





**FINAL**  
**1997**

**Integrated Water Management Plan  
for the  
Rocky Flats Environmental Technology Site**

**A Working Group of**

**City of Broomfield  
City of Northglenn  
City of Thornton  
City of Westminster  
Colorado Department of Public Health and Environment  
Department of Energy  
Environmental Protection Agency, Region VIII  
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## TABLE OF CONTENTS

1.0	INTRODUCTION .....	1
1.1	Water Management Vision .....	1
1.2	Evolution of the Plan .....	2
1.3	Roles and Responsibilities .....	2
	1.3.1 DOE and Site Contractor .....	3
	1.3.2 EPA and CDPHE .....	4
	1.3.3 Downstream Municipal Water Users .....	5
1.4	Action Level and Standards Framework .....	5
2.0	WATER MANAGEMENT AT RFETS .....	5
	2.1 Key Components of Effective RFETS Water Management .....	5
	2.2 Water Management Activities .....	6
	2.3 Water Management by Geographic Area .....	6
3.0	IDENTIFICATION OF UNRESOLVED ISSUES .....	6
4.0	IMPORTANT NEAR-TERM WATER MANAGEMENT ACTIVITIES .....	8
	REFERENCES .....	12
	Appendix A – Abbreviations and Acronyms .....	A-1
	Appendix B – Description of Water Management Plans and Strategies .....	B-1

## FIGURES

Figure 1	Key Components of Effective of RFETS Water Management .....	14
Figure 2	RFETS Water Management by Programs .....	15
Figure 2A.1	Water Management by Location .....	16
Figure 2A.2	Water Management Programs by Location .....	17

## TABLES

Table 1	Identification of Water Management Activities by Subject Area .....	18
Table 2	Interaction of Water Management Activities/Information .....	21



## **1.0 INTRODUCTION**

The Department of Energy (DOE), the Environmental Protection Agency (EPA), and the Colorado Department of Public Health and Environment (CDPHE) negotiated the Rocky Flats Cleanup Agreement (RFCA) to provide the regulatory framework for closure of the Rocky Flats Environmental Technology Site (RFETS or the Site). As part of the RFCA (Appendix 5), a Surface Water and Groundwater Working Group (Group) was created and tasked to develop an Integrated Water Management Plan (IWMP). The Group is composed of representatives from the DOE, EPA, CDPHE, Kaiser-Hill Company, L.L.C. (K-H), Rocky Mountain Remediation Services (RMRS) and the Cities of Broomfield, Northglenn, Thornton, and Westminster. The purpose of the IWMP (as stated in the RFCA, Appendix 5), is to develop consensus recommendations to the decision-makers regarding decisions and actions related to water quality at, or downstream of RFETS.

The IWMP is organized into the following sections: Section 1.0, Introduction, presents the overall objectives of the Group and the Water Management Vision; Section 2.0, Water Management at RFETS, provides a model for water management, outlines the current water management plans and strategies, and summarizes plans by source area; Section 3.0, Identification of Unresolved Issues identifies unresolved issues related to water management; and Section 4.0, Important Near-Term Water Management Activities, provides an outline for implementing each management action that is presented in the model.

Appendix A provides an acronym list for this document. Appendix B provides a summary of each water management plan or program at the Site.

### **1.1 WATER MANAGEMENT VISION**

In keeping with the spirit of the RFCA Preamble and the Rocky Flats Vision, the Group developed a Water Management Vision to guide this IWMP. The RFCA Vision states that the quality of water supplies of the communities surrounding RFETS will be protected and that the water leaving the Site after cleanup activities have been completed will be acceptable for any use. To support this goal, the Group agreed that this IWMP should:

- Identify the actions necessary to protect water quality and the watershed and recommend programmatic activities to effectively manage water resources at RFETS.
- Provide a comprehensive management tool to implement DOE's long-term commitment for protecting water and related ecological resources.
- Provide an integrated response to existing and evolving cleanup and Site closure activities and establish a management linkage between modifications to cleanup plans, Site closure activities, and overall water management activities.
- Maintain and guide a long-term partnership between local governments, DOE, EPA, CDPHE, and the Site contractor and establish a management tool providing an iterative and responsive process for interagency water management planning at and downstream from RFETS.

- Protect the quality of surface water leaving the Site so that downstream water quality will meet standards for aquatic life, recreation, and agricultural uses during active remediation and any use following completion of active remediation.
- Promote pollution prevention, water conservation, and innovative treatment technologies in water management at RFETS.
- Promote reliable controls and monitoring to protect water quality during cleanup, decontamination and decommissioning (D&D) activities, and long-term disposition of radioactive materials.
- Work towards a long-term and fully protective program for passive and natural flow conditions.
- Encourage a long-term water-use strategy in regard to anticipated diminished flows and impact to ecological resources.
- Encourage protection of surface water and ecological resources as key elements of soil and groundwater cleanup.
- Support compliance with the requirement that onsite groundwater not be used for any purpose unrelated to Site cleanup activities, as stated in the Preamble to the RFCA.
- Promote institutional controls necessary to protect water uses.

## **1.2 EVOLUTION OF THE PLAN**

For the IWMP to effectively meet the changing needs of RFETS as Site closure activities proceed, it must evolve with the Site. As a result, the Working Group recommends that the IWMP be updated annually, as needed, until Site closure activities have been finalized. This will facilitate stakeholder involvement in changes to water management programs and also allow input to prioritization issues that affect water management and quality. This document presents the first such annual update.

## **1.3 ROLES AND RESPONSIBILITIES**

Because water management at RFETS affects the entire watershed (Big Dry Creek Basin) and is guided by a number of different operational plans and regulatory requirements, many different agencies share a role in water management. These agencies include DOE and the RFETS Site contractor, EPA and CDPHE, and downstream water users (including the Cities of Broomfield, Northglenn, Thornton and Westminster). The Group (which includes members from the Agencies and downstream water users) will strive for consensus recommendations to the decision-makers regarding any decisions and actions related to water quality at, or impacted by, RFETS as specified in Appendix 5 of RFCA. As part of developing this IWMP, each agency identified a list of their roles and responsibilities as related to water management at RFETS. These roles and responsibilities are presented below.

### **1.3.1 DOE and Site Contractor**

- Perform environmental monitoring, evaluate, and publish the results.
- Perform plutonium stabilization, environmental restoration, and D&D activities in accordance with RFCA and the Vision.
- Plan and conduct cleanup activities to accomplish the goals of RFCA and the Vision and subsequently reduce Site risk.
- Consult with agencies and downstream water users regarding major operational changes in accordance with procedures and protocols.
- Manage emergency operations and promote timely communication with downstream water users in accordance with procedures and protocols.
- Accomplish agreed-upon data quality objectives (DQOs) and provide timely and efficient data distribution to stakeholders for project-specific and environmental monitoring activities.
- Provide cost-effective water management operations at RFETS consistent with the requirements of the RFCA and other applicable regulations.
- Co-develop and implement emergency response procedures and notification protocols related to nonroutine events affecting downstream water quality.
- Evaluate impacts of water management changes on ecological resources and consult the U.S. Fish and Wildlife Service.
- Prepare plans and reports, complete projects in accordance with approved schedules.
- Maintain and enhance an open relationship between downstream water users and RFETS.
- Determine and communicate adequate funding requirements to support water management at RFETS.
- Evaluate periodic monitoring reports (surface water and groundwater) against Action Levels and Standards Framework for Surface Water, Ground Water, and Soils (ALF) action levels, and National Pollutant Discharge Elimination System (NPDES) permit requirements, and identify trends and the need to evaluate sources and actions.
- Coordinate watershed improvements, dam safety and pond operation programs.

### **1.3.2 EPA and CDPHE**

- Perform environmental monitoring, evaluate, and publish the results.
- Evaluate periodic monitoring reports (surface water and groundwater) against ALF action levels, and NPDES permit requirements, and identify trends and the need to evaluate sources and actions.
- Work with DOE to scope and execute additional source investigations as required.
- Recommend and evaluate changes to monitoring programs when and as required.
- Review and approve required decision documents for early actions and remedial actions.
- Perform field oversight during conduct of actions to determine compliance with Decision Documents and applicable regulations.
- Provide oversight of operation/alteration/shutdown of existing groundwater control/treatment systems and any future systems.
- Oversee sitewide groundwater compliance and remedial action modeling.
- Initiate compliance activities if groundwater agreements to protect surface water are exceeded.
- Stormwater – Evaluate event-related monitoring data from the Industrial Area (IA) perimeter and points in drainages above terminal ponds against ALF. Make determinations on required actions and work with DOE to implement them.
- Pond Operations – Approve an acceptable Pond Operations Plan. Oversee the implementation of the plan and participate in non-emergency pond discharge approvals and monitoring.
- Wastewater and stormwater – Reissue, certify, administer and enforce NPDES permit.
- Administer wetlands banking agreement and make determinations of required mitigation efforts.
- Oversee ecological characterization, habitat enhancement, and restoration work.
- Provide regulatory and nonregulatory technical review and assist in the development of standards and applicable or relevant and appropriate requirements (ARAR) determinations.
- Collaborate with the downstream water users and the public to enhance interaction with DOE.
- EPA, as permitting authority, is required to consult with other agencies in conjunction with renewal of the NPDES permit. For example, under the interagency cooperation responsibilities for the Endangered Species Act, EPA must consult with the U.S. Fish and Wildlife Service on the modifications to the renewed NPDES permit's effects to ecological resources.

### **1.3.3 Downstream Municipal Water Users**

- Communicate with DOE regarding existing and anticipated changes to downstream municipal water quantity and quality programs which may be inconsistent with upstream operations and uses.
- Communicate with DOE regarding concerns they may have about proposed changes to RFETS that may impact the planning for, or operation of, water management facilities owned or controlled by the users.
- Co-develop and implement emergency response procedures and notification protocols related to nonroutine events affecting downstream water quality.
- According to the language in the RFCA, municipal water users have a shared responsibility with DOE and other parties to develop consensus-based changes to water quality standards for the Big Dry Creek Basin.

## **1.4 ACTION LEVELS AND STANDARDS FRAMEWORK**

ALF sets up the process of evaluating and protecting water quality at the Site. The ALF is included in Attachment 5 of RFCA. In 1996, representatives of the Group put forward a comprehensive recommendation to the Colorado Water Quality Control Commission for changes to water quality standards and classifications in Segments 1 through 5 of Big Dry Creek. This recommendation included changes to water quality standards contained in the RFCA. In December 1996 the Commission unanimously approved the consensus-based changes; the new standards and classifications went into effect March 1997 (except for changes in North Walnut Creek, which take effect January 1, 1998).

## **2.0 WATER MANAGEMENT AT RFETS**

This section will familiarize the reader with current RFETS water management operations. First, an overview of water management is presented in the form of a conceptual model. This model identifies the overall strategy of water management at RFETS. Then, an identification of the current water management programs and strategies is presented to familiarize the reader with the different water management plans/programs at RFETS. Finally, a cross-reference of each management plan to the water management subject area is given.

### **2.1 KEY COMPONENTS OF EFFECTIVE RFETS WATER MANAGEMENT**

One purpose of the IWMP is to communicate to the stakeholders decisions and actions related to water quality at, or impacted by, RFETS. This is achieved by identifying and promoting implementation of water management actions. Management actions critical to water management at RFETS are presented in Figure 1, *Key Components of Effective Water Management*, (page 14). As illustrated in Figure 1, the overall goal of water management at RFETS is to protect human health and ecological resources through the implementation of a variety of water management actions.

## 2.2 WATER MANAGEMENT ACTIVITIES

Each management action presented in Figure 1 is related to one or more of four water management groups at RFETS as illustrated in Figure 2 (page 15). These four groups are:

- Surface Water
- Groundwater
- Wastewater Treatment
- Site Closure Activities

Integrated water monitoring is an activity within each of these groups. Each of these groups is responsible for a number of different water management activities. As an example, the Surface Water group is responsible for the following: NPDES Discharge and Stormwater Permit; Pond Operations; Future Water Use Projections; and Downstream Water User's Plans. Appendix B presents the content and purpose of each plan outlined in Figure 2.

## 2.3 WATER MANAGEMENT BY GEOGRAPHIC AREA

To facilitate the understanding of water management practices at RFETS, a breakdown of water management actions by geographic area is presented in Figures 2A.1 (page 16) and 2A.2 (page 17). These figures present water management activities from upstream sources to downstream discharge points. These areas are: Onsite Industrial Area, Onsite Pond Area, Boundary Area, and Impacted Downstream Areas. Table 1 provides a cross reference of each water management plan to the water management subject area.

## 3.0 IDENTIFICATION OF UNRESOLVED ISSUES

The working group has identified and is continuing to resolve the following issues:

- **Issue No. 1:** Controlled Detention — Should the Site use controlled detention during the cleanup phase?

A controlled detention mode of surface water discharge is being considered at RFETS. Surface water is currently discharged from the Site in a batch-and-release mode using Ponds A-4, B-5 and C-2. Flows in and out of an individual pond, generally Pond A-4, are shut off, thereby isolating the pond's water from the rest of the pond network. A sample of the water is collected and, if sample results indicate water quality standards are met, the "batch" of water is pumped out of the pond to a stream that flows off the Site. DOE envisions a future water management mode that will discharge treated WWTP effluent to the individual creeks below the ponds and employ outlet works at all terminal ponds to discharge collected stormwater. Controlled detention water management at the Site is proposed in the Pond Operations Plan (POP), Rev. 2, dated September 1996 which proposes a four-step approach toward controlled detention from the current batch and

release process. Under controlled detention a pond would be configured to have water flowing into the pond at the same time that water is flowing out of the pond and off the Site. The inflow and outflow rates will be controlled to achieve an established efficiency for removing specific contaminants from the water. Transitioning the operating regime will require review and input from regulators, Actinide Migration Advisory Group and stakeholders. Stakeholders are unlikely to endorse the concept during cleanup of the Site.

- **PROs:** Controlled detention would maintain high water-quality control for radionuclides by providing a moderated discharge from the terminal ponds at water levels that would enhance sedimentation of particulates in storm water. This water management approach will reduce operating water levels in terminal ponds which will improve dam safety and increase the availability of storage for contaminated flows during storm and spill events. Movement to a controlled detention operation of the ponds is dependent upon institution of other actions to maintain adequate protection of downstream water supplies and other uses. This operational mode would also provide routine water flows to the intrinsic ecological communities.
- **CONs:** The Site currently operates in a batch-and-release mode because it provides a high level of confidence in water quality control. In the controlled detention mode, if contamination reaches the ponds undetected, it would be released downstream. There is concern about the Site's ability to detect and prevent contaminated releases to the WWTP and pond system.
- **Subissue:** Bypassing of WWTP flows, which currently discharge to Pond B-3, around the B-series ponds into Walnut Creek will reduce batch frequencies, make storage more frequently available for storms and spills, and simplify operations. Timely detection of contaminant releases to the WWTP is a concern. This option has been included in the draft NPDES permit released for public comment on August 15, 1997. Downstream users will not support this until the McKay Extension Ditch is constructed.
- **Subissue:** Sometimes during major storm events, the Ponds are discharged due to dam safety concerns before the analytical results from pre-discharge samples are obtained. Discharging water from the WWTP below Pond B-5 may alleviate the problem because it would increase storage in the ponds.
- **Subissue:** Can RFETS modify pond operation procedures to allow routine direct discharges from Pond B-5 to Walnut Creek? This action would eliminate the need to routinely transfer water from Pond B-5 to Pond A-4 before discharge. By-passing the WWTP around the B-series ponds into Walnut Creek will allow Pond B-5 to be isolated during routine pond operations. The completion of the upgrades to the B-5 outlet works will improve dam safety and water quality, and will allow direct release to Walnut Creek.
- **Issue No. 2:** After January 31, 1998, Broomfield will no longer operate Great Western Reservoir for drinking water supply, but will instead use it to supply water to Interlocken

for landscaping and golf course irrigation. Broomfield has purchased water rights from Denver Water Board from the South Boulder Diversion Ditch through the McKay by-pass. Broomfield will exercise their Denver Water Board water rights annually from April through October when in priority, but does not want to commingle its water with that from RFETS. Building an extension to the McKay Ditch would alleviate this problem.

- **Issue No. 3:** Can the Site obtain funding in a timely fashion to remediate/contain nonemergency but high-priority contamination sources on the watershed? DOE's position is that Site funding will be reallocated to deal with significant environmental problems. Other parties are not in agreement that funding will be available. There are no management reserve funds so that funding unplanned activities requires reshuffling funds to meet new priorities.
- **Issue No. 4:** Is the fate and transport of plutonium in the environment well known and understood by the Site? In FY96, an Actinide Migration Expert Panel reviewed existing data on actinide migration at RFETS and recommended that the Site gain a thorough understanding of actinide fate and transport and its effect on remedial actions and the protectiveness of surface water. Based on this recommendation, RFETS initiated a multi-year Actinide Migration Study. The FY97 findings include the following: (1) under oxic conditions, plutonium is strongly associated with particles and uranium significantly partitions to the dissolved phase; and (2) the dominance of plutonium in the organic form suggest the plutonium has potential for mobility over a greater range of environmental conditions than previously anticipated (what is the organic form and what initiates transport requires additional investigation). The FY98 direction includes: (1) completion of phase speciation and partition coefficient studies; (2) evaluation of anoxic conditions on plutonium transport; (3) determination of chemical oxidation form of plutonium; and (4) conduct watershed model and mass loading analyses for the Walnut and Woman Creek drainages.
- **Issue No. 5:** How can the timeline for receiving analytical results be improved to allow time for downstream communities to react to potential or actual releases to surface waters in excess of RFCA action levels?

If the working group is unable to resolve any of these issues, the Resolution of Dispute process outlined in RFCA will be used.

## 4.0 IMPORTANT NEAR-TERM WATER MANAGEMENT ACTIVITIES

The intermediate to long-term strategy for RFETS water management is defined in the Rocky Flats Vision statement, is mapped out in *Accelerating Cleanup: Focus on 2006* and in RFCA. As depicted in Figure 1, fulfillment of the strategy will be achieved through cost-effective management actions in several key areas to protect downstream water supplies and limit risks to human health and ecological resources. As charted in Table 2, these actions will occur through the implementation and outputs of the network of

in-place and developing water management activities at RFETS. In the near-term (FY97 and 98), the actions which are necessary to continue progress toward implementation of the water management strategy are listed below. In the ensuing months, the Group will provide comments and concerns on these activities to the budget decision-makers.

- Manage Groundwater to Protect Surface Water
  - Complete evaluations of groundwater impacts to surface water for areas where groundwater exceedances were detected.
  - Complete additional field work in FY98 to support the basis for groundwater cleanup for the Solar Pond Plume and the volatile organic compound (VOC) plumes in the former Operable Unit 2.
  - Construct and operate the Mound Site Plume groundwater collection and treatment system as a demonstration project. Fund monitoring of the demonstration so that data can be assessed to determine whether or not the technology should be used for remediating all VOC-contaminated plumes.
  - Establish monitoring for D&D activities and performance monitoring of source removals.
- Manage Groundwater and Surface Water to Protect Ecological Resources
  - Complete current site-closure planning activities under *Accelerating Cleanup: Focus on 2006*, estimate future stream flows and the capability of these reduced flows to sustain wetlands and critical habitats, and communicate this information to stakeholders.
- Manage Site Detention Ponds in a Safe Configuration to Protect Dam Integrity and Water Quality
  - The POP, Rev. 2, proposes a four step process toward controlled detention from the current batch and release process. DOE will work with regulatory agencies and downstream water users to reach agreement on the transition.
  - Complete pond construction activities, including the Pond B-5 and C-2 standpipes in FY98 and FY99 respectively to facilitate dam safety, water quality, and reduced operating costs.
  - Completed south interceptor ditch (SID) cleanout, A-1 and B-2 outlet works upgrades. Mower Ditch headgate, and placing the landfill piezometers on RFETS telemetry system in FY97.
  - Complete construction of McKay Ditch Extension in FY98.

- Manage the Process Wastewater Treatment and Disposition at Building 374 Liquid Waste Treatment Upgrades for Alternate Treatment Capacity to be Protective of Surface Water
  - Procure design/build subcontracts in FY98 for wastewater evaporation and sludge stabilization/immobilization to replace Building 374.
  - Continue to enforce the waste acceptance criteria for Building 374 and its potential replacement to maintain the ability of the facilities to meet a maximum discharge limit for plutonium and americium of 0.15 pCi/L.
  - Completed ITS options study in FY97.
- Manage Incidental Waters to Protect WWTP and Surface Water
  - Continue inspection and field measurements of incidental waters to determine if they pose a threat to surface water and/or the WWTP.
  - Continue management of incidental waters database which contains FY95 through FY97 data of water quality results of incidental water sampling.
- Manage Internal Waste Streams to Protect WWTP and Surface Water
  - Completed the Drain Identification Study in August 1996.
  - Continue to use the general pretreatment regulations (40 CFR 403) as guidelines in the control of internal waste streams.
  - Enforce sampling requirements and operational restrictions on nonprocess, nondomestic discharges to the WWTP (See Internal Waste Streams Program page B-2) to meet all waste acceptance criteria.
- Manage Sanitary Wastewater Treatment/Disposition at B995 to be Protective of Surface Water
  - Completed Phase III WWTP improvements in September, 1997 to allow storage of treated wastewater during upset conditions.
  - Implemented disinfection conversion (chlorine to ultra-violet light) in FY97.
  - Pipeline from WWTP to below Pond B-5 operational after the completion of the McKay Ditch Extension.
- Implement Accelerated Cleanup Actions and Watershed Improvements to Control Sources

- Implement source cleanups that have been targeted and prioritized based on their potential for impact upon groundwater and surface water.
- Conduct source cleanups consistent with available budget and in compliance with ALF.
- Control potentially contaminated runoff from each source cleanup action using specified Best Management Practices (BMPs).
- Transport contaminated groundwater generated from each removal action to the appropriate treatment facility.
- Implemented watershed improvements, including revegetation and soil stabilizing agent application (scheduled in FY97 to control radiological constituents in surface runoff and planned in FY98 for additional control measures based upon need).
- Practice Spill Control BMPs, Stormwater Pollution Prevention, and Maintenance Monitoring to Protect Surface Water
  - Continue to implement SPCC/BMP plans and programs to prevent or minimize the potential for releases of toxic materials or hazardous substances from the Site.
  - Continue the stormwater monitoring program to assess the environmental consequences of D&D and environmental restoration activities at the Site and to provide early warning of potential or actual releases to surface waters in excess of RFCA action levels.
  - Implement an integrated and cost-effective groundwater and surface water monitoring program for RFCA compliance.

In addition to the near-term water management activities listed above, coordination and communication among DOE and RFETS contractors, the regulatory agencies EPA and CDPHE, and the Cities which manage and deliver water supplies to downstream users will continue. The cooperative effort which produced this IWMP will be fostered through the following water management process improvements:

- The Water Management Group will highlight the importance of the anticipated activities listed above and communicate these preferences to Site management for consideration in the annual budgeting process. The Group anticipates reconvening to review the priorities of activities in future years.
- The network of water management plans and activities at RFETS, and related communication and coordination with the agencies and Cities will be streamlined, including simplifying lines of program control, and establishing a single point-of-contact management approach and liaison with the agencies and downstream water users.

- The Site will continue to participate in the Big Dry Creek Water Quality Focus Group, supporting the group's efforts as a party to the Partnership Agreement, and joining the other point-source dischargers in coordinating water management activities in addressing key concerns in the Big Dry Creek basin.

The above water management process improvements will be achieved by (1) the continuing work of a water management core team coordinated by the RFETS point-of-contact; (2) updating of the IWMP to incorporate process improvements and changes brought on by accomplishments of the Site water management activities; (3) reconvening of the Water Management Group on an as-needed basis to review progress and reissue updates of the IWMP; and (4) continuing the Big Dry Creek Watershed Partnership Agreement, joining the participating cities in supporting long range goals for the Basin.

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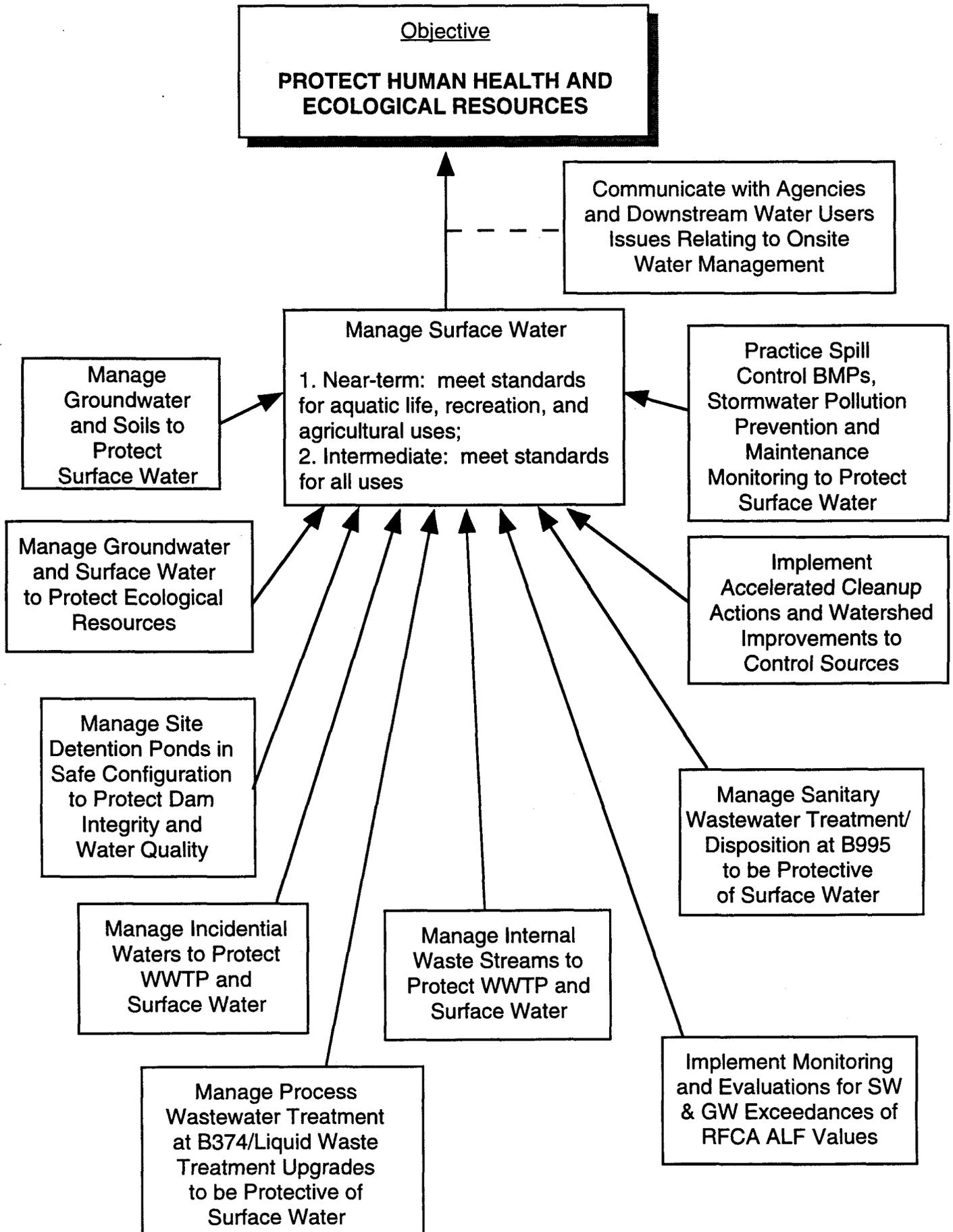


Figure 1 - Key Components of Effective RFETS Water Management

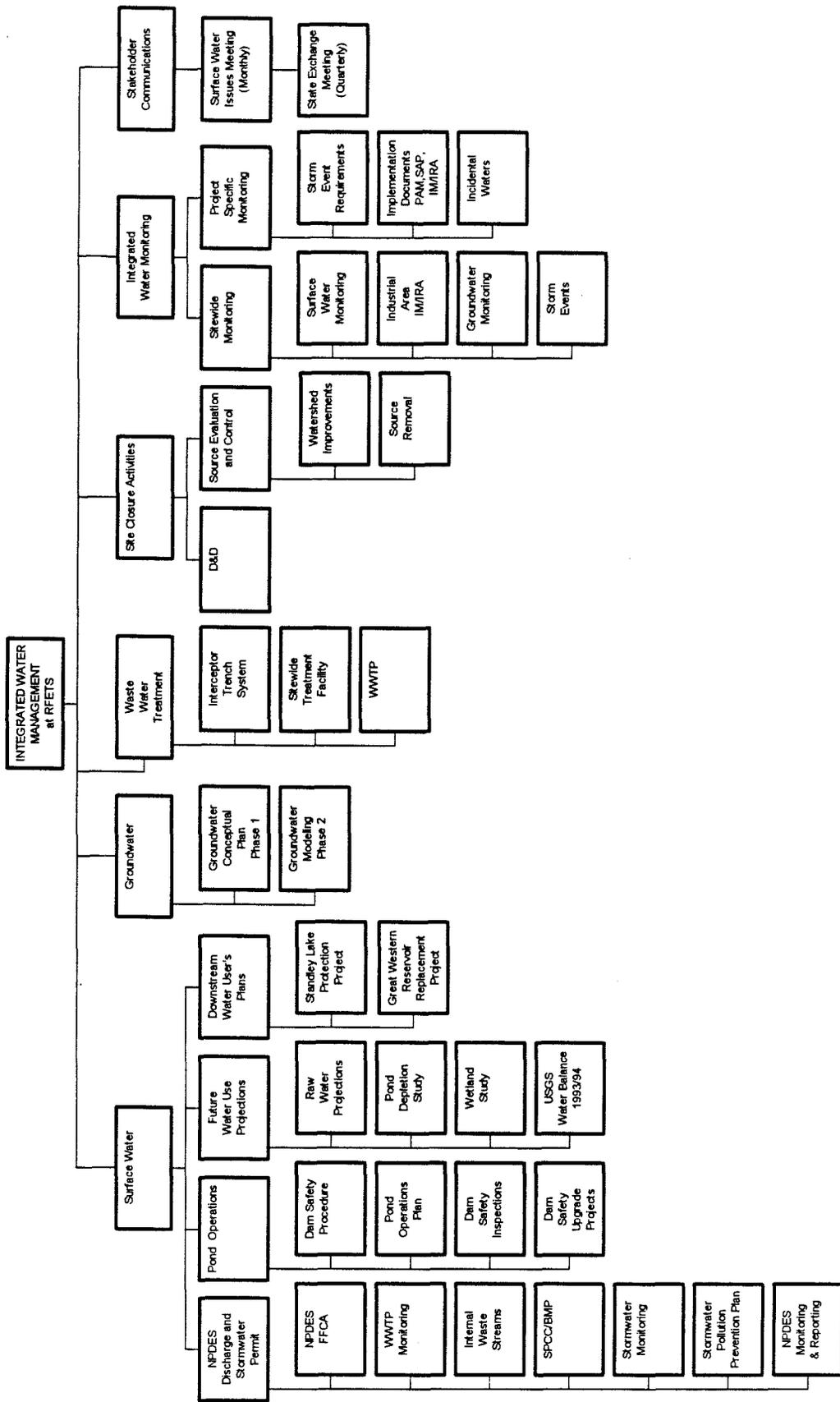


Figure 2 - RFETS Water Management by Programs

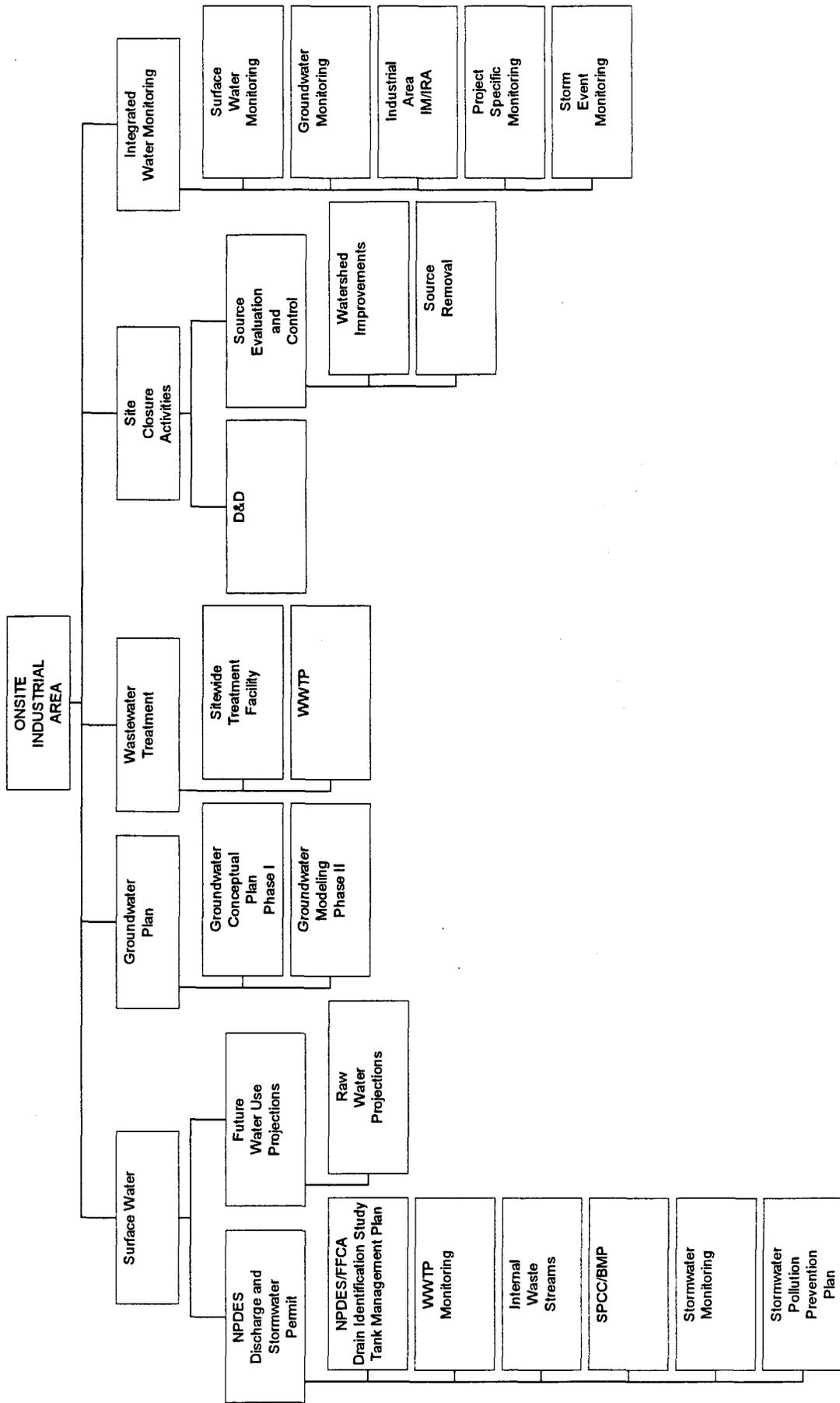


Figure 2A.1 - Water Management Programs by Location

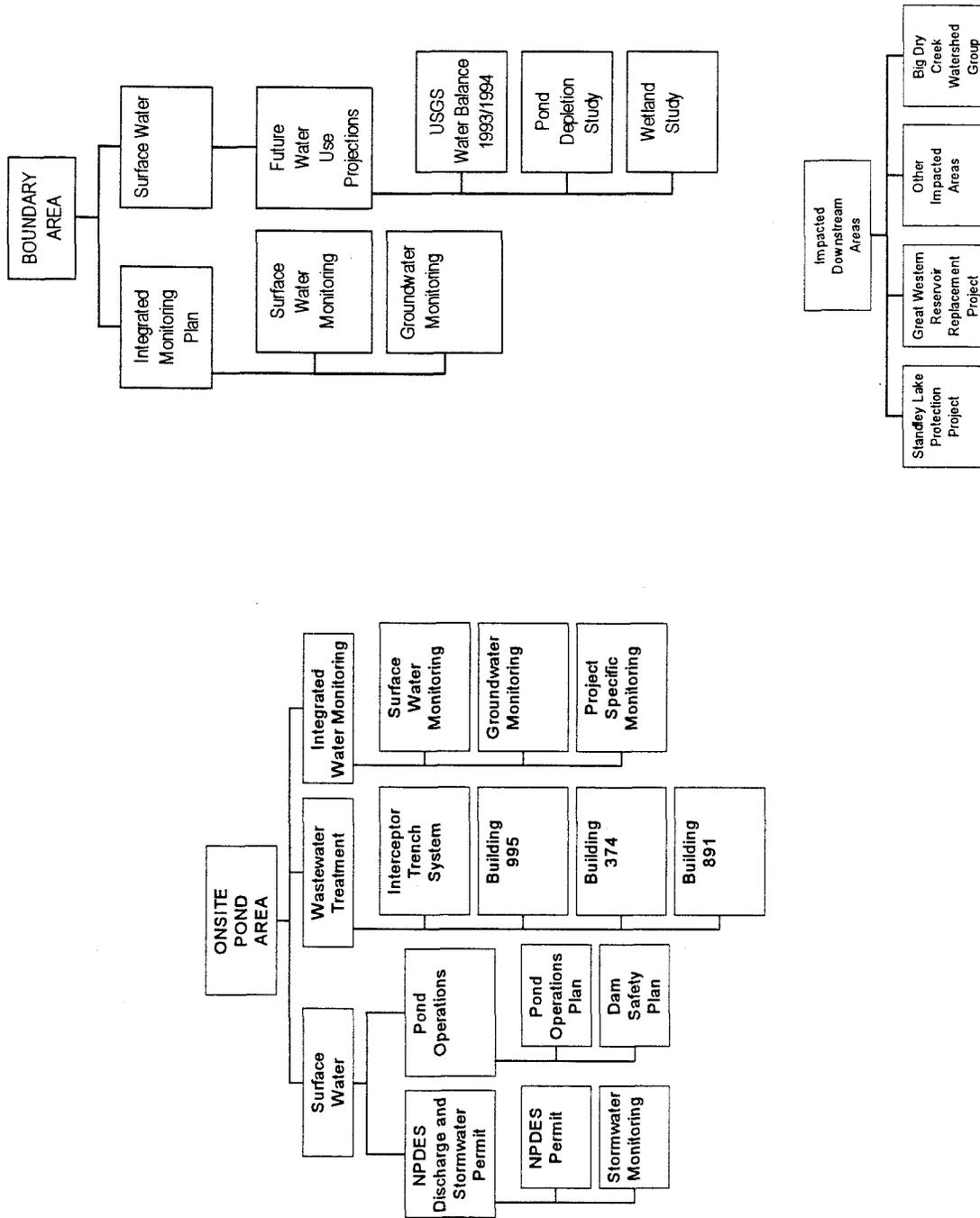


Figure 2A.2 - Water Management Programs by Location

**Table 1 - IDENTIFICATION OF WATER MANAGEMENT ACTIVITIES BY SUBJECT AREA**

Water Management	NPDES Permit	NPDES FFCA	NPDES DIS	NPDES TMP	Internal Waste Streams	SPCC / BMP	Storm Water Monitoring	SPPP	Dam Safety Proc.	POP	Raw Water Proj.	Wetlands Study	Groundwater Conceptual Plan and Modeling	B374	STF	Source Removal PAMS	Integ. Water Monitoring
<b>SURFACE WATER</b>																	
Storm water runoff	X				X	X	X	X		X							X
Pond Operations																	
• Site Discharges	X						X		X	X							X
• Pond Management							X			X							X
• Dam Safety									X	X							X
Spills	X					X				X				X			
Underground Tanks		X															
Above Ground Tanks		X				X		X									
Building Operations	X	X	X		X	X		X									X
Footing Drains	X	X						X		X			X	X			
Future Water Use Projections											X	X	X				
<b>GROUNDWATER</b>																	

**ACRONYMS:**

- |           |   |          |   |
|-----------|---|----------|---|
| BMP       | Best Management Practices                       | SPCC/BMP | Spill Prevention Control & Countermeasure/Best Management Practices |
| DIS       | Drain Identification Study                      | SPPP     | Stormwater Pollution Prevention Plan                                |
| IA IM/IRA | Industrial Area IM/IRA                          | STF      | Site-wide Treatment Facility  |
| NPDES     | National Pollutant Discharge Elimination System | TMP      | Tank Management Plan  |
| POP       | Pond Operations Plan                            | WMF      | Waste Management Facility   |
|           |   | WWTP     | Wastewater Treatment Plant  |

**Table 1 - IDENTIFICATION OF WATER MANAGEMENT ACTIVITIES BY SUBJECT AREA**

Water Management	NPDES Permit	NPDES FFCA		Internal Waste Streams	SPCC / BMP	Storm Water Monitoring	SPPP	Dam Safety Proc.	POP	Raw Water Proj.	Wetlands Study	Groundwater Conceptual Plan and Modeling	B374	STF	Source Removal PAMS	Integ. Water Monitoring
		DIS	TMP													
New Sanitary Landfill Leachate	Alternative Disposal <sup>1</sup>															
WMF Leachate	X															
Interceptor Trench System									X				X			
Environmental Restoration Groundwater												X		X	X	X
<b>WASTEWATER TREATMENT</b>																
Sanitary Sewer	X			X												
Laundry Water	X															
<b>SITE CLOSURE ACTIVITIES</b>																
Building Deactivation																
• Liquid Stabilization	X												X			
• Residue Elimination	X												X			

**ACRONYMS:**

BMP Best Management Practices  
 DIS Drain Identification Study  
 IA IM/IRA Industrial Area IM/IRA  
 NPDES National Pollutant Discharge Elimination System  
 POP Pond Operations Plan

SPCC/BMP Spill Prevention Control & Countermeasure/Best Management Practices  
 SPPP Stormwater Pollution Prevention Plan  
 STF Site-wide Treatment Facility  
 TMP Tank Management Plan  
 WMF Waste Management Facility  
 WWTP Wastewater Treatment Plant

**Table 1 - IDENTIFICATION OF WATER MANAGEMENT ACTIVITIES BY SUBJECT AREA**

Water Management	NPDES Permit	NPDES FFCA	NPDES DIS	TMP	Internal Waste Streams	SPCC / BMP	Storm Water Monitoring	SPPP	Dam Safety Proc.	POP	Raw Water Proj.	Wetlands Study	Groundwater Conceptual Plan and Modeling	B374	STF	Source Removal PAMS	Integ. Water Monitoring
• Tank Mgt.	X																
• B374/774 Sludge Treatment	X																
D&D	X													X	X		
Source Removals	X				X	X	X	X		X			X	X	X	X	X
<b>INTEGRATED MONITORING</b>																	
Surface Water Monitoring																	X
Groundwater Monitoring																	X
IA IM/IRA																	X
Stormwater Monitoring	X																

1. Normal operation is leachate to evaporation pond.

**ACRONYMS:**

- BMP Best Management Practices
- DIS Drain Identification Study
- IA IM/IRA Industrial Area IM/IRA
- NPDES National Pollutant Discharge Elimination System
- POP Pond Operations Plan
- SPCC/BMP Spill Prevention Control & Countermeasure/Best Management Practices
- SPPP Stormwater Pollution Prevention Plan
- STF Siterwide Treatment Facility
- TMP Tank Management Plan
- WMF Waste Management Facility
- WWTP Wastewater Treatment Plant

**Table 2 Interaction Of Water Management Activities/Information**

Management Tool	Description	Status	Output/Information
<b>SURFACE WATER</b>			
<b>NPDES Discharge and Stormwater Permit</b>			
NPDES Permit/WWTP Monitoring	Governs discharges from the WWTP and surface water ponds A-3, A-4, B-5 and C-2. (Note: New RFETS NPDES permit will govern Building 995 discharges only; ponds will be covered by RFCA.)	Monthly reports submitted to Agencies	Water quality data from Discharge Monitoring Report which will identify treatment deficiencies
Drain Identification Study	Reviewed sanitary and process drains and possible sources of hazardous or otherwise inappropriate influent to the sanitary sewer system.	Study completed. 85% of risk areas completed in May 1996. Balance was completed August 8, 1996.	Potential spill pathways to sanitary sewer system were identified and were capped.
Tank Management Plan	Assessed the integrity of aboveground storage tanks. Established a master tank data base for RFETS.	Inventory completed. Scheduled to complete initial testing & inspection cycle in September 1997.	Complete inventory and condition of aboveground and RCRA tanks. Maintenance/use of database through Site closure.
Phase III WWTP Improvements	Influent and effluent storage capacity will be added to the WWTP.	Improvements completed in FY97.	Provide storage that will allow time to store wastewater during upset conditions.
Internal Waste Streams Program	Uses pretreatment regulations (40 CFR 403) as guidelines in the control of internal waste streams.	All nonprocess, nondomestic discharges to the sanitary collection system are included in program.	Verifies that the WWTP can treat influent wastewater.
Spill Prevention Control and Countermeasures/Best Management Practices (SPCC/BMP)	Document existing plans and programs to prevent or minimize the potential for significant releases of toxic materials or hazardous substances from the Site.	Reviewed and revised as necessary every three years.	Identification of measures in place to prevent and contain spills from entering surface water.

**Table 2 Interaction Of Water Management Activities/Information**

Management Tool	Description	Status	Output/Information
Storm Water Monitoring	Measures streamflow during storm events.	Specific magnitude of storm events are targeted and funded for monitoring.	Water quality and quantity data from storm events that are monitored to identify for potential new sources of contamination.
Stormwater Pollution Prevention Plan	Establishes best management practices (BMPs) for stormwater quality improvement.	Revised July 21, 1995. Will revise upon NPDES permit issuance.	Description of potential stormwater pollutant sources and outline of existing and proposed stormwater pollution prevention measures.
<b>Pond Operations</b>			
Dam Safety Procedure	Describes response actions required in the event of an emergency involving the site's terminal detention ponds.	Procedure is in place, being followed by Site personnel and updated as needed in cooperation with the State and Cities.	Identification of activities, action levels, and responses for emergencies involving the Site's terminal detention ponds.
Pond Operations Plan	Revision 2 was submitted to stakeholders in September 1996. Future revisions will be implemented as required based on the status of pond operations and input from stakeholders.	Currently operating under. Future revisions are anticipated in FY98.	Description of the transition plan for pond operations with a network logic and schedule for the steps in the transition process.
<b>Future Water Use Projections</b>			
Raw Water Projections	Projects future raw water demand required for Site operation during closure activities.	Based on data in <i>Accelerating Cleanup: Focus on 2006</i> .	Estimate future raw water volume as required for Site operation as Site water use declines.
Wetland Study	Inventories wetlands and evaluates future potential wetlands based on raw water projections.	Water yield estimates planned as part of Site groundwater modeling in FY98.	Quantification of future sustainable wetlands based on water quantities in drainages.
<b>Impacted Downstream Areas</b>			

**Table 2 Interaction Of Water Management Activities/Information**

RF/RMRS-97-078.UN  
 Final Integrated Water Management Plan  
 for the Rocky Flats Environmental Technology Site

Management Tool	Description	Status	Output/Information
Standley Lake Protection Project	Woman Creek Reservoir protects the Standley Lake drinking water supply from any future water quality impacts of the Site.	Woman Creek Reservoir construction has been completed; Operations Agreement was approved August 21, 1996.	Standley Lake Protection Project Operations Agreement; retained flows are discharged to Walnut Creek.
Great Western Reservoir Replacement Project and Proposed Reuse Plan	Broomfield drinking water supply will no longer be affected by future impacts of the Site to water quality in Walnut Creek.	Water supply from Great Western Reservoir replaced by new water source. Pipeline and new water treatment plant to be operational by 1/98. Reuse Plan is being developed by the City of Broomfield. Expected completion in 2003.	Great Western Reservoir Operations and Reuse Plans. City wastewater effluent stored in Great Western Reservoir for golf course landscape irrigation.
<b>GROUNDWATER</b>			
Groundwater Conceptual Plan	Identifies and ranks principal contaminant plumes	Final Revised Version completed in September, 1996	Identification of preliminary alternatives for managing contaminated groundwater.
Groundwater Modeling	One model assesses vertical migration. Another deals with sitewide flows and allows refinement of the analyses in the Groundwater Conceptual Plan for groundwater remediation alternatives.	To be completed in FY98 as required for remediation of groundwater plumes which are FY99 RFCA milestone (i.e., Solar Pond plume).	Assessment of the potential for vertical migration of DNAPL. Provides preliminary design of plume containment/remediation.
<b>WASTEWATER TREATMENT</b>			
Liquid Waste Treatment Upgrades for Alternate Treatment Capacity	Develop alternate treatment capacity for wastewater evaporation and sludge stabilization/immobilization to replace Building 374.	Procuring design/build subcontract for alternate treatment capacity.	Treatment facilities designed to evaporate wastewater and stabilize/immobilize sludge in compliance with RFCA.

**Table 2 Interaction Of Water Management Activities/Information**

RF/RMRS-97-078.UN  
 Final Integrated Water Management Plan  
 for the Rocky Flats Environmental Technology Site

Management Tool	Description	Status	Output/Information
Interceptor Trench System (ITS)	Alternative management for ITS to meet Action Levels and Standards Framework (ALF)	Alternatives for Solar Pond Plume remediation and ITS management were evaluated in FY97.	The final report recommends phytoremediation or treatment in Building 995 as the most feasible alternatives to meet long-term objectives.
Sitewide Treatment Facility (STF)	STF designed to treat water from environmental restoration activities	The STF was upgraded in FY95 when two existing treatment facilities were combined.	Treatment facilities designed to meet standards specified in OU1/OU2 IM/IRA documents.
<b>SITE CLOSURE ACTIVITIES</b>			
<b>Source Evaluation and Control</b>			
Watershed Improvements	Identifies improvements to reduce/eliminate stormwater runoff with potentials for impacting surface water quality	Improvements conducted in FY97, additional control measures planned for FY98 on an as needed basis.	Used to guide the implementation of physical modifications to the watershed designed to improve the quality of surface water flowing from the Site.
Source Removal	Identifies specific locations from which contaminants leach to groundwater	Source removals have been identified and prioritized. Ryan's pit was excavated in FY96; Trenches T3 and T4 were excavated in FY96, and the Mound was excavated in FY97.	After sources of contamination are removed, contaminant loadings to surface water will be reduced, and documented as necessary in surface water source evaluations.

**Table 2 Interaction Of Water Management Activities/Information**

RF/RMRS-97-078.UN  
 Final Integrated Water Management Plan  
 for the Rocky Flats Environmental Technology Site

Management Tool	Description	Status	Output/Information
Groundwater Plume Management	<p>The results of groundwater modeling will be used to design groundwater containment systems.</p> <p>Remediation of the Mound Site Plume will be a demonstration project to test the use of reactive metals to treat VOC contaminated plumes.</p>	<p>Groundwater modeling will be completed in FY98 for Solar Ponds nitrate plume.</p> <p>Design was completed in FY97 and construction is scheduled for FY98.</p>	<p>The priority for design and installation of plume containment systems will be part of the Integrated Site Baseline.</p> <p>Performance data will be used in the design of remedial system for the other RFETS VOC plumes.</p>
<b>Deactivation and D&amp;D</b>			
Building D&D	<p>A detailed decommissioning plan has been developed for Building 779 which will serve as a model for decommissioning the majority of Site buildings. This plan will identify the requirements for water use by decommissioning operations.</p>	<p>Deactivation wastewater flows and characteristics have been estimated. The IA IM/IRA is in place to monitor D&amp;D activities.</p>	<p>IA IM/IRA is used to monitor D&amp;D activities.</p>
<b>INTEGRATED WATER MONITORING</b>			
Integrated Monitoring Plan (IMP)	<p>Will provide information on multi-media environmental monitoring being conducted at and around RFETS.</p>	<p>REV. 0 of the IMP was created in August 1996. Rev 1 was issued in June 1997. The IMP is still draft, with an expected finalization in FY98.</p>	<p>Identification of sitewide monitoring requirements and performance monitoring as applicable.</p>



**Appendix A**  
**Abbreviations and Acronyms**



## ABBREVIATIONS AND ACRONYMS

ALF	Action Levels and Standards Framework
BMP	Best Management Practices
CAIP	Chromic Acid Incident Plan
CDPHE	Colorado Department of Public Health and Environment
CDR	Conceptual Design Report
CFR	Code of Federal Regulations
CWQCC	Colorado Water Quality Control Commission
D&D	decontamination and decommissioning
DIS	Drain Identification Study
DNAPL	Dense Non-Aqueous Phase Liquid
DOE, RFFO	Department of Energy, Rocky Flats Field Office
DQO	data quality objectives
EPA	US Environmental Protection Agency
FFCA	Federal Facilities Compliance Agreement
GWRRP	Great Western Reservoir Replacement Project
IA	Industrial Area
IM/IRA	Interim Measure/Interim Remedial Action
ITS	Interceptor Trench System
IWMP	Integrated Water Management Plan
LL/LLM	low-level/low-level mixed
NPDES	National Pollutant Discharge Elimination System
PAM	Proposed Action Memorandum
POP	Pond Operations Plan
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
SID	South Interceptor Ditch
SLPP	Standley Lake Protection Plan
SOP	Standard Operating Procedure
SPCC/BMP	Spill Prevention Control & Countermeasure/Best Management Practices
STF	Sitewide Treatment Facility
SWPPP	Stormwater Pollution Prevention Plan
TA	Technical Appendix
TMP	Tank Management Plan
USGS	US Geological Survey
WWTP	Wastewater Treatment Plant



## **Appendix B**

# **Description of Water Management Plans and Strategies**



## **DESCRIPTION OF WATER MANAGEMENT PLANS AND STRATEGIES**

The content and purpose of each water management plan or program at RFETS are summarized below.

### **B.1 SURFACE WATER**

#### **B.1.1 NPDES DISCHARGE AND STORM WATER PERMIT**

Activities included under the NPDES program include the implementation of all requirements of the existing and prospective NPDES permits, for both the direct discharge from the site's wastewater treatment plant, and the storm water discharges, and the closure of remaining requirements of the NPDES Federal Facilities Compliance Agreement (FFCA). NPDES permit-based activities include monitoring and reporting functions required by the permit, the Internal Waste Stream program, which controls and tracks all non-domestic releases to the sanitary collection system, and continuation of the Spill Prevention, Control and Countermeasure/Best Management Practices Plan. NPDES FFCA activities are in transition from completion of all required activities included in the original agreement to the transfer of the remnant infrastructure of the tanks and drains activities to on-going operations. Key activities in these areas are described below.

#### **NPDES FFCA Program**

The *NPDES FFCA* was signed in March, 1991, initiating a compliance schedule with a number of improvements to the Site's wastewater system, including evaluation of all connections to the sanitary collection system, the Drain Identification Study, improvements to the wastewater treatment plant, Phases I, II, and III upgrades, an evaluation of soil and groundwater contamination below the WWTP sludge drying beds, and a collection of physical and managerial improvements identified in the aftermath of the February, 1989 chromic acid release. All of the activities committed to in the *NPDES FFCA* have been completed with the exception of a few remaining tank inspections under the Tank Management Plan. The final Phase III upgrades to the WWTP were completed in late FY97 and are on-line and operational.

#### **Wastewater Treatment Plant Monitoring**

Monitoring at the Site WWTP is divided into two major categories: compliance monitoring and operational monitoring. Compliance monitoring supports compliance with NPDES permit requirements, which apply to discharge from the facility. The results of compliance monitoring activities are reported monthly in the Discharge Monitoring Report, submitted to EPA and CDPHE. Operational monitoring supports optimal functioning of the facility. Operational monitoring also includes routine observations on the activated sludge and other unit processes as well as on-line monitoring for selected parameters as indicators of influent quality.

Following the chromic acid incident of 1989, continuous monitoring probes for pH, conductivity, and lower explosive limit were installed at the headworks of Building 995, as well as at the equalization basins upstream of the plant. Operators keep track of influent quality as part of normal shift operations, and are

prepared to respond to changes in influent quality, should any occur. Monitoring for radionuclides is not part of the influent monitoring program. The plant is also equipped with a bench-top respirometer for the measurement of oxygen uptake rate in the aeration basins as a further indication of the health of the biological treatment process.

### **Internal Waste Streams Program**

An Internal Waste Streams Program has been developed at the Site to manage the discharge of nonprocess, nondomestic wastewaters to the WWTP. These waste streams are a potential source of pollutants that may interfere with wastewater treatment operations, may pass-through the WWTP untreated and above NPDES effluent limitations, or threaten contamination of the WWTP sludge, impacting selected sludge uses or disposal practices. To prevent or reduce these potential problems, the general pretreatment regulations (40 CFR 403 et seq.) are used as guidelines in the control of internal waste streams. Some nonprocess, nondomestic wastewater is compatible with normal WWTP operations while others may have severe impacts, even in small quantities. Therefore, any nonprocess, nondomestic discharge is subject to control by the internal waste streams program. This type of discharge includes all chemicals, cleaners, foundation drain water, cooling tower blowdown, and others.

A request for authorization to discharge any such wastewaters to the WWTP must be filed and approved by Sitewide Surface Water and Liquid Waste Operations prior to commencing discharges. Sampling requirements and operational restrictions are identified on the discharge request form. Approval or denial is determined through investigation of waste stream treatability and chemical composition. The NPDES permit requires notification to the permit-issuing authority of any increased discharges to the WWTP that may impact effluent limitations specified in the permit.

### **Spill Prevention Control and Countermeasures/Best Management Practices Plan**

The *SPCC/BMP Plan* was prepared in support of the NPDES permit for the Site. The purpose of the *SPCC/BMP Plan* is to document existing plans and programs which prevent or minimize the potential for significant releases of toxic materials or hazardous substances from the Site to waters of the United States. Requirements for the SPCC portion of the plan, which pertains to oil spills, are outlined in 40 CFR 112.7. Requirements for the BMP portion of the plan, which pertains to controlling spills of hazardous or toxic pollutants, are outlined in 40 CFR 125.100. Issues addressed include material inventory, material compatibility, employee training, notification procedures, inspections, maintenance, housekeeping, and security. The Site *SPCC/BMP* is reviewed every three years and revised as needed.

### **Stormwater Monitoring**

Stormwater monitoring is accomplished through the IA IM/IRA which is implemented to monitor the environmental consequences of transition activities at the Site and to provide early warning of potentially harmful releases. Transition activities include, but are not limited to, the removal of building contents, waste storage areas, and in some cases, entire buildings or facilities from the Site. The Site's IA IM/IRA storm-water monitoring strategy uses a three-tiered approach; tiers of increasing monitoring resolution are defined by drainage basins of decreasing drainage area.

- Tier I, the first level of monitoring, consists of continuously recording, automated, stream-

gaging stations that monitor all surface water leaving the perimeter of the IA. There are ten Tier I stations established for the IA IM/IRA.

- Tier II monitoring consists of sub-basin gaging stations in and around transition areas to provide a high resolution of monitoring for potential releases of materials from those areas. Two Tier II stations are currently located near Building 889, and two additional Tier II stations are located near the 200 Area Fuel Oil tanks.
- Tier III monitoring consists of monitoring stations with ill-defined sources of water without adequate water-quality characterization. One Tier III station is located at the Building 887 Lift Station overflow. Tier III stations may consist of various seeps or springs that have resulted from anthropogenic sources of water.

## **Stormwater Pollution Prevention Plan**

The purpose of the *SWPPP* is to minimize pollution associated with storm-water runoff from the Site. A draft *SWPPP* was prepared to support the requirements of the draft NPDES permit issued on February 21, 1994 and revised July 21, 1995. A final *SWPPP* is due to EPA six months after the final NPDES permit is issued. The *SWPPP* may be broadly characterized by two components: identification and characterization of potential storm-water pollutant sources, and proposed storm-water pollution prevention measures. Extensive descriptions are provided for spill prevention and response measures, routine inspection programs, employee training programs, and recordkeeping procedures. The description of existing measures is followed by an outline of proposed BMPs and a summary table of all measures, both existing and proposed, for preventing storm water pollution.

### **B.1.2 POND OPERATIONS**

Terminal pond operations are governed by two plans, the *POP* and the *Dam Safety Procedure*.

#### **Pond Operations Plan**

The *POP, Revision 2, dated September 1996*, describes the Department of Energy, Rocky Flats Field Office (DOE, RFFO) transition plan for modifying the operation and management of the onsite surface-water detention ponds from the current batch mode to a future controlled detention or flow-through mode for discharging water. The *POP* is supplemented by a Technical Appendix (TA) that provides additional detail and a technical basis for the transition. Topics of the TA include: Site hydrology; spill response programs; contaminated runoff source areas and remediation options; an analysis of radionuclides contained in storm water runoff; an analysis of the capacity of the ponds to remove radionuclides through settling; operating guidelines for the controlled detention mode based on the analyses; and a description of pond monitoring necessary for controlled detention. Summary tables are provided in the *POP* that outline steps in the transition process.

#### **Dam Safety Procedure**

The dam safety procedure, officially titled *Emergency Response Plan for Failure of Dams A-4, B-5 or C-2*, describes response actions required in the event of an emergency involving the Site's terminal detention ponds. Situations addressed by the procedure include pond volumes that exceed established

safety limits, piezometer readings that exceed established safety limits, abnormal seepage or abnormal piezometer readings, emergency discharges of water, partial dam failure, and catastrophic dam failure. The status of each terminal dam is described by one of seven different action levels, ranging from Action Level 0 to Action Level 6. Action Level 0 refers to a stable condition with routine monitoring activities at the dams, whereas Action Level 6 requires action in response to a dam failure. The procedure identifies members of a Site Dam Response Team and specifies notification responsibilities with respect to varying dam action levels.

### **B.1.3 FUTURE WATER USE PROJECTIONS**

Under planning activities being conducted for Site closure, several water balance studies will be conducted to predict the effects of reduced water use onsite. These include an estimate of raw-water demand over time as the Site workforce decreases and buildings close. Also, groundwater modeling will be conducted as required to assess the effect on aquifer recharge and water table elevation as exfiltration from subsurface pipelines is reduced, and surface caps and revegetation programs are implemented. A study will be conducted to determine the amount and type of wetlands that can be sustained with reduced flows to the watershed. A *Water Balances/Pond Depletion Study* prepared by the US Geological (USGS) for the Site for water years 1993/94 will be the baseline for these projections.

### **B.1.4 DOWNSTREAM WATER USERS PLANS**

#### **Standley Lake Protection Plan**

Standley Lake is a storage reservoir which lies within the Woman Creek watershed in Jefferson County and serves as the drinking water supply for approximately 200,000 people. The Cities of Westminster, Thornton and Northglenn (the *Standley Lake Cities*) derive a major portion of their water supplies from Standley Lake. Woman Creek flows through the RFETS buffer zone prior to reaching Standley Lake.

The U. S. Congress authorized DOE to use environmental restoration funds to reimburse the Standley Lake Cities for the cost of implementing water management programs to protect Standley Lake from water released from RFETS. These funds were used to create the Standley Lake Protection Project (SLPP) which was completed in 1995. The SLPP is designed to physically prevent Woman Creek flows passing through RFETS from reaching Standley Lake. The SLPP consists of the Woman Creek Reservoir and pipeline, Kinnear Ditch Pipeline, and the Standley Lake Wetlands. The Kinnear Ditch Pipeline and Standley Lake Wetlands projects physically separate Coal Creek tributary flows from Woman Creek.

The Woman Creek Reservoir project consists of an off-channel reservoir on the south side of Woman Creek just east of Indiana Street. Woman Creek flows will be diverted into Woman Creek Reservoir through a diversion channel and associated drop structure. The 850 acre-feet capacity is designed to capture a 100-year 24-hour storm event. Natural flows from Woman Creek will be diverted and collected in one of three identical 100 acre-feet compartments. The multiple compartment system allows for separation of any accidental releases or contaminated stormwater..

Water going into Woman Creek Reservoir will be tested at the point of compliance at Indiana Street. If the water quality meets the Woman Creek stream standard, the water is considered to be clean going into the reservoir and no further testing will be required. If the water in Woman Creek is found to be out of compliance at Indiana Street, the DOE will be responsible for ensuring the compliance of this water with stream standards prior to its release from Woman Creek Reservoir.

## **Great Western Reservoir Replacement Project**

In 1997, the City of Broomfield culminated the Great Western Reservoir Replacement Project (GWRRP) by bringing on-line a new water treatment plant. The new plant uses western slope water transported via a pipeline from Carter Lake. The City of Broomfield no longer uses Great Western Reservoir as a drinking water supply, and, as part of the GWRRP, agreed to abandon forever the use of Great Western Reservoir as a drinking water reservoir. The City does have plans, however, to continue to operate the reservoir as an irrigation water supply, primarily for the growing Interlocken Industrial Park. Some issues remain over the continued use of Great Western Reservoir, such as the transportation of surface waters into the reservoir. The City has indicated that it has long-term plans to institute a wastewater reuse program, in which a certain portion of the city's wastewater treatment plant effluent would be pumped to the reservoir, instead of being released into Big Dry Creek. This water would then be available as irrigation for Interlocken and other customers. Current estimates are that a reuse project could take up to nine years to implement. In the short term, other water supplies were sought. In 1997, Broomfield announced a contract with the Denver Water Board to acquire water from the south Boulder diversion ditch, which flows south along the western boundary of Rocky Flats. In order to convey this water to Great Western Reservoir, the city intends to use the Upper Church and McKay ditches which flow eastward across the Site and, eventually, into the reservoir. Water quality concerns and other issues remain to be resolved regarding this proposed scheme.

## **Big Dry Creek Water Quality Focus Group**

In 1996, a group of parties in the Big Dry Creek watershed was convened to develop a comprehensive proposal for the triennial review of water quality standards scheduled before the Colorado Water Quality Control Commission. This group included DOE, Site contractors K-H and RMRS, representatives from neighboring cities, and several agencies, including EPA, CDPHE and the Colorado Division of Wildlife. The group's proposal addressed a wide range of issues in the watershed, and its recommendations were adopted by the Commission.

Some members of the 1996 group continued to meet in 1997 to gather additional water quality information with a view toward the next triennial review, and to discuss other issues of interest in the watershed. In the summer of 1997, a core group of the four direct dischargers (Broomfield, Westminster, Northglenn and Rocky Flats) was awarded a grant of \$47,400 from EPA Region VIII's Ecosystem Protection Program Regional Geographic Initiative, to support an expanded list of activities in two main areas, information exchange and bioassessments.

Approximately two thirds of the grant funds support a Watershed Coordinator, who is responsible for implementing the information exchange activities. The Coordinator will collect and organize information about the watershed, with emphasis on water quality, and will establish a communication network of stakeholders and their interests, and use such tools as newsletters and the World Wide Web, to make Big Dry Creek information available to anyone with an interest.

The remaining third of the grant supports field investigations, primarily sampling for macroinvertebrates and fish, which complement on-going water chemistry work funded by the cities. Over the past several years, water quality has been measured monthly in a cooperative effort between Broomfield, Westminster and Northglenn. With this information as a basis, the group now oversees the gathering of additional information about the occurrence and distribution of aquatic organisms in order to determine if there are

identifiable impacts from watershed activities. In 1997, for example, several dischargers discontinued the use of chlorine as a disinfectant. Sampling activities were timed to document any observable effects from the reduction of total residual chlorine being released into Big Dry Creek.

The Focus Group hopes to expand its activities in the coming years and attract participants with wider interests. The group will model itself on other successful watershed groups in Colorado such as Clear Creek and Fountain Creek and serve all members of the watershed community.

## **B.2 GROUNDWATER**

Planning for groundwater management at the Site is being done in two phases. Under Phase I a Groundwater Conceptual Plan was developed by the Groundwater Working Group, which includes EPA and CDPHE representatives. The *Groundwater Conceptual Plan for the Rocky Flats Environmental Technology Site* (RF/ER-95-0121.UN), September 1996, identifies and describes the principal organic contaminant plumes in groundwater at the Site, ranks the plumes for the purpose of establishing priorities for cleanup actions, and provides an initial planning basis for funding and implementation of groundwater cleanup.

Under Phase II, a groundwater panel composed of world recognized experts unaffiliated with RFETS or DOE reviewed the Site's assumptions and approach regarding groundwater contaminant management. The panel reviewed the scope of work and intermediate work products developed under the Site's *Accelerating Cleanup: Focus on 2000* plan for specific groundwater management activities relating to site closure. Activities reviewed include groundwater modeling to support capture or containment of groundwater plumes, site efforts to determine that dense non-aqueous phase liquids (DNAPLs) are not migrating vertically, and assessment of groundwater remediation methodologies. A Vertical Migration White Paper was issued in FY96 and reviewed by the groundwater panel.

## **B.3 WASTEWATER TREATMENT**

There are three functioning wastewater treatment facilities at RFETS: the WWTP (Building 995), Building 374, and the Sitewide Treatment Facility (STF). The WWTP treats sanitary wastes and nonprocess, nondomestic wastewater. Building 374 treats radiologically contaminated wastewater from building operations, deactivation and D&D activities and water from the Interceptor Trench System (ITS). There is no direct discharge from Building 374. The effluent from Building 374 is used as makeup water in the cooling tower system and as boiler feedwater. Blowdown from the cooling tower system and blowdown from the steam system go to the WWTP. The sitewide treatment facility treats wastewater from environmental restoration activities.

A *Sitewide Wastewater Treatment Strategy* (September 1995) was developed with the objectives of lowering lifecycle costs, shutting down and replacing Building 374, and meeting the Site's closure goals. The strategy quantified the temporarily increased flows associated with specific remediation/cleanup activities, including D&D, so that these increased flows could be properly managed.

A Conceptual Design Report (CDR) for proposed new facilities to replace Building 374, designed specifically for site closure activities, has been completed. The CDR and the new facilities' design is based on RFCAs requirements and the *Sitewide Wastewater Treatment Strategy*. Wastewater in the new facility

will be evaporated and discharged. Discharges from the new facilities will comply with RFCA and ALF and will not increase pollutant loading to surface water. DOE has approved the concepts in the CDR, but a final design decision was not made in FY97. It is anticipated that a replacement project will be initiated in FY98.

As part of the final 1996 Rocky Flats Cleanup Agreement (RFCA), DOE and CDPHE collectively put forward recommended changes in water quality standards to the Colorado Water Quality Control Commission. One of the recommendations was to change the stream standard for nitrate in Walnut Creek from the current value of 10 mg/L to 100 mg/L based on the rationale that the more relaxed standard would allow the Site to find a more cost-effective treatment alternative for waters collected in the ITS. The Commission approved the recommendation in December, 1996 with the provision that the Site find a suitable treatment process for the collected groundwater. ITS water, primarily contaminated with nitrate and uranium, is currently treated in Building 374 at a high cost not justified by the nature of the contaminant. The Site had proposed a system of intense water management, releasing the ITS water into the Site's storm water management system so as to not exceed applicable water quality standards. Because the proposal did not include suitable treatment, further alternatives are being evaluated.

In 1997, the Site initiated a formal alternatives evaluation, considering conventional treatment systems, as well as more exotic remediation technologies. The alternatives that rank highest by the criteria used in the study include diversion of the ITS water to the Site's wastewater treatment plant, installation of spray evaporation equipment to help concentrate the ITS water before evaporative treatment in Building 374, and an innovative alternative using new methods called "phytoremediation" in which a plantation of fast growing, nitrate using trees would be planted in the area of contamination and left for long term remediation. No decision has been made on the final remediation method for the nitrate plume.

The STF was designed to remove organics and radionuclides from groundwater and decontamination water generated from environmental restoration activities. Future requirements for treating water generated from environmental restoration activities are being developed under *Accelerating Cleanup: Focus on 2000* planning activities.

## **B.4 SITE CLOSURE ACTIVITIES**

Site closure activities including both D&D and environmental restoration activities have the potential to affect the quality of water released from the Site. To protect water quality during D&D activities, the following measures are being proposed.

### **B.4.1 Source Evaluation, Control, and Remediation**

Proposed cleanup actions to protect surface water include source removal to protect groundwater, watershed improvements to protect surface water, and management of contaminated groundwater plumes (Section B.2).

#### **Source Removal**

A number of sources of contaminated material which may contribute to groundwater contamination have been identified; specifically contaminated material in trenches. Source removal actions have been

prioritized (RFCA, Attachment 4) and require individual Proposed Action Memorandum (PAMs), Standard Operating Procedures (SOPs), or IM/IRAs to implement. Each will require project-specific monitoring to protect surface water. Initial source removals include Ryan's Pit (*Final Proposed Action Memorandum for the Remediation of Individual Hazardous Substance Site 109, Ryan's Pit* [completed]), Trenches T-3 and T-4 (*completed*) and the Mound Site.

## **Watershed Improvements**

The *Watershed Improvement Plan* will guide the implementation of physical modifications to the watershed designed to improve the quality of surface water flowing off the Site. The primary objective of the improvements will be to stabilize and entrap sediments that could be mobilized by precipitation and flow into surface waters. In particular, drainage areas identified as most likely to contribute radionuclides to the Site runoff will be targeted for control measures. Emphasis will be placed on watershed improvements that can be implemented quickly and cost effectively (e.g., silt fences, sediment traps and soil stabilizers). After the control measures have been installed, the results of subsequent storm water monitoring will be reviewed to determine the effectiveness of the various watershed improvements. Initial watershed improvements are in the implementation phase and the remaining watershed improvements are being prioritized for future execution.

### **B.4.2 Building Deactivation, Decontamination and Decommissioning**

During development of the *Sitewide Wastewater Treatment Strategy*, wastewater sources were identified for all building deactivation, and decontamination and decommissioning (D&D) activities related to site closure. Projected deactivation wastewater flows and characteristics were estimated by Safe Sites of Colorado personnel for liquid stabilization, residue elimination, tank management, and Building 374/774 sludge treatment. These projections were updated in FY97. Waste acceptance criteria have been developed for the deactivation liquids to determine whether Buildings 374 and 774 and the proposed replacement to Building 374 can adequately treat these liquids. Standard operating procedures are in place to monitor influent and effluent tanks to meet that treatment criteria prior to discharge.

A draft Decommissioning Program Plan, which developed a sequence for decommissioning all onsite buildings, has been prepared and is being reviewed by Stakeholders. The Kaiser-Hill Team has also developed a detailed Decommissioning Operations Plan for Building 779 which will serve as a model for decommissioning the majority of the buildings onsite. This plan is also currently being reviewed by Stakeholders. The approach to D&D is to use dry methods for decommissioning. Plans are for water generation to be minimal or nonexistent. The only anticipated water generation would be from concrete cutting operations, flushing of tanks (if sludges are present), dust control during demolition, and chemical decontamination techniques, if required.

Project-specific monitoring of surface and groundwater impacts of D&D activities is being instituted under the *Draft Integrated Monitoring Plan* and the IA IM/IRA (see Section B.1, Stormwater Monitoring and Section B.5, IA IM/IRA). Verification monitoring has been implemented to confirm the effectiveness of pathway protection during D&D activities. The verification monitoring includes monitoring surface water in the subbasin where the D&D activity is occurring, monitoring for analytes specific to the activity, building or area, and establishing baseline and statistically based response levels.

## B.5 INTEGRATED MONITORING PLAN

All monitoring programs at RFETS, including surface water, groundwater, ecological and air monitoring, are being integrated into a draft *Integrated Monitoring Plan*. The draft *Integrated Monitoring Plan*, as specified in the RFCA, will provide information on the operation and remediation of the Site, public safety, and discharges and emissions from the Site. The draft *Integrated Monitoring Plan* will be finalized in early FY98.

The draft *Integrated Monitoring Plan* was developed in consultation with EPA, CDPHE, and downstream water users and its adequacy will be evaluated annually based on previous monitoring results, changed conditions, planned activities and public input.

In addition to sitewide monitoring under the draft *Integrated Monitoring Plan*, each remediation project requires a specific implementation plan, including a monitoring plan to protect watersheds. The portions of the draft *Integrated Monitoring Plan* relating to surface water and groundwater monitoring are summarized below. The IA IM/IRA will be integrated into the *Integrated Monitoring Plan*.

### Surface Water Monitoring

The Site is working with EPA, CDPHE, Broomfield, and Westminster to develop an integrated surface-water monitoring program for Site discharges. Working together and separately, these entities monitor process discharges before they leave the onsite buildings, IA drainage ditches, onsite streams and ponds, the downstream reservoirs, and community drinking water. The level of health risk is maintained well below the one-in-one-million level, so that drinking water supplies downstream from the Site are maintained at a quality level that is well within EPA's national primary drinking water standards, when available.

### Groundwater Monitoring

In May 1995 a groundwater monitoring working group, including EPA and CDPHE representatives, evaluated the current RFETS groundwater monitoring network and made recommendations for a technically defensible, cost-effective program that met compliance requirements while providing adequate groundwater surveillance for the Site. The working group met from May through September 1995 and identified wells to be in the monitoring program.

The groundwater monitoring program has been updated to reflect RFCA requirements in the *draft Integrated Monitoring Plan*. At present, RFCA identifies the current monitoring program that was initiated in October 1995 as part of the agreement.

## **Industrial Area IM/IRA**

The IA IM/IRA focuses monitoring on areas within the IA that have the potential to impact water quality. Monitoring is implemented to address specific activities, such as D&D or environmental remediation, and will focus on the constituents associated with the activity or the area. This monitoring will establish preexisting baseline levels before the activity commences determine if the activity would impact the overall contaminant load for the area. However, IM/IRA monitoring provides source-area identification and characterization that will support the efforts of the *Watershed Improvement Plan*, and identify potential areas for source removal.

IM/IRA monitoring is closely linked with D&D activities (see Section B.4.2). The project is reprogrammed on an annual basis to be responsive to the D&D activities that are planned for the upcoming fiscal year. Because the activities of the Site are so dynamic, the IM/IRA is designed to be flexible and responsive to changing Site conditions and priorities.

All monitoring provided through the IM/IRA has been incorporated into the draft *Integrated Monitoring Plan*, and in turn, into the overall monitoring network for each media.

## **Project-Specific Monitoring**

### **Incidental Water**

Occasionally, water accumulates in utility pits, berms, footing drains, and sumps, or spills out onto the ground. These are referred to as incidental waters. For example, every precipitation event leaves rainwater in some utility pits and secondary containments. Disposition of such waters depends upon the contaminants present, if any.

The Incidental Waters Program requires only inspection and field measurements, unless there is reason to expect the presence of oil, hazardous, or radioactive substances. The field-screening initial assessment may be made on the basis of an estimate of volume, process knowledge of the immediate vicinity, field pH, appearance (e.g., visible sheen), and field conductivity. Additional testing is performed only if screening tests are positive or inconclusive. If screening tests are negative, then the waters may be discharged to the environment, or to the WWTP system.