Rocky Flats Environmental Technology

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Integrated Monitoring Plan FY2003

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ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

INTEGRATED MONITORING PLAN FY 2003

SUMMARY DOCUMENT

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ACRONYMS AND ABBREVIATIONS

ALF	Action Levels and Standards Framework
AoI	Analyte of Interest
AQM	Air Quality Management
BDCWA	Big Dry Creek Watershed Association
BMP	Best Management Practice
CAA	Clean Air Act
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
D&D	Decontamination and Decommissioning
DOE	Department of Energy
DRCOG	Denver Regional Council of Governments
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
FY	Fiscal Year
IMP	*Integrated Monitoring Plan*
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
POC	Point of Compliance
POE	Point of Evaluation
QA/QC	Quality Assurance/Quality Control
RAAMP	Radioactive Ambient Air Monitoring Program
RCRA	Resource Conservation and Recovery Act
RFCA	*Rocky Flats Cleanup Agreement*
RFETS	Rocky Flats Environmental Technology Site
Site	Rocky Flats Environmental Technology Site
T&E	Threatened and Endangered (Species)
TSS	Total Suspended Solids
WARP	Well Abandonment and Replacement Program
WWTP	Wastewater Treatment Plant
yr	year

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1 INTRODUCTION

Environmental monitoring programs at the Rocky Flats Environmental Technology Site (RFETS or Site) continue to evolve in response to new regulatory requirements and accelerated Site closure activities. Various monitoring programs have amassed data on soils, surface water, groundwater, air, and different ecological systems. The *Rocky Flats Cleanup Agreement* (RFCA) (DOE, 1996) requires the U.S. Department of Energy (DOE), in consultation with the Colorado Department of Public Health and Environment (CDPHE), and the U.S. Environmental Protection Agency (EPA), to establish an integrated monitoring program that effectively collects and reports the data required to ensure the protection of human health and the environment. The program is consistent with the RFCA Preamble, and complies with RFCA, laws and regulations, and effective management of RFETS resources.

This Fiscal Year (FY) 2003 *Integrated Monitoring Plan* (IMP) identifies the routine monitoring programs for surface water, groundwater, air, and ecology, designed to minimize the duplication of efforts among DOE, CDPHE, the cities of Broomfield and Westminster, and associated data management systems.

The IMP details RFETS monitoring activities performed for legal, contractual, and operational purposes. It restates the agreed-upon types of monitoring, monitoring locations, sampling frequencies, and purposes of the monitoring. Much of the monitoring discussed in this document is performed to satisfy specific regulatory requirements that are not due to the RFCA agreement. Where this is the case, such monitoring requirements are not subject to enforcement pursuant to RFCA, but may be subject to enforcement in accordance with the initiating legal requirements. In addition, RFETS monitoring programs encompass Best Management Practices (BMPs) that are not required by RFCA or other federal and state laws and regulations. The BMPs are incorporated into the IMP, but may be dependent on the availability of federal funding in accordance with RFCA, Paragraph 249.

In developing the IMP, RFETS personnel met with a working group of representatives from EPA, the State of Colorado, and the cities of Westminster, Northglenn, Thornton, Arvada, and Broomfield to develop consensus on the types of data to be gathered and their eventual uses as portrayed in the data quality objectives (DQOs) described in this IMP. The program is designed to provide data that meet the DQOs needed to support operational and regulatory decision making, and to address the requirements of the following statutes, regulations, permits and agreements:

- Resource Conservation and Recovery Act (RCRA);
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA);
- Clean Air Act (CAA);
- Clean Water Act (CWA);

- National Pollutant Discharge Elimination Systems (NPDES) Permit and amendments;
- Colorado Hazardous Waste Acts
- Standards promulgated by the Colorado Water Quality Control Commission;
- RFCA;
- Regulations governing natural resource (ecological) management;
- RFETS-specific monitoring and cleanup agreements; and
- DOE Orders and technical guidance.

1.1 Integrated Monitoring Plan

This document, the FY2003 IMP, is a revision of the FY2002 IMP (Kaiser-Hill, 2002a) and the FY2002 *IMP Background Document* (Kaiser-Hill, 2002b), which describes the activities being conducted at RFETS under the IMP to satisfy RFCA and other regulatory requirements and interests. The FY2003 *IMP Background Document* provides detailed discussions of the decision-making process that has resulted in numerous monitoring efforts at RFETS. This FY2003 IMP lists the monitoring programs to which DOE and the other regulatory agencies are committed. The FY2003 *IMP Background Document* provides additional information about the DQO decision process and the regulatory framework that drives many of the monitoring decisions at RFETS. The FY2003 *IMP Background Document* is not subject to enforcement under RFCA.

This FY2003 IMP lists the ongoing environmental monitoring activities that DOE, CDPHE, EPA, and other stakeholders have supported during the numerous working group meetings used to formulate monitoring-based decisions. It provides an overview of the requirements for these activities and the intended uses of the data that result. Monitoring is performed in four primary areas—surface water, groundwater, air, and ecological systems. Specific RFETS activities may involve soil monitoring, although RFETS-wide soil monitoring was discontinued in 1994 after many years of characterizing transuranic-contaminant distributions across RFETS. Interactions among these media have been recognized and discussed in some detail. The data collected can be used to support investigations into these interactions to the extent that the interactive effects are themselves measurable.

Each of the four major monitoring programs is discussed below. Soils are also considered. Soils and soil monitoring, as well as a discussion of the interactions between the media, are discussed below. Soil data relate to other media in various ways and continue to be important to the other programs, to future projects and project planning, and ultimately to Site closure. A discussion of RFETS soil monitoring is included in Section 6, and interactions between media are included in Section 7 of the *IMP Background Document.*

1.2 Data Quality Objectives

Representatives of DOE, Rocky Flats Field Office (RFFO), Kaiser-Hill, and the various federal, State of Colorado, and local stakeholder groups together developed a set of

DQOs to ensure that environmental monitoring data would satisfy the requirements of the regulations listed above and would aid in detection of conditions that could lead to unacceptable risks to public health and the environment. The data will be used to: (1) model contaminant movement and identify contaminant concentrations that exceed pre-established limits; (2) support planning, implementation, and assessment of remedial and Decontamination and Decommissioning (D&D) activities; (3) address regulatory reporting requirements and commitments; and (4) monitor various ecological systems at RFETS.

Therefore, the data need to meet or exceed quality requirements to ensure accuracy in modeling, risk assessment, performance assessment, and compliance. The data must be of sufficient quality to withstand scientific and legal scrutiny, and must be gathered using appropriate procedures for their intended use in making decisions for RFETS activities. Each environmental monitoring program includes a set of data usability requirements and procedures to ensure that high-quality data are produced.

1.3 Quality Assurance

The quality of the RFETS environmental monitoring data is ensured through careful planning and design of monitoring programs and implementation of work control procedures that address sampling, analysis and data management activities. Presented in this document are statements of the major decisions that need to be made based on monitoring data, how the data will be applied in decision making, and the approaches used to obtain the data. Procedures cover monitoring activities, including sampling, analysis and data management, and consist of approved, controlled documentation. Monitoring procedures are referenced in the various environmental program plans, which are contained in the RFETS Environmental Management Program Manual (MAN-080-EMPM, 9/98).

RFETS environmental program and analytical services managers have a significant role in controlling the quality of environmental monitoring data. They are responsible for designing adequate environmental monitoring programs, collecting environmental samples and field data of high quality, properly submitting samples, ensuring data are managed per procedures, and interpreting and reporting monitoring results.

Minimum requirements for laboratory quality assurance/quality control (QA/QC) programs have been promulgated. These requirements ensure that each laboratory generating data has procedures for assuring that the precision, accuracy, completeness, and representativeness of data generated are known and documented.

Additionally, analytical data are subject to data assessment (quality assurance evaluation of analytical chemistry data). Assessments cover monitoring activities, including sampling and analysis. Subcontracted laboratories are routinely audited and participate in inter-laboratory cross-check programs. Assessments are conducted pursuant to the RFETS *Site Integrated Oversight Manual* (1-MAN-013-SIOM), in compliance with DOE Order 414.1 and the Kaiser-Hill Team Quality Assurance program. Assessment findings are tracked and corrected pursuant to the *Site Corrective Action Requirements Manual* (1-

MAN-012-SCARM) and the Kaiser Hill Corrective Action Process (3-X31-CAP-001). The *IMP Background Document* details the overall QA/QC requirements, including field duplicate and blank samples, analytical detection limits, and standards for accuracy and completeness.

2 SURFACE WATER

2.1 Introduction

The surface water monitoring program at RFETS addresses the requirements of statutes, regulations, orders, and agreements, and supports many decision-making processes. Surface water monitoring (summarized in Table 1) encompasses five areas:

- RFETS-wide water quality;
- Quality of waters within the Industrial Area;
- Quality of discharges from the Industrial Area;
- Quality of water leaving RFETS; and
- Off-site water quality.

Protocols for sampling and analysis of surface water, as well as QA/QC requirements, are defined in several documents. Refer to Section 2.1.5 of the *IMP Background Document* for details.

RFETS maintains surface water data in the Rocky Flats Soils and Water Database (formerly the Rocky Flats Environmental Database System). The data can be retrieved and reported in many formats for specific purposes. Many of the data generated are not specifically reported in RFETS documentation, but are provided to requestors or decision makers as needed. However, regularly generated reports include:

- NPDES permit compliance reports including monthly and annual preparation and delivery of the Discharge Monitoring Report to EPA Region VIII.
- Pre-discharge and community assurance monitoring results gathered by the State, and reported routinely to RFETS and nearby cities.
- Reportable RFCA monitoring results (those above of RFCA standards and action levels) reported to EPA and CDPHE.
- The bulk of the surface water data collected are summarized and reported at Quarterly Information Exchange Meetings, which have been held since 1972.

Table 1 Surface Water Monitoring Matrix

Type of Monitoring	Locations	Sampling Frequency	Sampling Performed By	Purpose
SITE-WIDE				
Dam Operations - Imminent Danger to Life and Health	Detention ponds	Various regular intervals	Site personnel	Assess need for discharges from ponds to ensure dam integrity
Streamflow	8 stream locations	Continuous when flowing	Site personnel	Determine streamflow upgradient of Ponds A3, A4, B5, and C2. Determine outflow from Ponds A3, A4, B5, and C2
Pond Elevations	4 pond locations	Daily (hourly if needed)	Site personnel	Monitor amount of water detained in Ponds A3, A4, B5, and C2
Piezometers	Dams at Ponds A3, A4, B1, B3, B4, B5, and C2, Landfill	Continuous	Site personnel	Monitor level of saturated zone in detention structures
Dam Integrity Inspections	12 dams	Various	Site, DOE, and Federal Energy Regulatory Commission (FERC) personnel	Assess physical integrity of earthen dams
Ad Hoc	Varies	As needed[1]	Site personnel	Address need for special monitoring
New Contaminant Sources	Varies	As needed[1]	Site personnel	Identify sources of new contamination detected by the surface water monitoring program
Plutonium Correlation	Point of compliance (POC), plus 5 additional locations	As needed[1]	Site personnel	Correlate plutonium concentrations to levels of more easily measurable parameters
INDUSTRIAL AREA				
New Source Detection	5 locations	As needed[1]	Site personnel	Detect changes in Analyte of Interest (AoI) concentrations or water quality parameters that might indicate new contamination

Type of Monitoring	Locations	Sampling Frequency	Sampling Performed By	Purpose
Incidental Waters	Varies	As needed[1] (100-200 events/yr on average)	Site personnel	Determine acceptable disposal method
Performance Monitoring (Source Location)	Varies	As needed[1], generally from 18 months before project start-up to 3 months after completion	Site personnel	Establish baseline conditions and monitor effects of RFETS activities on water quality
INDUSTRIAL AREA DISCHARGES TO PONDS				
Stream Segment 5	4 Action Levels and Standards Framework (ALF) locations	Varies[1] (total approx. 85 samples)	Site personnel	Monitor compliance with RFCA action levels
Internal Waste Streams	Discharges from buildings, Wastewater Treatment Plant (WWTP), terminal ponds, and cooling towers, plus any new discharges	Various intervals, depending on location	Site personnel (EPA Region VIII conducts annual NPDES permit inspections)	Confirm NPDES permit compliance
Discharges to WWTP	New waste streams	As needed[1]	Site personnel	Consider for discharge to WWTP
WWTP Collection System	2 locations in collection system	Regular intervals specified in *IMP Background Document*	Site WWTP personnel	Check for signs of corrosivity and monitor Lower Explosive Limits
WWTP Radiological Monitoring	WWTP influent collection lines and effluent	Influent monthly, effluent monthly	Site personnel	Monitor impact of cleanup activities on WWTP and determine removal efficiency
NPDES-Permitted Discharges	WWTP outfall and terminal pond discharges	Specified in NPDES Permit	Site personnel	Demonstrate permit compliance and provide data for permit updates

Type of Monitoring	Locations	Sampling Frequency	Sampling Performed By	Purpose
WATER LEAVING THE SITE				
Predischarge	Ponds A4, B5, and C2	About 8-10 events/yr (1 event/yr at C2)	Site personnel (CDPHE analyzes samples)	Determine quality of water to be discharged from terminal ponds
Terminal Ponds	3 terminal ponds	Frequency specified in *IMP Background Document*	Site personnel	Verify that industrial discharges do not endanger waters of the U.S.
Segment 4	5 locations	About 3 samples for each of 8-10 discharge events, plus 1-3 samples per month between discharges[1]	Site personnel	POC monitoring
Non-POC at Indiana St.	Walnut Creek & Woman Creek Drainages	Total of 21 samples annually	CDPHE	Assess effects of flow changes on nutrient loads in water leaving RFETS
OFF SITE				
Uncharacterized Discharges	5 primary locations, but could vary with circumstances of discharge	As needed[1]	Site personnel	Assess impact of uncharacterized discharges on community water supply facilities
Community Assurance	4 points in Westminster and Broomfield water treatment process streams	Weekly, with samples composited semiannually or annually	Westminster and Broomfield municipal employees	Notify municipalities in the event of water quality exceedances; provide data for dose reconstruction studies

[1] Sampling frequency is determined based on project plans. (Refer to *IMP Background Document* for more information.)

2.2 Site-Wide Water Quality

This section deals with surface water monitoring objectives that are not confined to a particular part of RFETS. Site-wide monitoring includes:

- Monitoring the dams that form the RFETS detention ponds (dams lie within a defined area, but monitoring is performed to ensure their safety);
- Locating the source of contamination detected by the monitoring objectives described in subsequent sections of the IMP;
- Specific monitoring activities in response to requests (i.e., *ad hoc* monitoring);
- Monitoring to establish a correlation between plutonium concentrations and levels of indicator parameters; and
- Monitoring performed for operational reasons and BMPs, but not enforceable under RFCA or other federal and state laws and regulations.

The Site-wide monitoring is described below.

2.2.1 MONITORING DAM OPERATIONS

The RFETS detention ponds (Figure 1) are formed by earthen dams, which are designed for stormwater detention. Once water quality is determined to meet downstream standards, water is routinely discharged from the ponds as water levels rise. Although water rarely rises to the elevation of emergency spillways, there is a risk that the dams could fail or sustain damage.

RFETS uses data from the monitoring activities listed below, along with water quality data from the ponds, within a specific decision-making process (see *IMP Background Document*, Section 2.2.1, and ancillary documents cited therein) to determine if, and when, water should be released from the ponds. RFETS performs the following monitoring activities:

- Measure streamflow upgradient of Ponds A3, A4, B5, and C2;
- Measure outflow from Ponds A3, A4, B5, and C2;
- Monitor pond elevations continuously in Pond A-3, Landfill Pond, and Terminal Ponds A4, B5, and C2. Daily monitoring is adequate for normal operations; hourly monitoring is invoked as established by procedure (e.g., in response to storms) to ensure dam safety;
- Monitor piezometers installed in the dams to track the level of the saturated zone in the earthen detention structures;
- Evaluate dam integrity through visual inspections at appropriate frequencies as determined by procedure;
- Perform routine integrity inspections on dams on the 12 ponds at appropriate frequencies, as determined by the *Pond Operations Plan* (Kaiser-Hill, 1996), and perform a detailed internal inspection biannually. FERC and DOE personnel conduct an annual external inspection of the dams;

- Monitor spatial position of the terminal dam crest monuments to detect movement, if any, as required by the Colorado State Engineer's dam safety regulations;
- Monitor the inclinometers and evaluate dam crest movements quarterly to identify any movement of dam structure; and
- Annually exercise the valves in the outlet works of the terminal dams to ensure operability, as directed by the Office of the State Engineer.

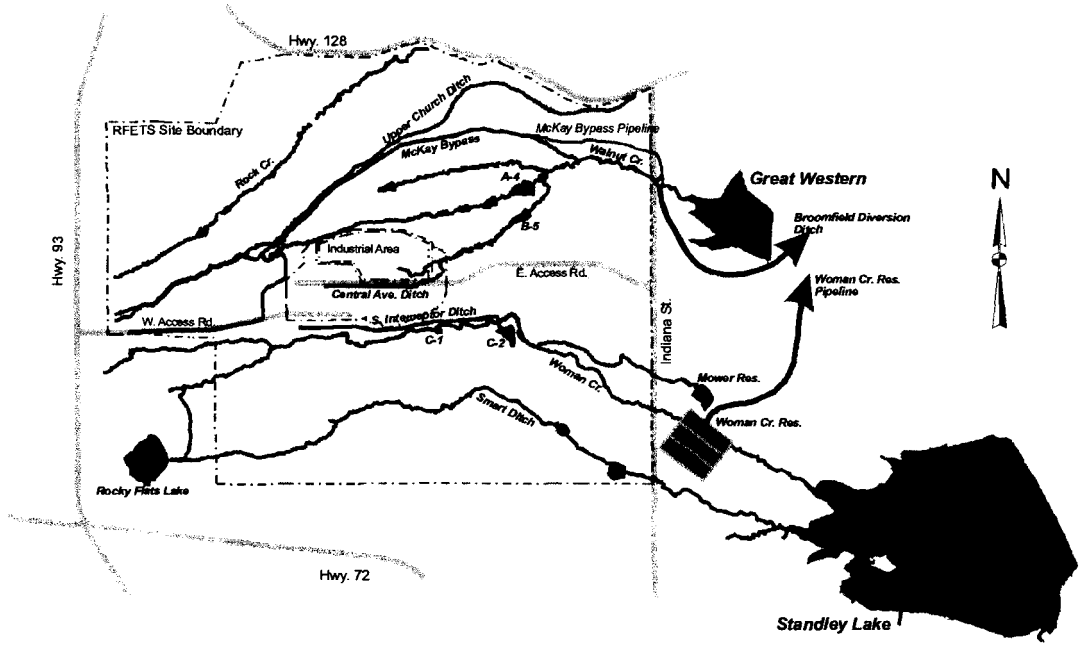

Figure 1. Schematic Surface Water Map

Data are entered into a spreadsheet model to assess the need for discharge, based on the *Pond Operations Plan*. Meteorological data are also used in the model, along with inflow and discharge rates as applicable.

2.2.2 LOCATING NEW CONTAMINANT SOURCES

If new contamination is indicated by surface water monitoring, New Source Detection stations, Point of Evaluation (POE) stations, or Point of Compliance (POC) stations, RFETS may use portable sampling equipment to help further isolate the source. This monitoring may cross the boundaries of other surface water monitoring objectives. For instance, if contaminants are detected outside the Industrial Area, portable sampling equipment may be deployed inside the Industrial Area to locate the source of the contaminants (see *IMP Background Document*, Section 2.2.2).

2.2.3 AD HOC MONITORING

Ad hoc monitoring is designed to address specific identified data needs. The data needs arise in response to circumstances that are not addressed by the routine monitoring program. *Ad hoc* monitoring falls into one of two categories:

- *Required*—Statutory, regulatory, permit, or other requirements that monitoring must be done to obtain analytical data; and
- *Discretionary*—Where analytical data could help with further decision making, or a need for additional data is otherwise strongly indicated.

Ad hoc monitoring may be conducted in response to events such as unusual precipitation volumes, community concerns, changes in permit or regulatory requirements, construction projects, operations, or spills.

2.2.4 INDICATOR PARAMETER MONITORING FOR ANALYTICAL WATER QUALITY ASSESSMENT

RFETS continues to study whether a correlation can establish relationships between analytical measurements of constituents, such as actinides or metals and selected indicator parameters (i.e., total suspended solids (TSS), turbidity precipitation, and flow rate).

Plutonium concentrations are already being monitored at the terminal pond outfalls and at the Indiana Street RFCA POCs. RFETS also monitors TSS concentrations when possible for samples collected at the locations covered by the other decision rules in this section. To evaluate the relationship between turbidity and analytical constituents, turbidity is monitored at the locations where required by the other applicable decision rules. To evaluate the relationship between precipitation and analytical constituents, precipitation is currently monitored at ten locations across RFETS.

RFETS is continuing to evaluate the data to study the correlation between actinide and metals concentrations, and levels of selected indicator parameters. Based on this analysis, this monitoring objective may be modified in the future to further define observed correlations. Although correlation can be demonstrated under some conditions, the results have not shown a reliable quantitative correlation across the Site sufficient to allow indicator parameters to be substituted for the primary measurements. The indicator parameters prove useful as an investigative tool to assist in understanding source-related environmental conditions.

2.3 Water Quality Within the Industrial Area

RFETS monitors water within the Industrial Area to detect new sources of contamination, assess the performance of facilities or project elements (e.g., during closure of a facility) in preventing releases of specific constituents, and assess the quality of incidental rainwater or snowmelt that may accumulate in utility pits and bermed areas. Indications of a contaminant release would trigger reporting and decision-making for response and remediation. RFETS conducts the following activities under this portion of the surface water monitoring program:

- Project-specific performance monitoring;
- Managing incidental waters;
- Monitoring the sanitary system including:
- Characterizing internal wastewater streams for NPDES Permit compliance;
- Monitoring discharges to the WWTP; and
- Monitoring total flow, potentially dangerous or damaging waste streams, and radiological activity of influent to the WWTP;
- WWTP influent monitoring; and
- WWTP collection system monitoring.

2.3.1 INCIDENTAL WATER

At RFETS, about 120 occurrences of incidental water per year (yr) require monitoring. Water that accumulates in utility pits, berms, footing drains, sumps, and excavation sites, or that is released within buildings or onto the ground, is evaluated using field screening observations and measurements, coupled with the process knowledge of RFETS personnel. Additional analysis is required if the circumstances or field observations provide cause to suspect the presence of oil or hazardous or radioactive constituents.

The program for monitoring incidental water provides for routine, data-driven decision making on whether to allow discharge of these waters into the environment without treatment. When evaluating incidental water, field personnel estimate the volume of water present, note its appearance (especially its color or presence of a visible sheen), and field test its pH, nitrate level, and conductivity. In conjunction with knowledge of the processes occurring in the immediate vicinity, these data guide the process of deciding how to dispose of the incidental water. Water that cannot be discharged to the environment may be considered for discharge to the WWTP (under internal wastewater stream rules) or may be managed under other applicable regulations.

2.3.2 SANITARY SYSTEM MONITORING

Sanitary collection system monitoring may provide D&D project managers and WWTP operators information about collection system conditions within the Industrial Area contributing to the WWTP flow. Current and prospective monitoring systems provide quantitative information about the relative contribution of the two main branches of the sanitary collection system, and qualitative information about the content of flows through the headworks of the WWTP. Sanitary system monitoring is conducted to:

- Determine percent removals across the treatment plant and, therefore, be able to predict compliance or noncompliance with NPDES Permit effluent limitations;
- Assess explosive levels at the headworks for worker safety;
- Identify corrosive substances that may impact the treatment units;
- Determine if trends in influent concentrations and loads are fluctuating up or down;

- Establish pollutant loads attributable to specific internal waste streams; and
- Establish baseline conditions for the flows from the Protected Area (PA) and non-PA areas.

Five distinct monitoring objectives have been identified for sanitary system monitoring. Separate decision rules have been developed for each of these objectives and are detailed in the IMP Background Document. Each of the five objectives are discussed in the following sections.

2.3.2.1 Characterization of Internal Wastewater Streams to Meet Permit Requirements

The first monitoring objective is to characterize routine internal waste streams to meet NPDES Permit requirements (see *IMP Background Document,* Section 2.3.2.1 - Internal Waste Stream Characterization to Meet Permit Requirements). Data on internal waste streams are used to make decisions regarding the disposition of contaminated wastewater produced on RFETS. Monitoring is needed to determine when wastewater requires treatment versus when it can be discharged to the WWTP. The data are used to determine whether discharges to the WWTP are compatible with the activated sludge, exceed the facility's ability to handle it, and comply with the NPDES Permit.

The NPDES Permit also covers discharges to surface water (including the WWTP outflow). RFETS personnel use monitoring data to maintain the permit and to negotiate periodic permit renewals. Both permit maintenance and renewal may require modifying specific conditions, particularly as closure activities accelerate. The permit specifies the managed and incidental discharges to be monitored, including sanitary discharges and process wastewater streams from buildings and discharges from the WWTP. New wastewater streams must be characterized and monitored as well. RFETS personnel must fully disclose wastewater streams to EPA Region VIII, which conducts annual NPDES Permit inspections to enforce this disclosure requirement.

2.3.2.2 Monitoring Discharges to the WWTP

This monitoring objective is separate from the non-routine objective, for which a distinct decision rule has been developed (see *IMP Background Document* Section 2.3.2.2 - Monitoring Discharges to the WWTP). New wastewater streams generated at RFETS must be evaluated to determine how best to dispose of them. Most, but not all, wastewater can be discharged to the WWTP under the terms of the NPDES Permit. Wastewater that is not sent to the WWTP must be disposed of according to applicable requirements. RFETS personnel screen wastewater streams for visible sheen, color, clarity, volume, field conductivity, and pH. However, the most important factor in determining the means of disposal is knowledge of the specific process that produces the wastewater. This information is considered in making decisions regarding disposal of wastewater streams.

2.3.2.3 Monitoring the WWTP Collection System

Monitoring of the WWTP influent flows include collection system flow monitoring, protective monitoring, and radiological influent monitoring. WWTP personnel regularly

check the WWTP collection system for pH, conductivity, and Lower Explosive Limits at two locations, and take manual pH readings at the headworks. This monitoring ensures that the WWTP effectively processes wastewaters that change as closure activity increases. The WWTP monitoring objectives and decision rules are described in the *IMP Background Document,* Section 2.3.2.3 - WWTP Collection System Protective Monitoring, Section 2.3.2.4 - WWTP Collection System Flow Monitoring, and Section 2.3.2.5 - WWTP Radiological Monitoring.

2.3.2.4 WWTP Collection System Flow Monitoring

Flow information for the sanitary collection system consists of influent records for the WWTP. The flow record will be used to establish annual baseline conditions and assist in further data assessment needs for flows from the PA and non-PA areas, as currently modified. Changes from the established baseline flow may be attributable to normal collection system conditions, such as infiltration and inflow, or abnormal conditions, such as increased flows from areas undergoing D&D. A preliminary sanitary collection system flow baseline was initiated during FY2001, and flow data are reported on a calendar year basis to EPA and CDPHE in an annual report required by the NPDES Permit.

2.3.2.5 WWTP Radiological and Metals Monitoring

This objective includes the monitoring of radiological and selected metals parameters at the influent to the WWTP, for the purpose of tracking pollutant loads entering the WWTP collection system. Radiological and metal loads at the WWTP should be decreasing, since RFETS has systematically tried to eliminate possible connections between waste streams containing radionuclides and the collection system. During FY2002, radiological and metals influent monitoring was conducted monthly, using 24-hour composite samples that were analyzed by the CDPHE.

2.3.3 PERFORMANCE MONITORING IN SURFACE WATER

Performance monitoring may be specific to individual projects (e.g., D&D, remedial activities, transition actions, or BMPs for transport and fate of plutonium in surface water runoff) within the Industrial Area. While performance monitoring may be conducted at any location on RFETS, most monitoring occurs within the Industrial Area. In general, project-specific monitoring targets 18 months of data prior to project startup to establish baseline conditions, and continues for three months after project completion. RFETS is conducting performance monitoring at Buildings 771/774, 776/777, 886, the Solar Ponds, and for Environmental Restoration (ER) projects at the 903 Pad.

2.3.4 MONITORING NPDES DISCHARGES TO PONDS

The NPDES permit program controls the release of pollutants into the waters of the United States, and requires routine monitoring of point source discharges and reporting of results. The first RFETS NPDES Permit was issued by EPA in 1974. The current permit was renewed in 2000. Monitoring for NPDES compliance is prescriptively required by EPA, and is not covered by the IMP process or detailed in this document.

Renewed Permit:

The renewed RFETS permit identifies one monitoring point for control of discharges, the WWTP (Building 995) effluent. The NPDES/Federal Facility Compliance Agreement was terminated by the renewal of the permit. Modifications included the elimination of discharge points except for the WWTP discharge point. The other previously permitted discharge locations will be regulated under CERCLA via the RFCA. Additional expanded scope includes requirements for plans and procedures for operations of influent/effluent storage tanks, influent monitoring at WWTP, internal wastestream reporting, stormwater monitoring, stormwater pollution prevention plan, and WWTP influent real-time radiological monitoring feasibility study. New stormwater monitoring provisions result from new regulations promulgated since the 1984 permit renewal. Refer to the permit for specific monitoring requirements.

2.4 Industrial Area Discharges To Ponds

Industrial Area discharges to the ponds include surface water runoff, discharges from the WWTP, and waters in Segment 5 that include the stream channels and interior ponds. Under this portion of the surface water monitoring program, RFETS monitors:

- Segment 5 water quality; and
- NPDES-regulated discharges to the ponds.

2.4.1 NEW SOURCE DETECTION

RFETS collects surface water samples at stations SW022, SW091, SW093, SW027, and GS10, which are located in the upper reaches of the three main drainages through which runoff leaves the Industrial Area. Analyte of Interest (AoIs) include plutonium, uranium, and americium isotopes; water quality parameters, including turbidity, pH, nitrate, and conductivity (measured every 15 minutes); and precipitation data (measured continuously at SW022) and flow rate (measured continuously). Additional AoIs also may be identified.

The "indicator parameters," those that can be and are monitored continuously, provide a qualitative early warning of potential contaminant releases without the long turnaround time or cost of more frequent sample analyses for the specific contaminants. For example, plutonium and americium concentrations may be correlated with TSS (which correlates with turbidity), and plutonium may be correlated with nitrate concentrations. Additionally, levels of chromium, beryllium, silver, and cadmium may correlate with conductivity readings. If a continuously monitored parameter provides cause for concern about a particular contaminant, samples may be collected and analyzed for that contaminant. It should be noted that none of the monitoring to date clearly demonstrates the correlations suggested here.

2.4.2 STREAM SEGMENT 5

RFETS monitors Segment 5 water quality at four RFCA POE monitoring locations (as represented by stations SW093, SW027, GS10, and 995 POE) for compliance with RFCA action levels. Reportable values require development of a source evaluation plan and source evaluation.

The RFCA Action Levels and Standards Framework (ALF) provides criteria for identified contaminants. A subset of these contaminants is monitored under this portion of the program (see Table A-26 in the *IMP Background Document*). RFETS collects samples (one to four per month depending on flows) from each station for an estimated total of 85 samples during the year (see Table 2-14 in the *IMP Background Document*). The number of samples collected from each station is determined using historical flow data. Approximately 15 liters (L) of water are collected for each 500,000 gallons of stream flow to a maximum of four per month, and each 15-L sample composite is designed to contain about 50 flow-paced grab samples.

Collecting only one sample per month and analyzing only for the AoIs listed above would be sufficient to comply with RFCA requirements. However, the higher number of samples reduces the chance of recording a false exceedance or of missing a short-duration contaminant surge. Sampling frequency may be adjusted to accommodate changing data needs.

2.5 Water Leaving the Site

Water leaves the Site in Stream Segment 4 at Indiana Street. Three monitoring objectives have been established to assess Segment 4 water quality:

- Predischarge monitoring;
- RFCA POC monitoring of Segment 4; and
- Additional, non-point of compliance (non-POC) monitoring.

2.5.1 PREDISCHARGE MONITORING

Before water is discharged from the Terminal Ponds, it must be evaluated for a range of constituents to ensure that unexpected contaminants have not been introduced. Therefore, RFETS collects predischarge samples eight to ten times per year from the Walnut Creek Drainage at Ponds A4 (North Walnut Creek) and B5 (South Walnut Creek), once per year from the Woman Creek Drainage at Pond C2, and as needed from another pond temporarily functioning as a terminal pond. RFETS and CDPHE analyze the samples for an extensive list of constituents, including inorganic compounds, metals, and radiologic parameters (see Tables 2-16a and 2-16b in the *IMP Background Document* for analyte list and sampling targets). Sampling and analyses are conducted far enough in advance of a planned discharge to allow action to be taken if exceedances are noted, but near enough to the time of discharge to be representative of the discharge composition.

2.5.2 SEGMENT 4 COMPLIANCE MONITORING

RFETS performs monitoring at five RFCA POC stations in Segment 4 (GS11, GS08, GS31, GS03, and GS01). POC monitoring is concerned primarily with concentrations of plutonium, americium, and tritium, although additional analytes are monitored in a subset of samples. About three samples are collected during each pond discharge event (about 8 to 10 discharge events per yr; see Table 2-19 in the *IMP Background Document* for POC monitoring targets), and flow-proportional sampling is conducted between discharges when flow rates are sufficient to obtain required water sample volumes.

2.5.3 CDPHE MONITORING AT INDIANA STREET

Various off-Site reservoir construction and water diversion projects will cause changes in the surface water flow regime. The CDPHE conducts additional monitoring to assess the effects of these flow changes on nutrient loads in water leaving RFETS. CDPHE collects samples quarterly from Walnut Creek to assess the composition of the water when it consists of either:

- 100% RFETS effluent;
- Mixed effluent and natural stream flow; and
- 100% natural stream flow.

In addition to these samples, CDPHE collects an annual sample from Woman Creek during a Pond C2 discharge. Samples are analyzed for a variety of parameters, including water quality and selected metals.

2.6 Off-Site Monitoring to Support Community Water Supply Management

RFETS and CDPHE personnel provide monitoring data to nearby communities for their use. Procedures are in place to monitor uncharacterized discharges from RFETS and to provide data that address public concerns regarding water quality.

2.6.1 MONITORING UNCHARACTERIZED DISCHARGES

Monitoring of uncharacterized discharges would normally be required only if monitoring, specified under the previous decision rules, is not performed in accordance with the sampling and analysis protocols (e.g., POC monitoring at Indiana Street) or if flow leaving RFETS exceeds the capacity of the downstream ditch or reservoirs.

If surface water of unknown quality (unmonitored) leaves RFETS, it is necessary to demonstrate that the water quality is acceptable to downstream users. Examples include:

- Unmonitored storm flow exceeding the capacity of Broomfield's diversion ditch that enters Great Western Reservoir; and
- Downstream water that may have been impacted by unmonitored effluent from RFETS.

2.6.2 COMMUNITY ASSURANCE MONITORING

Several factors have made it necessary for the communities to reassure residents that their environment is safe. These factors include the Site's past mission as a nuclear weapons production facility, the nature of the contaminants, the history of releases and accidents, and the geographic and hydrologic relationship of RFETS to the neighboring municipalities. Adequate and timely information regarding the impact of RFETS is necessary. The level of concern fluctuates with activities at RFETS, but may be expected to continue as long as environmental contamination and special nuclear materials are present at RFETS.

Since the completion of the Standley Lake Protection Project and the Great Western Reservoir Replacement Project, which were designed to protect potable water supplies, routine monitoring of the municipal treatment and distribution systems is no longer warranted. However, Great Western Reservoir is still used as an irrigation supply. Therefore, during FY2003, community assurance monitoring continues at Great Western Reservoir as specified in Section 2.6.2 of the *IMP Background Document.*

2.7 Watershed Integration

Geographically, the RFETS lies at the head of the Big Dry Creek Basin; functionally, every effort has been made to isolate RFETS from the rest of the watershed. Historical strategies on the part of RFETS and the downstream communities have focused on limiting, to the maximum extent possible, the natural flow of surface water from RFETS. Examples include past spray irrigation practices, the "Zero Discharge" goal, and the continuing detention of treated sanitary effluent and stormwater pending demonstration of acceptable water quality. Although these water management practices have been necessary to protect and reassure the downstream communities, they negatively impact the ecology of the basin and are inconsistent with the ultimate vision for the Site, as outlined in RFCA. As RFETS moves toward closure, the focus must evolve toward integrating the headwaters of Big Dry Creek with the rest of the watershed.

To accomplish this objective, RFETS must extend its water management strategy beyond Indiana Street, and participate with other stakeholders in identifying and implementing appropriate water quality and use goals for the basin. During 1996, DOE and its contractors progressed toward this goal by actively participating in a consensus group with the objective of achieving agreement on as many issues as possible prior to a standard-setting hearing before the Colorado Water Quality Control Commission (CWQCC). The group included representatives from the RFETS, regulatory agencies and surrounding communities, but the focus was limited to water quality issues impacting wastewater dischargers.

More recently, RFETS personnel helped to establish the Big Dry Creek Watershed Association (BDCWA). The BDCWA began as an extension of the original consensus group, but has evolved to include any entities or individuals interested in water-related issues within the basin. In addition to the original four dischargers (i.e., RFETS, Broomfield, Westminster, and Northglenn), participants include representatives of agriculture, parks, recreation, open space, and a variety of government agencies. The BDCWA has been recognized by Denver Region Council of Governments (DRCOG) as a district watershed in the Regional Clean Water Plan. The goals of the BDCWA include public education, monitoring activities, and protection of water quality, aquatic life and habitat.

The DOE has recognized the effectiveness of this approach by becoming a party to a formal agreement to participate, with the cities, in supporting monitoring activities within the basin. The agreement states that such support may consist of monetary contributions or in-kind services, but shall be equitably distributed among the parties. Monitoring

decisions are made jointly by the group, with input from regulators and planning agencies including EPA, the Water Quality Control Division, and DRCOG. The immediate use of the data is to characterize the watershed, and to identify and quantify sources of impairment. Ultimately, water quality and biological data will be used to support water-quality standards, native species protection, and basin-wide planning activities. A coordinated effort to obtain accurate information about existing conditions and relative impacts is beneficial and cost effective for stakeholders.

2.8 Project-Specific Monitoring

Project specific performance monitoring must be detailed in a project plan through the review and approval process when the project poses a concern for a specific contaminant release, especially for a contaminant that may not be adequately monitored by other monitoring objectives downstream. Each performance monitoring location will target the contaminants of greatest concern, as identified by the implementing organization, for the specific action. Performance monitoring for specific analytes as specified in Section 2.3.3 may be needed for D&D actions, remedial actions, transition actions, and BMPs for the control of plutonium transport in surface water runoff.

Project specific performance monitoring stations must be sited to monitor specific high-risk Site activities, such as D&D activities. These project specific stations will be placed upstream from the routine monitoring stations (assuming more than one source area could be contributing to the routine location), to ensure the monitor will be quantitative for releases of AoI. Data types must be specified in the project plan, and analyte suites and sample collection protocols are project specific. The schedule for performance monitoring will vary with individual projects. However, the initiation will begin far enough in advance of project initiation that a statistically defensible baseline can be established. Monitoring will continue during the project activities at a rate that allows the project managers and monitoring staff to make timely changes in activities that may be impacting the water channel. The frequency will be specified in the project's Sampling and Analysis Plan. After project completion, monitoring will continue long enough to identify residual impacts to surface water quality that may be attributable to the project activities.

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3 GROUNDWATER

Most of the groundwater at RFETS is hydraulically connected to surface water. The groundwater monitoring program is designed to accomplish the following:

- Detect and identify contaminants in groundwater and monitor their concentrations;
- Identify contaminant sources and monitor remediation efforts;
- Delineate contaminant pathways;
- Assess the effects of RFETS remediation and closure activities;
- Protect groundwater from new sources of contamination; and
- Evaluate the effects of contaminated groundwater on surface water.

3.1 Groundwater Monitoring Focus

Several contaminant plumes have been identified in RFETS groundwater (see Plate 3 in the *IMP Background Document*). The main AoI are volatile organic compounds. Possible sources of contaminants that could affect groundwater include storage tanks, the process waste system, drains, sumps, historical storage areas, and spills. The monitoring scope is designed to be conducted before, during, and after operations that may affect groundwater quality.

RFETS personnel determine the concentrations of groundwater AoIs and compare them to established background levels, as well as to RFETS action levels or standards. Exceedances of these criteria are evaluated to determine whether the data demonstrate an ongoing trend. The presence or absence of discernible trends is factored into the decision-making process (see Section 3.4.2 of the *IMP Background Document*) to assess the need for new remediation efforts or changes in ongoing activities.

Water level measurements are incorporated into water elevation maps and hydrographs to define groundwater gradients and flow rates. Both the program for measuring water levels, and the sampling and analysis program provide temporally related data for use in direct comparisons from year to year.

3.2 Groundwater Monitoring Program

The groundwater monitoring program includes the following components (see *IMP Background Document,* Appendix E):

- Sampling of monitoring wells;
- Measurement of water-table elevations;
- Data management, interpretation and reporting;
- Groundwater impact evaluations; and
- Well control, abandonment and replacement.

Table 2 lists the frequency and number of wells for samples and water levels.

Table 2 Groundwater Monitoring Matrix

Type of Monitoring	Locations	Sampling Frequency	Purpose
Sample for determination of analyte concentrations	186 wells & footing drains	Semi-annual	Monitor analyte concentrations in groundwater
Sample for determination of analyte concentrations	16 wells	Quarterly	Monitor analyte concentrations in groundwater
Water-level measurement	51 wells	Monthly	Characterize groundwater flow regime
Water-level measurement	195 wells	Quarterly	Characterize groundwater flow regime
Water-level measurement	78 wells	Semi-annual	Characterize groundwater flow regime
Water-level measurement	33 wells	Real-time	Characterize groundwater flow regime

3.2.1 WELL LOCATIONS

Groundwater sampling wells have been installed along known or suspected pathways between contaminated areas and outlets to surface water. The majority of the wells are located around the perimeter of the Industrial Area, the former Operable Unit 2 (OU2), and the existing landfill. Additional wells are located within RFETS drainages, because stream flow is ephemeral. Boundary wells are maintained at the downgradient (eastern) RFETS boundary to confirm that contaminants are not migrating off-Site. On-Site monitoring wells fall into eight categories:

- Plume definition - 22 wells
- Boundary - 6 wells
- Plume extent - 41 wells
- Performance - 33 wells
- Drainage - 5 wells
- Building D&D - 74 wells
- RCRA (covers monitoring of permitted waste storage units) - 8 wells
- Plume degradation - 13 wells

3.2.2 GROUNDWATER SAMPLING AND ANALYSIS

Field crews measure groundwater temperature, pH, conductivity, turbidity, and alkalinity, and submit a sample to a laboratory for measurement of total dissolved solids. The crews collect filtered samples for determination of metals concentrations and uranium isotopes, and also collect unfiltered samples for organic compound analyses, water quality determination, and measurement of other radionuclides. AoI vary among wells, depending on

the constituents in the plume being monitored. The scopes of work for the analytical laboratories contain complete target analyte lists.

The groundwater flow regime at RFETS limits sample volumes from some wells. If sample volume precludes determination of the entire analyte suite for a particular well, the analyses are performed in the following order of priority:

- Volatile organic compounds—Contract Laboratory Program SW846, Method 8260;
- Semi-volatile organic compounds;
- Pesticides and polychlorinated biphenyls;
- Nitrate/nitrite, as nitrogen;
- Metals;
- Specific metals for a particular well;
- Uranium-233/234, -235, -238;
- Strontium-89/90;
- Plutonium-239/240 and americium-241;
- Major anions (chloride, fluoride, sulfate, carbonate/bicarbonate); and
- Tritium.

3.3 Groundwater Data Disposition

3.3.1 DATABASES

RFETS personnel enter field data and analytical data into the Rocky Flats Soil and Water Database. Data integrity is maintained through the use of standard data entry operating procedures and by running error-checking routines when loading data.

Data can be extracted for various uses, including use of the geographic information system to map constituent distribution, and use of various analytical models to assess groundwater movement and constituent migration.

3.3.2 REPORTING

Groundwater monitoring activities are reported through the following vehicles:

- **RFCA Annual Groundwater Report:** The *RFCA Annual Groundwater Report* summarizes the data from the quarterly reports and provides assessment of the data gathered throughout the year. Based on these assessments, changes or improvements to the RFCA groundwater monitoring program are proposed. The *RFCA Annual Groundwater Report* replaced various previously required reports and serves as the primary compliance report. The *RFCA Annual Groundwater Report* is a calendar year report and is available in the designated RFETS reading rooms.
- **RFCA Quarterly Reporting:** Quarterly reporting presents data gathered during the reporting period, provides notification of any exceedances of RFCA groundwater action levels, and lists required actions for exceedances.

These reports replace all historic, quarterly reporting, integrating the elements of each regulatory driver into a single reporting vehicle. Quarterly reports are presented at the Quarterly Information Exchange Meetings, which are held off-Site and are open to the public.

- **IMP:** The IMP, reviewed annually, is the vehicle for documenting required groundwater monitoring program elements and is updated when necessary.

3.4 Groundwater Evaluations

Many of the DQO decisions for groundwater monitoring require the effect of potential groundwater contamination on surface water to be evaluated. In many cases, when groundwater action levels are exceeded, confirmatory samples will be taken. If analyses of follow-up samples confirm an exceedance, or if historic data indicate an impact to surface water that has not been evaluated, an evaluation will be performed. The evaluation phase will result in a focused DQO that will determine three things: (1) the type of data to be collected, (2) the methodology for determining the nature and extent of contamination, and (3) the effect on surface water.

3.5 Well Abandonment and Replacement Program

Section 3.6.7 of the *IMP Background Document* describes the Well Abandonment and Replacement Program (WARP), which specifies the approval process for well installation and ensures proper recording and registration of well installation activities. RFETS personnel maintain a database of well locations, construction, permitting, and other relevant information. They also maintain a core repository for use in hydrological and geological characterization.

Well abandonment is considered if: (1) the wells are damaged or poorly constructed; (2) construction details are unknown; (3) the wells present a potential for cross contamination with other wells or the aquifer; or (4) the wells are no longer needed. Activities conducted under the WARP are reported in the *RFCA Annual Report.*

3.6 Performance Monitoring

Project-specific remediation and D&D activities may require groundwater performance monitoring. This monitoring is intended to verify and evaluate the effectiveness of remedial actions in mitigating contamination of surface water through the groundwater pathway. Three categories of wells have been defined to satisfy performance monitoring requirements. The categories include performance monitoring for soil remedial actions, D&D monitoring for buildings, and plume degradation monitoring where the remedial decision may involve monitored natural attenuation. In cases where monitoring is not currently performed, or when there is a need for additional information not provided by existing monitoring near the planned activity, analyte suites will be developed based on knowledge of historic chemical use and AoIs. Initially, a full sample suite will be collected to characterize the well for AoIs. D&D monitoring activities may involve other potential contamination pathways such as underbuilding contamination, building footing drains, and building sumps. Disposition of these potential sources will be handled as part of building decommissioning, and will be integrated with ER program activities. Monitoring decisions will be made on an individual well basis prior to D&D activities.

Wells will be placed downgradient from potential contaminant sources. Upgradient wells may be required if existing data are not available. Sampling protocols will be established for individual projects and sampling will begin prior to D&D activities to establish baselines. Monitoring will continue throughout the project, and for a period after project completion, to observe the results of the remediation effort. The duration of the monitoring will be determined per guidelines outlined in the *IMP Background Document.*

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4 AIR QUALITY

4.1 Purpose and Programs

Air monitoring activities at RFETS (listed in Table 3) assist in both protecting and informing the public, and in protecting the environment by detecting and trending the impacts of RFETS operations on air quality at and near RFETS. Monitoring characterizes airborne radionuclide materials that may be introduced and identifies the associated meteorological conditions that influence the transport and dispersion of the airborne materials. Data are used to plan, implement, and assess the effects of on-Site activities including operations, construction, and closure activities, and to maintain emergency preparedness and demonstrate compliance with relevant regulations.

The Air Quality Management (AQM) group within Kaiser-Hill's Environmental Systems and Stewardship (ESS) organization determines the scope of RFETS air monitoring and reporting activities required to maintain compliance with air quality regulations and DOE Orders. In addition, CDPHE conducts oversight monitoring through a grant from DOE.

4.1.1 AMBIENT AIR MONITORING

Ambient monitoring of radionuclides on RFETS, at the perimeter and at several locations in the community is performed by ESS. CDPHE monitors radioactive and non-radioactive pollutants on and around RFETS. Ambient monitoring in the communities immediately adjacent to RFETS has been supported further by DOE through the ComRad program. ComRad stations, which monitor airborne plutonium concentration, are operated independently through a grant to the Rocky Flats Citizen's Advisory Board managed by an oversight panel representing local governments.

4.1.2 EFFLUENT AIR MONITORING

Air emissions (effluent) from RFETS facilities that have potential to contain significant quantities of radioactive materials are monitored continuously in accordance with state and federal regulatory requirements and agreements, and are used to verify the effectiveness of radiation control mechanisms. These emissions data may be used as part of the evaluation process to keep radioactive emissions as low as reasonably achievable.

4.1.3 METEOROLOGICAL MONITORING

Instruments continuously monitor meteorological conditions at RFETS to generate data for use in air dispersion models that estimate the transport of airborne emissions. RFETS personnel use model predictions to evaluate operations and closure projects, and to support emergency preparedness requirements.

Table 3 Air Monitoring Matrix

Type of Monitoring	Analyte	Locations	Performed By	Sampling Frequency	Purpose
Routine ambient air	Radio-particulate	38 Radioactive Ambient Air Monitoring Program (RAAMP) samplers[1]	RFETS AQM	Continuous (monthly filter exchange; monthly analyses of 14 perimeter samples)[1]	Detect and characterize Site-related airborne radiological emissions and demonstrate compliance with state and federal regulations
CDPHE monitoring	Radio-particulate, alpha/beta activity	11 on-Site continuous samplers and 6 close-in samplers (around selected projects)	CDPHE	Continuous	Detect and characterize Site-related radiological airborne emissions
Effluent from Industrial Area facilities	Radio-particulate	19 exhaust outlets	RFETS AQM	Continuous (weekly filter changes with monthly compositing and analysis)	Verify effectiveness of radiation control mechanisms and provide secondary compliance data
Meteorology		1 tower with instruments at 1.5, 10, 25, and 60 meters	RFETS AQM	Continuous	Monitor meteorological conditions for use in air quality modeling and for inputs to emergency response models
Meteorology		Five 10-meter towers at Site perimeter	CDPHE	Continuous	Provide data as needed for emergency response modeling
Performance	Radio-particulate	Selected subsets of existing RAAMP locations	RFETS AQM	Continuous during demolition projects; weekly filter exchange, followed by gross alpha/beta counting and/or gamma spectroscopy; isotopic analyses as required	Assess radiological impacts of decommissioning and ER projects against environmental standards
Performance	Beryllium	Six portable air samplers	RFETS AQM	During active demolition only; filter exchange and analysis determined on a project-specific basis	Assess beryllium impacts of selected decommissioning and ER projects against environmental benchmarks

[1] Performance monitoring for radionuclides uses designated subsets of the 38 RAAMP samplers, with weekly filter exchanges.

4.1.4 PERFORMANCE MONITORING

Ambient monitoring for radionuclides and beryllium around selected building demolition and environmental restoration projects is performed by ESS. This monitoring effort

characterizes the potential short-term impacts of emissions from such projects on ambient air quality and receptors closer to the projects than the RFETS perimeter. This scope differs from routine ambient monitoring because of shorter sampling periods, increased sampling frequency, closer proximity to potential source locations, and in one case, a different AoI (i.e., beryllium). Additionally, while no regulatory standards apply specifically to this scope, the ambient concentration limits identified in the standards are used as guidance to establish action levels (regulatory compliance for radionuclides is determined using the routine ambient samplers at the RFETS perimeter; no beryllium standards currently apply to RFETS).

4.2 Site Air Monitoring Scope

Most ambient air monitoring and effluent monitoring performed at RFETS is done to satisfy the requirements of Title 40 of the *Code of Federal Regulations*, Part 61, Subpart H, *National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy (DOE) Facilities* (Rad NESHAP) and DOE Orders. CDPHE and the ComRad Monitoring Program provide additional, independent air monitoring.

4.2.1 AMBIENT AIR

The RAAMP collects ambient radioparticulate air data. The RAAMP network comprises 38 size-partitioning, high-volume ambient air samplers. Fourteen of the 38 samplers are used to demonstrate compliance with Rad NESHAP. Remaining samplers can be used for emission confirmation purposes should there be an accidental release from RFETS. Designated subsets of the RAAMP network are also used to determine localized impacts from D&D and ER projects, as described below.

The RAAMP samplers run continuously, collecting airborne particles on pairs of sampler substrate that segregate smaller inhalable particles from larger, more easily deposited airborne particulate matter. Filters and impactor substrates are routinely collected and submitted for analysis for specific isotopes of plutonium, uranium, and americium. The *IMP Background Document* details specific sampling intervals and analytical detection limits.

The CDPHE also operates air samplers within RFETS and at the perimeter of RFETS. The CDPHE-operated monitoring network serves to independently measure RFETS air quality conditions and public exposure to radioactive releases.

4.2.2 EFFLUENT AIR

Air emissions exhausted from buildings that could contain radioactive materials in sufficient quantity to have the potential to contribute at least 0.1 millirem (mrem) per year effective dose equivalent (EDE), uncontrolled, to any member of the public (significant sources) are monitored by continuous effluent sampling systems. Filters from these systems are changed weekly and composited for analysis for selected plutonium, americium, and uranium isotopes. Historically, more than 50 locations within the Industrial Area were monitored; currently, 19 building release points are continuously sampled. Sources having low emission potential (insignificant sources) are not monitored unless building operational requirements dictate that continuous sampling be

performed. Radioparticulate emissions from insignificant sources that are not monitored using effluent samplers will be accounted for through the ambient monitoring network. Sampling for tritium in effluent air, once conducted at one or more locations at RFETS, has been discontinued following the removal of waste materials having substantial emissions potential for tritium.

4.2.3 METEOROLOGICAL CONDITIONS

A 61-meter tower is operated in the northwest part of the Buffer Zone by ESS, with monitoring instruments at 1.5, 10, 25, and 60 meters above the ground. Instruments measure horizontal and vertical wind speeds, horizontal wind direction, temperature, relative humidity (dew point), solar radiation, precipitation, and information used to calculate atmospheric stability class. CDPHE operates five 10-meter meteorological towers, located around the RFETS perimeter, that can provide data to support Site emergency response modeling.

4.3 Performance Monitoring - Air

When a decommissioning project or ER project is planned that has the estimated potential to release radionuclides in sufficient amounts to contribute a 0.1 mrem dose to the most impacted public receptor, existing on-Site ambient air samplers are used to provide performance monitoring for radionuclides. Sampler substrates from selected RAAMP samplers that surround the affected project are exchanged weekly instead of monthly. Filters are screened through gross alpha/beta counting and/or gamma spectroscopy, and the results compared to predefined action levels. If necessary, results of the screening may be used by project personnel to adjust schedule or project controls to ensure Site-wide compliance with state and federal regulatory requirements and to confirm the effectiveness of as-low-as-reasonably-achievable (ALARA) principles. The filters and impactor substrates may also be analyzed for selected plutonium, americium, and uranium isotopes.

The CDPHE may conduct independent performance monitoring for radionuclides during selected demolition and remediation projects. Filters will be collected and analyzed for gross alpha activity. If necessary, results of the screening may be used by project personnel to adjust schedule or project controls to ensure Site-wide compliance with state and federal regulatory requirements, and to confirm the effectiveness of ALARA principles. The filters may also be analyzed for selected plutonium, americium, and uranium isotopes. These monitoring efforts shall include, but are not limited to, the 903 Pad remediation and Building 865 demolition.

For beryllium monitoring purposes, a subject project will be ringed with six portable ambient air samplers that operate during periods of active demolition or remediation. Filters will be exchanged and shipped to off-Site laboratories for a total beryllium analysis, at a frequency set on a project-by-project basis. Results of beryllium analyses will be compared to ambient concentration benchmarks defined in the beryllium NESHAP. Although building demolitions are not subject sources pursuant to the beryllium NESHAP, the ambient air concentration standard listed therein was developed

to be protective of human health and the environment, and therefore provides a reasonable basis for evaluating project monitoring results.

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5 ECOLOGY

The Buffer Zone around the Industrial Area at RFETS is one of only a few areas along Colorado's Front Range that has remained largely undisturbed by encroaching development. The Buffer Zone contains several unique assemblages of animals and vegetation, and the ecological monitoring activities described in this section have been designed by DOE and its contractors to protect these valuable natural resources. Five major vegetation communities have been identified at RFETS:

- Xeric Tallgrass Prairie;
- Tall Upland Shrubland;
- Great Plains Riparian Woodland Complex;
- High Quality Wetlands; and
- Mesic Mixed Grassland.

Ecological monitoring is designed to protect wildlife in the Buffer Zone, including special-concern species (i.e., threatened, endangered, candidate, proposed, state-listed, or other sensitive species). The Preble's meadow jumping mouse (Preble's mouse) is of particular concern because it was listed as a threatened species on May 13, 1998.

5.1 Monitoring Objectives

The Ecological Monitoring Program (summarized in Table 4) is designed to provide data that can be used in management and conservation decision-making during RFETS cleanup activities that will occur over the next several years. Data also demonstrate compliance with applicable natural resource protective regulations.

RFETS ecologists monitor key variables in the five vegetation communities and other habitats, and changes in any of these variables would trigger ecological protection and compliance decision making. Comparisons of monitoring data over time enable ecologists to detect changes, identify potential causes, and plan corrective actions for changes that result from RFETS activities, rather than from natural fluctuations.

Table 4 Ecological Monitoring Matrix

Basis for Monitoring	Number of Locations	Sampling Frequency	Purpose of Monitoring
Manage and conserve significant species numbers and richness; comply with Endangered Species Act, other federal acts, and Colorado wildlife protection statutes.	One Site-wide Survey (follows passable Buffer Zone roads.)	12 times per yr	Track changes in numbers, richness, and area use of significant wildlife species at RFETS.
Monitor and conserve viable Preble's mouse populations in appropriate habitat, and monitor and conserve current coverage of characteristic Preble's mouse habitat. Comply with Endangered Species Act and Colorado wildlife protection statutes.	About four locations per yr, based on previous years results	1 time per yr (800 trap-nights per location per yr)	Monitor presence of Preble's mouse at RFETS

Monitor noxious weeds at RFETS; comply with weed control regulations.	Variable by yr	In flowering season and as available for observation	Evaluate effectiveness of weed control actions, and aid in out-year planning for weed controls at RFETS
Monitor for the presence, or potential presence, of special-concern, threatened, or endangered plant and wildlife species and wetlands; comply with federal, state, and local protection and conservation regulations.	Variable by yr	As required	Ensure compliance of projects with applicable ecological regulations and protect rare, threatened, and endangered species from harm

5.2 Scope of Monitoring

RFETS ecologists conduct several types of monitoring in the five vegetation communities, as well as conduct some activities specific to one or more communities. The following activities are common to the five vegetation communities:

- Define the extant area of the community.
- Provide baseline estimates of the presence of birds and mammals, and estimate the baseline species richness of plant, bird, and mammal populations (plant species richness baseline will be determined from 1993–96 or 1997 data, as applicable; the bird and mammal baseline was established in the *1996 Annual Wildlife Survey Report* (Kaiser-Hill, 1997a).
- Identify rare or imperiled plant or animal species.
- Conduct weed mapping and photo surveys.
- Monitor the presence of noxious weeds and the effects of weed control efforts.
- Anticipate impacts from proposed RFETS projects, and estimate the potential area affected.
- Perform monitoring of selected revegetated areas after remediation activities.

Ecologists also monitor the presence of noxious weeds and changes in plant community characteristics in areas not included within the five vegetation communities defined above.

5.2.1 PREBLE'S MEADOW JUMPING MOUSE

Populations of Preble's mouse have been identified in the four major drainages of the Site. The U.S. Fish and Wildlife Service published a proposed rule to designate critical habitat for the Preble's mouse on July 17, 2002. The proposed rule includes designating the Site as a critical habitat unit. The proposal includes a definition for critical habitat areas that is different than the Preble's mouse protection area currently defined by the Site. If the proposal is adopted, the Site's Preble's mouse protection plan will need revision to align the critical habitat definition with the current Preble's mouse protection area delineation.

Current Preble's mouse monitoring activities are described in the following paragraph.

Preble's mouse populations and habitat have been monitored over time (using monitoring through 1996 as a baseline). Monitoring concentrates on determining the presence or absence of the species; quantitative population measurements are not appropriate because of its rarity. Ecologists monitor the known population areas on a rotating basis, depending on results from the previous field season. Ecologists trap only during May through September because the mouse hibernates over the winter months.

5.2.2 WETLANDS

In addition to the activities listed above, the U.S. Army Corps of Engineers and the EPA conduct periodic wetland characterizations. The EPA is the lead agency on wetlands for CERCLA project activities impacting wetlands. The U.S. Army Corps of Engineers is the lead agency on wetlands for non-CERCLA project activities. The last characterization was completed in 1994. A comprehensive plan (Kaiser-Hill, 1997b) to manage and protect RFETS wetlands was issued in 1997, detailing the methods and procedures that will be used to identify wetlands and minimize impacts from closure and remediation projects.

5.2.3 PROJECT-SPECIFIC MONITORING

Proposed RFETS projects will be evaluated in terms of potential effects on threatened and endangered (T&E) species, species of special concern (SSC), migratory birds and wetlands. Much of the data for such evaluations will come from the monitoring activities listed above, but additional data needs may be identified to assess the impact of such projects in specific areas. Project-specific data needs may include:

- Seasonal presence or absence of affected species, and the seasonal timing of the proposed project;
- Presence of habitat considered suitable for T&E and SSC species; and
- Biological characteristics of species of concern (e.g., feeding and nesting habits, home range, habitat preference), and potential effects of the proposed project.

Proposed projects will also be evaluated in terms of their impacts to migratory birds and RFETS wetlands. Wetlands include both those areas mapped by the U.S. Army Corps of Engineers and those areas not included on the map.

Table 5 lists several potential 2003 projects that may impact wetlands or Preble's mouse habitat.

Table 5. Potential 2003 Projects at RFETS with Potential to Impact Wetlands or Preble's Mouse Habitat.

Project	Status of Project	Summary of Monitoring Requirements
Original Landfill	Scheduled 2003	Pending
Present Landfill	Scheduled 2003	Pending
Ash Pits	Scheduled 2003	Pending

East Firing Range	Scheduled 2003	Pending
903 Pad and Lip Area	Scheduled 2003	Pending
Temporary Flume Project in Woman Creek	Scheduled 2003	Pending
B-5 Pond Pipeline Removal	Scheduled 2003	None
Buffer Zone Powerline Removal Project	Scheduled 2003	Pending
Well Abandonment and Removal Program	Scheduled 2003	None
C-1 Pond Breach	Scheduled 2003	Pending
General IA Revegetation	Ongoing	Pending

Certain project activities may require a biological assessment or biological opinion, or a wetland mitigation plan. These plans may include monitoring activities for specified objectives over time. The DQOs for each activity will be indicated in the project-specific biological assessment or opinion or mitigation plan. Future annual updates to this section are anticipated to include a project summary of the projects listed in Table 5, the DQOs, and the current status of projects.

5.3 Outside Factors Affecting RFETS Ecology

The ecological resources at RFETS are influenced not only by Site activities but also by issues and activities that occur off-Site. Outside factors that may affect ecological resources at RFETS include, for example, noxious weeds, chronic wasting disease, West Nile virus, plague, and other zoonoses. These and other factors often affect the surrounding region, which must be considered when evaluating the ecology of the Site.

For example, the Colorado Division of Wildlife is killing and testing a portion of the existing deer population for chronic wasting disease in late FY2002. If test results show that chronic wasting disease exists, the entire population may have to be destroyed.

Activities on adjacent properties may also impact Site vegetative communities and habitats. The Site borders lands used for various activities, including grazing, mining, and open space. While the Site continues to implement a comprehensive integrated ecological management program, the Site is influenced by the activities on neighboring lands that are beyond the control Site personnel. Wind blown materials from adjacent mining activities, prairie dogs, and noxious weeds can readily cross property lines.

5.4 Data Management

Ecological data was historically stored in two databases, the Ecological Monitoring Program Database and the Sitewide Ecological Database. Because extracting data for specific purposes requires a high degree of system-specific knowledge, the two databases were combined. The new database, the Site Ecological Database, allows for multi-user access (with security restrictions) for Site personnel.

5 Reporting

ı *Ecological Resource Management Plan for the Rocky Flats Environmental* :hnology *Site* (Kaiser-Hill, 1997c) is in place, setting forth the management actions ıt will be required to preserve valuable RFETS ecological resources. RFETS)logists will update or modify this plan as required by variations in Site conditions, ıilable technology, or changing regulations.

e Ecological Monitoring Program issues an annual ecology report for the Site. The getation Management Plan is issued annually to document planned weed control and ıer management efforts for the year.

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