Section 3

SURFACE WATER MONITORING PROGRAM

INTRODUCTION

This section presents a description of the Surface Water Monitoring Program currently in place at the Rocky Flats Environmental Technology Site (Rocky Flats or Site). The present program combines 18 separate monitoring systems into a single Surface Water Monitoring Program to manage and monitor surface water originating from the Site prior to its offsite discharge.

Surface waters at Rocky Flats are sampled and analyzed to ensure that regulatory discharge limits and water quality requirements are met, and to detect potential contaminant releases from the Industrial Area. Surface water that originates from the Site, including plant effluents, treated sanitary water, and surface water runoff, are routinely collected and held in a series of holding ponds. These waters are sampled and analyzed for potential contaminants prior to offsite release.

This section summarizes the surface water hydrology at Rocky Flats and describes the function and operation of the various water monitoring systems, sampling procedures, and water quality evaluation criteria used to monitor the surface water at the Site.

SURFACE WATER HYDROLOGY

The surface water in the Rocky Flats area flows generally in a west to east direction. Four basins drain surface water from Rocky Flats: Upper Big Dry Creek, Woman Creek, Walnut Creek, and Rock Creek. Figure 1 shows the location and extent of these basins.

The drainage basins at Rocky Flats are characterized by soils with high infiltration rates and uniform vegetative cover. Except during periods of high flow (i.e., spring runoff), these soils tend to attenuate much of the surface water runoff, which reduces peak water flows and increases travel times. Water enters the drainages through precipitation, groundwater seepage, overland flow, and direct discharge from the Site.

FIGURE 1 - DRAINAGE BASINS AT ROCKY FLATS

The Big Dry Creek Basin lies south of Rocky Flats and covers 8.1 square miles. It contains two major drainages: North Upper Big Dry Creek and South Upper Big Dry Creek. Approximately nine percent of the basin is within the Rocky Flats buffer zone.

The Woman Creek Basin lies directly south of the Industrial Area and generally flows from west to east. The basin covers approximately 5.1 square miles, with approximately 18 percent flowing through the Rocky Flats buffer zone. The primary drainages in the Woman Creek Basin are Woman Creek on the north and Smart Ditch No. 1 on the south. Woman Creek originates just west of Rocky Flats and drains the southern portion of the buffer zone. It contains two C-series holding ponds within the Site boundary, and flows eastward into detention Pond C-1. Woman Creek has several artificial water controls including the South Interceptor Ditch. The South Interceptor Ditch intercepts runoff water from the south side of the Industrial Area and routes it to Pond C-2. Other than large storm event flows, little surface water from the Industrial Area reaches Woman Creek. Any remaining water in Woman Creek flows into Woman Creek Reservoir.

The Walnut Creek watershed drains the northern and central portions of Rocky Flats and a significant portion of the Industrial Area. The watershed encompasses approximately 3.8 square miles. The western portion of Walnut Creek receives runoff water from the relatively flat area west and north of the Industrial Area, which is diverted through the McKay Ditch and the Walnut Creek Diversion. Further east in the developed area, Walnut Creek forks into two branches. North Walnut Creek receives surface water runoff and seepage water from the northern portion of the Industrial Area and contains four A-series detention ponds in the downstream channel. South Walnut Creek receives surface water runoff, seepage water, and treated sanitary water from the central portion of the Industrial Area, and flows toward five downstream B-series detention ponds. The three forks of Walnut Creek join in the eastern buffer zone and flow toward Great Western Reservoir, located approximately one mile east of the confluence. Water leaving this drainage usually enters the Broomfield Diversion Ditch and is rerouted around Great Western Reservoir. The Broomfield Diversion Ditch, operated by the City of Broomfield, drains into Big Dry Creek.

Rock Creek flows through the northwestern corner of the Rocky Flats buffer zone. It runs northeast through the buffer zone, crosses under Colorado Highway 128, and discharges to its offsite confluence with Coal Creek. Rock Creek originates as subsurface flow and receives discharge from the Western Aggregate gravel mining operation located near the western buffer zone fence. Rock Creek receives no drainage from the Industrial Area.

Detention Pond System

Three sets of detention ponds were constructed at Rocky Flats to hold water before release to off-site drainages. The water detention pond system consists of one landfill pond and 11 constructed basins and dams grouped in a designated series (A-, B-, and C-series) located in three drainages. These detention ponds are used to retain storm water runoff, allow sediment settling, control flooding, confine spills, and detain effluent from the wastewater treatment plant and other waters for sampling and assessment prior to offsite discharge.

There are four A-series detention ponds, designated A-1 through A-4 in the downstream direction, in the North Walnut Creek channel. Ponds A-1 and A-2 are off-channel ponds and are used for emergency spill control for the northern portion of the Industrial Area. Stream flow is diverted around these ponds through an underground pipe. Pond A-3 receives North Walnut Creek stream flow and runoff from the northern portion of Rocky Flats. It has historically received some contaminated (primarily by nitrates) surface water and groundwater inflow by seepage from the Solar Evaporation Ponds. Pond A-4, the terminal pond, is used for surface water control and receives overflow from Pond A-3.

The five B-series retention ponds, designated B-1 through B-5 in the downstream direction, are located in the South Walnut Creek drainage. Ponds B-1 and B-2 are off-channel ponds reserved for emergency spill control for the central Industrial Area. Pond B-3 currently receives treated effluent from the Site Sewage Treatment Plant, which is released downstream to Ponds B-4 and B-5. Ponds B-4 and B-5 receive surface runoff from the central part of Rocky Flats and routinely receive discharge from Pond B-3. Pond B-5 collects the overflow from Pond B-4.

The two C-series detention ponds, designated C-1 and C-2, are located in the Woman Creek drainage south and east of the main production area. Pond C-1 receives flow from Woman Creek. This flow is diverted around Pond C-2 then back into the Woman Creek channel, downstream from Pond C-2. Pond C-2 receives storm water runoff from the southern portion of the Site via the South Interceptor Ditch, which collects surface runoff from the southern Industrial Area. Approximately once per year, Pond C-2 water is pumped to Woman Creek, where it then flows into Woman Creek Reservoir. The cities of Westminster, Thornton, and Northglenn operate Woman Creek Reservoir. Water in Woman Creek Reservoir is periodically pumped over to the Walnut Creek drainage.

All detention ponds except the last in each series are classified as “interior” ponds. Ponds A-1, A-2, B-1, and B-2 (off-channel ponds) are primarily used to store contaminated water. Water is impounded in the last ponds, terminal detention Ponds A-4, B-5 and C-2, and held for water quality analysis. The terminal ponds are the final control points for regulating surface water runoff for each pond series. Table I shows the capacity of each detention pond.

TABLE I
CAPACITY OF BUFFER ZONE PONDS

POND IDENTIFICATION	CAPACITY (in million gallons)
A-Series Ponds	
A-1	1.4
A-2	6.0
A-3	12.4
A-4	32.5
B-Series Ponds	
B-1	1.0
B-2	1.5
B-3	0.5
B-4	0.2*
B-5	23.9
C-Series Ponds	
C-1	1.7*
C-2	22.8

* Pond C-1 has no real detention capacity and is operated as flow-through

The Landfill Pond is located north of the Industrial Area at the head of an unnamed tributary to Walnut Creek. Water from the Landfill Pond is periodically transferred to Pond A-3 and subsequently to Pond A-4 as part of the Pond A-4 batch discharge.

Other Surface Water Management Controls

Numerous diversion canals and drainage ditches are in place to convey or divert water at or in the vicinity of Rocky Flats.

The West Interceptor Ditch diverts runoff from the North Walnut Creek headwaters north of the Industrial Area to Walnut Creek west of Indiana Street. The South Interceptor Ditch, located between the Industrial Area and Woman Creek, diverts runoff from the southern part of the Industrial Area away from Woman Creek and into Pond C-2.

Several other ditches, lined and unlined, convey water across the Site. These ditches are used to divert, control, and drain surface water from Rocky Flats. Some of the major diversion ditches include the following:

- Church Ditch;
- McKay Ditch;
- Smart Ditch;
- Last Chance Ditch.

Reservoirs

Four reservoirs are located outside the eastern boundary and downgradient from Rocky Flats.

The Great Western Reservoir is located 1.5 miles east of the Rocky Flats eastern boundary. It has an earthen dam built in 1904, and was originally designed to supply water for irrigation. Although classified as a recreational resource, public access to the reservoir and surrounding area is restricted and no recreational uses are permitted. The Great Western Reservoir is owned and operated by the City of Broomfield, located approximately two miles northeast of the reservoir. The Great Western Reservoir was used as a potable water supply for the City of Broomfield from 1955 until recently.

Standley Lake is a large reservoir located approximately 2.5 miles east of the Rocky Flats eastern boundary. An earthen dam on Big Dry Creek forms this lake, which was constructed around 1910 to supply irrigation water. Standley Lake is classified as a potable water source and suitable for recreational and agriculture use. The Farmers Reservoir and Irrigation Company in Brighton, Colorado has owned the reservoir since its construction. Standley Lake provides drinking water for the cities of Westminster, Northglenn, and Thornton, located approximately four miles south-east, eight miles east, and seven miles northeast of the lake respectively. An estimated two-thirds of the lake water is used for municipal water supplies, and one-third is used for irrigation.

Mower Reservoir is located southeast of Rocky Flats approximately 1,500 feet from the eastern boundary of the buffer zone. Reservoir water is used for pastureland irrigation and livestock watering. The City of Westminster owns Mower Reservoir and the surrounding land area. Mower Reservoir receives water from Woman Creek Reservoir. Outflow from Mower Reservoir flows southeast toward Standley Lake, where it discharges.

The diversion of water from Woman Creek below Pond C-2 to fill Mower Reservoir once flowed through the Mower Ditch. The Mower Ditch inlet has recently been modified by construction of a diversion headwork with a gate valve to close off all flow from Woman Creek into the channel. No further diversions are allowed into Mower Ditch at this time.

Woman Creek Reservoir is an 890 acre-foot impoundment located due east of the southeastern corner of the Rocky Flats buffer zone. The earthen dam structure, constructed in 1995, was built as an off-stream reservoir to capture the entire flow from the C-2 pond and any flow in Woman Creek before it reaches the nearby Standley Lake. The reservoir is capable of containing the entire runoff from the Woman Creek drainage basin from an expected 100-year return period storm.

The inlet channel to Woman Creek Reservoir was excavated down to a bedrock layer (some 15 to 20 feet) in order to intercept any groundwater flow. The Woman Creek Reservoir was built with two internal embankments to create smaller ponds, with each pond capable of holding 100 acre-feet of surface runoff. Water quality into the reservoir is monitored at a site monitoring station across from Indiana Street, located on Woman Creek inside the Rocky Flats buffer zone. The collected data is reviewed by the Site to determine if water can be safely released into other receiving water bodies. Discharge from the reservoir is then pumped in a pipeline northeast into Walnut Creek at a point downstream of the Great Western Reservoir.

CURRENT SURFACE WATER MONITORING PROGRAM

In concurrence with the Rocky Flats Cleanup Agreement (RFCA) objectives, the Site, CDPHE, and the communities evaluated the Surface Water Monitoring Program. An Integrated Monitoring Plan (IMP) for surface water was developed, using a Data Quality Objective (DQO) process to establish surface water monitoring requirements and protocols for the Site. The IMP describes the Site-wide Surface Water Monitoring Program to be implemented for the upcoming fiscal year. The Plan is reviewed and revised annually. The latest version of the surface water Integrated Monitoring Plan for implementation in fiscal year 1997 was released on June 30, 1997.

REGULATORY DRIVERS

Various federal and state statutes and regulations, DOE orders and directives, agreements, and specific policies govern surface water quality at Rocky Flats. Specific regulatory drivers are:

- The federal Clean Water Act, National Pollutant Discharge Elimination System (NPDES) Permitting;
- DOE Orders 5400.1 and 5400.5;
- The Agreement in Principle (AIP) between the U.S. Department of Energy (DOE) and the

State of Colorado;

- Rocky Flats Cleanup Agreement (RFCA).

The U.S. Environmental Protection Agency (EPA), Region VIII, and the State of Colorado determine compliance with surface water quality regulatory requirements.

The federal Clean Water Act requires a National Pollutant Discharge Elimination System (NPDES) permit, as modified by the NPDES Federal Facilities Compliance Agreement, to control pollutants discharged into surface waters of the United States. The NPDES permit for Rocky Flats is issued and administered by the EPA, Region VIII. The State of Colorado, through the Colorado Water Quality Control Commission, sets the surface water quality standards for state receiving streams and water bodies, and is required to certify that the EPA-issued NPDES permit protects state waters. The Colorado Water Quality Control Commission established the surface water quality standards for the stream segments immediately downstream of Rocky Flats.

Rocky Flats National Pollutant Discharge Elimination System (NPDES) Permit

The National Pollutant Discharge Elimination System (NPDES) is the permitting mechanism for the implementation of effluent limitations for all individual, or point source, discharges from Rocky Flats. The NPDES permit governs the release of pollutants into surface water, and requires routine monitoring and reporting of both point source and nonpoint (storm water) discharges. Discharging effluents into surface water without a permit is a violation of the Clean Water Act and is subject to civil and/or criminal penalties. In general, the contents of an NPDES permit reflects three basic components:

Part I. Identifies each waste stream from the Site facility and establishes the applicable effluent limitations and monitoring requirements for that waste stream. A Storm Water Pollution Prevention Plan is required for discharge of stormwater runoff, which is considered a waste stream and therefore subject to regulation under the NPDES permit.

Part II. Contains the permit's boilerplate administrative requirements associated with the implementation of modifications, monitoring methods, and reporting requirements.

Part III. Contains the Compliance Responsibilities and General Requirements deemed applicable to the facility. Examples of Part III conditions include, among others, penalties for violations of permit conditions, proper operation and maintenance, and provisions for future permit modifications. It also includes instream monitoring programs, specific prohibitions with respect to the facility, and requirements for a Best Management Prac-

tices Program to prevent spills and subsequent discharge of hazardous materials in storage.

The NPDES permit (#CO-0001333) for the Site was issued in 1984 and expired on June 30, 1989. The NPDES permit expiration date was extended and is currently enforced until the new permit application is approved. The Site has recently applied for renewal of its NPDES permit.

The Site, through negotiation with EPA and CDPHE, has developed a draft NPDES permit. Following a public comment period, the Site expects the renewal NPDES permit to be approved. If applicable, the anticipated permit modifications and relevant surface water monitoring program changes are identified within the appropriate sections of this report. The significant changes from the previous NPDES permit that impact the Surface Water Monitoring Program are summarized below:

1. The U.S. Department of Energy (DOE), Kaiser-Hill Company, L.L.C. (K-H) and Rocky Mountain Remediation Services, L.L.C. (RMRS) will be the co-permittees. The DOE was the sole permitee in the previous permit.

2. The renewal NPDES permit will not regulate or control discharges from detention Ponds A-3, A-4, B-3, B-5, and C-2. The EPA determined that these ponds are located within waters of the United States, and should not be considered point source discharges that require an NPDES permit. Instead, discharges from these ponds will be regulated and controlled through CERCLA and RCRA. The renewal NPDES permit will regulate discharges going to the ponds.

3. The discharges from the Sewage Treatment Plant and the stormwater discharges from the Site will be regulated under the renewal NPDES permit. The renewal NPDES permit identifies nine monitoring points for control of discharges.

4. The discharge from the Sewage Treatment Plant will include effluent limitations for many more pollutants.

The NPDES monitoring points for the permit renewal are listed in Table II.

TABLE II
NPDES MONITORING POINTS FOR NPDES RENEWAL PERMIT

OUTFALL IDENTIFICATION	DESCRIPTION OF DISCHARGE POINT	LOCATION
STP1	Outfall pipe from the Sewage Treatment Plant (Bldg. 995), prior to mixture with South Walnut Creek water. STP1 is proposed as a backup outfall.	A point upstream of Pond B-3
STP2	Outfall pipe from the Sewage Treatment Plant, prior to mixture with South Walnut Creek water. STP2 is proposed as the primary outfall.	A point downstream of Pond B-5. Extension of the outfall pipe is planned.
008	Stormwater discharge from Basin SW022.	Point where Central Avenue Ditch crosses the outer Industrial Area east security fence
009	Stormwater discharge from Basin SW023.	South Walnut Creek upstream from Pond B-1 (gaging station GS10)
010	Stormwater discharge from Basin SW027.	Downstream end of the South Interceptor Ditch
011	Stormwater discharge from Basin SW093. Receives stormwater discharge from Outfall 012.	North Walnut Creek at a point upstream of Pond A-1
012	Stormwater discharge from SW118. Discharge flows to Outfall 011 area.	North Walnut Creek above Portal 3, north side of road.
013	Stormwater discharge from Basin SW998..	West Diversion Ditch (McKay Bypass) west of the outer industrial area security fence
014	Internal waste stream from Building 374 cooling tower system and boiler blowdown water. This water is discharged to the Sewage Treatment Plant.	Building 374

Earthen Dams

In addition, the earthen dams at Rocky Flats are subject to the following federal and state regulations:

- Colorado Code of Regulations, Rules and Regulations for Dam Safety and Dam Construction (2 CCR 402-1, rules 14 and 15);
- Colorado Revised Statutes (CRS 37-87-102 through 115);
- Federal Emergency Management Agency (FEMA) Federal Guidelines for Dam Safety.

SURFACE WATER MONITORING ACTION LEVELS AND STANDARDS

The Colorado Water Quality Control Commission (CWQCC) determines water quality standards throughout Colorado. In concurrence with CWQCC, the Rocky Flats Cleanup Agreement (RFCA) provides the Action Levels and Standards Framework (ALF) for surface water used to evaluate and protect the surface water at Rocky Flats.

SURFACE WATER MONITORING GOALS

The primary focus of the Rocky Flats Surface Water Monitoring Program is to manage the surface water for characterization and compliance with regulatory requirements. Surface water is analyzed prior to offsite discharge to determine if water quality standards are met and to evaluate potential contaminant releases from specific locations. The Surface Water Monitoring Program incorporates all monitoring of Site discharges and contaminant impacts to the surface water down to and including Broomfield and Westminster water supplies.

SURFACE WATER MONITORING STATIONS

There are 12 monitoring stations (designated SW and GS) equipped with automated surface water monitoring systems currently in use at Rocky Flats. The monitoring stations are used in multiple monitoring systems within five service categories to monitor the majority of runoff from the Industrial Area. The automated monitoring systems include flow measurement apparatus and equipment to collect samples of the surface water flowing by the station location.

In addition, another nine monitoring stations, formerly operated by the U.S. Geological Survey, are incorporated into the Rocky Flats Surface Water Monitoring Program. These monitoring stations are equipped to monitor surface water flow.

Precipitation gauges are also installed both onsite and offsite to measure rainfall intensity. Frontal storms produce low-intensity rainfall in the area in the fall and early spring. During late spring and summer months, short, intense rain showers produce greater runoff than other times of the year.

The locations of the surface water and flow monitoring stations are described in Table III and shown in Figure 2 (pages 14-15).

TABLE III
SURFACE WATER MONITORING STATIONS

STATION ID	LOCATION	SURFACE WATER MONITORING PROGRAM
Automated Surface Water Monitoring Stations		
SW022	Central Avenue Ditch at inner east fence	New Source Detection
SW027	South Interceptor Ditch at Pond C-2	New Source Detection Segment 5 Action Level Framework
SW091	A-series ponds, gully northeast of Solar Ponds outside inner fence	New Source Detection
SW093	North Walnut Creek upstream from the A-1 Bypass	New Source Detection Segment 5 Action Level Framework
GS01	Woman Creek at Indiana Street, East Site fenceline	Non-Point of Compliance Segment 4 Compliance
GS03	Walnut Creek & Indiana Street; East Site fenceline	Non-Point of Compliance Segment 4 Compliance
GS08	Walnut Creek, Pond B-5 outlet works	Segment 4 Compliance
GS10	South Walnut Creek upstream from the B-1 Bypass	New Source Detection Segment 5 Action Level Framework
GS11	North Walnut Creek, Pond A-4 outlet works	Segment 4 Compliance
GS27	Ditch northwest of Bldg. 889	Performance Monitoring
GS28	Ditch northeast of Bldg. 889	Performance Monitoring
GS31	Pond C-2 outlet works	Segment 4 Compliance
GS32	N of Solar Ponds draining Bldg. 779 area	Performance Monitoring
Boundary Stations		
GS02	Mower Ditch at Indiana St., East Site fenceline	Flow
GS04	Rock Creek at Highway 128, N. Site fenceline	Flow
GS05	North Woman Creek at West Site fenceline	Flow
GS06	South Woman Creek at west boundary	Flow
GS16	Antelope Springs	Flow
SW134	Rock Creek at west boundary (Gravel Pit)	Flow
Interior Stations		
GS09	South Walnut Creek, Pond B-4 outlet	Flow
SW118	North Walnut Creek above Portal 3, north side of road	Flow
SW998	Runoff from T130 trailer complex into Walnut Creek	Flow

MONITORING RATIONALE AND INTENDED DATA USE

The Rocky Flats Surface Water Monitoring Program for fiscal year 1997 incorporates 18 separate monitoring programs into a single, integrated surface water monitoring program to control and monitor surface water at and leaving Rocky Flats. The Surface Water Monitoring Program integrates Site-wide compliance monitoring activities, water quality monitoring, detention pond operations, and stormwater management.

The Surface Water Monitoring Program incorporates the following monitoring program, which are summarized in Table IV and described below. The specific objectives and rationale for each monitoring activity is presented with each program description. Figure 2 (pages 14-15) shows the map locations for the surface water monitoring stations and sample points.

TABLE IV
SURFACE WATER MONITORING PROGRAMS

FOCUS AREA	MONITORING PROGRAM	PRIMARY PURPOSE	MONITORING POINTS
Industrial Area	New Source Detection	Monitor surface water in main drainages leaving the Industrial Area for impacts from remedial activities.	SW022, SW091, SW093, SW027, GS10
	Performance Monitoring	Project-specific monitoring to evaluate contaminant control during remedial or D&D activities in the Industrial Area.	GS27, GS28, GS32
	Incidental Waters	Evaluate accumulated water (> 50 gallons) in Industrial Area (utility pits, berms, footing drains, sumps, etc.) for discharge disposition.	Industrial Area, various sites
Water Quality	Non-Point of Compliance Monitoring at Indiana St.	Evaluate discharges leaving Rocky Flats at Walnut Creek and Woman Creek for nutrient land contaminant loading	GS01, GS03, Woman Creek (once each during pond discharge and nondischarge)
	Source Location	Global monitoring to locate and characterize new contaminant sources detected during environmental monitoring. Primarl focus is Industrial Area, but applicable site-wide.	No monitoring station currently installed
	Ad Hoc Monitoring	Support special request monitoring.	As needed per request
	Internal Waste Stream Characterization for Permit Application	Regulatory compliance: NPDES Permit Modification. Characterize discharge from new waste stream.	Industrial Area: -Cooling Towers -Unidentified Waste Stream
Sewage Treatment Plant (STP)	Internal Waste Stream Authorization to Discharge to the STP	Predischarge evaluation for authorization to discharge to Sewage Treatment Plant.	Industrial Area
	Sewage Treatment Plant Collection System	Safety and regulatory compliance monitoring.	STP
	NPDES Permit Monitoring	Required monitoring of discharge to surface waters of the United States.	Outfall discharges at Buildings 995 and 374
Pond Influent, Operations and Discharge	Segment 5 Action Level Framework Monitoring	Evaluate discharges from Industrial Area for RFCA Action Level compliance (Segment 5 = terminal ponds, North and South Walnut Creeks, Pond C-2, South Interceptor Ditch).	SW093, GS10, SW027
	NPDES Discharges to and from Ponds	Regulatory Compliance to NPDES Permit. Base monitoring of point sources identified in the permit for discharge standard compliance.	Effluent from: Bldg. 995. Ponds A3, A4, B5, & Pond B5 Transfers
	Predischarge Monitoring	Regulatory compliance to NPDES Permit. Annual water quality monitoring.	Ponds A-4, B-5 Pond C-2
	Segment 4 Compliance Monitoring	Regulatory compliance monitoring of discharges from terminal ponds into Segment 4 (Ponds A-4, B-5, C-2, Walnut Creek and Woman Creek at Indiana St.).	GS11, GS08, GS31, GS01, GS03
	IDLH Monitoring (Dam Safety)	Monitor dam safety; evaluate safe pond capacity.	12 detention ponds: A-, B-, and C-series
Offsite Community Monitoring	Community Assurance Monitoring	Assess community water supplies and distribution systems.	Great Western Reservoir (raw and treated water); Distribution system for Broomfield and Denver Service Areas
	Uncharacterized Discharge Monitoring	Analyze uncharacterized discharge waters from Rocky Flats.	Walnut & Woman Creek at east Site Boundary, offsite reservoirs, municipalities
Extraneous Monitoring	Correlation of Plutonium with Total Suspended Solids	Evaluate the relationship of plutonium concentrations with indicator parameters.	Sitewide

FIGURE 2 - SURFACE WATER MONITORING STATIONS

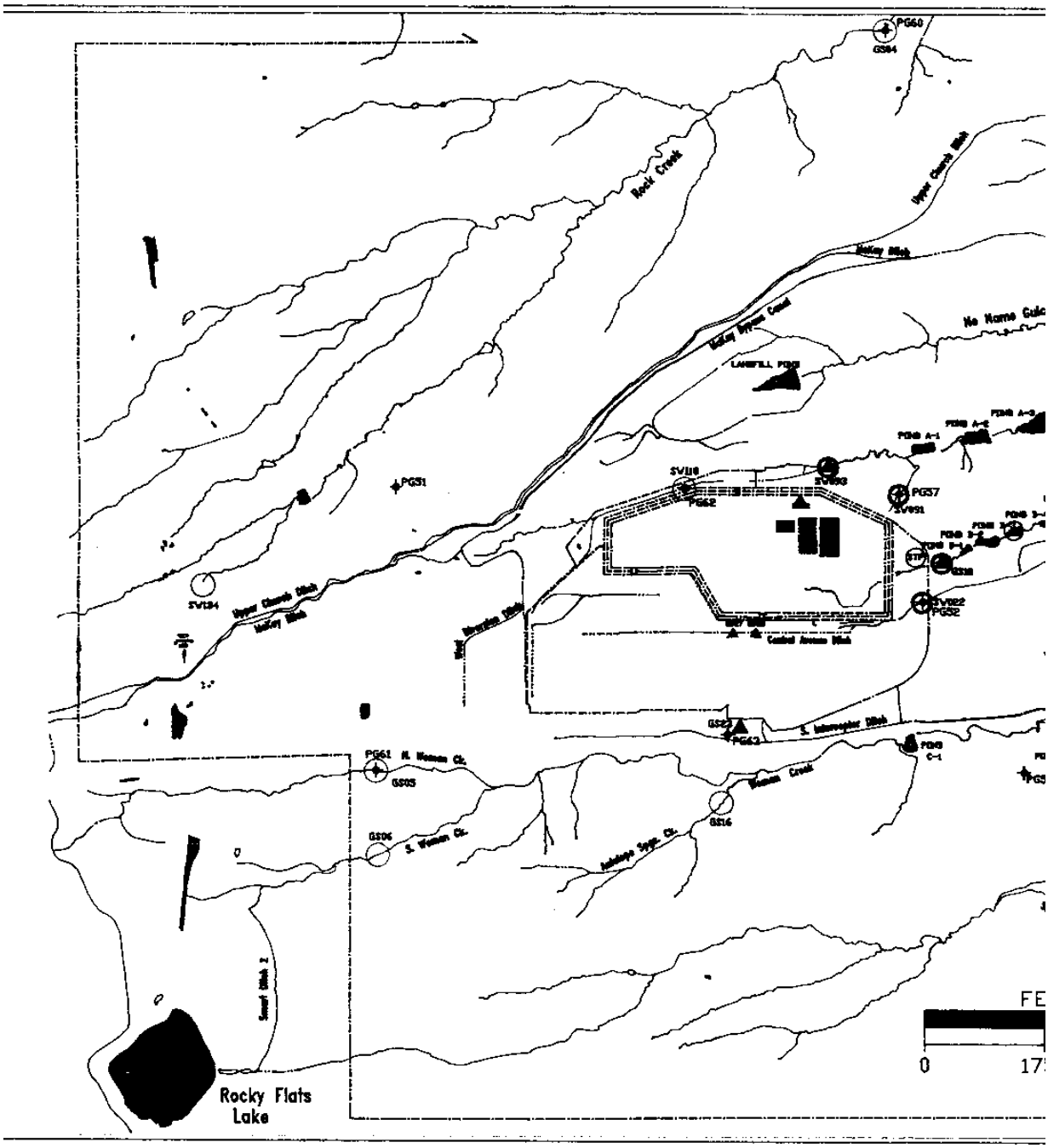
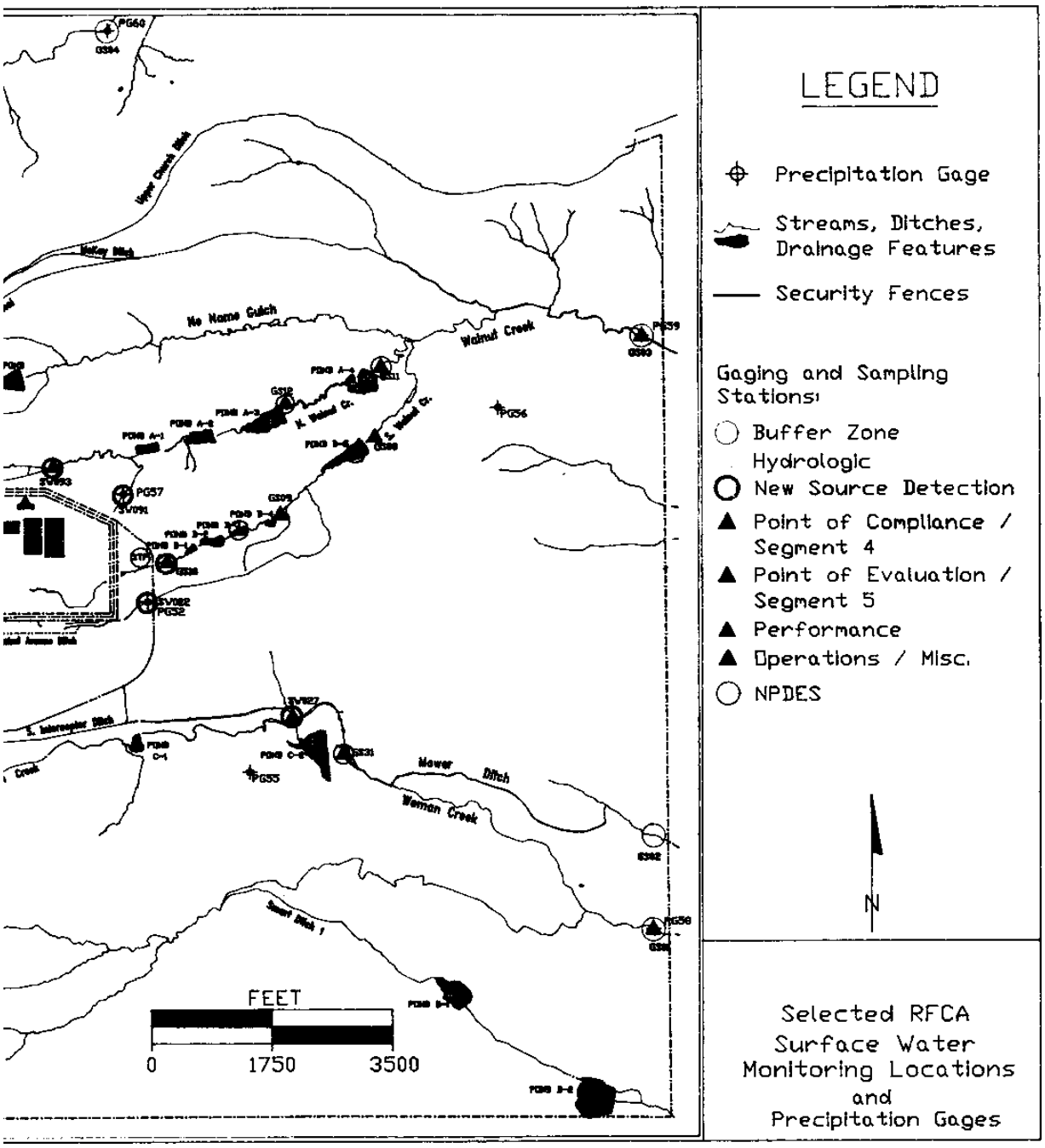


FIGURE 2 - SURFACE WATER MONITORING STATIONS



SURFACE WATER MONITORING PROGRAMS

The 18 separate monitoring programs that make up the Surface Water Monitoring Program were subdivided into six different categories for ease of presentation.

INDUSTRIAL AREA MONITORING

New Source Detection Monitoring

The purpose of the New Source Detection Monitoring program is to monitor impacts to the surface water from remedial or D&D activities occurring in the Industrial Area. It is focused on monitoring all of the surface water leaving the Rocky Flats Industrial Area (including the 903 Pad). Industrial Area runoff is monitored in the three main Segment 5 drainages and the tributaries to the A-4, B-5, and C-2 terminal ponds (located in North Walnut Creek, South Walnut Creek and Woman Creek, respectively).

The New Source Detection Monitoring is presently conducted at five gaging stations. These stations are used to monitor for potential chronic and acute releases of contaminants resulting from D&D activities in the Industrial Area, spills, and storm water runoff. Each gaging station has a relocatable surface water monitoring system equipped with continuously recording flow meters linked to automatic water samplers.

Gaging stations SW093 and SW091 are used to monitor surface water runoff from the northern portion of the Industrial Area, stations GS10 and SW022 monitor runoff from the central portion, and station SW027 monitors flow from the southern part of the Industrial Area.

Continuous, flow-proportional (flow-paced) water samples are collected at gaging stations SW093, GS10, and SW027, which are also used for monitoring Segment 5 Action Level compliance. Because the tributaries at gaging stations SW022 and SW091 have no base flow (constant flow from natural sources or Site discharge), flow-paced water samples are collected only during storm events. At these stations, sampling commences during the first flush of the rising limb of storm water flow. Historical records of storm water and runoff flow at a particular station location are

used to set the flow-pacing rate and to calibrate the automated sampler instrumentation.

As the water flow rate rises during the beginning of runoff from a storm, the automated sampler collects samples according the flow-paced rate set for the instrument. Samples collected during the rising limb of the stormwater runoff period are desirable because they will contain the first flush (first water flow), which carries the highest load of potential contaminants. If the storm lasts long enough, the rising limb will provide sufficient water volume necessary for proper sample analyses. For short duration storms, runoff may not produce sufficient water volume to allow complete analyses for all monitored pollutants.

All water samples collected from each gaging station are analyzed for plutonium, uranium, and americium. Indicator parameters are measured and recorded at 15-minute intervals using real-time water quality probes at each station. These measurements include temperature, pH, conductivity, turbidity, and nitrate. If a spike is detected in any of the indicator parameters, then, at the discretion of the Site, additional analyses for beryllium, cadmium, chromium, and silver may be performed. For example, significant changes in pH or conductivity may indicate the presence of chromium or a high nitrate concentration may suggest cadmium nitrate is present.

TABLE V
NEW SOURCE DETECTION MONITORING

STATION ID	LOCATION	FLOW STRUCTURE	ESTIMATED SAMPLE FREQUENCY(1), (2)
SW093	N. Walnut Creek upstream from the A-1 Bypass	36" Suppressed Rectangular Sharp-Crested Weir	12/yr
SW091	Gully NE of Solar Ponds outside inner fence	1' H Flume	12/yr
GS10	S. Walnut Creek upstream from the B-1 Bypass	9" Parshall Flume	12/yr
SW022	Central Avenue Ditch at inner east fence	9.5" Parshall Flume	12/yr
SW027	South Interceptor Ditch at Pond C-2	Dual Parallel 120º V-Notch Weirs	12/yr

(1) Samples are continuous flow-paced at stations SW093, GS10, SW027 and analyzed for plutonium, uranium, americium. Beryllium, cadmium, chromium, and silver may be analyzed if a spike in the indicator parameters is detected (pH, conductivity, and nitrate are measured with sample probes.)
(2) Samples are storm event flow-paced samples at stations SW091 and SW022; target is one sample per month. Number of samples depends on annual discharge volume at each location.

Table V describes the monitoring station locations for the New Source Detection Monitoring system.

Performance Monitoring

Performance Monitoring is initiated on a project-specific basis and is used to evaluate contaminant control performance of specific high-risk remedial activities within the Industrial Area. Project-specific performance monitoring is specified in a project plan if the risk of contaminant release to the surface water during project work is suspected, particularly for contaminants not routinely monitored.

Project-specific Performance Monitoring stations are equipped with mobile monitoring equipment. Action Levels and monitoring procedures for each location are specified in the project plan. Performance Monitoring may be used for the following activities:

- Specific D&D Actions;
- Specific Remedial Actions;
- Transition Actions;
- Best Management Practices for Plutonium Transport Control in Surface Water Runoff.

Presently, there are two subdrainage monitoring stations installed in the Industrial Area for Performance Monitoring:

- Gaging stations GS27 and GS28 were installed to monitor impacts from the demolition of Building 889. Gaging station GS27 is presently in operation, but sampling at gaging station GS28 was terminated in August 1997. Building 889 was used to decontaminate equipment and is reportedly contaminated with plutonium, uranium, beryllium, and various hazardous wastes. The building demolition was completed in the Fall of 1996. The GS28 station equipment reportedly will be moved to the area containing Buildings 779 and 980, to support baseline monitoring for the scheduled decontamination and demolition during the next fiscal year.

- Gaging station GS32 is currently used for baseline monitoring to monitor the potential impacts from the scheduled demolition of Building 779 (known as the Plutonium Development Building), formerly used for research and development. This building is reportedly contaminated with plutonium, uranium, beryllium, and hazardous wastes.

The monitoring stations used for Performance Monitoring are intended to be located close to the project site, upstream from routine monitoring stations. The existing monitoring stations are each equipped with continuously recording flow meters linked to automatic water samplers. The telemetry-linked water samplers are programmed to begin sampling stream water when the flow meter detects the rising limb stream flow stage. Like the New Source Detection Monitoring program, the automated water samplers and flow meters are programmed to collect grab samples from the first flush of a storm water runoff event. The grab samples are flow-weighted so sample data from the storm water runoff can be compared between different stream gages. The total volume of sample collected, as previously described, will depend upon the flow-pace setting and the nature and duration of the storm event being monitored.

TABLE VI
PERFORMANCE MONITORING STATIONS

STATION ID	LOCATION	FLOW STRUCTURE	APPROXIMATE SAMPLE FREQUENCY(1), (2)
GS27	Ditch NW of Bldg. 889	2" Cutthroat Flume, linked with telemetry	12/yr
GS28(3)	Ditch NE of Bldg. 889	4" Cutthroat Flume	12/yr
GS32	N of Solar Ponds draining Bldg. 779 area	18" corrugated metal pipe, linked with telemetry	12/yr

(1) All samples are analyzed for plutonium, uranium, and americium
(2) Samples are storm-event (rising limb) flow-paced at all stations, flow setting determined by historical station monitoring records. One sample per month is targeted.
(3) GS28 monitoring was discontinued in August 1997.

Water samples are currently analyzed for plutonium, uranium, and americium at each monitoring location. The current installation of each Performance Monitoring station is described in Table VI.

Incidental Waters Monitoring

Monitoring for incidental waters is performed only in the Industrial Area. Incidental waters are defined as non-routine accumulations of water in utility pits, berms, footing drains, sumps, excavation sites, and releases in buildings or ground spills. These waters are typically derived from rainwater, snow melt, groundwater, or potable water. Process water and discharges regulated by permit, or allowable discharges to the Sewage Treatment Plant are managed separately

and excluded from this monitoring program.

Because various sources of contamination exist within and around the Industrial Area, these incidental waters are potentially contaminated with organic, inorganic, and/or radionuclide constituents. If the incidental waters contain any hazardous constituents or pollutants, the discharge would require specific regulatory management under RCRA or CERCLA.

Industrial Area incidental waters with an accumulated volume of 50 gallons or greater are evaluated to determine if untreated water can be discharged to the environment (i.e., storm drains, surface water, ground surface). The incidental waters are monitored once for each water sample

Incidental Water Field Screening

Parameter Screened	Criteria
Volume Estimate	> 50 gallons
Process knowledge	Professional judgment
pH	pH range from 6 to 9
Appearance	Visible sheen or color
Nitrate	10 mg/l
Conductivity	700 μmho/cm^2

using field screening observations, measurements, and process knowledge. No laboratory analyses are performed. Field screening observations and measurements include the following parameters:

If the initial screening does not indicate the presence of contaminants (oil, hazardous constituents, or radioactive substances) in the incidental water sample, no further monitoring is performed. The incidental water can then be discharged to the environment (surface drainage channels) or, if approved, to the Sewage Treatment Plant. Incidental waters are considered uncontaminated if the water quality standards for Big Dry Creek Segment 5 are met (see Table VIII, Segment 5 Action Level Framework Monitoring).

If the preliminary screening results indicate the water is contaminated, additional testing is performed based on the discretion of the responsible facility or project manager.

Fifteen incidental water accumulation screenings per month are budgeted for FY 1997.

WATER QUALITY MONITORING

Non-Point of Compliance Monitoring at Indiana Street

Non-Point of Compliance Monitoring at Indiana Street is performed to evaluate the discharge water leaving the Rocky Flats boundary at Walnut Creek and Woman Creek for nutrient loading. Surface water nutrients are the compounds necessary to support aquatic life. Excess nutrients can degrade water quality and promote excessive growths of algae and other forms of microscopic life. This can result in undesirable turbidity, floating scum, and declining oxygen content. Nitrogen and phosphorus are common nutrients in watercourses.

The purpose of the monitoring is to establish a water quality baseline for the combined flow in Walnut Creek and for the new flow configuration in Woman Creek. Water leaving Rocky Flats via Walnut Creek is a mixture of potentially contaminated discharge water from Rocky Flats and natural stream flow.

Terminal Pond C-2 discharges directly into Woman Creek. Since the completion of the Woman Creek Reservoir, all Woman Creek flows are detained in the reservoir cells for water quality testing, then discharged to the Great Western Reservoir. The Woman Creek mainstream channel also receives water that is not monitored upstream from detention Pond C-2.

Presently, nutrient loadings generated by Rocky Flats are discharged offsite via Walnut Creek. The Walnut Creek flow is either discharged directly to the Great Western Reservoir or diverted around the reservoir to Big Dry Creek. The Colorado Water Quality Control Commission is currently considering new waste load allocation limits for the Big Dry Creek drainage.

Because of the Broomfield water replacement project and the new flow configuration for Woman Creek, the quantity and quality of the water entering the Great Western Reservoir may change. Monitoring data from the Non-Point of Compliance Monitoring program will be used to evaluate changes in water quality.

Non-Point of Compliance surface water monitoring is performed at two gaging stations, GS01

and GS03, located at the east fence line of Rocky Flats on Woman Creek and Walnut Creek. These two gaging stations are also used for compliance monitoring for the Segment 4 Compliance Monitoring program.

Each gaging station has a primary flow structure equipped with a flow meter linked by telemetry. Flow-proportional monitoring is conducted to ensure that significant storm events are sampled. These gaging stations are also equipped with real-time water quality probes that measure pH and conductivity. Additional water samples are collected at terminal Pond C-2 during pond discharge periods.

TABLE VII
NON-POINT OF COMPLIANCE MONITORING AT INDIANA STREET

STATION ID	LOCATION	FLOW STRUCTURE	SAMPLE FREQUENCY
GS01	Walnut Creek and Indiana Street	9" Parshall Flume	4/yr when C-2 pond is NOT being discharged 2/yr when C-2 pond IS being discharged
GS03	Walnut Creek and Indiana Street	6" and 36" Parallel Parshall Flumes	5/yr when flow is 100% Site effluent 5/yr when flow is mixed effluent and natural flow 5/yr when flow is 100% natural flow (pond is not discharging)

NOTE: All samples are analyzed for total ammonia, nitrate, total phosphate, orthophosphate, beryllium, cadmium, silver, chromium, and uranium.

Table VII describes the station locations and monitoring data collected for each station.

Source Location Monitoring

Source Location Monitoring is initiated when a new contaminant source is detected from other surface water monitoring activities. A new contaminant source is suspected when analytical results confirm an exceedance of the surface water Action Level (water quality standards or discharge permit requirement) for one or more contaminants of concern. A new contaminant source is also suspected if unexplained increases in the baseline surface water concentration levels are detected in onsite surface water or downstream reservoirs.

Source Location Monitoring activities are implemented within approximately 30 days after a new contaminant source is detected as indicated by the surface water sampling analytical results. The source location activities can begin before the analytical results are received if there are other

physical indications of a potential contamination occurrence. Typically the analytical results are the first indication than an Action Level exceedance has occurred. However, analytical results from all samples submitted to the laboratory, including the Source Location Monitoring surface water samples, are received approximately 35 to 45 days after submission. Normal testing procedures can range from two weeks or greater than 60 days to complete a water anlysis for radionuclides, depending on the typical turn-around time for the laboratory used.

Source Location Monitoring is a reactive program and is used only to locate, characterize, and evaluate a contaminant source detected during other surface water monitoring activities. This program is not used to search for or discover new contaminant sources.

Source Location Monitoring is conducted using portable sampling equipment installed at targeted locations within surface water drainage areas. Monitoring continues until the contaminant source is identified, evaluated, or no longer detected. Monitoring activities include sampling and analyses for the contaminants of concern and continuous flow monitoring. Sample analyses are limited to the specified contaminant(s) and related indicator parameters. Source Location Monitoring is applicable anywhere on the Site, but is primarily focused in the Industrial Area.

No Source Location Monitoring installations are currently in place or budgeted for FY 1997. However, the recent detection of plutonium levels at concentrations nearly three times the Action Level at gaging station GS03 may necessitate implementing this program.

Ad Hoc Monitoring

The Ad Hoc Monitoring program is intended to support specialized, unscheduled project and facility-specific needs and requirements upon request.

The DOE Rocky Flats Field Office (RFFO), cities, regulatory agencies, and the Sewage Treatment Plant have previously requested supplementary monitoring for various reasons and events.

Examples of events that may trigger the Ad Hoc Monitoring program include the following:

- Major precipitation events that disrupt pond monitoring and discharge schedules;
- Community assurance monitoring for downstream water users;
- Unanticipated revisions to regulatory permits, agreements, or funding;
- Construction projects;
- Spill events.

The Ad Hoc Monitoring requirements are determined on an individual basis, depending upon the specific objectives of the monitoring request.

At present, there are no ongoing Ad-Hoc Monitoring activities at Rocky Flats.

Internal Waste Stream Characterization (IWS) for Permit Application

In accordance with the NPDES permit requirements for Rocky Flats, the Site is required to monitor and provide compliance data for waste streams considered to be point discharges. This information is provided in the NPDES renewal permit or permit modifications. The permi requires any new waste streams to be disclosed and characterized. The following Industrial Area process streams were budgeted in fiscal year 1997 to be monitored for the NPDES permit application:

1. Characterize the new waste stream from the NCPP Building (865);
2. Characterize an unidentified new waste stream (included for budgetary purposes);
3. Determine if discharge from the four cooling towers is a permit reporting requirement.

One representative sample will be collected from the NCPP Building waste stream and the unidentified new waste stream for characterization and analyzed for the following constituents:

Hazardous Substance List metals	Biological Oxygen Demand (BOD)
Semi-volatile compounds	Total suspended solids (TSS)
Plutonium, uranium, americium	Total phosphate
pH	NO_3/NO_2
Conductivity	Ammonia

Twelve samples will be collected from each of the four cooling towers to characterize the effluents and establish effluent variability in order to evaluate the need for a reporting requirement. These samples will be analyzed for metals, pH, conductivity, and total suspended solids.

SEWAGE TREATMENT PLANT MONITORING

Internal Waste Stream Authorization to Discharge to the Sewage Treatment Plant

Rocky Flats manages discharges to the Sewage Treatment Plant (STP) to ensure that operational capabilities are not exceeded and to comply with regulatory requirements (NPDES Permit, RCRA, DOE orders, and other applicable regulatory criteria).

This program deals with the monitoring requirements for requests to discharge non-routine internal process or sanitary waste streams to the Sewage Treatment Plant. These internal waste streams may include, but not be limited to, chemical solutions, new process discharges, contaminated incidental waters, or foundation drainages.

Each waste stream for which authorization to discharge to the Sewage Treatment Plant is granted is initially assessed using a field screening procedure and process knowledge. The screening

Internal Waste Stream Screening Test

Process Knowledge		Screening Tests
Location	Visible sheen	Volume
Source	Color	Field Conductivity
History	Clarity	pH (litmus paper)

protocol consists of observations and minor field tests. The process knowledge input includes information such as source identification, present location, and historic precedent. A single sample is typically collected and evaluated using the following standard screening protocols.

If process knowledge and screening test results do not indicate the presence of restricted contaminants in the waste stream, additional analysis is not required and authorization for discharge to the Sewage Treatment Plant is granted. If the screening results are inconclusive or positive for suspected contaminants, discharge is either denied or additional analyses and tests are required to further characterize the waste stream. The additional analyses are performed at the expense of the requestor and are not budgeted for in this monitoring program.

Sixty requests for authorization to discharge internal waste streams were estimated for budgeting in fiscal year 1997.

Sewage Treatment Plant (STP) Collection System Monitoring

The NPDES permit for the Site requires the influent to the Sewage Treatment Plant to be monitored. This monitoring is required to detect any spills or discharges into the sanitary sewer system that could cause operational upsets of the sewage treatment processes, or result in discharge of contaminants.

Sewage Treatment Plant Collection System Monitoring is currently limited to two locations: flow at the headworks to the plant (influent) and the equalization basin. Real-time measurements for pH and conductivity are performed at these two locations. In accordance with the NPDES permit requirements (including the renewal permit), the following monitoring is performed:

- Continuous measurements of pH and conductivity readings to monitor for corrosivity and detect spills;
- Lower Explosive Level (LEL) monitoring of the atmosphere above the headworks and flow equalization basin to protect worker safety;
- Oxygen uptake rate of a grab sample collected from the headworks of the plant once each operating shift;
- Visual inspections for unusual conditions such as color, excessive foam, odors, oil sheen, etc. at the on-line flow equalization basin and/or headworks flow. Visual observations are performed once per operating shift.

Additional manual pH readings are also performed at the headworks to the Sewage Treatment Plant. All monitoring results are recorded for each 24-hour period. These records are maintained at the Sewage Treatment Plant and made available for inspection by EPA or the Colorado Water Quality Control Division.

The renewal NPDES permit (recently submitted to the EPA) will require a response plan for abnormal influent monitoring results. The plan must identify the Action Level for each influent monitoring activity and detail the response action for any detected exceedance. This plan is must be developed and implemented within six months after the effective date of the renewed permit.

Within 12 months after the effective date of the renewed NPDES permit, the Site is required to submit the results of a feasibility study for viable methods and procedures that would improve

radionuclide monitoring at the Sewage Treatment Plant.

The Site expects the scope of future Sewage Treatment Plant Collection System Monitoring to increase as Decontamination and Decommissioning (D&D) activities proceed and building drains to the collection system are impacted. These issues are planned to be addressed in fiscal year 1998 revisions to the Integrated Monitoring Plan for surface water.

Sewage Treatment Plant NPDES Permit Monitoring

The discharge from the Sewage Treatment Plant (STP) is the main non-storm water discharge from Rocky Flats. The effluent from the Sewage Treatment Plant is currently discharged into Pond B-3 via South Walnut Creek at a point upstream of Pond B-3, which is subsequently released downstream to Ponds B-4 and B-5. This discharge location is currently designated a NPDES compliance point for Sewage Treatment Plant discharge. STP2 (see Table II, page 10, for description) will then be used as the primary outfall for Sewage Treatment Plant discharge. STP1(see Table II) will be maintained as a backup location. STP1 is located at a point upstream of Pond B-3, and STP2 is at a point downstream of Pond B-5.

The NPDES renewal permit proposes to move the wastewater discharge compliance point back to the point of discharge, which will be either into Pond B-3 or into South Walnut Creek downstream from Pond B-5 (STP2). The existing outfall pipe from the Sewage Treatment Plant (STP1) is expected to be extended to the proposed discharge point downstream from Pond B-5 during the term of the renewed NPDES permit.

The NPDES renewal permit includes additional numerical effluent limitations for discharges from the Sewage Treatment Plant. The monitoring requirements for wastewater discharge from the Sewage Treatment Plant at STP1 and STP2 are summarized in Table VIII.

POND INFLUENT, OPERATIONS, AND DISCHARGE MONITORING

Segment 5 Action Level Framework Monitoring

Stream Segment 5 includes the terminal ponds (Ponds A-4, B-5, and C-2), the main stream channels of North and South Walnut Creeks (upstream of the ponds), and the South Interceptor Ditch (not classified as State of Colorado waters). Stream Segment 5 waterways are considered the major

TABLE VIII
EFFLUENT LIMITATIONS FOR SEWAGE TREATMENT PLANT
DISCHARGE AT STP1 AND STP2

EFFLUENT CHARACTERISTICS	MONITORING FREQUENCY	SAMPLE TYPE	EFFLUENT LIMITATIONS		
			30-Day Ave.	7-Day Ave.	Daily Max.
Total Flow (MGD)	Continuous	Recorder		none	none
$CBOD_5$[1]	2/week	Composite	8.0	none	20
Total Suspended Solids (mg/L)[1]	2/week	Composite	15	none	25
Fecal Coliforms (no./100 mL)	2/week	Grab	200	400	none
Nitrate as Nitrogen (mg/L0	2/week	Composite	none	none	10 (100)
Nitrite as Nitrogen (mg/L	2/week	Composite	none	none	0.5 (4.5)
Ammonia, as Nitrogen (mg/L)	2/week	Composite	N/A	N/A	N/A
Total Phosphorous (mg/L)	2/week	Composite	8	none	12
Oil and Grease, Visual	Daily[2]	Observation	N/A	N/A	N/A
Oil and Grease (mg/L)	If visible sheen	Grab	none	none	10
pH	Daily	Grab	none	none	6.5-9.0
Alkalinity as $CaCO_3$ (mg/L0	2/week[3]	Composite	none	none	none
Chromium, total recoverable (µg/L)	2/month	Composite	none	none	50
Chromium, hexavalent, dissolved (µg/L)	2/month	Grab[4]	11	none	16
Silver, PD (µ/L)	weekly	Composite	0.6	none	none
Gross Alpha (pCi/L)	2/month	Composite	11	none	none
Gross Beta (pCi/L)	2/month	Composite	11	none	none
Americium (pCi/L)	per RFCA[5]	[5]	[5]	[5]	[5]
Plutonium (pCi/L)	per RFCA[5]	[5]	[5]	[5]	[5]
Tritium (pCi/L)	per RFCA[5]	[5]	[5]	[5]	[5]
Uranium (pCi/L)	per RFCA[5]	[5]	[5]	[5]	[5]
Benzene (µg/L)	1/month	Grab	1.0 (5)	none	none
Carbon tetrachloride (µg/L)	1/month	Grab	0.25 (5)	none	none
1,2-Dichloroethylene (µg/L)	1/month	Grab	70 [0.4 (5)]	none	none
1,1-Dicloroethylene (µg/L)	1/month	Grab	[0.57 (7)]	none	none
Tetrachloroethylene (µg/L)	1/month	Grab	0.8 (5)	none	none
1,1,1-Trichlorethane (µg/L)	1/month	Grab	200)	none	none
Trichloroethylene (µg/L)	1/month	Grab	2.7 (5)	none	none
Whole Effluent Toxicity	Quarterly[6]	Composite	none	none	none

[1] Influent to the Sewage Treatment Plant is monitored for this pollutant for the same sample type and frequency as the effluent.
[2] If an oil sheen is visible, a grab sample is collected and analyzed for oil and grease.
[3] Alkalinity samples are collected concurrently with ammonia samples.
[4] Quarterly sampling for hexavalent chromium occurs within two weeks after total chromium exceed 11 µg/L and continues for four consecutive quarters.
[5] Monthly samples are collected during normal plant operations. Five-day composite samples are collected during non-stormwater discharge periods.
[6] Quarterly samples are collected in January, April, July, and October during continual discharge

Level Framework Monitoring program is intended to monitor surface water runoff from the Industrial Area before it arrives at the terminal ponds.

The Segment 5 Action Level Framework (ALF) Monitoring is used to evaluate discharges from the Industrial Area into the main stream channels of stream Segment 5 prior to discharge to the terminal ponds for compliance with RFCA Action Levels. Historical data indicate several regulated contaminants have exceeded RFCA Action Level criteria in stream Segment 5.

Surface water is monitored at three Segment 5 Action Level Framework monitoring stations, SW093, GS10 and SW027. Continuous, flow-paced pond inflow water samples are collected at each station using automated samplers. Flow-paced sampling is determined from historical storm contaminant transport pathways for water leaving the Industrial Area. The Segment 5 Action

flow records at each gaging station. Depending on the volume of flow, either daily or 30-day moving averages for the primary constituents of concern are computed from the sample data and compared to stream Segment 5 Action Levels.

If RFCA Action Levels are exceeded for any of the monitored analytes of interest, the Site is required to take the following actions:

- Notify EPA within 30 days and CDPHE within 45 days after the exceedance is detected;
- Locate the contaminant source;
- Implement mitigation to control the contaminant source.

Each monitoring station has a primary flow structure equipped with a flow meter linked by telemetry. Real-time water quality probes measure and record pH, conductivity, turbidity, and

TABLE IX
SEGMENT 5 ACTION LEVEL FRAMEWORK MONITORING

STATION ID	LOCATION	FLOW STRUCTURE	APPROXIMATE SAMPLE FREQUENCY(1)
SW093	N Walnut Creek upstream from the A-1 Bypass	36" Suppressed Rectangular Sharp-Crested Weir	36/yr
GS10	S Walnut Creek upstream from the B-1 Bypass	9" Parshall Flume	34/yr
SW027	South Interceptor Ditch at Pond C-2	Dual Parallel 120° V-Notch Weirs	15/yr

(1) All samples are analyzed for plutonium, uranium, americium, total beryllium, dissolved cadmium, dissolved silver, hardness, and total chromium

nitrates. Water samples are analyzed for the analytes of interest and hardness.

Table IX shows the analytes monitored and describes the monitoring station locations.

NPDES Discharge to and from Ponds

The current NPDES permit requires base monitoring of all point sources identified in the permit to verify that the industrial discharges from Rocky Flats protect U.S. waters. The monitoring points identified in the permit are effluent discharges from the Sewage Treatment Plant (Building 995) and Ponds A-3, A-4, B-3, B-5, and C-2.

Rocky Flats anticipates that the NPDES renewal permit will be authorized in the last half of 1997, which may require additional monitoring points. Draft versions of the new permit were prepared in August 1997. Anticipated revisions to the current NPDES permit are noted through-

out this document. When the NPDES renewal permit is issued, additional monitoring locations

TABLE X
NPDES MONITORING REQUIREMENTS

ANALYSIS	BLDG. 995 EFFLUENT	POND A3 EFFLUENT	POND A4 EFFLUENT	POND B3 EFFLUENT	POND B5 EFFLUENT	POND B5 TRANSFERS
	ANNUAL SAMPLING FREQUENCY					
Silver, arsenic, lead, cadmium, mercury	18					
Acute Toxicity	4					
Americium^{241}	12		4		4	2
BOD_5				50		
$CBOD_5$	104			50		
Chromium	30		8		8	8
Fecal colliform	106					
Gross Alpha	24				14	
Gross Beta	24				14	
HSL Metals	16					
CLP Metals	2					
NH3 as N	120					
NO_3/NO_2	62	24		56		
NVSS			26		24	
Phosphorous	120					
Plutonium^{238}	12				4	
Plutonium$^{239/240}$	12				4	
Total chromium	12		2			2
Tritium	18					
Total suspended solids	116			52		
U-isotopic	12				4	
VOA CLP	18					

will be required.

Table X presents the current NPDES monitoring requirements.

Predischarge Monitoring

Predischarge Monitoring is routinely conducted in Ponds A-4 and B-5 in the Walnut Creek drainage and Pond C-2 in the Woman Creek drainage.

The intent of the Predischarge Monitoring program is to confirm that the water quality meets stream standards before pond discharge is initiated. Predischarge Monitoring provides advance notice of contaminant exceedances in the surface water prior to offsite discharge. This monitoring allows Rocky Flats to manage the surface water rather than proceed with immediate offsite discharge.

Single, depth-integrated grab samples are collected prior to batch pond discharge by the Site. These samples are then submitted to CDPHE for analysis. The following samples are collected:

- A total of 8 to 10 samples per year from the Walnut Creek drainage ponds;
- One sample per year from Pond C-2 in the Woman Creek drainage.

Predischarge water samples are analyzed by CDPHE for the following parameters:

Volatile organic compounds	Hardness
Semivolatile organic compounds	Chloride
Total metals	Sulfate
Dissolved metals	Sulfite
Total dissolved solids	Gross alpha
Total suspended solids	Gross beta
NO_3/NO_2	Plutonium, uranium, americium
Total phosphorous	Tritium
Ammonia	pH
Dissolved oxygen	Conductivity

If a contaminant exceedance is detected, CDPHE notifies the Site of the nature of the exceedance. The Site determines the disposition of the contaminated pond discharge after considering various management options, such as treatment, storage, disposal, or pond discharge. The Site will also initiate flow-proportional monitoring at the Segment 4 monitoring stations for contaminant(s) that exceed the standard.

Segment 4 Compliance Monitoring

Segment 4 Compliance Monitoring is used to monitor the surface water leaving the eastern Site boundary (Indiana Street). It also includes the terminal pond monitoring required by the current NPDES permit. Discharges from the terminal ponds will no longer be regulated as point source discharges from the Site in the NPDES renewal permit because the EPA has determined that these waters are located in waters of the United States. However, these discharges are regulated and controlled through CERCLA and RCRA, as specified by agreement in the RFCA.

Segment 4 Compliance Monitoring is used to evaluate discharges from the following locations:

- Terminal Pond A-4 effluent;
- Terminal Pond B-5 effluent;
- Point at Indiana Street and Walnut Creek where it leaves Rocky Flats boundary;

- Point at Indiana Street and Woman Creek where it leaves Rocky Flats boundary;
- Terminal Pond C-2 after discharge but prior to entering Woman Creek.

There are five continuously operating automatic gaging stations in the Segment 4 Compliance Monitoring system. Pond discharge is sampled at gaging stations GS11, GS08, and GS31 located at Ponds A-4, B-5 and C-2, respectively. Two gaging stations, GS03 and GS01 located at Walnut Creek and Woman Creek, are used to monitor water prior to leaving the Rocky Flats boundary.

The automated samplers at each station collect composite water samples during each pond discharge event to represent the total volume discharged. Approximately 17 composite samples are collected annually for the base flow at gaging station GS01 at a frequency determined by the discharge rates. Gaging station GS03 also collects one composite of any base flow for the periods between discharges. The samples are analyzed for the primary constituents of concern and 30-day moving average concentration values are computed and reported. These values are compared to stream segment standards. Exceedance of the standards may result in Notices of Violation. The five gaging stations are also equipped with real-time water quality probes. The probes measure temperature, conductivity, pH, nitrate and turbidity at gaging stations GS11, GS08 and GS31, and pH and conductivity at stations GS01 and GS03.

TABLE XI
SEGMENT 4 POINT OF COMPLIANCE MONITORING

STATION ID	LOCATION	FLOW STRUCTURES	ANALYTES OF INTEREST	APPROXIMATE SAMPLE FREQUENCY(4)
GS11(2)	Pond A-4 outlet works	24” Parshall Flume	(1), Uranium	3 per discharge
GS08(2)	Pond B-5 outlet works	24” Parshall Flume	(1), Tritium	3 per discharge
GS31(2)	Pond C-2 outlet works	24” Parshall Flume	(1), Uranium	3 per discharge
GS01(3)	Woman Creek and Indiana Street	9” Parshall Flume	(1), Tritium	20
GS03(3)	Walnut Creek and Indiana Street	6” and 36” Parallel Parshall Flumes	(1), Tritium	36

(1) In addition to the analyte indicated, all samples are analyzed for plutonium and americium
(2) Water quality probes measure pH, conductivity, turbidity, and nitrate at stations GS11, GS08, GS31
(3) Water quality probes measure pH and conductivity at stations GS01 and GS03
(4) All Stations collect samples on a flow-paced basis

Table XI describes the sampling locations and analytes monitored at the Segment 4 Point of Compliance monitoring stations.

Imminent Danger to Life and Health (IDLH) Monitoring (Dam Safety)

Twelve ponds with earthen dams comprise the Rocky Flats water detention system. The pond system is used to retain surface water runoff, control flooding, confine spills, and detain Sewage Treatment Plant effluent for sampling and analysis.

Pond and dam monitoring is conducted to assess the structural integrity of the earthen dams and evaluate conditions that may lead to potential dam failure. The purpose of the monitoring is to provide a mechanism to mitigate potential dam failures and to allow early public warning of a pending dam breach.

The following monitoring activities are performed:

- Routine and emergency dam inspections for structural integrity;
- Pond pool level and volume measurements;
- Pond inflow and discharge rate measurements;
- Measurements of pond discharge rates and outflow;
- Monitor weather reports, forecasts, weather alerts and warnings;
- Computer modeling to predict pond filling and discharge events;
- Drawdown or emergency pond discharge.

Both field and telemetry measurements are performed for IDLH monitoring to evaluate safe pond capacity, measure pond elevations, inflow and discharge flow rates, and assess dam integrity using piezometer and inclinometer readings. Real-time telemetry data is continuously recorded and routinely monitored on a daily basis (Monday through Friday). The telemetry system is programmed to trigger alarms if pre-established water surface elevations for ponds are exceeded.

Table XII summarizes the IDLH monitoring station locations, type of monitoring, and monitoring frequency at each location.

All ponds and dams are inspected in accordance with the following schedule:

- Routine dam inspections once per week by Rocky Flats monitoring staff;

TABLE XII
IDLH MONITORING FREQUENCY

(1) LOCATION	INFLOW RATE		DISCHARGE RATE		POND ELEVATION		PIEZOMETER		(3) MODEL
	Field	Telemetry	Field	Telemetry	Field	Telemetry	Field	Telemetry	
Pond A-1	1/wk	--	4/d	--	1/wk	--	--	--	1/wk
Pond A-2	1/wk	--	4/d	--	1/wk	--	--	--	1/wk
Pond A-3	1/d	9/d	12/d	9/d	3/wk	9/d	1/wk	3/d	1/d
Pond A-4(2)	1/d	9/d	12/d	9/d	3/wk	9/d	1/wk	3/d	1/d
Pond B-1	1/wk	--	4/d		1/wk	--	1/wk	--	1/wk
Bond B-2	1/wk	--	4/d		1/wk	--		--	1/wk
Pond B-3	--	--	--	--		--	1/wk	--	--
Pond B-4	--	--	--	--	--	--	--	--	--
Pond B-5(2)	1/d	9/d	12/d	9/d	3/wk	9/d	1/wk	3/d	1/d
Pond C-1	--	--	--	--	--	--	--	--	--
Pond C-2(2)	1/d	9/d	12/d	9/d	3/wk	9/d	1/wk	3/d	1/d
Landfill	1/wk	--	4/d	--	1/wk	--	1/wk	--	1/wk

Legend: d = day wk = week
(1) Routine dam inspection once per week at all locations
(2) Inclinometer and crest monument field measurement 4 times per year
(3) Data used in computer model to predict pond filling and/or discharge events

- Detailed dam inspections on a biannual basis by Rocky Flats monitoring staff;
- Annual dam inspection by DOE and Federal Energy Regulatory Commission.

COMMUNITY MONITORING

Community Assurance Monitoring

The IDLH monitoring activities and Action Levels are defined in the Rocky Flats "Pond Operations Plan, Revision 2, " and "Emergency Response Plan for Failure of Dams A-4, B-5, or C-2."

The Community Assurance Monitoring is a public request for confirmation that the public water supply remains at safe levels.

The purpose of the monitoring is to verify Rocky Flats water quality measurements. Community Assurance Monitoring is conducted to assess the community water supplies and distribution systems for Site contaminants.

Sampling and analyses are performed at the following locations:

- Raw water influent from Great Western Reservoir;
- Treated water effluent from the Great Western Reservoir water treatment facility;
- Broomfield Service Area of Broomfield's distribution system;
- Denver Service Area of Broomfield's distribution system.

Water samples are collected by community staff and analyzed by the CDPHE Laboratory and Radiation Services Division. Quarterly composite daily grab samples are collected from the influent and effluent at Great Western Reservoir and six-month composite weekly grab samples from the two Broomfield distribution service areas.

The water samples are analyzed for the following radiologic pollutants:

Plutonium$^{239+240}$	Uranium, isotopic
Americium^{241}	Tritium

CDPHE notifies the community representatives if analytical results show any exceedance of the historical baseline values.

Uncharacterized Discharge Monitoring

The objective of the Uncharacterized Discharge Monitoring program is to safeguard the down-stream communities from uncontrolled releases of contaminated surface water from the Site. The intent of the program is to allow communities downstream from Rocky Flats to take appropriate measures to protect water supplies until the water quality is safe for use.

Uncharacterized Discharge Monitoring is performed only when water of unknown quality is released from Rocky Flats. Uncharacterized releases may occur during significant storm events, emergency discharges, dam breaks, or when discharge from Rocky Flats flows directly to the Great Western Reservoir.

If an uncharacterized release occurs, the City of Broomfield will collect either single grab samples, location composites, or time composited water samples, as deemed necessary. It is anticipated that the following locations will be monitored:

- Woman Creek at Indiana Street;
- Walnut Creek at Indiana Street;
- Great Western Reservoir;
- Woman Creek Reservoir;
- Mower Reservoir;
- Broomfield Water Treatment Plant.

These locations will continue to be monitored until it is determined that the water quality has reached acceptable standards. Depending upon the nature of the release, additional monitoring may be performed to determine downstream impacts. The samples will be analyzed for the constituent suite shown in Table XIII.

TABLE XIII
UNCHARACTERIZED DISCHARGE MONITORING

CONSTITUENT GROUP	MINIMAL ANALYTE LIST	EXTENDED ANALYTE LIST
Radionuclides	Plutonium, Gross alpha	Gross alpha , Gross beta, Plutonium, Americium, Uranium (isotopic), Tritium
Physical Properties & Water Quality Parameters	pH, Temperature, Turbidity or Total Suspended Solids, Conductivity or Total Dissolved Solids	pH, Temperature, Turbidity or Total Suspended Solids, Conductivity or Total Dissolved Solids, Hardness, Alkalinity, Fluoride, Chloride, Sulfate
Nutrients	Nitrate + Nitrite	Nitrate, Nitrite, Total & Unionized Ammonia, Orthophosphate, Total Phosphate
Organic Compounds		Volatile Organic Compounds
Metals		Total metals: per stream standards Dissolved: Iron, Manganese, Chromium, Cadmium, Beryllium

EXTRANEOUS MONITORING

Monitoring for Correlation of Plutonium with Total Suspended Solids (TSS)

This monitoring program is an experimental program wherein an attempt is made to statistically correlate the analytical data collected for concentrations of plutonium and total suspended solids (TSS) in the same surface water sample. A strong positive correlation would provide an economical real-time measurement for plutonium concentrations. The laboratory analysis used to determine plutonium concentrations in the surface water requires a minimum of two weeks to complete and therefore does not provide real-time protection for spill detection or the transport of contamination.

Sample collection has been the primary focus during fiscal year 1997. Recent development of correlations has determined that an overall Site correlation for plutonium concentrations and total suspended solids does not exist. However, some select locations within the Industrial Area have been shown to demonstrate some degree of plutonium to TSS correlation. Further development of this program is still in progress.

SURFACE WATER SAMPLING PROCEDURES

Remote, automated surface water monitoring systems employing radio-based telemetry hardware, computer control software, and real-time monitoring are used in the Rocky Flats Surface Water Monitoring Program. The telemetry system allows flow meters and automatic samplers to operate remotely; it also allows remote monitoring during stream stage changes, data storage, and statistical analysis of related data.

The 12 monitoring stations are equipped with automated surface water monitoring apparatus, and are associated with the following monitoring systems: five Segment 4 Compliance Monitoring stations, three Segment 5 Action Levels Framework Monitoring stations, two New Source Detection Monitoring stations, and three Performance Monitoring stations.

These stations are each equipped with a flow meter linked to a portable automated sampler. A radio-based telemetry system is used to transmit real-time data from most of the monitoring stations. Several monitoring locations are also equipped with dedicated, multi-parameter water quality probes capable of transmitting and/or logging data. Each monitoring station has a primary flow structure, which may consist of an existing culvert, concrete stormwater conveyance structure, flume, or weir.

The flow meters continuously log the stream stage at five-minute intervals and store data points at 15-minute intervals. Composite water samples are collected in 15-liter carboys on a continuous flow-paced basis, meaning each station collects a discrete volume of water for a specified number of cubic feet of water measured by the flow meter.

Continuous flow-paced and target-paced water samples are collected at Segment 4 Compliance Monitoring stations and Segment 5 Action Level Framework Monitoring stations. The target sample frequency is a maximum of four samples per month. A composite of approximately fifty 200-mililiter grab samples are drawn from each carboy every month. Approximately 75 grab water samples can be composited from each 15-liter sample carboy. Sample pacing at these locations is determined from historical discharge records and the characteristics of the area that will provide runoff flowing past the measurement station. The volume of flow past a given station that triggers the sampler to collect surface water varies for each station.

Previously, a value of one sample for each 500,000 gallons of flow was utilized to flow-pace the automated sampler. Rather than an arbitrary volume of flow, the volume used to set the flow

pacing is based on historical flow records at a specific location for a given month. The flow pace rate is determined by dividing the anticipated monthly flow at the gaging station by the number of sample carboys required to be filled that month.

Other automated monitoring stations collect a composite of 15 grab samples from the rising limb, or first flush, of a storm runoff event. These instruments maintain the same flow-pace rate used during continuous flow sampling. However, because the water level at the station is rising during a storm, the volume of flow is also increasing and more frequent sampling occurs. To sample a storm event, a new carboy is inserted into the sampling equipment. Storm flow samples are not typically composited with normal base flow water samples.

The telemetry system monitors the status of the automated field samplers. At monitoring stations equipped with telemetry, composite samples are pulled after a sufficient volume of water fills the carboys. If an insufficient sample volume is collected for the required analyses, the water samples are typically not analyzed. However, based on professional judgment, these water samples are sometimes analyzed for certain contaminants.

Water quality parameters, such as temperature, pH, conductivity, nitrate, and turbidity, are measured during the sampling process and recorded using water quality probes tied to the radio-telemetry network. Figures 3 and 4 depict typical automated water quality samplers.

The terminal ponds (A-4, B-5, and C-2) are sampled prior to pond discharges. CDPHE is notified prior to a planned pond discharge to observe and receive the pond water samples for analysis.

Prior to sampling, the deepest point in the pond is checked to determine if stratification and/or a lack of mixing exists. This point is typically located across from the center of the dam approximately 10 to 15 feet off shore. Depth-integrated samples are collected from the pond being discharged at different locations within the pond.

To check for pond stratification or poor mixing, a multi-parameter measuring instrument is used to take dissolved oxygen and temperature readings from the surface of the pond down to pond bottom. If there is a 1^{o} C or greater temperature change over a 3.3 foot (1 meter) depth or the maximum and minimum dissolved oxygen measurements vary by more than 5 mg/L, then each pond sample collected is handled discretely and not composited. When neither condition is met, all collected samples are composited into a single sample at the sampling location. This can also be referred to as depth integrated sampling. The analytical results for the composited sample would represent an average condition of the pond at the sampling location.

FIGURE 3 - AUTOMATED SAMPLER
Refrigerated Sampler

FIGURE 4 - AUTOMATED SAMPLER
Disassembled Sampler

The number of samples collected in a pond will depend upon the depth of the pond. If the pond is less than 4.5 feet deep, samples are only taken at mid-depth. If the pond is between 4.5 and 6.5 feet deep, two depth samples are collected at each sample location. One sample is collected at the mid-depth interval down to one foot below the surface, and the other is collected in the interval from mid-depth to 1.5 feet from the pond bottom. If the pond is over 6.5 feet deep, samples are taken at three depths, one foot below the surface, mid-depth, and 1.5 feet above the pond bottom. The Rocky Flats Plant Manual of Operation Standard Operating Procedures, manual number 5-21000-OPS (Procedure SW.8, Rev. 2) details the sampling procedures and specific types of equipment used to collect the water samples at different pond depths. Previous duplicate analyses by Rocky Flats confirmed the accuracy of the CDPHE laboratory analyses. Presently only five percent of the collected samples are analyzed as controls and checks for the CDPHE analyses.

Monitoring of the dams and embankments utilize two different techniques along the crests of dams at Ponds A-4, B-5, and C-2. Inclinometers allow quantifiable measurement of internal movement in the dam embankment. Initial monitoring in 1994 for a one-year period created the statistical database against which to compare the current measurements to determine if changes occur. The inclinometer consists of a 2.75 inch outside diameter (O.D.) ABS (plastic) casing, installed in nearly vertical drill holes, with grooves on the inside at the quarter points aligned perpendicular and parallel to the dam axis. Current monitoring is quarterly unless conditions indicate movement of concern.

The second dam monitoring technique utilizes survey monuments installed in 1993 in the dam surface to allow quantifiable measurement of horizontal and vertical movement of the dam. The number of monuments installed on each dam varies, with seven monuments each installed at dams for Ponds A-4 and C-2 and four monuments on the Pond B-5 dam. Quarterly monitoring of the horizontal and vertical locations of each monument is referred back to the original survey to determine if the dams experience any movement of concern.

ANALYTICAL PROCEDURES

Standard U.S. EPA or SW846 chemical analysis methods are used to analyze water samples for the constituents of concern. Nearly all samples collected are outsourced to a private laboratory for analysis.

QUALITY ASSURANCE

Sampling and analysis of Rocky Flats surface water is controlled by Standard Operating Procedures for the RMRS Quality Assurance Program Plan, the Site Quality Assurance Manual, and the requirements specified in the Analytical Projects Office Statement of Work.

The automatic samplers use dedicated plastic carboys to collect the composite samples. Upon completion of sample preparation, the carboys are washed with Liquinox® (a laboratory soap), rinsed with deionized water, then replaced in the samplers for the next sample collection period. The intake tubing for each sampler is automatically flushed and rinsed prior to each grab sample collection. Rinsate and duplicate samples are collected to evaluate overall sample integrity and potential cross-contamination from contact with the sampler intake and pump tubing.

REPORTING

Surface water quality data is available in the Rocky Flats Environmental Data System (RFEDS). The majority of the surface water data are routinely distributed electronically to EPA. The EPA has a copy of the entire RFEDS database and provides updates to CDPHE.

Surface water monitoring results reports are described below.

Data Routinely Reported

- CDPHE routinely reports Predischarge and Community Assurance Monitoring data to Rocky Flats and the surrounding cities.

- The Site reports exceedances of RFCA Standards and Action Levels to the EPA and CDPHE.

Monthly Reporting

- NPDES monitoring data are reported by the Site in a NPDES Discharge Monitoring Report, which is submitted to EPA on a monthly basis.

Quarterly Reporting

- CDPHE monitoring data and limited surface water data collected by the Site are summarized and reported at the Quarterly Information Exchange Meetings in Broomfield and published in the quarterly reports.

- A RFCA quarterly report is prepared by the Site and distributed to EPA and CDPHE. This report provides a management brief of the monitoring program and contains relevant data summaries.

Annual Reporting

- An annual Discharge Monitoring Report (summary for year) is published, as required by the NPDES permit.

Other Reporting

- Verbal reports of IDLH data (dam safety) are provided to the DOE Rocky Flats Field Office and other regulators to determine flood gate and valve status. No formal regulatory reports are produced.

- Internal reporting is provided upon location of a new contaminant source. Regulatory reporting is provided only if required for the specific contaminant or source.

- Ad Hoc Monitoring results are reported only if requested.

- Internal reporting is provided for New Source Detection Monitoring results if a new contaminant source is detected. No public or regulatory reporting is routinely issued.

- The disposition of internal waste streams and incidental waters is recorded and reported to decision makers. No regulatory or public report is produced.

CRITICAL ANALYSIS

INTRODUCTION

This section presents a critical analysis of the Surface Water Monitoring Program currently utilized at the Rocky Flats Environmental Technology Site (Rocky Flats or Site). The primary purpose of the critical analysis is to determine if the current Surface Water Monitoring Program satisfies the public concerns regarding management of the surface water runoff from the Industrial Area and the discharge monitoring performed prior to offsite release from the Site.

The critical analysis is based on information provided by Rocky Flats staff and other knowledgeable parties, including staff from Kaiser-Hill and its subcontractors, municipalities, Colorado state offices, EPA, DOE, and the public stakeholders. Information sources include various reports, documents, studies, articles, personal interviews, and follow-up telephone conversations with knowledgeable parties.

The primary objective of the existing Rocky Flats Surface Water Monitoring Program is to ensure that all surface water discharges leaving the Site comply with the applicable regulatory requirements. Samples of the surface water are analyzed to determine if water quality standards are met and to evaluate the surface water for potential contaminant releases into the downstream water resources.

CRITICAL ANALYSIS OF MONITORED SYSTEMS

SUMMARY

The Rocky Flats Surface Water Monitoring Program is designed to provide the data needed to control and manage surface water runoff from the Site in compliance with the regulatory requirements of the National Pollutant Discharge Elimination System (NPDES) permit and the State of Colorado surface water quality standards. This program incorporates 18 separate monitoring programs currently in place across the Site into a single Surface Water Monitoring Program. There are 12 surface water monitoring stations (designated SW and GS) equipped with automated surface water monitoring systems.

The 18 surface water monitoring programs are grouped into six categories, as follows.

INDUSTRIAL AREA MONITORING
- ⊙ New Source Detection Monitoring
- ⊙ Performance Monitoring
- ⊙ Incidental Waters

WATER QUALITY MONITORING
- ⊙ Non-Point of Compliance Monitoring at Indiana Street
- ⊙ Source Location Monitoring
- ⊙ Ad Hoc Monitoring
- ⊙ Internal Waste Streams Characterization for Permit Application

SEWAGE TREATMENT PLANT MONITORING
- ⊙ Internal Waste Stream Authorization to Discharge to the Sewage Treatment Plant
- ⊙ Sewage Treatment Plant Collection System Monitoring
- ⊙ Sewage Treatment Plant NPDES Monitoring

POND INFLUENT, OPERATIONS AND DISCHARGE MONITORING
- ⊙ Segment 5 Action Level Framework Monitoring
- ⊙ NPDES Discharges from and to Ponds
- ⊙ Predischarge Monitoring
- ⊙ Segment 4 Compliance Monitoring
- ⊙ Imminent Danger to Life and Health Monitoring (Dam Safety)

OFFSITE COMMUNITY MONITORING
- ⊙ Community Assurance Monitoring
- ⊙ Uncharacterized Discharge Monitoring

EXTRANEOUS MONITORING
- ⊙ Correlation of Plutonium with Total Suspended Solids (TSS**)**

SURFACE WATER MONITORING PLAN

The Site-wide Surface Water Monitoring Program for fiscal year 1997 is presented in the annual *Rocky Flats Environmental Technology Site Integrated Monitoring Plan*. This plan describes the required monitoring program elements for each environmental media and provides a means to revise the requirements as needed for the upcoming fiscal year, which extends from October 1 through September 30 of the following calendar year. The Integrated Monitoring Plan (IMP) is reviewed annually and revised as necessary for the next fiscal year.

The Surface Water Monitoring Program for fiscal year 1997 (FY 1997) was presented in two versions of the IMP. The first IMP version was published in March 1997, six months into FY 1997, and a revision was published on June 31, 1997. The IMP revision contained substantial changes from the first draft IMP. The IMP states that "this plan is to be fully implemented during FY97."

The IMP is an important, useful document and a valuable aid to the citizens. In a single document, the IMP presents all the environmental monitoring to be performed by DOE and its subcontractors, CDPHE, and the cities for the upcoming fiscal year..

All environmental monitoring data is reviewed quarterly and decisions are made annually. This information is used to plan and budget for the upcoming fiscal year. With all this information in hand, the IMP should be developed and issued before the year begins to allow all participating parties to review the monitoring agenda prior to the upcoming year.

INDUSTRIAL AREA MONITORING

New Source Detection Monitoring

New Source Detection Monitoring serves an important function. It is the only surface water monitoring program that routinely measures the quality of the surface water close to the potential contaminant sources soon after it leaves the Industrial Area.

The Integrated Monitoring Plan for surface water monitoring states that the objective of New Source Detection Monitoring is to provide "comprehensive coverage of the entire Industrial Area," which includes the 903 Pad. New Source Detection Monitoring activities are focused on detecting chronic contaminant releases to the main drainages discharging from the Industrial Area into the three Segment 5 channels upgradient of the A-, B-, and C-series detention ponds.

The five New Source Detection surface water monitoring stations are located near the eastern boundary of the Industrial Area, within three main drainages and in two major drainage ditches, as follows:

- Two gaging stations monitor discharge from the northern portion of the Industrial Area: station SW093 in North Walnut Creek, and station SW091 located in a small drainage (gully) to North Walnut Creek;

- Two gaging stations monitor drainage from the central portion of the Industrial Area: gaging station GS10 in South Walnut Creek and station SW022 in Central Avenue Ditch, which flows to South Walnut Creek;

- Gaging station SW027 in the South Interceptor Ditch monitors discharge from the southern portion of the Industrial Area.

At these monitoring locations, it is possible to detect contaminated discharge waters from the Industrial Area close to the potential source areas before the contaminated surface water moves downstream into the detention ponds, where contaminant concentrations may be diluted.

The Integrated Monitoring Plan indicates that New Source Detection Monitoring is used primarily to monitor impacts to the surface water from remedial or D&D activities in the Industrial Area and, secondarily, to support spill response actions. This monitoring provides a means for early detection of smaller releases during D&D activities, but is not intended to locate specific contaminant sources in the Industrial Area. Source Location Monitoring, discussed later, is used to monitor the surface water for locating specific contaminant sources.

Continuous flow-paced surface water samples are collected over a one month period from gaging stations SW093, SW027, and GS10 using portable automated samplers. These three stations are also used for the Segment 5 Action Level Framework Monitoring, discussed later in this report. Only storm event samples are collected at gaging stations SW091 and SW022. Water samples from each station are composited and analyzed for three radionuclides (plutonium, uranium, and americium). Real-time water quality probes are used to measure indicator parameters during the sampling events (temperature, pH, conductivity, turbidity, and nitrate). If a spike is detected in the indicator parameters, the Site may also analyze for beryllium, cadmium, chromium, and silver.

Several Individual Hazardous Substance Sites (IHSSs) and associated groundwater contaminant plumes are identified in the Industrial Area. The groundwater plumes and their transport pathways have not been well defined. The extent and movement of the polluted groundwater is tracked by sampling and analyzing groundwater monitoring wells used in the Site's groundwater monitoring program. Although a significant amount of the groundwater discharges to the stream drainages and contributes to surface water flow, surface water and groundwater analyses are not congruent.

The analyte list for samples collected at the New Source Detection surface water monitoring locations should be expanded, at a minimum, to include the same analyte list for the Plume Definition, Plume Extent, Drainage, and Performance groundwater monitoring wells. In addition, the contaminants of concern listed for each IHSS located in areas that might impact surface water drainages should be reviewed. These contaminants should also be included in the analyte list for the specific New Source Detection monitoring station located in the drainage area that could potentially be impacted by the IHSS.

Although the New Source Detection monitoring stations are used to monitor impacts to the surface water from remedial or D&D activities ongoing in the Industrial Area, the contaminants of concern for these activities are not reflected in the sampling analyses. For example, during the recent Mound Site remediation both the monitoring frequency and analyte list should have been reviewed for gaging station SW022 to monitor this remedial activity. The Mound Site is near the Central Avenue Drainage Ditch and impacts to the surface water were possible during excavation and source removal activities at the Mound Site. However, there were no changes in the monitoring activities performed at SW022 during the Mound Site remediation. If volatile organic compounds (a major contaminant of concern at the Mound Site) had been released during or after the project activity, it would not have been detected during surface water monitoring at station SW022 because the surface water samples are not analyzed for these compounds at that location. Ongoing activities and remediation tasks at the Site could result in the release of contaminants to the soils within and around the Industrial Area and degrade downstream surface water quality.

In summary, the analyte list for the surface water samples is deficient. The New Source Detection Monitoring activities should be integrated with the Site's groundwater monitoring program. Contaminants of concern from the Industrial Area IHSSs and groundwater contaminant plumes should be reviewed and added to the list of analytes monitored at the New Source Detection monitoring stations. New Source Detection Monitoring for impacts to the surface water from remedial actions and D&D activities is not implemented and therefore does not meet the stated objectives for this monitoring activity.

Performance Monitoring

Performance Monitoring is conducted to evaluate contaminant control performance of specific high-risk remedial activities whenever a risk of contaminant release during project work is likely.

The Performance Monitoring stations are located close to the project site area and are typically installed 18 months prior to project commencement to provide a baseline of the current condition of surface water quality in that area.

Three relocatable Performance Monitoring gaging stations were installed for surface water baseline monitoring for scheduled building demolitions. Flow-weighted water samples were collected at these locations during storm water flow. The water samples from each monitoring station were composited and analyzed only for plutonium, uranium, and americium. This limited analyte list fails to provide adequate baseline information in the areas targeted for monitoring.

Gaging stations GS27 and GS28 were installed to provide baseline monitoring in the impact area for the scheduled Building 889 demolition. This building was formerly used for equipment decontamination and is reportedly contaminated with plutonium, uranium, beryllium, and various hazardous wastes. Monitoring station GS28 was terminated in August 1997, but GS27 remains in service. Gaging station GS32 is currently performing baseline monitoring in the impact area for the scheduled demolition of Building 779, the Plutonium Development Building. This building is reportedly contaminated with plutonium, uranium, beryllium, and hazardous wastes.

To be useful, baseline surface water monitoring should provide data for all the potential contaminants that may impact the monitored area. Presently, surface water samples from the Performance Monitoring stations are analyzed for anticipated radionuclide contamination, but are not analyzed for the reported beryllium and hazardous constituent contamination.

Incidental Waters

Incidental waters are non-routine accumulations of water in utility pits, along berms, footing drains, sumps, and excavation pits in the Industrial Area. Incidental waters in volumes of 50-gallons or greater are sampled and screened to determine the appropriate disposition of these waters. The disposition of incidental water accumulations less than the 50-gallon volume is not specified.

A single sample is collected from each incidental water accumulation and then field screened, using an established protocol, for the presence of contaminants. The screening protocol includes observations of the appearance, field measurements for pH, conductivity, and nitrate, and application of process knowledge. No further monitoring is conducted if water samples pass the screening protocol, and the incidental water accumulations are discharged as an uncontaminated waste stream. Additional testing and investigation is performed for water samples that fail the screening test.

Although this field screening protocol would be useful for grouping similar waste streams for disposal analyses, it is insufficient for evaluating waters that may be discharged to the environment or the Sewage Treatment Plant. Most incidental waters are accumulations of rainwater, snowmelt, or groundwater. However, because of their location in the Industrial Area, the potential for cross contamination by radionuclides, solvents, chemicals, and waste oils from runoff and transport to the accumulation area is increased. Historical records show that decisions for analysis based on process knowledge and minimal screening is not sufficient for determining if a potential hazard is present in a waste stream. Relevant examples of inadvertent contaminant discharges after using a field screening protocol include the 1973 Broomfield tritium incident and the 1996 T3/T4 trench remediation depleted uranium incident.

WATER QUALITY MONITORING

Non-Point of Compliance Monitoring at Indiana Street

Non-Point of Compliance Monitoring is performed to evaluate discharge water leaving the Site boundary at Walnut and Woman Creeks for nutrient content. Water quality is monitored at gaging stations GS01 and GS03 to establish a water quality baseline for the combined flow in Walnut Creek and the new flow configuration in Woman Creek. This monitoring is performed in anticipation of the new waste load allocation limits for Big Dry Creek currently under consideration by the Colorado Water Quality Control Commission. Water samples are analyzed for concentrations of ammonia, nitrate, phosphates, beryllium, cadmium, silver, chromium, and uranium.

Source Location Monitoring

Source Location Monitoring is initiated when a contaminant of concern in the surface water is detected above the regulatory Action Limits or if unexpected changes are observed during baseline monitoring. This program differs from New Source Detection Monitoring because an Action Level exceedance or change in baseline concentrations in the surface water must occur before Source Location Monitoring is implemented. A contaminant exceedance or baseline change is detected by laboratory analyses of surface water samples from anywhere on the Site or offsite in downstream reservoirs.

When a new contaminant source is detected, within 30 days the Site prepares a plan of action and commences New Source Location Monitoring to locate the source. Monitoring then continues until the contaminant source is located or the contaminant is no longer detected.

The Site staff reports that the laboratory turn-around time for analytical results from surface water samples ranges from four to six weeks. This means that the contaminant exceedance actually occurred over one month before it was detected. Because of this lag time, added to the allowable 30-day response time before the Site is obliged to initiate monitoring, Source Location Monitoring could be delayed by more than two months after the contaminant exceedance actually occurred. The probability of locating the contaminant source is diminished with passing time, particularly after two months.

Although more costly, a faster turn-around time for laboratory analyses is required. Also, the Site's allowable 30-day response time before acting on or reporting an exceedance is unnecessary and should be eliminated. Source Location Monitoring should be initiated immediately after a contaminant source is detected.

There are currently no New Source Location Monitoring stations installed at the Site, and none are budgeted for FY 1997.

Ad Hoc Monitoring

Ad Hoc Monitoring is performed on request to support specialized, unscheduled project and facility-specific monitoring needs. Monitoring procedures depend on the nature and objective of the requested monitoring. The cities, state, DOE, and the Sewage Treatment Plant may request Ad Hoc Monitoring. The party requesting the monitoring provides funds for the specialized monitoring.

SEWAGE TREATMENT PLANT MONITORING

Internal Waste Stream Authorization to Discharge to the Sewage Treatment Plant

Non-routine process or sanitary waste streams are evaluated for authorization to discharge to the Sewage Treatment Plant. These waste streams may include chemical solutions, new process discharges, contaminated incidental waters, etc. The intended purpose of the monitoring is to ensure that the operational capabilities of the Sewage Treatment Plant are maintained and the NPDES permit effluent limits are not exceeded.

Each waste stream for which discharge to the Sewage Treatment Plant is requested is sampled and undergoes a field screening procedure similar to the Incidental Waters screening protocol. A single sample is collected from the waste stream and assessed on the basis of process knowledge, visual

inspection, and field measurements for pH and conductivity. The range of acceptable readings for pH and conductivity are not provided in the Integrated Monitoring Plan for surface water. Waste streams that pass the field screening test are authorized for discharge to the Sewage Treatment Plant. Additional testing and waste characterization may be required for waste streams that do not pass the screening tests.

This screening process is not sufficient for detecting the presence or absence of potential hazardous compounds or other contaminants, such as radionuclides, for the same reasons presented earlier in this section for the Incidental Waters screening process.

Sewage Treatment Plant Collection System Monitoring

Sewage Treatment Plant Monitoring is required by the NPDES permit to detect spills or unauthorized discharges to the plant. Presently, collection system monitoring is limited to continuous measurements of pH and conductivity at the headworks (influent), grab samples for oxygen uptake measurements at the headworks, lower explosive level (for methane) measurements at the headworks and equalization basin, and routine visual inspections.

In the NPDES renewal permit, development of a response plan for anomalous influent results and a feasibility study for radionuclide monitoring is proposed after the permit is issued.

The present scope of monitoring for the Sewage Treatment Plant collection system is insufficient. Although laboratory analyses of influent samples may be performed for radionuclides, metals, and other chemical constituents, it is not described in the NPDES permit or the Integrated Monitoring Plan. The sampling frequency, analyte list, Action Levels, and contaminant exceedance response actions should be defined in the Site-wide Surface Water Monitoring Program.

Sewage Treatment Plant NPDES Permit Monitoring

A draft NPDES renewal permit for compliance monitoring was recently released for public review and comment. The permit explicitly describes additional monitoring locations for stormwater discharge and Sewage Treatment Plant effluent. These locations and monitoring parameters are not described for the Surface Water Monitoring Program.

POND INFLUENT, OPERATIONS AND DISCHARGE MONITORING

Segment 5 Action Level Framework Monitoring

Segment 5 Action Level Framework (ALF) Monitoring is used to evaluate discharges from the Industrial Area into the three main stream channels for compliance to the RFCA Action Levels. Segment 5 includes waters in North and South Walnut Creeks upstream from the terminal ponds, the South Interceptor Ditch, and terminal ponds A-4, B-5 and C-2. The intent of the program is to monitor surface water runoff from the Industrial Area for contaminant exceedance of the Action Level criteria before it reaches the terminal ponds.

The three monitoring locations used for Segment 5 ALF monitoring, stations SW093, GS10 and SW027 are the same stations used for New Source Detection Monitoring. Continuous flow-paced surface water samples are collected from each station. The composited samples are analyzed for radionuclides (plutonium, uranium, and americium) and metals (beryllium, chromium, cadmium, and silver). Indicator parameters (pH, conductivity, turbidity, and nitrate) are measured with real-time sample probes. The number of water samples collected from each monitoring station differs by the month due to seasonal flow variations. However, at least one composited water sample per month is collected and analyzed for each monitoring station.

If analytical results show a contaminant(s) exceeds the RFCA Action Levels, the Site must notify DOE (Rocky Flats Field Office) within 30 days after the exceedance was detected. During the 30-day lag period, the Site may, at its own discretion, perform verification analyses to confirm the exceedance or conduct “discretionary mitigating action.” CDPHE is notified of the exceedance within 45 days after detection. The Site’s reasoning for the 45-day delay in public notification is to “prevent undue public alarm when the initial high result is not confirmed by subsequent monitoring.” Because laboratory turn-around time for reporting analytical results is 30 to 45 days, the public may not be notified of a contaminant exceedance for more than three months after detection.

The Site’s public notification schedule is unacceptable. The downstream communities should be alerted immediately if an exceedance is suspected. The Site’s 30 to 45 day exceedance evaluation period can also be used by the communities to plan “mitigating actions” for their public water supplies, or to perform confirmation sampling at the exceedance point and in city water distribution systems. It is unlikely the public will overreact if notified of a suspected contaminant exceedance

before the contaminant exceedance is confirmed, particularly if the Site is candid and provides full disclosure of the nature of the exceedance and the subsequent actions taken to verify or mitigate the release.

It is worth noting that no funds were budgeted for Source Location Monitoring in FY 1997, suggesting the Site anticipated there would be no contaminant exceedances during the year.

The objectives and monitoring activities for the New Source Detection and Segment 5 ALF Monitoring programs are similar. However, the sampling schedule and analyte list for the Segment 5 ALF Monitoring is more rigorous. The objectives and implementation of these two monitoring programs should be combined.

The criticisms presented for the New Source Detection Monitoring also apply to the Segment 5 ALF Monitoring program. The monitoring activities in both programs should be integrated with the groundwater monitoring activities, particularly with the monitoring wells that evaluate the extent and movement of contaminated groundwater plumes. The surface water samples should be analyzed for the same contaminants monitored in the groundwater monitoring wells associated with the plumes. The contaminants of concern listed for the IHSSs should be reviewed and added to the analyte list for surface water monitoring. More rapid turn-around time for the laboratory analyses is a necessity.

NPDES DISCHARGES TO AND FROM PONDS

Predischarge Monitoring

Predischarge monitoring is routinely performed prior to any pond discharge. This monitoring is required by the current NPDES permit to ensure that any pond discharge meets the water quality standards and protects U.S. waters.

Approximately two weeks prior to pond discharge, the Site collects single depth-integrated grab samples from the pond. CDPHE analyzes the water samples for a long list of analytes, which includes radionuclides, volatile organic compounds, metals, and other chemical constituents. If a contaminant exceedance is detected, CDPHE notifies the Site. An additional pond water grab sample may be collected to verify the contaminant exceedance.

The Site has sole discretion concerning the pond discharge, independent of any response action taken by CDPHE for a contaminant exceedance. If a contaminant exceedance is verified, the Site considers the available pond management alternatives and decides the disposition of the contaminated pond water. Alternative management options is limited to pond discharge or, if there is sufficient pond capacity, holding the pond water.

Treatment options are no longer available for contaminated pond water. In the recent past, the Site's pond water treatment operations were dismantled and removed. The absence of water treatment alternatives for contaminated pond water is unacceptable and considered a major deficiency in the program. Rather than discharge contaminated surface water, in situ water treatment methods or external treatment options for the pond water should be developed and installed as a contingency.

Although it is recognized that the ponds have a limited holding capacity, discharge of contaminated pond water to offsite drainages should not be an option decided solely by the Site.

Segment 4 Compliance Monitoring

Segment 4 Compliance Monitoring is an important element of the Surface Water Monitoring Program at Rocky Flats, particularly for the downstream communities. It is the last monitoring that is performed before the surface water leaves the Site. Segment 4 Compliance Monitoring is used to evaluate both terminal pond discharges and the surface water quality in Walnut and Woman Creeks where it leaves the eastern Site boundary.

Five monitoring stations collect flow-proportional water samples using automated samplers and real-time water quality probes to measure indicator parameters. Gaging stations GS11, GS08, and GS31 are used to monitor the flow during discharge from terminal ponds A-4, B-5, and C-2, respectively. A maximum of three water samples are collected from each terminal pond during every pond discharge event. Ponds A-4 and B-5 are discharged approximately five times per year, and Pond C-2 is discharged once per year. Sample probes measure pH, conductivity, turbidity, and nitrate during each pond discharge.

At Indiana Street, gaging station GS03 monitors the flow in Walnut Creek and station GS01 monitors the Woman Creek waters. These stations are also used for Non-Point of Compliance Monitoring. A maximum of three samples per 30-day interval are collected at each gaging station. Sample probes only measure pH and conductivity at these stations.

All Segment 4 Point of Compliance water samples are anlyzed only for radionuclides. Water samples collected from all stations are analyzed for plutonium and americium. In addition, water samples from gaging stations GS08, GS01, and GS03 are also analyzed for tritium and uranium is measured in water collected from gaging stations GS11 and GS31.

Six groundwater Boundary Wells are located within drainages along the eastern Site boundary at Indiana Street. These wells are used to monitor for contaminated groundwater that may have migrated from the Site and impacted the surface water. Two of these wells are within Walnut Creek and Woman Creek drainages. All six groundwater wells are sampled on a semiannual basis and analyzed for plutonium, americium, uranium, tritium, volatile organic compounds, nitrate, fluoride and sulfate. In the critical analysis for groundwater monitoring, additional analyses were recommended for the Boundary Well groundwater samples to monitor for the potential contaminants of concern in the Industrial Area. Additional analyses for strontium, metals, and other chemical compounds were recommended.

At a minimum, surface water from the five Segment 4 Compliance monitoring stations should be analyzed for the same parameters monitored for the Boundary Well groundwater. Because of the extensive interaction between groundwater and surface water at the Site, these two programs must be integrated and the analytical results from their sampling programs reviewed in concert.

Imminent Danger to Life and Health Monitoring (Dam Safety)

The dam safety monitoring program is an inspection program of the ponds and earthen dams for structural integrity and water levels to monitor for an impending dam breach. Routine inspections are performed weekly by Site staff. The Site staff also conducts a more detailed biannual inspection. Annual inspections are performed by the DOE and the Federal Energy Regulatory Commission. This is a good program and well implemented.

OFFSITE COMMUNITY MONITORING

Community Assurance Monitoring

Community Assurance Monitoring is performed by the communities and CDPHE to confirm that the public water supplies remain at safe levels. Water samples, collected by community staff and analyzed by CDPHE, are routinely tested only for radionuclides. Dissolved metals and other chemical

contaminants are not tested under this program, although these contaminants could potentially be released offsite and travel into the drinking water sources.

Several onsite waterways, including canals and ditches, carry surface water that discharge to the water resources used by the communities. These waterways are not currently monitored.

Uncharacterized Discharge Monitoring

Uncharacterized Discharge Monitoring is initiated when water of unknown quality is released from the Site, such as during a storm event, emergency discharge, or a dam break. The purpose of this monitoring is to give the downstream communities an opportunity to protect their water supplies from potential contamination. Although in theory this may be considered a protective monitoring program, timely and successful implementation is questionable.

If an uncharacterized discharge from the Site occurs, the downstream communities should be notified immediately to allow sufficient time to protect and manage community water resources. The procedures for community notification and the specific criteria that would trigger implementation of this program are not described in the Integrated Monitoring Plan for surface water. Further, as evidenced by the recent discovery (August 1997) of elevated plutonium concentrations in Walnut Creek, one or two months may pass after a release has occurred before notification is issued.

EXTRANEOUS MONITORING

Correlation of Plutonium with Total Suspended Solids (TSS)

Monitoring is being conducted to collect experimental data to determine a correlation between the concentration of total suspended solids (TSS) and the corresponding plutonium concentration in the surface water samples. A strong positive correlation would provide a real-time tool to cost-effectively monitor plutonium concentrations in the surface water. If a correlation is determined, it would be used to monitor plutonium concentrations during continuous pond discharge. However, preliminary monitoring results indicate a decided lack of correlation between these two components, except for very limited and specific individual sources.

The likelihood of determining a reliable correlation for use in monitoring plutonium concentrations is not promising, primarily because it requires the underlying assumption that Rocky Flats is

a static source of total suspended solids and plutonium. The Site is not static. The increasing decontamination and decommissioning project work and the variable nature of the soils and the storms that scour and transport sediments cannot be controlled to the extent that a correlation would be valid for any other time except at the instant it is created. It is unlikely this monitoring program will yield a Site-wide surrogate measuring tool for use in measuring plutonium concentrations. Many attempts have been made in other wastewater treatment industries to develop a similar correlation between total suspended solids and various contaminants, and all have failed to find such a correlation.

SAMPLING PROCEDURES

A number of automated surface water sampling apparatus are used in the 12 monitoring stations around Rocky Flats. The Surface Water Monitoring Program, as presented in the FY 1997 Integrated Monitoring Plan (June 30, 1997), does not adequately describe the operation of some of the automated water sampling equipment. Specifically, the flow rate setting for the automated sampler to actuate the water sampling cycle is described as 500,000 gallons of flow. This flow rate is actually only a target value. The actual flow rate should be specified for each monitoring location based upon the historical flow records.

The decision to determine if an insufficient water sample volume collected during a monitoring interval should be analyzed is described as “professional judgment.” Decision procedures and criteria for analyzing insufficient sample volume need to be established and described. Potential contaminant releases could be missed if a sampling interval is skipped. Although there was insufficient volume, the water sample from gaging station GS03 (where the August 1997 plutonium release occurred) was analyzed and the plutonium exceedance was detected. This exceedance would have been missed if the water sample at this location had not been analyzed because of “professional judgment.”

Because of the long sample collection intervals, ranging from 30 to 45 days, the reported analytical results only represent long-term averages for each contaminant. It is possible that a short-term contaminant exceedance from a spill could be diluted during the sampling interval and not be realized from the sample analysis. It is also difficult to obtain representative sample analyses for other parameters, such as total suspended solids (TSS), unless separate samples are taken manually due to the short hold time.

REPORTING

A large quantity of surface water monitoring data is collected at the Site. Much of the data is reported only internally, unless otherwise required by the regulations or various agency agreements. When the surface water analytical results indicates that RFCA Action Levels were exceeded, the exceedance is reported to the EPA and CDPHE, but not downstream communities. NPDES monitoring data is also not reported to the communities, or the data from the dam inspection program. The Site relies on CDPHE to disseminate valuable monitoring results to the communities. Many of the other monitoring efforts, including the disposition of internal waste streams and Ad Hoc monitoring results, are not required to be reported to any public or governmental entity.

SUMMARY

Although a reasonable effort has been expended by the Site to install automatic sampling devices to ensure that the surface water data collected is more representative of actual conditions, there is apparent overlap and contradictory sampling information in the records.

The Surface Water Monitoring Program exhibits a lack of coordination between the various surface water monitoring subprograms. A minimum number of contaminants are analyzed for the surface water samples, primarily for radionuclide concentrations. Turn-around time for the radionuclide analyses requires four to six week, which is unacceptable. Timely disclosure procedures for notifying the public of a contaminant exceedance in the surface water is lacking, and does not allow opportunity for proper assessment of community water resources when a release has occurred.

Better integration and coordination between surface water subprograms and with the other Site-wide multi-media monitoring programs is needed. The Site should also ensure that there are an adequate number of dedicated surface water monitoring stations to provide proper monitoring of the surface waters of the Site. The Site must work to shorten the time for analysis of parameters of concern and to shorten the response/notification times when an Action Level exceedance has been detected.

RECOMMENDATIONS FOR IMPROVEMENTS

INTRODUCTION

This section presents recommendations for improvements to the Rocky Flats SurfaceWater Monitoring Program. A critical analysis of the Surface Water Monitoring Program was performed and some deficiencies and contradictions in the scope and implementation of the monitoring program were identified. Recommended improvements are presented below.

SURFACE WATER MONITORING PROGRAM

The Rocky Flats Surface Water Monitoring Program is used to manage surface water discharges leaving the Site in compliance with the regulatory requirements. It is composed of 18 separate monitoring programs now administered under a single integrated program.

The primary purpose of the Surface Water Monitoring Program is to protect surface water quality by complying with regulatory requirements of the NPDES permit and the State of Colorado surface water quality standards. The recommended program improvements are presented herein.

INDUSTRIAL AREA MONITORING

The Industrial Area monitoring is comprised of New Source Detection, Performance Monitoring and Incidental Water Monitoring. The annual sampling frequency required at the five surface water monitoring stations is uncertain, in particular for the New Source Detection Monitoring. The established sampling frequency should be reconciled with the permits, and rationalized and clearly described in the Surface Water Monitoring Plan.

New Source Detection Monitoring

The New Source Detection and Segment 5 Action Level Framework (ALF) Monitoring are similar programs and should be combined. These two programs are used to monitor the surface water leaving the Industrial Area in the three main Segment 5 drainages upstream from the detention ponds.

Five New Source Detection Monitoring stations are installed near the eastern boundary of the Industrial Area within the drainages of Walnut Creek and Woman Creek to monitor impacts to the surface water from the Industrial Area. Three of the New Source Detection monitoring stations,

gaging stations SW093 in North Walnut Creek, GS10 in South Walnut Creek, and SW027 in Woman Creek, are also the only monitoring stations used for the Segment 5 ALF Monitoring program. Two additional New Source Detection gaging stations, SW091 and SW093, are installed in drainage canals to North and South Walnut Creeks, respectively. These monitoring stations are all equipped with automated water samplers to collect continuous flow-paced water samples for analyses.

Water samples collected from the New Source Detection monitoring stations are analyzed for plutonium, uranium, and americium and, at the Site's discretion, optionally analyzed for metals (beryllium, cadmium, chromium, and silver). The Segment 5 ALF Monitoring water samples are analyzed for the same contaminants, including required metal analyses, and the water samples are collected on a more frequent basis.

The stated objective for the New Source Detection Monitoring program is to monitor for potential chronic and acute contaminant releases resulting from D&D activities, remediation, and spills from the Industrial Area. The intent of the Segment 5 ALF Monitoring program is to evaluate potential impacts to the surface water from Industrial Area activities prior to discharge to the detention ponds. In function, the monitoring objectives for both programs are the same.

Because of the overlap in monitoring objectives and shared monitoring stations, the monitoring efforts for the New Source Detection and Segment 5 ALF Monitoring programs should be combined. Both programs serve an important function by monitoring the contaminant impacts to surface water from Industrial Area activities and would be strengthened by combining the most rigorous elements from each monitoring system into a single program. This combined program would add two monitoring stations to the Segment 5 ALF Monitoring program, and increase the sampling frequency and analyte list for the New Source Detection monitoring program. The combined program would be less costly but more expansive, easier to manage, and provide a more effective monitoring program capable of detecting potential contaminant impacts that originate from the Industrial Area.

The potential for contaminant releases to the surface water from the Industrial Area will increase as more D&D and cleanup activities are implemented. A large number of contaminant source areas (IHSSs) have been identified in the Industrial Area. Some of these contaminated source areas have impacted the groundwater and formed contaminant plumes that are slowly migrating from the source area. Numerous groundwater monitoring wells are installed within these plume areas to monitor and track the extent and movement of the contaminated groundwater in order to protect the surface water.

The surface water and groundwater at the Site are intimately interactive, and a significant amount of the groundwater discharges to the stream drainages. During wetter periods, the surface water recharges the groundwater. Because of this periodic intermixing of waters, close integration of the surface water and groundwater monitoring programs is necessary and the sampled waters should be analyzed for the same contaminants.

The analyte list for water samples collected for the New Source Detection (and Segment 5 ALF) Monitoring program is limited to a few radionuclides and, when indicated, some metals. The groundwater samples collected in areas that potentially impact the surface water are analyzed for more radionuclides and metals, several organic chemicals, and inorganic compounds. It is recommended that the limited analyte list for the New Source Detection (and Segment 5 ALF) surface water samples be expanded to match the groundwater analyses performed for the Plume Extent, Drainage, and Performance Monitoring Wells. The surface water analyte list should be comparable to the analyses performed for the monitored groundwater to achieve proper integration of the related monitoring efforts. Additional surface water analyses for certain radionuclides (strontium, tritium), a longer list of metals, volatile and semivolatile compounds, and inorganic compounds (nitrates, sulfates, fluorides) should be considered. Furthermore, because groundwater wells are only monitored semiannually, the more frequent monthly surface water sample collection provides closer monitoring and greater protection from an unanticipated release from the groundwater contaminant source areas. This added protection becomes more important as the Industrial Area D&D and cleanup activities are accelerated.

Also, the contaminants of concern listed for each IHSS located in areas that might impact surface water drainages should be reviewed. These contaminants should be included in the analyte list for the specific surface water monitoring stations located in each waterway that could be impacted by the IHSS. Furthermore, the Site should ensure that additional surface water monitoring equipment is available to plan for future monitoring of the upcoming remedial and D&D activities. This will become even more critical as the D & D activities accelerate in the years ahead.

Performance Monitoring

Performance Monitoring is conducted whenever there is a potential risk for contaminant release during Site project activities. The surface water stations designated for Performance Monitoring are located near the project site area, and are typically installed and activated 18 months prior to project commencement to collect baseline information of the surface water quality in the project area.

The baseline information is evaluated during and after the project activity to help identify the occurrence of any contaminant release that impacts the surface water due to the project work. Consequently, the baseline surface water monitoring activities should provide data for all the contaminants that could potentially impact the surface water in the project area.

The present analyte list does not provide adequate baseline information for the targeted areas currently monitored. The surface water samples collected from the Performance Monitoring stations for baseline information at Building 889 (Equipment Decontamination) and Building 779 (Plutonium Development) are not analyzed for all the contaminants of concern identified for these facilities. Buildings 889 and 779 are scheduled for future demolition. Water samples for the baseline monitoring at these locations are analyzed for the radionuclides of concern, but not for the reported beryllium and hazardous constituents listed as suspected contaminants.

The analyte list for water samples collected from the current Performance Monitoring stations should include the additional contaminants of concern listed for the two buildings. In the future, a thorough review of all known and suspected contaminants of concern should be performed for the areas impacted by D&D activities, and a comprehensive list of analytes to be monitored for the baseline studies should be developed.

Incidental Waters

The field screening protocol used to evaluate the incidental waters for disposal decisions is inadequate. This protocol is useful for grouping similar waste streams for characterization and disposal analyses, but is insufficient for assessing the presence of contaminants. A more rigorous procedure using chemical analyses for target analytes is needed to assess the incidental water waste streams for ultimate disposal in order to ensure that contaminants are not released to the environment or the Sewage Treatment Plant. As noted earler in the surface water monitoring critical analyses, historical records confirm that inadvertent contaminant releases have occurred using a screening protocol solely based on process knowledge and imprecise qualitative field tests.

Because many incidental water accumulations recur in the same locations, similar water accumulations could be transferred to a holding area for composite sampling and analyses for the anticipated potential contaminants to properly evaluate the incidental waters for appropriate disposal. A similar process should be used for incidental water accumulations of less than 50 gallons.

The use of the current screening protocol should be limited to categorizing similar waste streams for ultimate disposal following analysis, but not used exclusively for disposal decisions. A more rigorous evaluation of the incidental waters is recommended for disposal decisions.

WATER QUALITY MONITORING

Source Location Monitoring

Source Location Monitoring is a reactive program, and is initiated only after laboratory results from surface water monitoring activities indicate a contaminant exceedance has occurred. This monitoring is commenced within 30 days after a contaminant(s) of concern is detected above the Action Levels or if an unexplained change in baseline concentrations is noted.

Because laboratory turn-around time for analytical results may range from four to six weeks, combined with the allowable 30-day lag time before the Site is required to respond, an exceedance may have occurred approximately two or three months before the Source Location Monitoring is initiated. This long lag time in response is not acceptable, and diminishes the opportunity to locate a contaminant source. Although the monitoring plan states that the Site may attempt to mitigate the contaminant release and determine a plan of action during the 30-day delay period, these actions cannot be reasonably decided or implemented until the contaminant source is determined.

To effectively locate and mitigate the contaminant source, Source Location Monitoring must be initiated as soon as the exceedance is detected. There should be no delays in locating a suspected contaminant source if an exceedance is detected, and the Site's allowable 30-day response time should be eliminated. Confirmatory sampling and mitigation plans and activities should be initiated concurrently with the commencement of Source Location Monitoring. Although more costly, timely, rapid laboratory analyses are also necessary during a suspected contaminant release event

An additional option is to implement staggered, redundant surface water sampling within equivalent drainage locations close to contaminated areas. Surface water sampling in equivalent areas would be initiated at different times of the month. While one composited sample is being analyzed, a redundant water sample is being collected in the same area. If a new contaminant source is detected, analysis of the redundant sample could provide corroboration.

Finally, all appropriate parties, including the communities, should be notified immediately whenever a contaminant exceedance in the surface water is detected or suspected.

Internal Waste Stream Characterization for Permit Application

The Surface Water Monitoring Program should explicitly describe the new Site waste streams that require characterization studies for the NPDES permit. The unidentified waste stream referenced in the current program plan as needing further investigation should be described in as much detail known. The description should include the location of the waste stream, reason for characterization, known contaminants, sampling frequency, sampling analyte list, its disposition, and provide other relevant information. The Surface Water Monitoring Program Plan should be a stand-alone document that fully describes all key elements of the surface water monitoring program in place for the year.

WASTEWATER TREATMENT PLANT MONITORING

Internal Waste Stream Authorization to Discharge to the Sewage Treatment Plant

Non-routine process or sanitary waste streams are evaluated for potential discharge to the Sewage Treatment Plant using a field screening process similar to the Incidental Waters screening protocol. However, the screening protocol used to determine the suitability of a waste stream for allowable discharge to the Sewage Treatment Plant puts greater emphasis on process knowledge of the waste stream.

Waste streams that pass the screening protocol receive authorization for discharge to the Sewage Treatment Plant. These waste streams may include, but are not limited to, new process discharges, chemical solutions, and even contaminated incidental waters that failed the Incidental Waters screening protocols.

For the same reasons discussed in the Incidental Waters monitoring protocol, the limited screening protocol is not sufficient to assess a waste stream for contaminant content. As discussed earlier in the critical analysis, contaminant releases have occurred after applying the screening protocol, although process knowledge was a major screening component. A more reliable and rigorous evaluation protocol is required for these waste streams. The screening protocol, including process knowledge, could be used to minimize the number of chemical analyses for the waste stream but should not be the sole criteria for decision-making. Chemical analyses is recommended for waste streams designated for disposal to the Sewage Treatment Plant.

Sewage Treatment Plant Collection System Monitoring

The current monitoring performed at the Sewage Treatment Plant is minimal and should be more comprehensive. The monitoring is limited to a few measurements at the headworks and the equalization basin.

The Sewage Treatment Plant should be managed like other municipal facilities, which includes development and implementation of a routine monitoring plan to sample and analyze the influent and waste streams at intermediate unit operations. The collected monitoring data would be used to evaluate treatment efficiencies and locations where untreated pollutants are accumulating. A routine monitoring plan for the Sewage Treatment Plant should be developed and implemented as soon as possible.

The effluent from the Sewage Treatment Plant should also be analyzed prior to discharge, both in accordance with the NPDES renewal permit and for a suite of potential contaminants that could potentially degrade the surface water quality, including radionuclides. From an operational viewpoint, this provides an additional operating safety margin if a contaminant release passes undetected through the treatment facility. This stringent monitoring is important in lieu of the Site's plan to extend the Sewage Treatment effluent outfall pipe to a discharge point downstream from Pond B-5, as proposed in the NPDES renewal permit.

In the NPDES renewal permit, the Site proposes to develop a response plan for abnormal influent monitoring results within six months after the effective permit date. The plan will identify Action Levels for the influent monitoring activity and the response action for any exceedance. This plan should be developed immediately and be in place as soon as possible.

The Site also proposes to submit the results from a feasibility study to evaluate viable radionuclide monitoring procedures within 12 months of the effective date of the renewal NPDES permit. It is assumed the Site is proposing the study to prepare for potential increases in radionuclide releases to the Sewage Treatment Plant during future D&D and remediation activities. This is not discussed in the Surface Water Monitoring Plan, and the study details should be presented to the public for information and review.

POND INFLUENT, OPERATIONS AND DISCHARGE MONITORING

Segment 5 Action Level Framework Monitoring

Some of the recommended improvements to the Segment 5 Action Level Framework Monitoring program were discussed earlier under the New Source Detection Monitoring recommendations. It is proposed that these two programs be combined to improve monitoring effectiveness in the stream Segment 5 waterways.

Stream Segment 5 encompasses the drainages upstream from the detention ponds and includes the terminal ponds (Ponds A-4, B-5, and C-2), the main stream channels of North and South Walnut Creeks, and the South Interceptor Ditch (not classified as Colorado waters). Stream Segment 5 waterways are considered to be major contaminant transport pathways for waters leaving the Industrial Area, and are also monitored under the Source Detection Monitoring initiative.

The Segment 5 Action Level Framework (ALF) Monitoring program is used to evaluate all runoff leaving the Industrial Area in the main stream channels upstream from the detention ponds. These waters are monitored for compliance with RFCA Action Levels. Continuous flow surface water samples are collected using automated samplers at gaging stations SW093, GS10 and SW027, which are also used for New Source Detection Monitoring. The water samples are analyzed for plutonium, americium, uranium, beryllium, chromium, cadmium, and silver.

Thirty-day moving averages of contaminant concentrations are calculated from the analytical results and reported. This term may be a misnomer, implying that the "average" represents analytical results from 30 discrete daily water samples. In actual practice, the “30-day moving average” is calculated using analytical results derived from zero to three continuous water samples collected over a 30-day period. The definition and significance of the 30-day moving average values should be clarified to ensure that the reported average values are properly understood.

If RFCA Action Levels are exceeded for any analyte of interest monitored, the Site is required to take the following actions:

- Notify EPA within 30 days and CDPHE within 45 days after exceedance detection;
- Locate the contaminant source;
- Implement mitigation to control the contaminant source.

Although the Site wishes to protect the public from undue alarm if an unverified contaminant exceedance is detected, it is important that downstream communities are notified at the time an exceedance is suspected. With proper information transfer concerning any detected exceedance in the surface water and a description of the Site's response activities, the public would be assured that the proper controls are in place. The 30-day grace period before notification is required should be eliminated. A new policy should be implemented that requires the Site to immediately notify all affected parties and regulators of any suspected contaminant exceedance. Public notification procedures should be developed to ensure the public stakeholders are kept informed in an efficient and timely manner.

There is a 30 to 45 day turn-around time before the analytical results from surface water samples (and all other media) are submitted to the Site. This is not acceptable. The CDPHE laboratory routinely completes radionuclide analyses and reporting within two weeks after a water sample is submitted. The CDPHE laboratory is currently experimenting with a solvent extraction process that may yield radionuclide analytical results within a few days. However, this analytical method is still in the experimental phase and may not be immediately beneficial. The Site should consider using the CDPHE laboratory for radionuclide analysis or explore an alternative commercial laboratory that will provide analytical results in less time. The present 30 to 45 day turn-around time is untypically long for many laboratories.

The recommendations presented earlier for the New Source Detection Monitoring program also apply to the Segment 5 ALF Monitoring program. Because of the close interaction, surface water and groundwater monitoring activities must be coordinated. Surface water samples should, at a minimum, be analyzed for the same constituents as the groundwater samples from the monitoring wells used evaluate the extent and movement of contaminated groundwater plumes. The monitoring data from the groundwater and surface water sample analyses should be routinely compared.

Nearly all water produced at or crossing the Site is directed to the detention ponds. EPA has determined that detention ponds A-3, A-4, B-3, B-5, and C-2 are located in waters of the United States. As a consequence, discharge waters from these ponds will no longer be regulated by an NPDES permit. In lieu of this, additional monitoring stations are recommended at the influent to these ponds. Water samples from these locations should be analyzed for a comprehensive list of contaminants, similar to the water analyses performed by the CDPHE for the Predischarge Monitoring program. This includes analyses for radionuclides, metals, volatile and semi-volatile organic compounds, inorganic compounds, herbicides, and pesticides. Comprehensive monitoring is important because the terminal ponds are the last control points before Site waters are discharged offsite.

NPDES DISCHARGES TO AND FROM PONDS

Predischarge Monitoring

Detention ponds are routinely sampled prior to discharge. Water samples are analyzed by CDPHE for a long list of potential contaminants, as noted in the above discussion. If the analytical results indicate a contaminant exceedance has occurred, the Site is notified and, at their sole discretion, determines the appropriate response action. Typically, the pond water is sampled a second time if pond discharge has not commenced, then analyzed to verify the contaminant exceedance.

The Site has full discretion regarding the release of pond waters. Because of the limited pond capacity, the Site may be compelled to discharge the pond waters before the initial sample analyses are received or even after analytical results show a contaminant exceedance is suspected.

Pond management procedures are described under the Predischarge Monitoring program description presented in the Surface Water Monitoring Program of the IMP. If a contaminant exceedance is detected in the pond samples, the IMP states that the Site would "then perform flow-proportional monitoring for the additional analyte(s) of interest during the discharge" or alternatively "consider other management options, such as treatment, storage, or disposal rather than immediate discharge." The decision process for these optional responses must be explained and reviewed by the public stakeholders. Without more information concerning these optional responses or a description of the proposed mitigation procedures, discharge of potentially contaminated pond waters should not be allowed.

Alternative procedures must be developed and instituted to avoid the offsite discharge of potentially contaminated pond water. The "treatment, storage, or disposal" management options referred to in the IMP are not described. However, a footnote states that "there are no treatment options readily available" for contaminated pond water. With this discrepancy, the Site's "management options" are unclear and seemingly nonexistent.

Because of the potential risks to the downstream communities and the probable increases in the contaminant load in suface water during future D&D and remediation activities, reasonable options for pond discharge management should be developed, selected, and implemented. Contingent temporary storage or pond re-routing alternatives must be in place. The contingent storage capacity should large enough to reduce the pond holding capacity to a safe level that protects the dams

from potential structural damage. Pond treatment alternatives must be developed and implemented as necessary. Both in situ water treatment methods and external treatment options should be evaluated. Off-the-shelf, skid-mounted water treatment systems are readily available, are commonly used in the industrial sector, and should be considered for pond water treatment at the Site.

Another reasonable option is to increase the analyte list for upstream monitoring in Segment 5 for the same parameters analyzed for the Predischarge Monitoring pond water samples. Alternatively, additional automated water samplers could be installed at the influent to ponds, where samples are analyzed for the entire analyte suite listed for the Predischarge Monitoring samples.

Better control and management of the treatment and pond systems is attainable with more intermediate sampling is performed between processes or ponds and if the surface water samples are analyzed for a wider range of parameters to verify pollutants are not being discharged. However, even if additional pond and intemediate monitoring is implemented, pond treatment alternatives must be readily available.

The protection of downstream communities from the discharge of contaminated surface waters is vital and should be the Site's highest priority.

Segment 4 Compliance Monitoring

Segment 4 Compliance Monitoring is used to evaluate surface water leaving the Site boundary. It includes monitoring terminal pond waters during discharge and evaluating the surface water quality in Walnut Creek and Woman Creek at Indiana Street (the Site's eastern boundary). Flow-paced water samples are collected at five gaging stations using automated samplers. These water samples are composited and analyzed for plutonium, americium, and at some locations for uranium and tritium.

Both the analyte list and monitoring locations for Segment 4 surface waters should be expanded. As discussed earlier in the critical analysis for Segment 4 Compliance Monitoring, the Site monitors groundwater at six Boundary Wells installed in the drainages along the eastern Site boundary. These wells are sampled semiannually and analyzed for plutonium, americium, uranium, tritium, volatile organic compounds, nitrate, fluoride, and sulfate. At a minimum, surface water from the five Segment 4 Compliance monitoring stations should also be analyzed for these same parameters. Additionally, all monitoring data from the groundwater and surface water monitoring programs should be correlated and evaluated in concert.

The groundwater Boundary Wells are situated along the entire eastern boundary of the Site. In addition to monitoring groundwater in Woman and Walnut Creeks, three Boundary Wells are also located in subdrainages near the East Access Gate and near the southeastern and northeastern corners of the Site. New surface water monitoring stations should be installed in the drainages near these well locations to monitor the surface water for potential contaminant concentrations.

Redundant surface water monitoring at points upstream from the Site boundary in Woman and Walnut Creeks should also be considered. The sampling time interval should be staggered at the mid-point of the sampling interval in the upstream monitoring locations. This would allow an earlier opportunity to detect a contaminant exceedance in the Segment 4 waterways, will provide timely verification data should an exceedance occur, and provides increased protection to the downstream communities.

The recent (August 1997) plutonium Action Level exceedance detected in the Segment 4 gaging station GS03, as well as other recent documented contaminant releases, confirms the need for prudent redundant surface water monitoring and demonstrates the value of integrating the surface water and groundwater monitoring activities. This exceedance event also emphasizes the vital need for more timely and rapid turn-around time for analytical results, as discussed earlier.

Also discussed earlier, the improvements in the notification procedures are necessary if a contaminant exceedance is detected during surface water monitoring. Early public notification at the time a contaminant exceedance is suspected would allow the downstream communities to evaluate their water supplies for contaminant impacts and to plan and initiate any necessary controls to protect these water resources.

OFFSITE COMMUNITY MONITORING

Community Assurance Monitoring

Community Assurance Monitoring is used to assess the community water supplies and distribution systems for contaminant impacts from Rocky Flats. Water samples are collected by community staff at the influent to Great Western Reservoir, effluent from the water treatment facility, and the Broomfield and Denver service areas for the Broomfield distribution systems. CDPHE analyzes the water samples for plutonium, americium, uranium, and tritium.

Additional offsite water sampling is recommended in the canals and waterways that discharge to the community water supply sources, such as the McKay Bypass Canal. This sampling should be performed by the Site or, alternatively, conducted by the communities with DOE funding. These water samples should be analyzed for the same constituents analyzed for the Predischarge and Segment 4 water samples.

The Site might consider extending the McKay Bypass Canal to bypass Walnut Creek to Indiana Street to reduce the potential contamination of community water resources.

Uncharacterized Discharge Monitoring

The Uncharacterized Discharge Monitoring program is used to evaluate waters of unknown quality that were released from the Site, such as during emergency discharge or storm events.

The notification and implementation procedures for this program are not described in the IMP Surface Water Monitoring Program. These procedures must be explicitly detailed and reviewed by community staff. The procedures should describe a reporting strategy for the timely notification of an uncharacterized release to the downstream communities, identify potential mitigation procedures, and ensure that a contingency budget has been allocated.

As discussed earlier, the Site's community notification procedures and laboratory response time require improvement. In addition, the Site must also ensure that the analysis and reporting time constraints discussed earlier are maximally minimized in order to effectively evaluate uncharacterized discharge waters in a timely a manner.

EXTRANEOUS MONITORING

Correlation of Plutonium with Total Suspended Solids

Although the concept of a correlation between plutonium and total suspended solids (TSS) is desirable as a real-time indicator of plutonium concentrations in surface waters, the likelihood of a finding a reliable, Site-wide correlation is minimal. The technical literature suggests this type of correlation is unreliable. Therefore, the resources invested in these correlation studies may be technically and economically unreasonable at this time. Instead, the Site should investigate other alternative means for rapid analytical procedures for radionuclides, such as the two week turn-around time achieved by the CDPHE laboratory or a similar onsite laboratory dedicated to radionuclide analyses.

Further, the Site should investigate and support some of the research currently in progress that is focused on developing faster, more reliable analytical procedures for radioactive element analyses.

SAMPLING AND ANALYSES

Except for detention pond water, all of the Site surface water is monitored at 12 different monitoring locations. The 12 monitoring stations are equipped with automated surface water monitoring systems.

Surface water samples are collected and analyzed to demonstrate compliance to the NPDES permit requirements, prevailing water quality standards, and to evaluate offsite discharges for potential contaminant releases.

Upon review of the 18 separate surface water monitoring programs, a lack of coordination between the different programs was apparent. The Surface Water Monitoring Program would be improved if all the elements in each program are reviewed for coordination and a standardized analyte list for all water samples is developed. The Site records show that metals and semi-volatile organic compounds are present in some of the Site waste streams. These contaminants could be carried in the surface water to locations where water samples are not presently analyzed for these compounds. However, the only common parameter between all of the sampled areas at this time is the analyses for radionuclides.

The radionuclide analyses are subcontracted out to an independent laboratory, which currently provides 30 to 60 days (on average 35 to 45 days) turn-around time before reporting analytical results. As mentioned earlier, the Site must find alternatives to reduce the turn-around time for the analytical results in order to respond earlier to a suspected contaminant exceedance. One solution would be to employ an onsite or mobile laboratory that uses the current analytical methods. This laboratory would reduce sample transfer times and be dedicated to analyzing the samples collected at the Site. Periodic samples could be sent to an external laboratory for quality assurance/quality control testing of the onsite laboratory procedures.

Another possibility is to submit the water samples for radionuclide analysis to the CDPHE laboratory. This laboratory, which performs the analyses for the Predischarge Monitoring for the Site, routinely complete radionuclide analyses within a two-week period.

ADDITIONAL SURFACE WATER MONITORING RECOMMENDATIONS

The Surface Water Monitoring Program described in the revised IMP is an improvement from the earlier version. However, many of the monitoring program elements are minimally described, incomplete, or in some cases are contradictory. The Site must work to improve the coordination of its surface water monitoring planning efforts. A process for integrating and correlating the 18 different surface water monitoring programs in a single Site-wide program, as well as integration with the other multi-media monitoring programs, should be developed, described, and implemented.

At present, the 18 different surface water monitoring programs are apparently managed as discrete programs and are not wholly coordinated within the Surface Water Monitoring Program. The integration of surface water monitoring with other monitored environmental media is also inadequate. This is particularly evident with the groundwater monitoring program.

Additional recommendations for improving the Surface Water Monitoring Program at Rocky Flats are summarized below. These recommendations generally apply to the overall Surface Water Monitoring Program, but in some cases may repeat some of the recommendations presented in earlier sections.

- It is relevant that after the recent plutonium exceedance was detected at GS03, it was realized that low flow surface water sampling is not typically performed. This may be a significant deficiency in the surface water sampling procedures currently implemented. It is recommended that the Site review the procedures used to select the flow rate that triggers the automated samplers to ensure that both high flow and low flow water samples are collected and analyzed.

- The Site should established guidance procedures for prioritizing the analyses for water samples with insufficient volume. Presently, the decision for analyses is determined by aribitray "professional judgement." Also, the disposition of the unanalyzed water samples with insufficient volume should be described. If these samples are archived for potential subsequent sampling, the preservation procedures should be defined.

- There is no sediment sampling performed in the Surface Water Monitoring Program. This is a significant deficiency. Sediments are capable sinks for contaminant accumulations. During the ebb and flow of surface waters during and after storm flow, sediments both settle and are resuspended. Accumulated contaminants trapped in the sediments can be flushed downstream within a short time interval and contaminate virgin areas. It is recommended that routine sediment monitoring be incorporated into the Surface Water Monitoring Program.

- During the long sample intervals in surface water monitoring, some of the sediments (total suspended solids) may settle in the sample carboys. Provisions for sampling and analyzing these sediments should be included. Other sediment sampling issues are addressed separately in the Soils Monitoring section.

- Additional samples should be taken with a higher frequency at each upstream pond in the series to ensure that contaminants trapped in the sediments are not flushed down through the pond system. Some studies suggest the plutonium contaminants occur as colloidal particles. Preliminary results from the ongoing Actinide Migration Study shows the surface sediments in the ponds contain concentrations of plutonium in exceedance of the Action Levels. Although the pond outlet pipe for the terminal ponds is set high, suspended sediments potentially contaminated with plutonium and other constituents could be released offsite during pond discharge. Contaminated sediments in the ponds and waterways should be considered as contaminant sources and managed accordingly.

- Additional surface water monitoring stations should be developed and located to ensure that the base flows and storm water leaving the Site in all stream channels, tributaries, diversion ditches/canals are routinely sampled and analyzed for the known pollutants present at the Site. This would include some of the intermediate pond locations, recently unclassified as Colorado waters, and other locations consistent with the groundwater monitoring program.