IRA plan identifies the goals and objectives for the IM/IRA and the technical approach. The overall objective of the South Walnut Creek Basin Surface Water IM/IRA program is surface water collection from the portion of the South Walnut Creek Basin located between the east perimeter of the Protected Area (PA) and the Rocky Flats Plant security fence. The objective of IM/IRA systems operation is to meet the treatment goals defined in the *Final Surface Water Interim Measures/Interim Remedial Action Plan/Environmental Assessment and Decision Document*.

## 2.2 Stage 2--Identify Data Uses/Needs

The specific elements addressed in Stage 2, which are consistent with the *Data Quality Objectives for Remedial Response Activities* (U.S. Environmental Protection Agency [EPA, 1987]) include the following:

- Data uses
- Data types
- Data quality needs
- Data quantity needs
- Sampling/analysis options
- Precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters

Stage 2 of the DQO process defines data uses and specifies the data types needed to meet the project objectives.

### 2.2.1 Data Uses

The data use for the IM/IRA FTU systems operation includes determining the treatment system's continuing ability to meet treatment goals and determining appropriate disposal options for waste generated by the Field Treatability Unit.

Table 2-1 describes the data needs during the longer term systems operation.

### 2.2.2 Data Types

The IM/IRA system will generate analytical data as well as operating data. The analytical data will include the following:

#### Aqueous Process Samples

- Volatile organic parameters in the equalization tank influent, effluent from the neutralization tank, and effluent from the lead and polishing GAC units.
- Selected radionuclides in the equalization tank influent and effluent, neutralization tank effluent, and effluent from the polishing GAC unit.
- Metals in the equalization tank influent and effluent, neutralization tank effluent, and effluent from the polishing GAC unit.

TABLE 2-1

DATA NEEDS TO FULFILL SPECIFIC OBJECTIVES FOR FIELD TREATABILITY  
UNIT SYSTEMS OPERATION

Influent Equalization Tank - Sample Point RS1

**Data Need:** Monitor the effectiveness of IM/IRA for removing organic, inorganic and radioactive contaminants to treatment goals.

**Activity:** Operate IM/IRA field treatability unit continuously as surface water flow requires for up to 24 hours per day. Feed the surface water to the chemical pretreatment, microfiltration and GAC units under optimized conditions. Collect periodic, representative samples of the three surface weirs which provide influent flow to the Equalization Tank on a weekly basis.

**EPA Analytical Levels:** Volatile organics--Level IV.  
Metals--Level IV.  
Radionuclides--Level III.

**Data Use:** Establish influent concentrations for all analytes. Use this data with the IM/IRA effluent data to determine performance in meeting treatment goals, and to determine the long-term impact of influent variability on treatment goals.

Equalization Tank Effluent - Sample Point RS2

**Data Need:** Monitor the concentrations of metals and radionuclides in the Equalization Tank effluent prior to treatment in the chemical pretreatment and microfiltration portions of the field treatability unit.

**Activity:** Collect periodic, representative samples of the effluent from the Equalization Tank on a monthly basis.

**EPA Analytical Levels:** Radionuclides--Level III  
Metals--Level IV  
Turbidity--Level II

**Data Use:** Establish treatability unit influent concentrations for all analytes. Use this data with the IM/IRA effluent data to determine performance in meeting treatment goals.

TABLE 2-1 (Continued)

**Neutralization Tank Effluent - Sample Point RS5**

**Data Need:** Monitor the effectiveness of the chemical precipitation and microfiltration system for removal of metals and radionuclides.

**Activity:** Collect periodic, representative samples of the effluent from the Neutralization Tank on a weekly basis.

**EPA Analytical Levels:** Volatile Organics-Level IV  
Metals-Level IV  
Radionuclides-Level III  
Turbidity-Level II  
pH-Level II

**Data Use:** Establish chemical precipitation and microfiltration system effluent concentrations for all analytes. Use this data to determine performance in meeting treatment goals.

**Lead GAC Unit Effluent - Sample Point RS6**

**Data Need:** Monitor the effectiveness of the lead GAC unit for removal of volatile organics.

**Activity:** Collect periodic, representative samples of the lead GAC unit effluent on a weekly basis.

**EPA Analytical Levels:** Volatile Organics-Level IV

**Data Use:** Establish performance of the lead GAC unit for removal of volatile organics and determine volume throughput in relation to influent concentrations of volatile organics.

TABLE 2-1 (Continued)

**Polishing GAC Unit Effluent - Sample Point RS7**

- Data Need:** Monitor the effectiveness of the treatability unit for removal of all analytes.
- Activity:** Collect periodic, representative samples of the polishing GAC unit effluent on a semi-weekly basis.
- EPA Analytical Levels:** Volatile Organics-Level IV  
Metals-Level IV  
Radionuclides-Level III
- Data Use:** Establish the performance of the treatability unit for removal of all analytes. Use this data with the system influent data to determine performance in meeting treatment goals and to determine the impact of influent variability on treatment goals.

**Filter Press Solids Cake - Sample Point RS8**

- Data Need:** Monitor the filter press solids cake for radioactive and hazardous constituents for future disposal.
- Activity:** Collect a representative sample of the filter press solids cake during packaging activities.
- EPA Analytical Levels:** TCLP Volatile organics-Level IV.  
TCLP Metals-Level IV.  
Radionuclides and uranium-Level III.
- Data Use:** Determine concentrations of radioactive and hazardous constituents in filter press cake for storage and disposal.

TABLE 2-1 (Continued)

**Spent GAC (Lead Unit) - Sample Point RS9**

- Data Need:** Determine the background inorganic and radioactivity levels in virgin GAC prior to use in the treatability unit and determine final levels of organic, inorganic and radioactive constituents after use.
- Activity:** Collect samples of carbon for analysis of background radioactivity and metals levels prior to placing unit in service. After use, obtain sample of carbon from sidestream canister for analysis of inorganic, organic and radioactive constituents.
- EPA Analytical Levels:** Radionuclides-Level III  
TCLP Volatile Organics-Level IV  
TCLP Metals-Level IV
- Data Use:** Determine concentrations of radioactive and hazardous constituents in the GAC for regeneration, treatment and disposal.

**Spent Cleaning Tank Solution - Sample Point RS10**

- Data Need:** Determine the inorganic and radionuclide concentrations in spent cleaning solutions.
- Activity:** Collect representative samples of cleaning solutions after use for cleaning the microfiltration membranes.
- EPA Analytical Levels:** Radionuclides-Level III  
Metals-Level IV
- Data Use:** Determine concentrations of all analytes in spent cleaning solutions to determine appropriate treatment and disposal methods.

TABLE 2-1 (Continued)

Spent Flush Tank Solution - Sample Point RS11

**Data Need:** Determine the inorganic and radionuclide concentrations in spent flush solutions.

**Activity:** Collect representative samples of flushing solutions after use for cleaning the microfiltration membranes.

**EPA Analytical Levels:** Radionuclides-Level III  
Metals-Level IV

**Data Use:** Determine concentrations of all analytes in spent flushing solutions to determine appropriate treatment and disposal methods.

Equalization Tank Vapor-Phase GAC - Sample Point RS12

**Data Need:** Determine the organic and inorganic concentration in vapor phase GAC.

**Activity:** Obtain a sample of vapor-phase GAC from the Equalization Tank vent.

**EPA Analytical Levels:** TCLP Metals-Level IV  
TCLP Volatile Organics-Level IV

**Data Use:** Determine concentrations of all analytes to determine appropriate disposition options.

### Solids Samples

- Filter press solids will be tested for metals, volatile organics and selected radionuclides.
- The GAC sidestream canisters and samples from the parent GAC unit will be tested for metals, volatile organics and selected radionuclides. Virgin GAC units will be tested for metals and radionuclides to establish baseline natural radioactivity levels. Breakthrough of the vapor phase GAC for the Equalization Tank will be monitored for by use of a HNu on a weekly basis.

The operating data will be used during data evaluation to determine the impact of the operating parameters on performance and the treatment goals.

### 2.2.3 Data Quality

The EPA defines five levels of analytical data (EPA, 1987 modified) associated with data quality for treatability studies. These analytical levels are defined as follows:

- **Level I** – Field screening or analysis with portable instruments. This level provides an indication of contamination presence and has few quality assurance/quality control (QA/QC) requirements.
- **Level II** – Field analyses with more sophisticated portable instruments or mobile laboratory. The data quality associated with this level depends on the QA/QC steps used. Data concentrations are usually reported in concentration ranges.
- **Level III** – Organics and inorganics are analyzed in an offsite analytical laboratory that may or may not involve contract laboratory program (CLP) procedures. The detection limits will be similar to those specified by the CLP. Level III requires rigorous QA/QC.

- **Level IV** – Analyses encompass the organic and inorganic parameters by sophisticated laboratory instrumentation such as gas chromatography/mass spectroscopy (GC/MS), atomic absorption (AA), and inductively coupled plasma (ICP). Detection limits reach the low  $\mu\text{g/L}$  level. This analytical level also provides tentative identification of non-Hazardous Substance List parameters. Data require validation to evaluate compliance with rigorous QA/QC requirements. Level IV procedures are appropriate to develop data of known quality.
- **Level V** – Analyses using nonstandard analytical methods. Method development or method modification may be required for specific constituents or detection limits.

Table 2-1 specifies the appropriate analytical levels for data needs and data uses. Section 3.0 of this plan describes the quantity needs, the rationale for sampling frequency, and appropriate analytical methods for evaluating and operating the IM/IRA systems.

#### **2.2.4 Sampling and Analysis Options**

Data collection activities herein are designed to afford maximum data use. The sampling and analysis approach for the IM/IRA systems operation and evaluation is based on guidelines provided in the IM/IRA Decision Document previously referenced. If an evaluation of the systems testing results indicates that additional analyses or sampling are necessary, the sampling and analysis program will be modified to avoid performing additional, redundant studies. The sampling and analysis options are described in more detail later in this subsection.

#### **2.2.5 Precision, Accuracy, Representativeness, Completeness, Comparability Parameter Information**

PARCC parameters indicate data quality. Section 3.0 of this plan describes the analytical requirements for the IM/IRA systems operations phase. The analytical program specifies using EPA-approved

methods, such as the CLP methods where applicable, since these methods and associated QA/QC protocols are generally considered industry standards for producing accurate and precise data.

In addition, analytical methods referenced in the EG&G Rocky Flats General Radiochemistry and Routine Analytical Services Protocol (GRRASP) (DOE, 1990) are specified for selected analytes. These CLP and GRRASP analytical methods are appropriate for meeting the data quality requirements for levels II through V DQOs. The precision, accuracy, and completeness parameters for analytical levels II through V are discussed below along with the comparability and representativeness for all analytical levels. The DQOs specified for the precision, accuracy, and completeness will be used in evaluating the quality and useability of the laboratory data.

Precision and accuracy objectives for the IM/IRA systems operation data will be evaluated on the basis of the control limits specified in the referenced analytical method and/or in data validation guidelines. For the radionuclide analyses, the accuracy objectives specified in the GRRASP methods and data evaluation protocols will be followed.

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that emphasizes the proper design of the sampling program. The rationale for the sample program to provide for representative samples is provided in Sections 3.0 and 4.0.

A completeness goal of 90 percent is expected for the IM/IRA; that is, for each sample taken and analysis performed during the IM/IRA systems operation, the usable data points will be at least 90 percent of the theoretical amount of data points.

Comparability is a qualitative parameter that expresses the confidence with which one data set can be compared with another. To achieve comparability, work performed as part of the systems operation will follow the approved SAP, use standardized analytical protocols, collect data following Environmental

Management Department Operating Procedures 5-21000-OPS-FO.13, Containerization, Preserving, Handling and Shipping of Soil and Water Samples and 5-21000-OPS-SW.07, Collection of Tapwater Samples and report data in consistent units of measurement.

### 2.3 Stage 3--Design Data Collection Program

The Stage 3 DQO process is consistent with *Data Quality Objectives for Remedial Response Activities* (EPA, 1987) and includes discussions of the following elements:

- Data collection components
- SAP

To enhance this discussion, the elements identified in Stages 1 and 2 were assembled in Section 3.0. A detailed discussion of all samples to be collected, including sample type, frequency of sampling, number of samples, analytical methods, and QA/QC samples, is presented in that section.

## 3.0 SAMPLING STRATEGY

This section presents information concerning sample locations and frequency, analytical methods, and field QC procedures for each sample.

### 3.1 Sampling Locations and Frequency

Provisions are made for sample collection at specific points in the treatment system to evaluate process effectiveness. Sampling points are shown on the process flow diagram (Figure 1-2). A Sampling Summary is contained in Table 3-1. The placement of sampling locations allows each treatment unit to be isolated if evaluation of individual unit functioning is required.

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The primary DQO is to determine the overall system's performance, with a secondary objective of assessing the effectiveness of each system component in meeting treatment goals. Each sample point in the system has a sample port for water collection, and the filter solids are sampled as they are removed from the filter press and are placed in drums.

A weekly 24 hour composite sample for radionuclides and inorganics is taken at RS1 - Equalization tank influent, by taking samples from both SW59, and SW61/SW132 sumps into one set of sample containers. A weekly grab sample for organics is also taken at RS1. RS5 - Neutralization tank effluent is sampled weekly as a 24 hour composite. RS6 - Lead GAC unit effluent is sampled as a weekly grab sample. RS2 - Equalization Tank effluent is sampled as a monthly grab sample. RS7 - Polishing GAC unit effluent is sampled semi-weekly as a 24 hour composite for radionuclides and inorganics and as a grab sample for organics.

TABLE 3-1  
 SAMPLING SUMMARY FOR FIELD TREATABILITY  
 UNIT SYSTEMS OPERATION

Sample Point	Sampling Location	Sampling Frequency	Analytical Suites
RS1	Influent to the Equalization Tank	One composite sample per week	Metals, radio-nuclides <sup>1</sup>
RS1	Influent to the Equalization Tank	One grab sample per week	VOC, acetone
RS2	Effluent from the Equalization Tank	One grab sample per month	Metals, radio-nuclides <sup>1</sup>
RS5	Effluent from the Neutralization Tank	One composite sample per week	Metals, radio-nuclides <sup>1</sup> ,
RS5	Effluent from the Neutralization Tank	One grab sample per week	VOC, acetone
RS6	Effluent from the lead GAC Unit	One grab sample per week	VOC, acetone
RS7	Effluent from the GAC polishing unit	Two composite samples per week	Metals, radio-nuclides <sup>1</sup> ,
RS7	Effluent from the GAC polishing unit	Two grab samples per week (in conjunction with composite sampling)	VOC, acetone
RS8	Solids cake from filter press	One composite sample per two drums as generated	TCLP VOC, TCLP Metals, radio-nuclides <sup>2</sup>
RS9	Spent GAC from lead unit	One sample per lead unit as removed from service	TCLP VOC, TCLP Metals, radio-nuclides <sup>2</sup>

TABLE 3-1 (continued)

Sample Point	Sampling Location	Sampling Frequency	Analytical Suites
RS9	Virgin GAC from unit	One sample per unit prior to placing in service	Metals, radio-nuclides <sup>2</sup>
RS10	Spent cleaning tank solution	One grab sample after use prior to disposal	Metals, radio-nuclides <sup>1</sup>
RS11	Spent flushing tank solution	One grab sample after use prior to disposal	Metals, radio-nuclides <sup>1</sup>
RS12	Equalization Tank vapor-phase GAC	One grab sample prior to disposal	TCLP VOC, TCLP metals

Notes: <sup>1</sup> Radionuclides include gross alpha and beta activities, Pu 239 and 240, Am 241, U 233/234, 235, and 238, dissolved gross alpha and beta activities, and dissolved U 233/234, 235, and 238.

<sup>2</sup> Radionuclides include gross alpha and beta activities, Pu 239 and 240, Am 241, U 233/234, 235, and 238.

sample. Each of these locations is sampled from a sample port with a control valve and tygon tubing.

Sampling frequency for the filter press cake is a function of several variables, including surface water influent flow rate and suspended solids concentration, and chemical addition rates. Heavy precipitation generally increases flow rates, TSS, and chemical addition, requiring the press to be run more frequently than normal. Two drums of filter cake are normally produced at the same time with a composite sample taken. The lead carbon unit is replaced after breakthrough of organic compounds based upon sampling results obtained from RS6.

### 3.2 Analytical Methods

Table 3-2 summarizes the analytical suites, analytical methods, detection limits, and DQO levels for the contaminants of concern for the IM/IRA field treatability unit operation. EPA's CLP protocols are considered Level IV analytical methods. The CLP methods are based on *TEST METHODS FOR EVALUATING SOLID WASTE, EPA SW-846, November, 1986* methods for analyzing wastewaters and solid wastes. Radionuclides are not routinely analyzed by most environmental laboratories; however, the analytical methods have been either developed or reviewed and approved by EPA.

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TABLE 3-2  
ANALYTICAL METHODS AND DETECTION LIMITS

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Parameter	EPA Method	Detection Limit (µg/l)
Volatile Organics	SW846/8240	5-10
Metals	SW846/6010/7000	0.2-5000
Gross Alpha	EPA 900	2 pCi/L
Gross Beta	EPA 900	4 pCi/L
Plutonium 239+240	EMSL-LV-0539-17	0.01 pCi/L
Uranium	EPA 908.0	0.6 pCi/L

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Note: Only the ranges of detection limits are presented for volatile organics and metals. Refer to the analytical methods in SW-846 for detection limits for individual parameters.

The methods proposed for the IM/IRA sample analyses are those recommended by EPA and are deemed consistent with the DQOs. In addition, the EG&G Rocky Flats GRRASP analytical and specific QA/QC requirements will be used.

The analytical accuracy and precision goals are presented in the respective methods. These criteria include surrogate recoveries, matrix spike recoveries, matrix spike duplicate or laboratory duplicate precision, calibration linearity, laboratory control sample analyses, etc. Refer to the CLP protocols, the analytical methods, and GRRASP for an exact description of the QA/QC measures and acceptance ranges.

### 3.3 Field Quality Control

Field QC samples will be included to assure the accuracy and precision of the sampling and decontamination procedures. The QC samples and frequencies outlined below will be used; however, a more accelerated schedule for the type and frequency of field QC samples may be used by the EG&G IM/IRA Field Treatability Unit Project Manager, depending on testing and operations schedules.

- Field Duplicates—one per 20
- Field Preservation Blanks (radionuclides and metals only)
  - One per 20
- Trip Blank (Volatile Organics only)—one per 20
- Equipment Rinseate Blank—not applicable

#### 4.0 SAMPLING PROCEDURES

This section discusses the methods for collecting samples during IM/IRA operation. Sampling will be conducted in accordance with the following procedures:

- EMD Operating Procedure 5-21000-OPS-FO.13, Containerization, Preserving, Handling and Shipping of Soil and Water Samples.
- EMD Operating Procedure 5-21000-OPS-SW.1, Surface Water Data Collection Activities.
- EMD Operating Procedure 5-21000-OPS-SW.07, Collection of Tapwater Samples.
- EMD Operating Procedure 5-21000-OPS-SW.9, Industrial Effluent Discharge Sampling.

The samples will be collected in accordance with the referenced procedures and the Operations and Maintenance Manual (O&M Manual) of the Field Treatability Unit. The amount of sample required for analyses is given in Section 3.0 and is based on the minimum quantity of the liquid needed to perform the required analyses. Sampling, handling, and shipping will be performed by the operations personnel. The operators will collect the samples from the treatment system and will be responsible for properly storing, packaging, and shipping the samples to the analytical laboratory as directed by the EG&G Project Manager. Sample packaging and shipping must be in accordance with the RFP SOPs and Department of Transportation (DOT) regulations. The operators and/or EG&G personnel will also schedule and coordinate with the analytical laboratory.

Each time samples are collected, the following preliminary steps are followed:

1. Establish a sample number for each suite of samples to be collected.
  - Example--RS1: Rad Screen, volatile organic analysis (VOA), metals, and radionuclides, equals one suite.
  - Example--RS6: VOA equals one suite.

Make sure to have one unique sample no./sample port/suite/sample event (FT2XXXXRG). (Refer to previous logs or contact EG&G to obtain new sample number.)

2. Identify the required analyses (suite) for each port.
3. Determine to which laboratory samples are to be shipped. Verify laboratory destination with the EG&G laboratory coordinator before collecting samples, and determine the shipping/handling requirements for that destination.
4. Prepare the sample log as much in advance as possible (sample number, parameters, sample point, persons doing sampling, date, etc.; see example).
5. Obtain a clean ice chest(s) and sample bottles. Place the bottles in the ice chest(s) with the necessary preservation for each type of analysis. Discard any bottles that appear to be dirty. Samples that need to be chilled should be properly transferred to a refrigerator for storage before they are shipped. Table 4-1 shows the bottles and preservation required for each sample.

TABLE 4-1  
BOTTLE AND PRESERVATION REQUIREMENTS FOR WATER ANALYSES

Analysis	Bottle	Preservative <sup>a</sup>
Rad Screen	100 or 125 ml/poly	Unpreserved
VOA	2 x 40 ml/amber glass	4°C
Unfiltered/Filtered metals	Liter/poly	4°C/H <sub>2</sub> NO <sup>3</sup> 5 ml
Unfiltered/Filtered gross $\alpha/\beta$ , uranium, Sr 90	Gallon/poly	HNO <sub>3</sub> 10 ml
Plutonium 239 + 240	Gallon/poly	HNO <sub>3</sub> 10 ml

<sup>a</sup> All samples preserved with acid must be checked for pH; they must be below 2 pH for proper preservation.

6. Prepare sample labels as much in advance as possible (sampler's ID, date, number containers, analysis, etc.). Do not place the labels on the bottles until after each sample is collected. However, the bottle should be marked with an indelible marker with appropriate information (e.g., filtered or unfiltered) to avoid any confusion with other sample containers.
7. All onsite personnel follow the Health and Safety Plan (HSP) for South Walnut Creek Basin Surface Water Interim Measure/Interim Remedial Action (IM/IRA) treatment system at Operable Unit 2 (OU2). As such, all operators have received site-specific safety training and are familiar with the HSP.
8. Obtain and use personal protective equipment in accordance with the site-specific HSP.
9. Set up a bucket under the sample port with sufficient capacity to contain purge water. Poly sheeting may also be needed to contain splash. Clean up any overspray or washdown.
10. Purge the line prior to sampling.
11. It is important to maintain the sample collection log concurrently with the sampling sequence. Document the information as soon as possible after taking readings.

*After completing the preliminary steps, sampling can be initiated as desired. The field treatability unit should operate for at least 2 hours before sampling, to insure that the sample is representative of the process conditions.*

**IMPORTANT** – When collecting samples, do not touch the water as it enters the bottle and do not touch the inside of the bottle or cap. If any of these occur, discard the bottle, obtain a new one, and collect a new sample. Sampling will be conducted as follows:

1. **Rad Screen, 100 to 125 ml poly bottle** - Fill Rad Screen bottles to the shoulder before capping. Apply label and custody tape, and document the sample collection log. Also, apply clear tape over the label. Place custody tape across the top, down along the sides, and across the gap between the bottle and cap. Place the sample in a plastic bag and store the sample in a pre-cooled ice chest or refrigerator.
  
2. **VOA, 2 x 40 ml, amber glass vials** – Open the vial just before filling. Do not sample downwind (within 50 feet) of exhaust fumes, open containers of paints, solvents, etc. Take the sample as close to the sample port as possible. Open the port slowly, allowing water to free fall from the sample port (not under pressure) in a pencil-size stream. Start filling the vial by tipping slightly to allow water to run down the inside surface, creating as little turbulence as possible. Straighten the vial as water reaches the shoulder of the vial. This will help force out trapped bubbles from under the shoulder. Continue filling until a meniscus is formed at the top of the vial. Check the vial for trapped bubbles before capping. If bubbles exist, gently tap the side of the vial to dislodge them. Once bubbles are gone, carefully place the cap on the vial and tighten. Turn the vial upside down and tap against palm of other hand to prompt any trapped bubbles to rise. If bubbles are detected, properly dispose of the vial and repeat the process with a new vial. If no bubbles are detected, fill a second and third vial using the same procedures. Apply label and custody tape across the gap between cap and bottle. Document in the sample collection log, place samples in a plastic bag, and then place them in an ice chest or refrigerator as soon as possible.
  
3. **Metals, 1liter, poly** – Fill the bottle to its shoulder, place the cap on the bottle, and shake. Remove the cap and pour a small amount of the sample into a bucket across a pH strip to check pH. The pH must be below 2, or more acid will need to be added until the pH is below 2. If the pH is below 2, replace the cap. Apply label and custody tape across the top of the bottle, down the sides of the bottle, and across the gap between the cap and bottle. Place the sample bottle in a plastic bag and then in an ice chest. Document the sample on the sample collection log.

4. **Unfiltered Gross  $\alpha/\beta$ , Uranium, Sr<sup>90-90</sup>, gal, poly** – Place the cap on the bottle and shake. Remove the cap and pour a small amount of the sample into a bucket across a pH strip to check pH. The pH must be below 2, or more acid will need to be added until the pH is below 2. If the pH is below 2, replace the cap. Apply label and custody tape across the gap between the cap and bottle, document the sample collection log, place the sample in a plastic bag, and place in an ice chest or refrigerator as soon as possible.
  
5. **Unfiltered Plutonium gal/poly** – Fill and check pH the same as for Gross  $\alpha/\beta$ .

Once samples are collected and properly stored, transfer the data from the sample collection log to the chain of custody (COC) form. Make sure the names of all samplers are on the form. Keep the COC until both the COC and samples are relinquished for shipping. Remember to sign in the *Relinquished By* section of the COC.

Dispose of purge water through the treatment system (TK-8). Dispose of plastic sheeting in a properly labeled drum. Clean up and dispose of any spillage. Remove and dispose of gloves.

As soon as sampling is complete, the samples must be properly packaged and stored until they are shipped.

Store general chemistry samples (VOC, metals) in plastic bags and refrigerate at 4°C until shipped.

Rad Screen samples do not have to be refrigerated but do need to be stored in a cool, dry area out of the way.

Radiochemistry samples do not need to be refrigerated but do need to be kept in a cool, dry area, preferably in the ice chest used during sampling. Samples should be kept in an out of the way area where cross contamination will not occur. Store the samples until results come back from the Rad screen sample.

#### 4.1 Sample Shipment

Samples must also be properly packaged for shipment to a laboratory.

Ice chests, vermiculite, plastic bags, strapping tape, custody tape, address labels, Federal Express airbills, and blue ice are needed for packaging general chemistry samples. Start with a clean ice chest that has been Rad smeared *non-detectable*. Add 3/4- to 1-inch vermiculite to the bottom of ice chest before placing ice or samples inside. Place enough ice in the ice chest to keep samples cold for 24 hours; samples need to be in plastic bags and placed in the ice chest. Make sure that the data on each sample label corresponds with the COC information. Allow ample room around samples for vermiculite packing.

*If all the samples on the COC will not fit in one ice chest, set up another. The COC will then either have to be photocopied and the copy included in the second ice chest with the original COC included in the first, or the COC will need to be redone to reflect the contents of each ice chest. Once samples and ice are in place, fill voids around and above samples with vermiculite, leaving enough head space for the COC or the copy of the COC (placed in a plastic bag). Do not forget, when enclosing the COC, to sign the *Relinquished By* section of the COC, noting the airbill number on the form. Once the COC or its copy is in place, close the lid and secure with strapping tape around the outside of the ice chest across the gap between the lid and the main body. Apply custody tape across the opening and then apply the address. Cover the address label with clear tape. Complete a Federal Express airbill and deliver to the nearest Federal Express office.*

Radiochemistry samples are packaged and handled like general chemistry samples except they do not need to be refrigerated.

Maximum sample hold times prior to shipping are 7 days for VOC, 28 days for total metals and 180 days for radiological samples.

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EG&G ROCKY FLATS PLANT  
Sampling and Analysis Plan for O&M of the  
Field Treatability Unit for OU 2

Manual: RFP/ER-WP-OU2.4

Section: 1

Revision: 0

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Organization: Environmental Management

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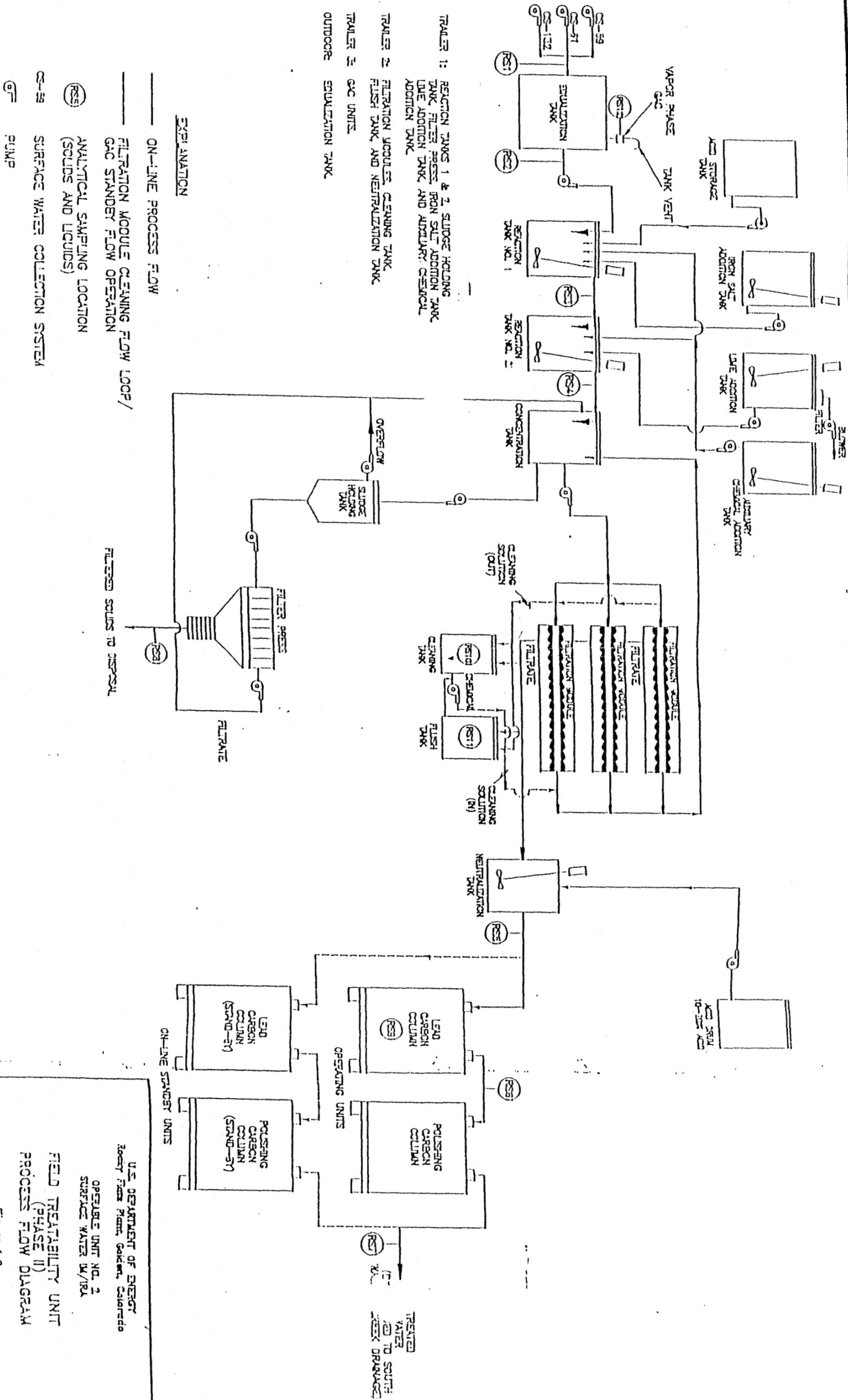
Procedures for obtaining sample containers, ice chests, and shipping samples to laboratories vary according to the selected laboratory destination. Refer to the O&M Manual for specific laboratory shipping instructions.

#### 4.1.1 Department/Office Contact List

EG&G Rocky Flats or its designee is responsible for obtaining the appropriate documentation for RAD screening and monitoring of all field samples for shipment offsite.

The following department will need to be contacted before sample shipment.

- **EG&G Sample Management Department**—To confirm the laboratory destination.



U.S. DEPARTMENT OF ENERGY  
 Energy Field Plant, Concord, California  
 OPERABLE UNIT NO. 2  
 SURFACE WATER W/IRDA  
 FIELD TREATABILITY UNIT  
 (PHASE II)  
 PROCESS FLOW DIAGRAM  
 Figure 1-2