VOLUME I

DRAFT

POND WATER MANAGEMENT INTERIM MEASURES/INTERIM REMEDIAL ACTION DECISION DOCUMENT

U.S. DEPARTMENT OF ENERGY

EG&G ROCKY FLATS, INC.

NOVEMBER 22, 1993

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ACRONYMS AND ABBREVIATIONS

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ACL	Alternate Concentration Limit
af	Acre-Feet
ANOVA	Analysis of Variance
APEN	Air Pollution Emission Notice
ARAR	Applicable or Relevant and Appropriate Requirements
AIP	Agreement in Principle
AWQC	Ambient Water Quality Criteria
BAT	Best Available Technology
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
BRA	Baseline Risk Assessment
C	Celsius
CAA	Clean Air Act
CAQCC	Colorado Air Quality Control Commission
CAP	Corrective Action Plan
CBOD	Carbonaceous Biological Oxygen Demand
CCR	Colorado Code of Regulations
CDH	Colorado Department of Health
CEARP	Comprehensive Environmental Assessment and Response Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
cm	Centimeter
CMS	Corrective Measures Study
CMP	Corrugated Metal Pipe
COC	Contaminant of Concern
COD	Chemical Oxygen Demand
COE	Corps of Engineers
CRS	Colorado Revised Statute
CWQCA	Colorado Water Quality Control Act
CRAVE	Carcinogen Risk Assessment Verification Endeavor
CRS	Colorado Revised Statutes
CWA	Clean Water Act
CAQCC	Colorado Air Quality Control Commission
CWQCC	Colorado Water Quality Control Commission
CWQCD	Colorado Water Quality Control Division
DCG	Derived Concentration Guide
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation

EG&G	EG&G Rocky Flats, Inc.
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPIP	Emergency Preparedness Implementation Plan
ERM	Environmental Restoration Management
FFCA	Federal Facilities Compliance Agreement
FS	Feasibility Study
ft	Foot
g	Gram
GAC	Granular Activated Carbon
gpd	Gallons per Day
gpm	Gallons per Minute
HazMat	Hazardous Materials Response
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
HRR	Historical Release Report
HSL	Hazardous Substance List
HSWA	Hazardous and Solid Waste Amendments of 1984
IAG	Interagency Agreement
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measure/Interim Remedial Action
IRIS	Integrated Risk Information System
LANL	Los Alamos National Laboratory
LECR	Lifetime Excess Cancer Risk
LDR	Land Disposal Restriction
L	Liter
$M	One Million Dollars
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MG	Million Gallons
MGD	Million Gallons per Day
MG/yr	Million Gallons per Year
mg/L	Milligrams per Liter
ml	Milliliter
μg/L	Micrograms per Liter

NAAQ	National Ambient Air Quality
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration
NO_x	Nitrogen Oxide + Nitrogen Dioxide
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
OPPP	Oil Pollution Prevention Plan
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Wastes and Emergency Responses
OU	Operable Unit
PCB	Polychlorinated Biphenyl
PCE	Percholoroethylene
pCi	PicoCuries
PL	Public Law
POTW	Publicly Owned Treatment Works
PPCD	Plan for the Prevention of Contaminant Dispersal
PPP	Pollution Prevention Plan
PQL	Practical Quantification Limit
PSD	Prevention of Significant Deterioration
Pu	Plutonium
PVC	Polyvinyl Chloride
RAGS	Risk Assessment Guidance for Superfund
RCG	Radioactivity Concentration Guide
RCRA	Resource Conservation and Recovery Act
RfDo	Oral Reference Dose
RFEDS	Rocky Flats Environmental Database System
RFI	RCRA Facility Investigation
RFO	Rocky Flats Office
RFP	Rocky Flats Plant
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RQ	Reportable Quantity

SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SFo	Oral Cancer Slope Factor
SID	South Interceptor Ditch
SM	Standard Method
SOP	Standard Operating Procedure
SOX	Sulfur Oxides
SPCC	Spill Prevention Control Countermeasures
SPPP	Stormwater Pollution Prevention Plan
STP	Sewage Treatment Plant
SU	Standard Units
SVOA	Semi-Volatile Organic Analytes
SWD	Surface Water Division
SWMU	Solid Waste Management Unit
SWTMP	Surface Water Toxicity Monitoring Program
TAL	Target Analyte List
TBC	To Be Considered
TCA	Trichloroethane
TCE	Trichloroethylene, Trichloroethene
TCL	Target Compound List
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TRC	Total Residual Chlorine
TRU	Transuranic
TSP	Total Suspended Particulates
TSS	Total suspended solids
U	Uranium
UCL	Upper Confidence Limit
USGS	U.S. Geologic Service
UTL	Upper Tolerance Limit
VOC	Volatile Organic Compound
WET	Whole Effluent Toxicity
WMP	Watershed Management Plan

CHAPTER 1
INTRODUCTION

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INTRODUCTION

1.1 PROJECT BACKGROUND

This Interim Measures/Interim Remedial Action (IM/IRA) Decision Document has been prepared for the A- and B-series drainage ponds, Pond C-2 and the Landfill Pond at the Rocky Flats Plant (RFP) at the request of the Colorado Department of Health (CDH) and the U.S. Environmental Protection Agency (EPA). CDH and EPA are given the authority to request an IM/IRA in paragraph 150 of the RFP Interagency Agreement (IAG)[1]. This IM/IRA Decision Document has been prepared to identify, screen and evaluate appropriate interim remedial action alternatives, and to select the preferred interim remedial action for management of surface water within the drainage ponds.

Final remedial actions for these ponds, including sediment removal and reclamation, will be conducted under the IAG schedule for Operable Unit (OU) 6 (for the A- and B-series drainage ponds), OU 5 (for Pond C-2) and OU 7 (for the Landfill Pond). The IAG schedule includes the completion of RCRA Facility Investigation/Remedial Investigations (RFI/RIs) and Corrective Measures Study/Feasibility Studies (CMS/FSs) prior to implementation of final remedial actions. It is anticipated at this time that the RFI/RI and CMS/FS studies will be complete in approximately five years. Therefore, the time frame for implementation of actions proposed in this IM/IRA Decision Document is within five years of the completion date of this document. The formal public comment process will be implemented as a part of completing this document.

Overlapping requirements and programs will control the management of surface water and sediment impounded in the drainage ponds at RFP. Many of these requirements and programs, such as spill prevention plans and stormwater best management practices (BMPs), will be driven by requirements of the Clean Water Act (CWA). However, a number of other requirements and programs will be driven by the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). These RCRA/CERCLA requirements will address issues such as remediation of contaminated groundwater and soils near the drainage ponds and remediation of contaminated sediments within the ponds.

Although both the current CWA and RCRA/CERCLA activities at RFP seek to minimize the potential for pond waters to become contaminated, that potential exists nonetheless. Therefore, the goal of this IM/IRA Decision Document is to identify and evaluate options that will effectively manage drainage pond water quality until all IAG-related CMS/FS remedial actions are fully implemented.

The process followed in the identification, screening and evaluation of appropriate remedial actions, as presented in this document, complies with EPA guidance and reference documents specific to this process or specific to RFP[2,3,4]. Applicable laws are RCRA (1976), as amended by the Hazardous and Solid Waste Amendments (HSWAs) of 1984, and CERCLA (1980), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. Specific pond management techniques evaluated in this IM/IRA Decision Document include spill control options as well as options that address storage, treatment, volume reduction, transfers, monitoring and discharges of pond water. These efforts must be consistent with IAG remediation efforts for OUs 5, 6 and 7, as well as forthcoming National Pollutant Discharge Elimination System (NPDES) permits (which will address both the sewage treatment plant [STP] point-source outfall and stormwater sources).

1.2 GENERAL APPROACH TO POND WATER MANAGEMENT

During the history of RFP, sixteen on-site ponds have been used in the drainages to allow for the detention and sampling of water prior to off-site discharge. These ponds also allowed for the retention of spills that might occur on plant site, thereby minimizing immediate off-site release. Of the sixteen drainage ponds built at RFP, twelve still exist and eleven are addressed in this IM/IRA Decision Document. The existing drainage pond that is not addressed is Pond C-1, because it is a small "flow-through" pond on Woman Creek. The drainage ponds at RFP are illustrated in Figure 2-3 of Chapter 2, where this issue is more fully addressed.

In November, 1986, a RCRA Part B Permit Application was filed by the U.S. Department of Energy (DOE) for RFP. As a portion of that permit application, previously or currently used Solid Waste Management Units (SWMUs) were identified. According to the guidance available to RFP at that time, the A-, B- and C-series drainage ponds and related drainages constituted SWMUs, and were identified as such in the permit application.

Subsequent to 1986, an IAG was signed for RFP. In this IAG, the term "Individual Hazardous Substance Site" (IHSS) was introduced to refer to RFP sites at which contaminants might be present due to past spills or past operational practices. Sites identified earlier as SWMUs became IHSSs, and all IHSSs were grouped into sixteen OUs. The IAG specified schedules for investigation and possible remediation for the OUs. As IHSSs, the A-, B- and C-series ponds were grouped into OU 5 and OU 6. The Landfill Pond was later identified as a site to be addressed in OU 7 activities.

Prior to 1974, off-site discharges from RFP ponds were unregulated by outside agencies but were monitored to determine their quality relative to drinking water standards and Radioactivity Concentration Guides (RCGs). RCGs were allowable or recommended maximum radionuclide discharge concentrations identified by the predecessor agencies to DOE based upon dose considerations. DOE replaced RCG radionuclide discharge concentrations with Derived Concentration Guides (DCGs) concentrations in 1985. DCGs are based upon the concentration of a radionuclide that would result in a 100-millirem per year effective dose equivalent under chronic exposure conditions. Since 1974, off-site discharges from RFP drainage ponds and many of the operations related to the drainage ponds (such as spray evaporation and spray irrigation activities) have been regulated by an NPDES permit for non-radionuclide analytes. Radionuclide discharges have been governed strictly by DOE criteria to date. However, DOE received correspondence from EPA in December, 1991 and from EPA in conjunction with CDH in June and October, 1992, which indicated that the basic regulatory framework for water management in the drainage ponds would change substantially. EPA and CDH stated that a new NPDES permit would regulate discharges from the STP and stormwater discharges from the developed portion of the RFP prior to entering the A-, B- and C-ponds. The agencies also indicated discharges from RFP drainage ponds and the operational management of the drainage ponds would be regulated by the requirements identified in an IM/IRA until final actions for these ponds are implemented as a part of the OUs 5, 6 and 7 IAG-related activities.

Currently, the basic goal of water management at RFP is to ensure operations and activities are conducted to minimize impacts to human health and the environment, while achieving and maintaining compliance with current environmental laws and regulations. This goal remains constant even as management methods and practices, physical facilities and regulatory requirements have changed over time. The general approach to water management at RFP consists of the following policies and practices:

1. Divert upstream storm drainage and irrigation ditch flows around the developed plant site to isolate the core area and reduce the volume of water subject to intensive on-site monitoring and management.

2. Capture and retain stormwater and other flows, as well as transported sediment from the developed plant site area, in the retention ponds. Prior to release, ensure pond water complies with relevant standards.

3. Maintain the capability to divert and isolate potentially contaminated flows for sampling, analysis and disposition, thereby protecting downstream ponds and receiving waters.

4. Rigorously implement source controls for point and non-point contaminant sources potentially affecting surface water.

5. Implement state-of-the-art technologies for pond monitoring, modeling, treatment and water quality management.

6. Maintain dam safety to ensure, to the extent possible, that health, safety and the environment are protected. (An emergency response plan has been developed for implementation in the event the dams fail.)

Numerous documents describe and establish how pond water is best managed at RFP in the context of the above policies. Sometimes the above policies are contradictory to each other. For instance, detention of water to allow for monitoring of that water reduces the capacity for stormwater capture. Implementation of these policies has protected downstream water users and the general public. This IM/IRA Decision Document is designed to incorporate and coordinate existing pond management strategies and guidance with newly-applied regulatory constraints to further lower the risk.

1.3 OBJECTIVES AND DISCUSSION OF OBJECTIVES

This IM/IRA process and the final remedial actions for OUs 5, 6 and 7 are, by definition, risk-driven activities. IM/IRA activities are normally conducted to address an immediate threat to human health and the environment (an imminent hazard). No such immediate threat is known or has been identified as associated with the drainage ponds. Section 2.5 of this IM/IRA Decision Document presents a discussion and analysis of risks posed by chemical contaminants present in the ponds. The results demonstrate that the level of risk posed by the ponds under the current management scheme is quite low. In fact, the level of risk associated with these ponds is in the acceptable range, as established by EPA in guidance documents on interim measures and final remedial actions.

The objective of this IM/IRA process is to comprehensively review existing pond management approaches and evaluate a broad spectrum of management alternatives to determine how human health and the environment can be best protected. To conduct this evaluation, it was necessary to define the broad goal of risk reduction in tangible terms. To this end, the purpose and goals of the IAG and other applicable regulatory documents were reviewed and scoping meetings were held with EPA and CDH on this subject. These activities identified the following specific objectives for this IM/IRA Decision Document:

1. Ensure discharges from the RFP ponds comply with relevant state and federal standards, including appropriate benchmarks.

2. Discontinue the long-term use of Ponds A-1, A-2, B-1 and B-2 for containment and storage of spills.

3. Consider and address the hazardous waste implications of pond water management.

4. Address water treatment to meet the applicable state and federal standards identified in 1, above.

5. Coordinate actions called for in IM/IRA planning with relevant RFI/RI and CMS/FS activities, given that the ponds will ultimately be remediated or eliminated as part of OU 5, OU 6 and OU 7 clean-up activities.

6. Coordinate pond management activities with future NPDES compliance requirements.

By directly addressing pond water quality and management, this IM/IRA Decision Document indirectly addresses all influent water sources to the ponds. These influent water sources include stormwater, base flows in the streams, STP discharges, spills, footing drain flows and groundwater flows captured by the ponds. The objectives of this IM/IRA Decision Document, and the relationship of these objectives to the management of the drainage ponds and drainage pond water, are discussed in more detail below.

1.3.1 Discharges from RFP Ponds

Stormwater discharges from Ponds A-3, A-4 and C-2, as well as combined stormwater and STP discharges from Pond B-5, have been regulated for approximately 20 years through the federal NPDES permit system. This permit system established broad operating criteria for the ponds and established numeric standards for discharges from the ponds. CDH and EPA recommended the new NPDES permit no longer apply to the drainage ponds, but only to the STP. Instead, the ponds will be regulated under conditions specified in this IM/IRA Decision Document and the resulting Record of Decision (ROD).

This IM/IRA process must consider applicable relevant and appropriate requirements for the existing and proposed actions; these requirements will define the new operating criteria for the ponds as well as numeric benchmarks both for transfers among the ponds as well as discharges from the ponds. The evaluation process for identification of these new requirements, documented in Chapter 3, considers both federal and state requirements and results in the identification of new numeric benchmarks for pond activities. These numeric benchmarks include standards for organics, inorganics, metals and radionuclides.

A considerable amount of analytical data has been collected on water quality at RFP. These data indicate that, since the summer of 1989, discharges from the RFP ponds have consistently achieved the numeric standards identified and proposed within this IM/IRA Decision Document for off-site discharges from the drainage ponds (these numeric criteria include Big Dry Creek Segment 4 water quality standards set by the Colorado Water Quality Control Commission [CWQCC]). Whereas these CWQCC standards were unenforceable in the past, standards adopted through this IM/IRA process will be enforceable.

1.3.2 Containment and Storage of Spills

Presently, Ponds A-1, A-2, B-1 and B-2 are maintained off-line and are available for the emergency containment of spills at RFP until other storage or treatment can be arranged. Although these ponds are not routinely used for spill containment, they provide an extra measure of protection for abnormal situations. The majority of past spills have consisted of small quantities of materials that did not impact any area beyond the immediate spill zone. However, the chromic acid spill of February, 1989[5] resulted in the review of operations and facilities and the creation of an action plan to minimize the likelihood of a similar spill in the future[6,7].

In addition to those actions identified as a direct result of the chromic acid spill, there have been ongoing site environmental upgrade activities, such as those documented in the Spill Prevention Control and Countermeasures (SPCC)/BMP Plan[8]. Most of the spill prevention activities focus on minimizing spill occurrences and improving immediate spill response.

Major activities related to spills and spill management at RFP include:

1. Reporting of Spill Events. RFP personnel have been trained and instructed to report releases greater than or equal to one pound of solids or one pint of liquids.

2. Response to Spills. The Hazardous Materials Response Team (HazMat Team) was established to provide 24-hour response to hazardous material occurrences at RFP. This team provides fast response to any significant environmental incident involving the release of a radioactive, toxic, or hazardous material, or a petroleum product.

3. Incidental Water Management. Surface water, groundwater, utility water, process water, or wastewater originating from incidental sources such as construction activities or collection structures is controlled, contained, sampled, analyzed and treated or discharged according to procedures developed by the EG&G Rocky Flats, Inc. (EG&G) Surface Water Division (SWD) and described in the SWD Implementation of the Control and Disposition of Incidental Waters[9].

4. Cross-Connections to Building Footing Drains. Piped cross-connections are being modified and cracks or holes in the foundations or floors of buildings are being corrected. These activities have been undertaken as part of a program to identify and correct building cross-connections which provide potential routes for contaminants within buildings to reach the outside[8].

5. Bulk Storage Tanks. Materials incompatible with the intended contents and conditions of service of tank systems are being excluded by labeling tanks and pipes for the proper material. New storage tanks containing regulated materials will be constructed with full secondary containment[10].

6. Loading and Unloading Areas. Tank car or tank truck loading and unloading procedures are being developed to comply with the provisions established by CDH, EPA, the Occupational Safety and Health Administration (OSHA), the Department of Transportation (DOT) and Standard Method-136, Standard for Tanks Containing Regulated Substances[10].

Considerable actions are being taken at RFP to reduce the probability of spill occurrence. However, the risk of spills reaching the drainage ponds will never be reduced to zero. Thus, options for changed management activities and altered structures are reviewed within Chapters 4 and 5 of this IM/IRA Decision Document to determine whether the risk of spills impacting the drainage ponds at RFP can be further reduced.

1.3.3 Hazardous Waste Ramifications Applicable to RFP Drainage Ponds

Hazardous waste currently generated at RFP is managed according to RCRA interim status requirements or according to RCRA Part B Permit requirements so that such wastes do not impact surface water. However, a concern exists that leachate contaminated with a hazardous waste, or leachate classified as a hazardous waste, may enter RFP drainage ponds. This concern is based on the existence of IHSSs upgradient of nearly every pond at RFP. If leachate from IHSSs impacts groundwater or stormwater, the groundwater or stormwater can, in turn, impact the ponds. Consequently, new water management requirements based on hazardous waste ramifications potentially applicable to the drainage ponds must be identified.

The evaluation process for the identification of these new requirements is documented in Chapter 3 of this IM/IRA Decision Document. The result of this review is the identification of concerns over leachate from a hazardous waste unit qualifying as a listed hazardous waste. This listed hazardous waste is designated an "F039 waste," and is defined as multi-source leachate derived from the treatment, storage or disposal of more than one listed hazardous waste. In particular, landfill leachate that enters the Landfill Pond from the present landfill could qualify as an FO39 hazardous waste. The source of this leachate is directly traceable to OU 7 (the present landfill) and will therefore be addressed by OU 7 activities. Similarly, contaminated seeps exist on the hillside south of the B-series drainage ponds. Water flowing from these seeps typically evaporates or re-infiltrates surficial soils prior to reaching the drainage ponds. The OU 2 IHSSs have been identified as the source of the contamination in these seeps. Therefore, these contaminated seeps will be addressed by OU 2 activities.

1.3.4 Water Treatment

There are two anticipated instances in which treatment of pond water may be required: (1) pond water quality does not meet water quality standards for discharge from the ponds, and (2) pond water quality does not meet water quality standards that apply to the ponds. Since the summer of 1989, discharges from RFP ponds have consistently met the Big Dry Creek Segment 4 water quality standards. Other data indicate the ambient pond water quality normally meets Big Dry Creek Segment 5 water quality standards. However, it is possible that water quality problems may occur in the future to make treatment necessary. Moreover, in an industrial setting where ponds have multiple inflows, both detectable levels of contaminants and occasional exceedances of stringent numeric standards are virtually inevitable.

Water treatment systems currently available to treat drainage pond water consist of filtration and granular activated carbon (GAC) units at Ponds A-4 and C-2. These systems are not capable of treating water for all potential pollutants. Therefore, both available methods for water treatment and possible new methods for water treatment will be investigated to determine whether the risk to human health and the environment can be further reduced. This evaluation is conducted in Chapters 4 and 5, with anticipated benchmarks for water quality compliance identified in Chapter 3, based on a detailed analysis of potentially applicable regulations.

1.3.5 Coordination of Pond Management with RFI/RI and CMS/FS Activities

Pond management must be coordinated with RFI/RI (site characterization) and CMS/FS (site remediation) activities. The specific RFI/RI and CMS/FS activities and remedial actions that will be implemented at the various ponds are still being developed.

Performance goals for both the IM/IRA selected alternative and the final actions will be established using the same risk assessment process. In addition, remedial technologies and alternatives will be evaluated against the same criteria. Thus, the interim management of pond water will be based upon the same criteria that will govern final remedial actions. Since these two programs are now based on similar criteria, the risk of these two programs reaching opposite conclusions has been considerably reduced. It is also important to note there is significant coordination and communication among EG&G SWD and OU 5, 6 and 7 Environmental Restoration Management (ERM) personnel who are charged, respectively, with day-to-day pond management and remediation responsibility.

1.3.6 Coordination of Pond Management with NPDES Requirements

Pond management must be coordinated with NPDES activities. NPDES permit applications for both STP discharges and stormwater were made in 1992. These permit applications have not yet been acted upon by EPA. Until the new NPDES permit is effective, the terms and conditions of the existing NPDES permit remain in effect. This IM/IRA Decision Document will only take effect after the NPDES permit is issued and the monitored discharge point is relocated upstream to the outlet of the STP. However, for the purposes of this document, it is necessary to anticipate future NPDES permit requirements. Since these new NPDES permit requirements are assumptions, variances of the new permit from these assumptions may influence the conclusions of this IM/IRA Decision Document and affect implementation.

It appears that future RFP NPDES activities will consist of two separate areas of compliance. The first area of NPDES compliance will be the STP operations and the application of numeric standards to the STP discharge. The numeric standards applicable to STP discharges are expected to be Big Dry Creek Segment 5 water quality standards. The second area of compliance will be the implementation of stormwater BMPs. It is expected that the stormwater NPDES permit will designate seven specific stormwater monitoring locations and will require the preparation and implementation of a Stormwater Pollution Prevention Plan to control stormwater runoff quality from the developed portions of RFP. No numeric standards applicable to stormwater are expected.

The activities that will be regulated by these NPDES permits are outside the scope of this IM/IRA Decision Document since those activities will be subject to a formal permitting procedure and an established regulatory framework. This IM/IRA Decision Document is the governing document for pond water management where these other permit programs end.

The STP now discharges to the drainage ponds; consequently, the STP is a major concern of this IM/IRA Decision Document. If the STP discharge complies with Segment 5 standards, this discharge will not represent a water quality problem for the drainage ponds. However, it is not possible to ensure all discharges from the STP will comply with all applicable discharge limits. Therefore, Chapters 4 and 5 of this IM/IRA Decision Document explore a number of options for alternate routing of the STP discharge, as well as alternate management of the STP discharge water. These options are evaluated to determine whether they result in reduced risk to human health and the environment while still meeting other requirements of the option evaluation process.

Stormwater quality also has a direct influence on pond water quality because stormwater flows into all of the ponds (even though the majority of stormwater is routed around some of the ponds, those ponds are still subject to stormwater inflows from the watershed immediately adjacent to those ponds). Stormwater management activities implemented upstream of the drainage ponds will be directly governed by the stormwater NPDES permit, and are outside the scope of this IM/IRA Decision Document. However, stormwater management activities are expected to consist of BMPs designed to improve the quality of stormwater. Chapters 4 and 5 of this IM/IRA Decision Document explore additional options for management of stormwater influent to the drainage ponds. These options are evaluated to determine whether they result in reduced risk to human health and the environment while still meeting other requirements of the option evaluation process.

REFERENCES

[1] Department of Energy, United States Environmental Protection Agency Region VIII, and State of Colorado, 1991, Rocky Flats Interagency Agreement (IAG).

[2] Environmental Protection Agency Office of Solid Waste and Emergency Responses, 1990, A Guide to Developing Superfund Records of Decision. OSWER Directive 9335.3-02FS-3.

[3] Environmental Protection Agency Office of Solid Waste and Emergency Responses, 1991, A Guide to Developing Superfund No Action, Interim Action, and Contingency Remedy RODs. OSWER Directive 9355.3-02FS-3.

[4] Environmental Protection Agency, 1993, RCRA Corrective Action Plan (CAP), Draft.

[5] Chromic Acid Investigation Team, 1993, Letter to D.J. Sanchini.

[6] EG&G Rocky Flats, 1990, Federal Facilities Compliance Agreement - Chromic Acid Incident Plan and Implementation Schedule.

[7] Department of Energy, 1989, Report of the Chromic Acid Incident Investigation at Rocky Flats.

[8] EG&G Rocky Flats, 1992, Spill Prevention Control Countermeasures and Best Management Practices (SPCC/BMP) Plan.

[9] EG&G Rocky Flats, 1991, Surface Water Division Operating Procedures Manual, SWD Implementation of the Control and Disposition of Incidental Waters, Draft A, May.

[10] EG&G Rocky Flats, 1993, Rocky Flats Plant Standard Method (SM) 136, Standard for Tanks Containing Regulated Substances.

CHAPTER 2
SITE CHARACTERIZATION AND PROCESS DESCRIPTION

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Chapter 2 provides background and current practice information about the Rocky Flats Plant (RFP) relevant to this Interim Measures/Interim Remedial Action (IM/IRA) Decision Document. The main sections within the chapter discuss (2.1) site description and affected environment, (2.2) current pond management practices, (2.3) sources of potential contaminants affecting the ponds, (2.4) water quality data summary and (2.5) summary of site risks.

2.1 SITE DESCRIPTION AND AFFECTED ENVIRONMENT

2.1.1 RFP Location Map and Facility Description

RFP is owned by the U.S. Department of Energy (DOE) and operated by EG&G Rocky Flats, Inc (EG&G). The plant's historical mission was the development and fabrication of nuclear weapons components from radioactive and non-radioactive materials. In January 1992, the decision to halt the production of nuclear weapons components was announced. RFP is currently in transition from a defense production facility to one whose planned future missions include environmental restoration, waste management, maintaining production contingency and eventual decontamination and decommissioning.

RFP covers almost ten square miles, occupying Sections 1 through 4 and 9 through 15 of Township 2 South, Range 70 West in Jefferson County, Colorado. The developed plant site, or "core area," comprises roughly 0.65 square miles in the center of the property and is surrounded by a buffer zone of approximately nine square miles (Figure 2-1). The plant is bounded on the north by privately-owned agricultural land along State Highway 128, on the west by privately-owned land paralleling State Highway 93, on the east by Indiana Street, and on the south by privately-owned agricultural land.

The plant location is sixteen miles northwest of Denver, Colorado and nine to twelve miles from the communities of Boulder, Golden and Arvada. The communities of Broomfield and Westminster to the east are the closest population centers to RFP. These communities have grown substantially in the last decade, and Indiana Street represents one of the current boundaries of the City of Broomfield. There are approximately two million people within a 50-mile radius of RFP[1]. Most of the land immediately surrounding RFP is presently undeveloped.

2.1.2 Physical Environment - Spatial Setting and Topography

RFP is situated at an elevation of about 6000 feet on the eastern edge of a geological bench known locally as Rocky Flats. This bench is approximately five miles wide in an east to west direction. To the east, the topography slopes gradually at an average downgrade of 95 feet per mile. Approximately 20 miles to the west, the continental divide rises to elevations exceeding 14,000 feet[2].

2.1.3 Meteorology/Climate

Meteorologic measurements (e.g., precipitation, wind speed) have been made at RFP since 1953. Data collected under the program are aimed at controlling airborne emissions, but is also used for surface water management operations. For example, precipitation data are used to estimate the plant pond inflows, which are considered in the decision-making process for pond releases.

The climate at RFP is characterized by dry, cool winters and warm summers. The average precipitation for the site is 15.2 inches per year with a range of 7.8 to 24.9 inches based on 24 years of data (1953-1976)[3]. Typically, more than 70 percent of the precipitation falls as rain between April and September.

Relative humidity at the plant site averages 46 percent, and the annual mean temperature is approximately 50 degrees Fahrenheit. The average wind velocity is between 8 and 9 miles per hour and the number of sunny days averages over 250 annually.

Estimates of yearly evaporation for RFP vary depending on yearly precipitation and pan constants use. According to National Oceanic and Atmospheric Administration (NOAA) data for 1956 to 1970, gross shallow lake evaporation averages forty inches per year. Net evaporation, which takes into account average precipitation, is approximately twenty-six inches per year[4]. A more recent study estimated RFP total reservoir evaporation to be between 43.9 and 46.5 inches per year with net annual evaporation between 28.8 and 31.3 inches per year, depending on the pan evaporation coefficient used[5].

2.1.4 Ecology - General

Vegetation at the site consists of species representative of short- and mixed-grass prairie, and includes grasses, cacti and shrubs. Introduced Eurasian weeds are also present, and riparian vegetation exists along the watercourses. A more detailed description of the vegetation on the site can be found in the Baseline Biological Characterization of the Terrestrial and Aquatic Habitats at the Rocky Flats Plant - Final Report[6].

Animal life in the buffer zone includes species associated with western prairies, the most common of which include mule deer, coyote, red fox, striped skunk, pocket gopher and white-tailed weasel. The EG&G 1991 Rocky Flats Plant Site Environmental Report[7], which supplemented the findings of the 1980 Environmental Impact Statement (EIS)[8], found 6 species of amphibians, 8 species of reptiles, 23 species of mammals and 144 bird species present on plant site.

2.1.5 Ecology - Aquatic - Specific to Ponds/Streams

Because of their intermittent nature, the creeks that cross RFP do not support a significant fish population, but minnows have been observed in Walnut Creek, Woman Creek and most of the ponds. A significant fish population has also been noted in many of the ponds. Seven species of fish, including the white sucker (*Catostomus commersoni*), green sunfish (*Lepomis cyanellus*) and largemouth bass (*Micropterus salmoides*[6]) were documented as being present in the Woman Creek and Rock Creek drainages. Each of these seven species was listed as common in occurrence. Two other previously recorded species, the bluegill (*Lepomis macrochirus*) and rainbow trout (*Salmo gairdneri*), were not encountered in a recent study but may be confirmed once sampling is completed in the Walnut Creek drainage system[6]. All of the ponds contain algae or vascular plants. A detailed survey of aquatic life of the ponds is in progress.

2.1.6 Geology/Hydrology/Hydrogeology

2.1.6.1 Geology

RFP is characterized by alluvial surficial deposits ranging from zero to 100 feet thick overlying less permeable bedrock formations. Surficial deposits consist mainly of the Rocky Flats Alluvium, which is composed of coarse gravel, coarse sand and gravelly clay. Limited quantities of groundwater occur in the surficial materials, typically moving along the top of bedrock surface or in the weathered bedrock materials. Three bedrock formations occur in the RFP area (from deepest to shallowest): the Fox Hills Sandstone, Laramie Formation and Arapahoe Formation. These formations are part of the deep aquifer system which is part of the Denver basin. Additional details on site geology can be found in R. T. Hurr's 1976 publication, Hydrology of a Nuclear Processing Plant Site[9] and in each of the site-specific geologic or Operable Unit (OU) characterization reports.

2.1.6.2 Hydrology

RFP is located within four drainage basins (Figure 2-2). These basins include: Woman Creek, Walnut Creek, Rock Creek and a small basin associated with an unnamed tributary to Big Dry Creek. These drainage basins generally traverse the plant from west to east. Rock Creek flows through the northeast section of the plant site and is not addressed in this document because it is hydrologically unimpacted by RFP operations. Woman Creek and Walnut Creek are of particular interest to this IM/IRA Decision Document. These creeks are intermittent streams tributary to Great Western Reservoir and Standley Lake, respectively. The estimated long-term average annual yields of Walnut Creek and Woman Creek at Indiana Avenue are 34.5 and 32.1 acre-feet, respectively. These yields are so low that the streams are considered essentially dry most of the year except for the summer months (May through August)[10]. Volumes and peak flow rates associated with 6-hour storm events ranging from the 2-year to the 100-year storm are contained in Table 2-1.

Great Western Reservoir, Standley Lake and Mower Reservoir are located immediately downstream of RFP. Great Western Reservoir and Standley Lake supply drinking water for five municipalities: Broomfield, Federal Heights, Westminster, Thornton and Northglenn. Mower Reservoir receives water from Woman Creek and is used for agricultural purposes. Downstream water use is being considered in this IM/IRA Decision Document with respect to how the quality, quantity and useability of discharges from RFP may be impacted by IM/IRA activities. (It should be noted that reservoir water was not used for the risk assessment in Section 2.5.)

2.1.6.3 Hydrogeology

Understanding the hydrogeology of RFP area rests on studies conducted since the 1970's, including the study by Hurr in 1976[9] and other geophysical studies conducted by Rockwell International, DOE and EG&G. Much of the present understanding of the groundwater system is based upon information derived from approximately 600 monitoring wells on-site[7].

Hydraulic conductivity for the Rocky Flats Alluvium (including colluvium and the valley fill alluvium) ranges from 0.3 to 0.003 feet/day (10^{-4} to 10^{-6} cm/sec) with a representative conductivity of roughly 0.17 feet/day ($6x10^{-5}$ cm/sec). These values are much greater than the hydraulic conductivity of the claystone in the underlying Arapahoe Formation, which ranges from approximately 0.0003 to 0.00003 feet/day (10^{-7} to 10^{-8} cm/sec). The claystone acts as a relatively impermeable barrier and impedes downward flow of groundwater, resulting in a dominantly lateral flow regime to the east along the drainages.

TABL 1

PEAK FLOW AND RUNOFF VOLUME AT SELECTED LOCATIONS[1]
PRESENT DEVELOPMENT CONDITIONS
(6-Hour Storm)

Location	Area (acres)	2-Year Event		5-Year Event		10-Year Event		25-Year Event		50-Year Event		100-Year Event	
		cfs	af	cfs	af	cfs	af	cfs	af	cfs	af	cfs	af
STANDLEY LAKE BASIN													
Woman Creek Basin at SBDC[2]	570	0	0	0	0	0	0	0	0	31	6	130	21
Woman Creek at Pond C-2 Bypass	1,414	10	1	62	7	130	22	320	52	460	77	690	116
Inflow to Pond C-2	192	6	2	39	6	77	10	150	18	190	22	250	28
Woman Creek at Indiana Street	2,880	29	9	150	30	370	78	830	162	1,100	221	1,600	301
Upper Big Dry Creek Basin at SBDC	1,261	32	10	130	30	250	53	440	84	580	109	800	144
Upper Big Dry Creek at Indiana Street	2,995	27	12	240	68	530	135	970	277	1,300	291	1,700	377
GREAT WESTERN RESERVOIR BASIN													
Walnut Creek Basin at SBDC	154	0	0	0	0	0	0	0	0	6	2	23	6
Walnut Creek Basin at Walnut Creek Diversion Dam	486	51	5	74	7	90	8	130	12	170	19	240	31
McKay Diversion Canal at Outlet	550	28	5	42	7	54	8	78	12	120	20	210	33
Inflow to Pond A-4	371	87	13	160	21	240	29	420	44	520	53	650	64
Inflow to Pond B-5	346	140	22	230	31	310	40	470	52	560	61	690	71
Walnut Creek at Indiana Street	2,374	210	42	480	78	800	118	1,400	183	1,800	232	2,300	296
ROCK CREEK BASIN													
Rock Creek Basin at SBDC	224	0	0	0	0	0	0	0	0	33	2	99	8
Rock Creek at Highway 128	1,862	68	19	94	24	270	60	660	122	890	163	1,200	215

[1]The values listed are the peak flow and volume of runoff occurring at the downstream end of the Surface Water Management Model element.
[2]SBDC = South Boulder Diversion Canal

As groundwater nears the steep sides of the drainages, numerous seeps or springs form where bedrock occurs near the soil surface. Thus, seeps and springs can occur on steep slopes at considerable distances from any surface water drainage. Following periods of appreciable precipitation, Woman Creek and Walnut Creek gain flow from groundwater over most of their lengths on the plant site. Water levels in the Rocky Flats Alluvium fluctuate in response to precipitation patterns. In spring and early summer, the alluvium is recharged predominantly by precipitation. In the late summer and early fall, the alluvium is generally recharged by seepage from streams, ditches and ponds.

2.1.7 Sensitive Environments - Wetlands/Floodplains/Threatened and Endangered Species Habitat

Wetlands are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions[11]." Natural and man-made wetlands occur along portions of the drainages on the site, around the perimeters of ponds and at numerous seeps. Many of these latter wetlands occur on relatively steep slopes and are well stabilized. Wetland vegetation includes cattails, willows, cottonwoods, sedges, rushes and forbs.

Certain threatened and endangered bird and animal species have the potential to occur at RFP, but have rarely been observed within RFP boundaries. Sensitive plant species occur in very limited areas of RFP. Sensitive habitat at RFP includes Preble's meadow jumping mouse habitat, potential Ute ladies'-tresses orchid habitat, forktip three-awn grass areas and raptor foraging areas (prairie dog colonies). These are discussed in more detail in Section 5.3.

2.1.8 Cultural Resources

Two archaeological surveys of the plant site were conducted to comply with requirements of §106 of the National Historic Preservation Act of 1966[12], 36 CFR Part 800[13] and other federal and state laws governing the management of cultural resources[14]. A total of 51 cultural resources were located in these surveys. All of the identified cultural resources were related to the historic Euro-American occupation, except for one isolated artifact affiliated with Native American use of the area. None of the identified cultural resources were recommended as eligible for listing on the National Register of Historic Places. No further work or evaluation was recommended for these resources.

2.1.9 Ponds/Drainages/Flowpaths - Description and Maps

This section describes the main surface water features on and around RFP. Upstream and on-site creeks, ponds, ditches and other water features are shown in Figure 2-3.

The ponds addressed in this IM/IRA Decision Document are the A- and B-series ponds, as well as Pond C-2 and the Landfill Pond (Section 2.2.1.1 provides more detail on the purposes of these ponds). The four A-series ponds (A-1, A-2, A-3 and A-4) lie northeast of the core area along North Walnut Creek, while the five B-series ponds (B-1, B-2, B-3, B-4 and B-5) lie just east of the core area along South Walnut Creek. The North and South Walnut Creek drainage basins collectively constitute OU 6. There are two ponds in the C-series (Pond C-1 and C-2). Pond C-1 is a flow-through pond located on Woman Creek southeast of the plant and is not addressed in this IM/IRA Decision Document. The portion of the Woman Creek drainage basin within the RFP boundary constitutes OU 5. Pond C-2 is an off-channel pond which is addressed in this IM/IRA Decision Document and collects all stormwater and other flows from the southern portion of RFP. Also addressed in this IM/IRA Decision Document is the Landfill Pond, which is located in the north buffer zone immediately downstream of the existing RFP landfill. The landfill and associated pond are in an unnamed drainage tributary to Walnut Creek below the confluence of North Walnut Creek and South Walnut Creek.

The drainage system for the undeveloped portion of the plant consists of both natural and man-made channels. Runoff from upstream of the core area of the plant site is diverted around the core area of the plant via the McKay Diversion Structure. The drainage system for the core area consists of swales, ditches, culverts and storm sewers. Core area runoff is stored in the RFP ponds for sampling and treatment, as needed, prior to discharge.

2.1.10 Downstream Water Use and Downstream Considerations - Option B Projects, Water Rights

2.1.10.1 Option B Projects

In October, 1990, DOE agreed to fund an off-site surface water diversion project known as Option B to further reduce any risks posed by RFP to downstream water users. The plan includes two categories of components as follows: (1) off-site improvements to protect Standley Lake water quality, and (2) utilization of Great Western Reservoir for the storage and management of runoff from RFP and the acquisition of an equivalent water supply for the City of Broomfield[15]. In general, the purpose of Option B is to guard against accidental releases in the future and is not to serve as a remedial response. Although funding for Option B is provided by DOE, the Cities of Westminster and Broomfield are responsible for designing and implementing the project.

Planning for the Standley Lake portion is in progress and includes the following major features:

1. A diversion of Smart Ditch to ensure its base flow remains in the ditch during storm events;

2. A diversion dike and spillway on Woman Creek west of Indiana Street to capture and store runoff from the Woman Creek watershed during the 100-year event;

3. An interceptor canal to route water from Woman Creek upstream of the Church Ditch to Big Dry Creek below Standley Lake. This canal may occupy the present alignment of the Upper Church Ditch, which will have to be relocated; and

4. A pipeline to route Kinnear Ditch water to Standley Lake before it reaches Woman Creek.

The Great Western Reservoir replacement portion of the Option B project is being implemented and includes:

1. The purchase of raw water for the City of Broomfield;

2. The development of a delivery system from the raw water source to Broomfield;

3. A new water treatment facility for the incoming raw water; and

4. A raw water storage system.

2.1.10.2 Water Rights

Water rights are an essential element of the selected IM/IRA action, but it is not appropriate at this time to discuss the water rights issues associated with the various IM/IRA alternatives. DOE prefers that water rights not be a part of the IM/IRA selection criteria. However, the appropriate water rights activities will be incorporated into the selected IM/IRA alternative's schedule and budget.

2.2 CURRENT POND MANAGEMENT PRACTICES

2.2.1 Ponds/Drainage Basins/Ditches - Current Functions

This section of the IM/IRA Decision Document briefly addresses current RFP water management practices as they affect Ponds A-1 through A-4 on North Walnut Creek, Ponds B-1 through B-5 on South Walnut Creek, the Landfill Pond on an unnamed tributary to Walnut Creek, and Pond C-2 and the South Interceptor Ditch.

2.2.1.1 Ponds

The ponds addressed in this IM/IRA Decision Document have several purposes, which include containment of surface water runoff, emergency spill containment and/or containment of STP effluent to allow for sample collection and analysis. All ponds also intercept some groundwater. The current destination of the surface water contained in each pond may be transfer to another pond, discharge to North Walnut Creek, spray evaporation or discharge to the Broomfield Diversion Ditch. Table 2-2 summarizes the purposes of each pond and the destination of its water. Figure 2-4 is a mass balance routing schematic for the ponds which serves to quantify the description identified in Table 2-2.

2.2.1.2 Drainage Basins and Creeks

The primary RFP drainage basins and creeks are Walnut Creek, Woman Creek and their drainage basins (Figure 2-3). The upper reach of North Walnut Creek collects water from areas west of the core area fence line. This water is currently diverted to the McKay Diversion Structure by a diversion structure in North Walnut Creek and is routed north of the Landfill Pond and A-series ponds. The water then converges with the McKay Ditch and is eventually delivered to Walnut Creek downstream of Pond A-4. Runoff in the reach of North Walnut Creek below the diversion structure at the west side of the core area bypasses Ponds A-1 and A-2 and is collected in Pond A-3 under normal operations.

Woman Creek receives runoff from areas west of RFP, from Rocky Flats Lake via Smart Ditch 2, from portions of the southern and eastern buffer zone including the old landfill used by RFP prior to 1968, and upgradient groundwater, likely from Rocky Flats Lake. Runoff from the southern portion of the core area flows south toward Woman Creek and is collected by the South Interceptor Ditch (SID) prior to reaching Woman Creek. The SID routes the runoff water to Pond C-2 where it is monitored for water quality prior to discharge or transfer.

2.2.1.3 Ditches

Several ditches route surface water flows through or around the RFP site (Figure 2-3). They are relevant to this IM/IRA because they are generally "losing" ditches. In other words, they release groundwater to Rocky Flats alluvium and may enhance the movement of constituents into ponds via augmentation of springs and seeps. The existence and location of these ditches are important because of the potential interference of these ditches with proposed surface water management changes. Church Ditch and McKay Ditch flows are directed around RFP. Kinnear Ditch connects to Smart Ditch 1 above the ponds and diverts the water to Woman Creek. Smart Ditch 2 runs from northeast of Rocky Flats Lake toward Smart Ditch 1 and is currently not usable. Mower Ditch taps Woman Creek in the eastern portion of the plant site and supplies Mower Reservoir east of Indiana Street.

2.2.2 Current Regulatory Requirements and Guidance Documents

A number of regulatory requirements and guidance documents currently affect surface water management at RFP. Those that most directly affect pond management include: (1) the National Pollutant Discharge Elimination System-Federal Facilities Compliance Agreement (NPDES-FFCA), (2) the Colorado Water Quality Control Commission (CWQCC) standards, and (3) the Agreement in Principle (AIP). Each of these will be discussed in more detail below followed by Section 2.2.2.4 which identifies other regulatory requirements of interest.

2.2.2.1 NPDES/NPDES-FFCA

Under the Clean Water Act (CWA), either the EPA Administrator or states with approved programs issue NPDES permits that control and limit the discharge of any pollutant to "Waters of the United States[16]." The State of Colorado has authority to issue permits for discharges of pollutants to surface waters pursuant to the CWA[16] and the Colorado Water Quality Control Act (CWQCA)[17].

The Colorado Department of Health (CDH), through its Colorado Water Quality Control Division (CWQCD), administers the state NPDES program. Because Colorado does not currently have the authority to issue NPDES permits for federal facilities, Environmental Protection Agency (EPA) Region VIII in Denver issues and administers the NPDES permit for RFP. However, Colorado is required to promulgate stream standards for waters of the state[16], and these stream standards are generally incorporated into federal NPDES permits. The State of Colorado is also required to certify that any NPDES permits issued by EPA for federal facilities comply with Colorado stream standards[16].

TABL[illegible]2

PONDS ADDRESSED IN THE POND MANAGEMENT IM/IRA

Pond	Type	Purpose	Destination of Surface Water
A-1 and A-2 (North Walnut Creek)	Non-discharge	Provides containment for their immediate drainage areas; in the case of storms >2 year event, provides containment for drainage from upstream basins. Provides emergency capacity for diversion of suspect water within North Walnut Creek. A-2 also receives water from B-2 via pumping for spray evaporation.	A-1 is routinely transferred to A-2 by pumping. A-2's volume is controlled by spray-evaporation.
A-3 (North Walnut Creek)	Discharge	Impounds normal surface water runoff from North Walnut Creek and northern plant site area.	Discharges to A-4.[1]
A-4 (North Walnut Creek)	Discharge/ Terminal Pond	Serves as the point of discharge for surface waters collected from North Walnut Creek and South Walnut Creek, water pumped from B-5 and direct discharges from A-3.	Discharges to North Walnut Creek, provided Big Dry Creek Segment 4 standards are met. Timing of release depends on volume of stormwater runoff, STP inflow and current storage levels at A-3, A-4 and B-5.
B-1 and B-2 (South Walnut Creek)	Non-discharge	Provides emergency spill capacity from central portion of the core area by diverting South Walnut Creek flows to B-1, which overflows into B-2. B-2 can receive STP effluent if quality is unsuitable for discharge.	B-2 discharges via pump to A-2 for spray evaporation.
B-3 (South Walnut Creek)	Discharge	Receives treated sanitary effluent from STP and impounds during the evening.	Releases to B-4 on a daily basis during daylight hours.
B-4 (South Walnut Creek)	Controlled Flow-through	Conveys surface water runoff from South Walnut Creek to B-5 and provides secondary monitoring and control during normal flow and flood conditions.	Flows through to B-5, no operational holding capacity.
B-5 (South Walnut Creek)	Discharge/ Terminal Pond	Acts as terminal pond for B-series.	Transfers to A-4.[1]
C-2 (Woman Creek)	Discharge/ Terminal Pond	Receives and impounds surface water runoff from southern portion of developed plant site via South Interceptor Ditch. Serves as point of discharge.	Discharges via pump and pipeline to the Broomfield Diversion Ditch, provided Segment 4 stream standards are met.
Landfill Pond	Non-discharge	Provides detention for intercepted leachate and non-contaminated groundwater from the landfill and surface water runoff.	Volume controlled by spray evaporation or may be transferred to Ponds A-1 and A-2 if Segment 5 stream standards are met.

[1]Water quality analyses are performed prior to discharge.

The current NPDES permit (CO-0001333) expired on June 30, 1989[18]. RFP filed a timely application for renewal and is operating under a statutory extension until a renewal permit is issued by EPA. In March, 1991, an FFCA was signed by DOE and EPA which modified the RFP NPDES permit. The purpose of the combined NPDES-FFCA[19] is to achieve and maintain compliance with water pollution control standards included in RFP's NPDES permit and to strictly regulate the treatment and discharge of sanitary wastewater from RFP. The FFCA mandates four general activities at RFP to reduce the possibility of an inadvertent release of hazardous substances to the sewage treatment plant (STP) and, subsequently, to downstream waters:

1. Upgrades to the STP, including improved sludge handling, instrumentation, influent/effluent management and nitrification/denitrification;

2. Monitoring upgrades via a *de facto* modification of the plant's NPDES permit, including a requirement for whole effluent toxicity (WET) testing;

3. Testing of the water and soil beneath the STP sludge drying beds for possible contamination; and

4. Development of a comprehensive strategy for limiting hazardous materials and toxic substances releases to the STP through implementation of the recommendations of DOE's report responding to the 1989 chromic acid incident.

The NPDES-FFCA[19] also changed a monitoring point and certain parameters in the NPDES permit. NPDES monitoring points are located at discharge outfalls for Ponds A-3, A-4, B-3, B-5, C-2 and the STP. Monitoring for biochemical oxygen demand (BOD) at Pond B-3 was discontinued under the FFCA and has been replaced with monitoring for carbonaceous biochemical oxygen demand (CBOD) at the STP outfall to provide a more accurate measurement of STP performance. The STP must also demonstrate compliance through a self-monitoring program. Table 2-5 in Section 2.4.2.1 provides current limits and reporting requirements under the NPDES-FFCA permit.

2.2.2.2 Colorado Water Quality Control Commission

CWQCA[17] created CWQCC and CWQCD to establish use classification and water quality standards for waters of the state. On July 10, 1989, the CWQCC held an emergency hearing on classifications and standards for Woman Creek and Walnut Creek on RFP. As a result of this hearing, Stream Segments 4 and 5 were created under the Big Dry Creek Basin, and a water supply classification was adopted for tributaries to Great Western Reservoir and Standley Lake. These tributaries include the main stems of Woman Creek and Walnut Creek and their tributaries, excluding those identified in Segment 5. Segment 5 includes the main stems of North Walnut Creek and South Walnut Creek including all tributaries, lakes and reservoirs from their sources to the outlets of Ponds A-4 and B-5 on Walnut Creek and Pond C-2 on Woman Creek (Figure 2-5).

In December of 1989, the CWQCC held a landmark hearing to discuss establishing permanent classifications and standards for Segments 2, 3 and 4 of Big Dry Creek. In January of 1990, the CWQCC formally adopted the new classifications and standards for the streams located on the RFP site and for Standley Lake (Segment 2) and Great Western Reservoir (Segment 3). The standards for RFP were amended in September 1991 to reflect changes in state-wide standards. Site-specific groundwater standards were adopted in February, 1991 (see Section 3.2.4).

In December, 1992, the CWQCC concluded its hearings on establishing stream standards for Segment 5 of Big Dry Creek. The Commission accepted a CWQCD proposal to impose Segment 4 standards with temporary modifications for nine parameters, including a numeric level for un-ionized ammonia. The Commission accepted several additional modifications to Segments 4 and 5 standards put forth by DOE and EG&G to make site-specific standards consistent with statewide standards for organic constituents. The Commission also adopted a standard for beryllium. Currently applicable stream standards for Segments 4 and 5 (as well as Segments 1, 2, 3 and 6) are contained in Appendix A. These standards are applicable until April 1, 1996.

2.2.2.3 Agreement in Principle

The AIP[20] between DOE and CDH was signed on June 28, 1989. The agreement is an extension of a Memorandum of Understanding that was signed between DOE and Colorado in 1979 that formalized already-existing arrangements for monitoring and assessment of terminal ponds prior to discharge. The AIP adopted existing programs and created substantial new commitments by DOE, further formalizing an already existing program of independent monitoring and oversight of RFP by CDH. With respect to plant surface water discharges, the AIP was designed to assure citizens of Colorado that any discharges from RFP do not adversely affect public health and safety or the environment.

Under the AIP[20], CDH tests for inorganic and organic chemicals and radionuclides in RFP ponds and the drinking water reservoirs immediately downstream of RFP. Before any water is discharged from RFP ponds, DOE notifies CDH and split samples are taken for analysis. The AIP also requires DOE to conduct a study of possible methods for eliminating discharges to surface waters at RFP. Pursuant to this provision of the AIP[20], a zero-discharge study that included a number of subordinate studies was recently completed by RFP.

2.2.2.4 Other Regulatory Requirements

Other regulatory requirements which must be considered in the course of pond water management at RFP include the Interagency Agreement (IAG), the National Contingency Plan (NCP), administrative requirements of CWA, Colorado statutes concerning dam safety and federal and state water rights laws. The IAG and NCP mandate that pond management practices be conducted in compliance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). State dam safety statutes govern the construction, maintenance and operation of dam structures. Water rights laws ensure water use and water management practices do not injure the water rights of downstream users. In addition to permitting actions, CWA also requires the preparation of Pollution Prevention Plans (PPPs) and the implementation of best management practices (BMPs) to control pollutants and ensure on-site activities are in accord with practices recommended by field professionals.

2.2.3 Pond Volume Management and Operations

2.2.3.1 Operational Protocols

Water transfers and discharges from RFP ponds are schematically illustrated in Figure 2-6. Prior to transfers from the Landfill Pond to Pond A-1 and from Pond B-2 to Pond A-2, discharges from Ponds A-4 or C-2 or spray evaporation operations, EG&G currently submits a written request and obtains approval from DOE, and DOE notifies CDH and/or EPA. Spills are handled with immediate response according to procedure to contain any potential spill routed to Ponds A-1, A-2, B-1 or B-2, while concurrently EG&G notifies DOE, and DOE notifies CDH and/or EPA.

Normal operations for Ponds A-1 and A-2 are to transfer Pond A-1 water to Pond A-2 and spray evaporate Pond A-2 water. Normal operations for Ponds B-1 and B-2 are to transfer Pond B-1 to Pond B-2 and then to transfer Pond B-2 to Pond A-2 for spray evaporation. Spray evaporation operations are conducted during daylight hours and are not conducted during unsuitable weather conditions (humidity greater than 80 percent for prolonged periods, sustained wind speed in excess of 30 mph and/or air temperature less than 35°F) or after containment of suspect water in one of the ponds.

Prior to initiating a transfer or spray evaporation procedure at Ponds A-1, A-2, B-1 or B-2, pond water is sampled and analyzed for Hazardous Substance List (HSL) metals, semi-volatile and volatile organics, gross alpha and gross beta, pH and nitrates. Operations commence after demonstration that Segment 5 stream standards have been met for the parameters analyzed.

Pond A-4 is the pond currently used in the Walnut Creek basin for off-site discharges of RFP surface water. Water in Pond A-3 or B-5 is transferred to Pond A-4 for off-site discharge. Discharge of water from Pond A-3 to Pond A-4 and transfer of water from Pond B-5 to A-4 is ideally initiated when pond volumes at A-3 or B-5 approach 50 percent. Prior to discharging Pond A-3 water to A-4, samples are taken and analyzed for gross alpha/beta, nitrates (as nitrogen), total dissolved solids (TDS), total suspended solids (TSS), pH and tritium. Weekly composite samples during discharge are also taken for plutonium, uranium and americium. In addition to the above, chromium and WET samples are also collected for analysis during transfers of Pond B-5 water to Pond A-4. Prior to off-site discharges from Ponds A-4 and C-2, samples are taken and split for analysis by CDH, EG&G and an independent EPA-registered (CLP) laboratory. Normally, discharge of Pond C-2 is also supposed to be initiated when its volume approaches 50 percent. Pond C-2 is discharged via pipeline to the Broomfield Diversion Ditch, provided Segment 4 standards are met. Discharges from Ponds A-4 and C-2 are discontinued when the ponds are at or below 10 percent of capacity. Physical measurements of pond water levels are made three times per week.

As a final check on water quality and for reporting purposes, samples of all discharges from Ponds A-4 and C-2 are collected by daily composites for weekly analyses of plutonium, uranium and americium. Tritium, pH, nitrate (as nitrogen) and non-volatile suspended solids are analyzed daily; chromium test samples are analyzed monthly while WET test samples are analyzed quarterly per the requirements of NPDES-FFCA. Flows from Walnut Creek near its intersection with Indiana Street are sampled for radionuclides. If Ponds A-4 and C-2 meet water quality requirements, DOE typically seeks concurrence from CDH prior to granting permission to initiate discharge. CDH determines the safety of the discharges as identified in the AIP.

Pond water may need treatment if duplicate sampling shows state standards are not met in untreated water. In response to water quality concerns, treatment systems were established at terminal ponds A-4, B-5 and C-2 beginning in February, 1990. The consolidation of the systems at Ponds A-4 and C-2 was completed in 1991 and included pipelines to route Pond C-2 water to Broomfield Diversion Ditch, Pond B-5 and/or Pond A-4. The consolidated treatment system at Pond A-4 consists of two parallel banks of particulate filter stations followed by two activated carbon adsorption vessels. A total of 8 filter tanks holding six filters each and four 20,000-pound granular activated carbon (GAC) vessels are located at Pond A-4. The treatment system at Pond A-4 has a maximum treatment capacity of 1,500 gallons per minute, and is maintained and operated on a twenty-four-hour basis when required. This system is located in a weatherproof enclosure and can be depended on for reasonable operation during cold weather. The system at Pond C-2 consists of four filter tanks and two GAC vessels, is not protected from the weather, and is generally not usable from November through March.

Normal operations for the Landfill Pond include spray evaporation to control volume. During Springs with heavy precipitation, the pond has experienced a water balance problem which has resulted in three transfers of water to the A-series ponds. Spray evaporation and transfers take place following the same protocol used for Ponds A-1 and A-2.

2.2.3.2 Volume Management Methods

Pond volume management is a key component of pond operations. Pond operational specifications related to volume management are provided in Table 2-4. (See Section 2.2.1.1 for descriptions of normal surface water inputs to the ponds.)

Terminal ponds A-4, B-5 and C-2 were designed to handle flows and volumes from the core area resulting from a 100-year storm. The current NPDES permit specifies that these ponds retain permanent pools at or below 10 percent, so the remaining 90 percent is available for containment of stormwater. This 10 percent requirement has not been achievable on a routine basis since 1989. Average pond levels are between 20 and 30 percent.

The United States Army Corps of Engineers (COE) recently conducted stability analyses of the dams at Ponds A-4, B-5 and C-2 and identified potential dam stability problems under current operational practice. COE recommended lowering routine pond levels and adding instrumentation (e.g., piezometers) to monitor internal dam conditions. These recommendations are currently being evaluated. Flow and pond level surveillances and frequencies are shown in Table 2-3.

TABLE 2-3
FLOW AND POND LEVEL SURVEILLANCES AND FREQUENCIES

Area Surveyed	Feature Surveyed	Frequency	Notes
Pond A-1	Bypass flow	3 times per week	Also monitored by telemetry
Ponds A-1 and A-2	Level	Weekly	Frequency is increased during precipitation
Ponds A-3 and A-4	Inlet flow level	3 times per week	Also monitored by telemetry
Ponds B-1 and B-2	Level	Weekly	Frequency is increased during precipitation
Pond B-5	Level transfer flow Inlet flow from STP	Weekly	
Pond C-1	Outlet flow	Weekly	Also monitored by telemetry
Pond C-2	Level	2-3 times per week	
Landfill Pond	Level	Weekly	
South Interceptor Ditch	Flow	2-3 times per week	

Action levels are specified on Table 2-4 for Ponds A-1, A-2, B-1, B-2 and the Landfill Pond, and represent the current definition of potential emergency conditions at these ponds. Action levels are not specified on Table 2-3 for Ponds A-3, A-4, B-5 and C-2. For Ponds A-4, B-5 and C-2, a series of seven action levels and corresponding response actions are defined in the Emergency Preparedness Implementation Plan (EPIP) for Water Detention Pond Dam Failure[21]. This procedure requires revision to reflect the findings and recommendations of the COE Stability Analysis[19]. A narrative description of currently recommended actions to be taken under emergency conditions at these ponds is given below. The purpose of these actions is to prevent overtopping, uncontrolled discharge and/or actual dam failure.

During emergencies affecting the A-series ponds, Pond A-1 is transferred to Pond A-2 or water from Pond A-2 is pumped to Pond A-1, depending on the available capacity of each pond, if *both* of the following conditions exist:

1. Pond A-1 water elevation is within 1/2-foot of the spillway or Pond A-2 water elevation is within one foot of the drop structure (action levels), *and*

2. Further storms are predicted or other factors prohibit spray evaporation to reduce volumes below the action level.

For emergencies affecting the B-series ponds, water from Pond B-1 is transferred to Pond B-2 and then water from Pond B-2 is transferred to Pond A-2 if *both* of the following conditions exist:

1. Pond B-1 water elevation is within 1/2-foot of the spillway and/or Pond B-2 water elevation is within one foot of the drop structure (action levels), *and*

2. Further storms are predicted or other factors prohibit spray evaporation to reduce volumes below the action level.

During emergencies affecting the Landfill Pond, water may be transferred to Ponds A-1 and A-2 if the water level is within one foot of the spillway *and* further storms are predicted or other factors prevent spray evaporation to reduce volume.

For emergency conditions affecting Ponds A-3, A-4, B-5 and C-2, response actions include transfers to any other available pond, water diversions and emergency discharges, regardless of water quality conditions.

All emergency operations must be consistent with procedures contained in the EPIP for Water Detention Pond Dam Failure[21], including specific requirements for notification, reporting and documentation.

TABLE 2-4
POND OPERATIONAL SPECIFICATIONS

Pond	Elevation (feet)	Capacity (million gallons)	Capacity (acre feet)	Percent of Capacity Full
Pond A-1				
Maximum Elevation	5829.1	1.40	4.30	100%
Action Level	5828.6	1.24	3.81	88.6%
Normal Operational Range	5827.3 5825.9	0.84 0.42	2.58 1.29	60% 30%
Pond A-2				
Maximum Elevation	5816.9	6.03	18.51	100%
Action Level	5815.9	5.21	15.99	86.4%
Normal Operational Range	5813.7 5810.4	3.62 1.81	11.11 5.56	60% 30%
Pond A-3				
Maximum Elevation	5793.0	12.4	38.06	100%
Normal Operational Range	5788.1 5781.5	6.2 1.2	19.03 3.68	50% 10%
Pond A-4				
Maximum Elevation	5757.9	32.5	99.75	100%
Normal Operational Range	5753.3 5741.0	21.1 3.3	64.76 10.13	65% 10%
Pond B-1				
Maximum Elevation	5882.0	0.53	1.63	100%
Action Level	5881.5	0.43	1.32	81.1%
Normal Operational Range	5878.5 5877.5	0.33 0.17	1.01 0.52	60% 30%
Pond B-2				
Maximum Elevation	5868.9	1.56	4.79	100%
Action Level	5867.9	1.25	3.84	80.1%
Normal Operational Range	5866.8 5864.6	0.94 0.47	2.88 1.44	60% 30%

TABLE 2-4
POND OPERATIONAL SPECIFICATIONS
(Continued)

Pond	Elevation (feet)	Capacity (million gallons)	Capacity (acre feet)	Percent of Capacity Full
Pond B-3				
Maximum Elevation	5851.7	0.57	1.75	100%
Action Level	N/A	N/A	N/A	N/A
Normal Operational Range	5849.7	0.260	0.80	45%
Pond B-4 (flow-through)				
Maximum Elevation	5835.8	0.18	0.06	100%
Action Level	N/A	N/A	N/A	N/A
Normal Operation	5835.8	0.18	0.06	100%
Pond B-5				
Maximum Elevation	5803.9	24.0	73.66	100%
Normal Operational Range	5796.5 5785.8	12.0 2.4	36.83 7.37	50% 10%
Landfill Pond				
Maximum Elevation	5921.0	7.52	23.08	100%
Action Level	5920.0	6.65	20.41	88.4%
Normal Operational Range	5917.0 5912.5	4.51 2.26	13.84 6.94	60% 30%
Pond C-2				
Maximum Elevation	5765.3	22.8	69.98	100%
Normal Operational Range	5760.3 5753.5	11.4 2.3	34.99 7.06	50% 10%
Total Capacity (excluding Pond B-4)		109.31	335.51	

2.3 SOURCES OF POTENTIAL CONTAMINANTS AFFECTING THE PONDS

Several sources of potential contamination are associated with water management at RFP for the purposes of this IM/IRA Decision Document. These contaminants may be found within groundwater, surface water, soils and wastes at RFP, and may combine or leach into groundwater or surface water that eventually reaches the drainage ponds. Potential sources of contaminants are identified below:

1. Previous releases including remobilization of contaminants from release sites identified in the Historical Release Report (HRR)[22];

2. STP discharges containing contaminants in unacceptable levels;

3. Discharges of treated water from interim or final actions at operable units;

4. Landfill leachate;

5. New on-site spills and releases that reach the drainage ponds; and

6. Other sources of contaminants such as diesel spills, open fields, lawns, rooftops, parking lots, sidewalks, roadways, algal blooms and the 460 outfall.

Less significant sources of contamination may include atmospheric deposition, sediments within the ponds that may become resuspended and flows from Coal Creek diversions which pass through the site. Stormwater runoff is also a potential source of contaminants and is discussed as it relates to remobilization of contaminants from previous releases (see Section 2.3.1). Sediment resuspension is incorporated into the discussions of the STP discharge (see Section 2.3.2) and the Landfill Pond (see Section 2.3.5). Natural sources of contaminants such as manganese, iron, uranium, radium and thorium were not evaluated in this document. Although numerous investigations are currently ongoing or planned for the future to definitively identify sources of contaminants, the primary source list is considered adequate for the purposes of identifying likely contaminants of concern (COCs) as well as selecting and screening practical water management and treatment technologies that should be considered.

2.3.1 Previous Releases - Remobilization of Contaminants - Historical Release Report

RFP operations generate nonhazardous, hazardous, radioactive, and mixed hazardous and radioactive waste streams[23]. Hazardous substances which have been detected in the environment in and around RFP include various radionuclides, nonradioactive metals, volatile organic compounds (VOCs), semi-volatile organic compounds and inorganic ions. These substances have been released to the environment through past residue and waste management practices that were legal at the time (e.g., waste incineration, discharges of contaminants to the drainages or waste burial) and unplanned events such as leaks, spills and fires. The locations at which these materials were released or currently reside are identified as individual hazardous substance sites (IHSSs). These IHSSs are defined in the IAG as "... individual locations where hazardous substances have come to be located at a discrete area within the larger 'Site'...[24]." In addition to IHSSs, herbicides which have been applied in the past at various locations at RFP have also been detected in the environment at unacceptable levels.

The IAG identifies 178 separate IHSS locations at RFP. These IHSSs are grouped into 16 OUs for purposes of conducting field investigations and remediation activities. A number of the IHSSs consist of multiple release locations which are grouped together as a single IHSS because of similar contaminant characteristics or site conditions. A description of the events that led to the creation of each potential area of concern from which EPA and CDH identify IHSSs is provided in the HRR. The HRR contains a listing of spills, releases and/or incidents potentially involving hazardous substances occurring since the inception of RFP based primarily on historical records. Detailed field investigation activities have not yet been completed at many of the 16 RFP OUs, and therefore most of the IHSSs have currently been characterized only on the basis of historical information. The HRR information is used as a starting point to identify hazardous constituents potentially present in the environment at RFP. Specific documents prepared on the issues of characterization or remediation of each IHSS or OU may contain more complete or detailed information on the contaminants at that particular IHSS or OU.

Specific or historic data on concentrations of contaminants at sites within a given OU are currently available only for OUs 1-8, 10-14 and 16. No data are currently available for OU 9 or OU 15, although the types of contaminants most likely to be present at these locations can be predicted based upon historical operations. Because the OUs are typically addressed separately from the drainage ponds, OU-specific data are provided in Appendix B for informational purposes and are summarized by maximum and minimum analyte concentrations detected site-wide in the groundwater, surface water, soils and sediments at the OUs. These OU data are based on both historical data and more recently generated information.

In addition to the 16 OUs, an Industrial Area IM/IRA project is also underway at the current time. The Industrial Area IM/IRA will address the RFP area typically known as the core area and is primarily in support of anticipated decontamination and decommissioning activities. Available data for this area are being reviewed and appropriate actions addressing water quality data and water management are being planned as part of the document. The Industrial Area IM/IRA will also consider the need for upgraded monitoring in order to fully support anticipated decontamination and decommissioning activities.

Contaminants present at IHSSs and OUs are relevant to this IM/IRA Decision Document because they may be transported in stormwater runoff to the ponds. Although plans and programs have been (and are being) developed to reduce the transport of contaminants in stormwater, management of the drainage ponds must consider the possibility of contaminated stormwater reaching the ponds. Direct discharge from OUs may also affect pond management and is addressed in Section 2.3.4.

2.3.2 STP Discharges

The STP discharge may contain COCs based on the following scenarios:

1. The past release of contaminants or materials to the STP (these materials may have become resuspended from contaminated sludge or sediment);

2. The current release of contaminants or materials to the STP;

3. The infiltration or inflow of contaminants or materials entering sanitary sewer lines to the STP influent; and/or

4. Creation of compounds through chlorination of the STP effluent.

Historical RFP operations introduced a number of compounds or materials to the STP in decontamination laundry wastewater and other wastewaters that are no longer considered suitable for discharge to the STP. (Historical discharge limits for radionuclides were higher than the current stringent discharge standards; thus, RFP historical discharge practices were in keeping with standards protecting human health at that time.) Some of the compounds and materials that were discharged to the STP are known to have contributed to radionuclide contamination of sediments in the on-site drainage ponds and off-site Great Western Reservoir.

Contaminants may also still be present in sediments and sludge that have accumulated in the sanitary sewer lines and in the STP, although many of the sewer lines have been replaced, lined and cleaned in recent years. The potential for resuspension of these contaminated sediments and sludge into the STP effluent is considered to be at least partly responsible for the current EPA designation of the STP sludge as a low-level radioactive contaminated waste. Although the possible presence of contaminants and materials in the STP effluent is expected to decrease with time, the possibility of the presence of such materials should be considered for STP effluent water management as well as pond water management.

A second potential source of contamination in the STP effluent is current releases. Although numerous preventive measures are available to protect the STP from unacceptable contamination, accidental spills and releases will always be a potential source of contaminants. Forty-two industrial waste streams totaling some 7 MG/yr are routinely discharged to the STP. These streams are strictly screened for hazardous waste. In addition, discharges from small cooling towers may also be infrequently discharged to the STP. Based on routine flows, these industrial waste streams account for 10 percent of all flows to the STP[25].

A third potential source of contaminants in the STP effluent is from the infiltration or inflow of materials and compounds into the sanitary sewer lines that lead to the STP. These materials and compounds may be present in the environment at RFP as a result of past waste management practices and spills. These materials and compounds may be present in groundwater, surface water, stormwater or in soils, and may find a route of entry into the sewer lines that lead to the STP. To address this problem, many of the older sewer lines leading to the STP have been sleeved. As site groundwater and general environmental characterization becomes more detailed, any sources of contaminated infiltration and inflow will be identified and considered for remediation. However, until that time, it is necessary to address the possibility of contaminated infiltration and inflow occurring to the STP influent.

A final source of contaminants in the STP discharge is the creation of compounds through effluent treatment. Chlorination of the effluent can create compounds such as trihalomethanes for which water quality standards have been set. These new compounds created through chlorination can impact available and viable water management activities.

2.3.3 New On-site Spills/Releases

The policy of RFP is to reduce to an absolute minimum the instances in which spills and releases of hazardous or radioactive materials occur at RFP. Existing programs, including the Chemical Tracking system and Spill Prevention Control Countermeasures (SPCC)/ BMP Plan, currently address these sources. However, it is not possible to reduce the risk of spills and releases to absolute zero. Thus, new on-site spills and releases that may inadvertently pass through the STP or that directly impact a pond are a potential source of contaminants in the drainage ponds. Management of RFP drainage ponds should consider the possibility of contaminants reaching the ponds as a result of new on-site spills and releases.

2.3.4 Discharges from OUs/Identified OU COCs

The discharge of treated water to drainages on plant site is currently taking place from OUs 1 and 2. OU 1 addresses the 881 Hillside, and OU 2 addresses the 903 Pad, Mound and East Trenches. The source of water treated at OU 1 is groundwater and infiltrate, while the source of water at OU 2 is a combination of groundwater seepage and surface water runoff. The treatment systems at these OUs are IM/IRAs with the OU 1 system discharging into the SID and the OU 2 system discharging in South Walnut Creek upstream of Pond B-5. The effluents from these interim actions are currently treated for radionuclides, metals and organic compounds prior to discharge. Flows for OU 1 are approximately 30 gallons per minute, 40 hours a week, and flows for OU 2 are approximately 15 gallons per minute up to 24 hours a day, seven days a week. These flows vary depending upon precipitation and season.

As OU characterization and remediation proceeds, more discharges of treated water to the drainage ponds may occur. These discharges, future discharges of a similar nature, and the potential for upsets should be factored into any proposed modifications to pond water management. This is especially important because discharges from interim or final actions at OUs are most likely to take place upgradient of the drainage ponds addressed in this IM/IRA Decision Document. The majority of the OUs have not formally identified COCs; however, contaminant levels are available through the Final Feasibility Studies Plan and are contained in Appendix B.

2.3.5 Landfill Leachate

The landfill was designed for the disposal of RFP's non-radioactive solid waste. Use of the landfill began in August, 1968, and the landfill is still in use at this time. The non-hazardous waste disposed of at the landfill includes office trash, paper, rags, demolition materials, empty cans and containers, used filters from the filtration of machining oils and coolants and various electrical components. Additionally, dried sanitary sewage sludge, solid sump sludge and other miscellaneous sludges were disposed of in the landfill during the 1970s. In 1986, it was determined that some of the wastes being placed in the landfill were hazardous wastes.

The four general categories of hazardous waste streams disposed of in the landfill included (1) partially filled containers of paint, solvents, degreasing agents and foam polymers; (2) wipes and rags contaminated with these materials; (3) used filters that may have contained hazardous constituents; and (4) metal cuttings and shavings coated with hydraulic oil and solvents. Since 1986, no materials currently defined as hazardous wastes were sent to the landfill. However, the landfill is being regulated as a former hazardous waste disposal site and is currently known as OU 7.

Following the identification of contaminants in landfill leachate in 1973, two ponds were constructed east of the landfill for the purposes of environmental monitoring. In 1981, the more western pond at the landfill was filled to allow eastward expansion. The East Landfill Pond, referred to as the Landfill Pond in this document, is still in existence. The current primary sources of contamination in this pond are leachate generated from the wastes disposed in the landfill and leachate-contaminated groundwater. Secondary possible sources of contamination in the pond include stormwater tributary to the pond and the pond sediments.

2.3.6 Other Sources of Contaminants

Other sources of COCs pertinent to this IM/IRA Decision Document include algal blooms, diesel spills and the Building 460 outfall.

Algal biomass may contribute significantly to the BOD content of pond water during the summer months. An abundance of algae may cause other potentially adverse water quality changes including dissolved oxygen depletion and increased pH. Algae can also elevate dissolved metal concentrations.

Diesel fuel spills to drainage ponds at RFP have occurred. These spills are caused by the use of portable pumps and diesel-powered generators used to transfer and discharge water. Although the volume of diesel fuel subject to this type of release is relatively small (tanks associated with these activities are typically either 8 or 40 gallons in size), the close proximity of these tanks to the ponds makes it more likely that any problem with the tanks would impact the ponds. While secondary containment is in place at all portable pumping operations that involve diesel fuel, history indicates that the possibility of diesel spills to drainage ponds nonetheless exists.

The Building 460 outfall is a storm sewer that conveys stormwater from the general Building 460, 444 and 440 area to the SID. Historically, this outfall was routed over the original landfill until the pipe broke, resulting in erosion of the surface of the original landfill. This problem was corrected by rerouting the storm sewer to east of the original landfill while still discharging to the SID. The outfall is still an area of concern with respect to potential impacts on drainage pond water quality due to the presence of processing materials in Buildings 440, 444 and 460. These materials include both water-soluble machining coolants and lubricants, fuels, hazardous materials and some radioactive materials. Building 460 is still used in limited operations which generate metal scraps coated with Trimsol® that are stored in dumpsters outside the building. Secondary containment is provided for the dumpsters, which seldom accumulate more than two inches of Trimsol®. Materials stored in these areas could have an impact on stormwater quality if spills or other releases occurred during a precipitation event, or if the spill was of such quantity as to reach the inlets for the 460 outfall. However, severe impacts are unlikely since few materials are stored outside and secondary containment is provided for all large quantities of liquids which are stored outside.

2.4 WATER QUALITY DATA SUMMARY

A variety of water quality monitoring efforts occur at RFP. These efforts fall into three general categories: background water quality characterization, regulatory monitoring requirements and ambient water quality characterization. The purpose of background water quality characterization is to provide a basis for comparison and identification of added environmental contamination. Regulatory monitoring of pond water management activities is required to assess compliance with requirements of the CWA and AIP. Ambient water quality characterization provides an understanding of normal water quality so that deviations from normal may be quickly identified and addressed. A current list of surface water monitoring activities occurring at RFP is contained in Appendix C.

The data summary used in the risk assessment (Section 2.5) is provided in Tables 1-5 of Appendix D. These tables provide data on a pond-by-pond basis including radionuclides (Table 1), metals (Table 2), dissolved metals (Table 3), water quality parameters (Table 4) and volatile/semi-volatile organics (Table 5). The relevant CWQCC standards, percent exceedances, mean values and 85th percentile values are provided for each parameter. Interpretation and application of these data are provided in the risk assessment section (Section 2.5).

2.4.1 Background Water Quality Investigations

This section describes various programs and data collection efforts employed to characterize background water quality at RFP. These include:

1. Background Geochemical Characterization Reports,

2. Off-site Reservoir Monitoring, and

3. Seep Monitoring and Characterization.

2.4.1.1 Background Geochemical Characterization Program

The Background Geochemical Characterization Program at RFP was conducted from 1989 through 1992 for the purpose of characterizing background conditions in areas surrounding the plant. The resulting chemical data were summarized to provide a basis for comparison with non-background areas of RFP and to help identify and assess potential environmental contamination. The geochemistry of surface water, seep water, sediments, groundwater and geologic materials was characterized under this program. Samples were collected at stations in buffer zone areas west, north and south of the main plant. The samples were analyzed for: radioactive isotopes (total and filtered), EPA target analyte list (TAL) metals (total and filtered), the EPA target compound list (TCL) organics, major anions and indicator parameters such as pH, specific conductance and TDSs.

Surface water background stations (see Figure 2-7) were sampled at SW04-SW07, SW41, SW80, SW104, SW107 and SW108. SW80, SW104 and SW108 were seep water stations. Surface water stations SW127, SW130 and SW134-137 had not yet been sampled at the time of the 1992 report. Nine sediment stations were also sampled at SED04 and SED16-23. Sediment stations SED018-19 and SED21 were seep sediment stations. Surface water stations were sampled on a monthly basis during 1989-91 and on a quarterly basis during 1992. The surface water chemistry data were tested for significant differences in chemistry between Rock Creek and Woman Creek, as well as for differences in quarterly mean concentrations. No systematic seasonal variation was apparent in mean concentrations of chemicals in surface water. However, some differences in chemistry between Rock Creek and Woman Creek were identified. More detail may be found in the 1992 Background Geochemical Characterization Report[26].

2.4.1.2 Off-site Reservoir Monitoring Program

Annual background samples were collected from Ralston, Dillon and Boulder reservoirs, and from the South Boulder Diversion Canal at distances ranging from 1 to 60 miles from RFP. This monitoring program began in the early 1980s and was discontinued in October, 1992. Samples were collected for background levels of plutonium, uranium, americium and tritium. Concentrations of these constituents in the regional reservoirs listed above averaged 0.26 percent or less of the derived concentration guide (DCG). DCGs are DOE standards for release of radionuclides based on the concentration of a radionuclide that would result in a 100-millirem per year effective dose equivalent under chronic exposure conditions. DCGs are discussed in greater detail in the 1991 Annual Environmental Monitoring Report[7].

In addition, reservoir water quality data were compared with nine Denver area community drinking water supplies. There were no significant differences identified in radionuclide concentrations between these data sets.

2.4.1.3 Seep Monitoring and Characterization

As mentioned in Section 2.4.1.1, the Background Geochemical Characterization Report[26] also characterizes seep water quality. Three seep water stations (SW80, SW104 and SW108) were sampled on a monthly basis from 1989 through 1991 (Figure 2-7). Parameters sampled included total and dissolved metals, total and dissolved radionuclides, physical/biological parameters (e.g., pH, dissolved oxygen, sulfate, total dissolved solids) and volatile organic compounds. Seep water chemistry data were tested using parametric Analysis of Variance (ANOVA) and non-parametric ANOVA methods for significant differences in geochemistry between seasons. There was no significant difference in mean concentrations for these constituents, although insufficient data rendered many of the statistical tests inconclusive. SW80 had elevated sulfate values relative to all other seep stations. These elevated sulfate values are believed to reflect elevated sulfate which is found in Rocky Flats alluvium groundwater[26].

2.4.2 Regulatory Water Quality Reporting (Discharge Monitoring Reports: STP Discharges, Off-site Discharges)

2.4.2.1 Discharge Monitoring and Reporting Required by the Clean Water Act

The NPDES permit program (discussed in Section 2.2.2.1) controls the release of pollutants into waters of the United States and requires routine monitoring and reporting of results. The NPDES[21] permit as modified by the FFCA[18] identifies six monitoring points for control of discharge; three of these discharge points, Ponds A-4, B-5 and C-2, are capable of discharging water off-site. Based on stream segment water quality standards for constituents most commonly found in municipal wastewater treatment plant effluents, the limitations placed on RFP's water discharges were initially the same as what might be expected for any city treatment plant (Table 2-5). After the chromic acid incident of 1989, the NPDES permit terms were modified by the NPDES-FFCA[19] to eliminate two discharge points which had been inactivated (the Reverse Osmosis Pilot Plant and the Reverse Osmosis Plant) and to include new monitoring parameters at the other discharge locations. The revised NPDES permit terms went into effect in April of 1991 and are summarized in Table 2-6 for the six monitoring points.

TABLE 2-5
NPDES MONITORING LOCATIONS, LIMITS AND REPORTING REQUIREMENTS OF 1984 PERMIT

Location/Analyte	Daily Maximum Value	7-Day Maximum Average	30-Day Maximum Average	Minimum Required Sample Frequency
Discharge 001 (Pond B-3)				
pH (standard units)[a]	9.0	N/A	N/A	2/week
Nitrate as N (mg/L)	N/A	20	10	1/week
Total Suspended Solids (mg/L)	N/A	45	30	1/week
Total Residual Chlorine (mg/L)	0.5	N/A	N/A	Daily
Total Chromium (mg/L)	0.1	N/A	0.05	2/month
Total Phosphorus (mg/L)	12	N/A	8	2/week
BOD_5[d] (mg/L)	25	N/A	10	1/week
Fecal Coliform (#/100ml)	N/A	400[b]	200[b]	1/week
Oil & Grease	No Visual	N/A	N/A	Daily
Flow (MGD)	RPT	N/A	RPT	Continuous
Discharge 002 (Pond A-3)				
pH (standard units)[a]	9.0	N/A	N/A	Daily
Nitrate as N (mg/L)	20	N/A	10	Daily
Flow (MGD)	RPT	N/A	N/A	Continuous
Discharge 005 (Pond A-4)				
Non-Volatile Suspended Solids (mg/L)	RPT	N/A	N/A	Daily
Flow (MGD)	RPT	N/A	N/A	Continuous
Discharge 006 (Pond B-5)				
Non-Volatile Suspended Solids (mg/L)	RPT	N/A	N/A	Daily
Flow (MGD)	RPT	N/A	N/A	Continuous
Discharge 007 (Pond C-2)				
Non-Volatile Suspended Solids (mg/L)	RPT	N/A	N/A	Daily
Flow (MGD)	RPT	N/A	N/A	Continuous

[a]pH daily minimum value = 6.0
[b]Fecal coliform averages calculated by geometric rather than normal mean.
[c]Report only, no limitation placed on this analyte by permit.
[d]BOD_5 = Five-day Biochemical Oxygen Demand.

Note: Discharge 003 (Reverse Osmosis Plant) and Discharge 004 (Reverse Osmosis Pilot Plant) were moved from service prior to 1989, and are not included in this table for clarity.

TABLE 2-6
NPDES MONITORING LOCATIONS, LIMITS AND REPORTING REQUIREMENTS AS MODIFIED BY THE FFCA (EFFECTIVE APRIL 1991)

Location/Analyte	Daily Maximum	7-Day Maximum Average	30-Day Maximum Average	Minimum Required Sample Frequency
Discharge 001 (Pond B-3)				
Total Suspended Solids (mg/L)	RPT[c]	N/A	RPT	1/week
BOD_5[f] (mg/L)	RPT	N/A	RPT	1/week
$CBOD_5$[f] Demand 5-Day (mg/L)	RPT	N/A	RPT	1/week
Nitrates as N (mg/L)	N/A	20	10	1/week
Total Residual Chlorine (mg/L)	0.5	N/A	N/A	Daily
Discharge 002 (Pond A-3)				
pH (standard units)[a]	9.0	N/A	N/A	
Nitrates as N (mg/L)	20	N/A	10	
Discharge 005 (Pond A-4)				
Non-Volatile Suspended Solids (mg/L)	RPT	N/A	N/A	Daily[e]
Flow (MGD)	RPT	N/A	N/A	Continuous
Whole Effluent Toxicity (WET) (LC50)[d]	RPT	N/A	N/A	Quarterly
Total Chromium (μg/L)	50	N/A	N/A	1/month
Discharge 006 (Pond B-5)				
Total Chromium (μg/L)	50	N/A	N/A	1/month
Non-Volatile Suspended Solids (mg/L)	RPT	N/A	N/A	Daily[e]
Flow (MGD)	RPT	N/A	N/A	Continuous
Whole Effluent Toxicity (WET) (LC50)	RPT	N/A	N/A	Quarterly

(Table continued on following page.)

[a]pH daily minimum value = 6.0
[b]Fecal coliform averages calculated as geometric mean rather than arithmetic mean.
[c]Report only, no limitation placed on this analyte by permit.
[d]WET test results are reported as the percentage of effluent concentration required to cause lethality to half the test organisms within the time period specified (LC50). Ceriodaphnia are tested for 48 hours, Fathead Minnows for 96 hours.
[e]The monitoring for nonvolatile suspended solids is only required for discharges through the normal outlet works from the ponds. It is not required for water discharged from the ponds by means of pumping or water transferred from one pond to another pond.
[f]BOD_5 = Five-day Biochemical Oxygen Demand. $CBOD_5$ = Five-day Carbonaceous Biochemical Oxygen Demand.

TABLE 2-6
NPDES MONITORING LOCATIONS, LIMITS AND REPORTING REQUIREMENTS AS MODIFIED BY THE FFCA (EFFECTIVE APRIL 1991)
(Continued)

Location/Analyte	Daily Maximum	7-Day Maximum Average	30-Day Maximum Average	Minimum Required Sample Frequency
Discharge 007 (Pond C-2)				
Total Chromium (μg/L)	50	N/A	N/A	1/month
Non-Volatile Suspended Solids (mg/L)	RPT	N/A	N/A	Daily[e]
Flow (MGD)	RPT	N/A	N/A	Continuous
Whole Effluent Toxicity (LC50)	RPT	N/A	N/A	Quarterly
Discharge STP (995 Eff)[g]				
pH (standard units)[a]	9.0	N/A	N/A	Daily
Total Suspended Solids (mg/L)	N/A	45	30	2/week
Oil & Grease (mg/L)	No Visual	N/A	N/A	Daily
Total Phosphorus (mg/L)	12	N/A	8	2/week
Flow (MGD)	N/A	N/A	N/A	Continuous
Total Chromium (μg/L)	100	N/A	50	1/week
$CBOD_5$ (mg/L)	25	N/A	10	2/week
Total Residual Chlorine (mg/L)	N/A	RPT	RPT	Daily
WET test[d]	N/A	N/A	N/A	Quarterly
Fecal Coliform (#/100ml)[b]	N/A	400	200	2/week

[a]pH daily minimum value = 6.0
[b]Fecal coliform averages calculated as geometric mean rather than arithmetic mean.
[d]WET test results are reported as the percentage of effluent concentration required to cause lethality to half the test organisms within the time period specified (LC50). Ceriodaphnia are tested for 48 hours, fathead minnows for 96 hours.
[e]The monitoring for nonvolatile suspended solids is only required for discharges through the normal outlet works from the ponds. It is not required for water discharged from the ponds by means of pumping or water transferred from one pond to another pond.
[g]The FFCA also requires monitoring at the 995 effluent outfall once per month and reporting for the following volatile organic compounds and metals but does not specify discharge limitations:

Antimony	Bromoform	Methyl bromide
Arsenic	Carbon Tetrachloride	Methyl chloride
Beryllium	Chlorobenzene	Methylene chloride
Cadmium	Chlorodibromomethane	1,1,2,2-Tetrachloroethane
Copper	Chloroethane	Tetrachloroethylene
Iron	Chloroform	Toluene
Lead	Dichlorobromomethane	1,2-Trans-dichloroethylene
Manganese	1,1-Dichloroethane	1,1,1-Trichloroethane
Mercury	1,2-Dichloroethane	1,1,2-Trichloroethane
Nickel	1,1-Dichloroethylene	Trichloroethylene
Silver	1,2-Dichloropropane	Vinyl chloride
Zinc	1,3-Dichloropropylene	
Benzene	Ethylbenzene	

2.4.2.2 NPDES Monitoring Results

Monitoring of the NPDES discharge points is conducted according to the frequency and analyte list specified by the current, modified permit. Some parameters are sampled more often than required to ensure the results will be available for reporting in the event some circumstance prevents the collection or analysis of a scheduled regulatory sample. Reporting of water quality monitoring results is done via a Discharge Monitoring Report (DMR). DMRs are prepared and transmitted to EPA and CDH on a monthly basis, as required by the permit. Tables 2-7 through 2-10 contain summaries of the data collected to meet the requirements of the NPDES permit during 1990 through 1992.

During this three-year period, there were occasions in which RFP reported an analytical value in excess of the permit limitations for a discharge or had a data quality problem resulting in an inability to report a complete set of results required by the permit. Over the three-year period, six data quality problems were documented and eight exceedances (or elevated values in the case of no limits) occurred. These exceedances and their probable causes, as determined by EG&G personnel, are listed in chronological order below:

- In May and June 1990, the 30-day average for BOD_5 (10 mg/L) was exceeded for Pond B-3. The calculated monthly averages for May (12.2 mg/L) and for June (22.1 mg/L) likely resulted from algal blooms in the pond.

- During July 1990, the fecal coliform 30-day geometric mean of 200 colonies/100 ml and the maximum 7-day geometric mean of 400 colonies/100 ml for Pond B-3 were exceeded. The calculated 30-day geometric mean was 333.3 colonies/100 ml and the calculated 7-day geometric mean was 4806 colonies/100 ml. Both values were the result of a single sample result of 222,000 colonies/100 ml, approximately 1000 times greater than other typical values found at Pond B-3. This single, abnormally high result is suspect; there were no other indications of unusual operating conditions at Pond B-3.

- In August 1990, the fecal coliform 30-day effluent limitation (geometric mean of 200 colonies/ 100 ml) was again exceeded in Pond B-3. The calculated 30-day geometric mean was 285 colonies/100 ml. There were no indications of unusual operating conditions that might have contributed to the observed exceedance.

- In September 1990, the BOD_5 daily maximum (25 mg/L) and 30-day average (10 mg/L) for Pond B-3 were exceeded. The daily maximum was 37.8 mg/L and the calculated 30-day average was 11.1 mg/L. These exceedances resulted from continuing algal blooms.

TABLE 2-7
NPDES MONITORING RESULTS: 1990[a]

	Number of Analyses	C_{min}[b]	C_{max}[b]	C_{mean}[b,c]
Discharge 001 (Pond B-3)				
pH (standard units)	125	6.5	8.6	N/A
Nitrate as N (mg/L)	127	0.75	12.8	3.39
Total Suspended Solids (mg/L)	127	0	78	11
Total Residual Chlorine (mg/L)	238	0.0	0.35	0.06
Total Chromium (mg/L)	127	<0.006	0.017	<0.008
Total Phosphorus (mg/L)	127	<0.01	1.91	<0.31
BOD_5 (mg/L)	125	<2.5	37.8	<7.8
Fecal Coliform (#/100ml)	120	<10	222,000	<41
Discharge 002 (Pond A-3)				
pH (standard units)	57	7.2	8.6	N/A
Nitrate as N (mg/L)	58	1.12	6.61	4.6
Discharge 005 (Pond A-4)				
pH (standard units)	162	6.6	8.6	N/A
Nitrate as N (mg/L)	163	0.22	6.96	2.89
NVSS (mg/L)	163	0	73	3
Discharge 006 (Pond B-5)				
pH (standard units)	93	7.1	8.5	N/A
Nitrate as N (mg/L)	93	0.19	7.26	3.48
NVSS (mg/L)	94	0	22	3
Discharge 002 (Pond C-2)				
pH (standard units)	45	7.2	8.4	N/A
Nitrate as N (mg/L)	45	<0.02	2.13	<0.85
NVSS (mg/L)	46	0	16	3

[a]Average annual concentration reported for each parameter is an estimate of central tendency (mean value) for all samples collected during the year. This provides an estimate of average effluent water quality for the entire year. The maximum values listed are the highest values observed and represent the worst-case scenario for the entire year. The NPDES permit limits are specified as 30-Day Maximum Average and 7-Day Maximum Average and are measures of central tendency for the shorter time periods as required by the permit. The "Daily Maximum" is the largest value measured during the month. EPA has established limits for these required reporting intervals.
[b]C_{min} = minimum measured concentration; C_{max} = maximum measured concentration; C_{mean} = mean measured concentration.
[c]For fecal coliform, #/100 ml geometric mean used.

TABLE 2-8
NPDES MONITORING RESULTS: JANUARY THROUGH APRIL 1991[a]

	Number of Analyses	C_{min}[b]	C_{max}[b]	C_{mean}[b]
Discharge 001 (Pond B-3)				
pH (SU)	89	6.17	8.14	N/A
Nitrate as N (mg/L)	35	0.65	4.24	1.83
TSS (mg/L)	35	0	26	7
TRC (mg/L)	89	0	.3	.02
Total Chromium (mg/L)	35	<0.006	0.0107	0.0067
Total Phosphorus (mg/L)	34	0.13	1.09	0.43
BOD_5 (mg/L)	33	<2.5	11.8	6.4
Fecal Coliform (#/100ml)	36	<10	30	10
Discharge 002 (Pond A-3)				
pH (SU)	3	8.2	8.65	N/A
Nitrate as N (mg/L)	3	0.66	4.12	2.94
Discharge 005 (Pond A-4)				
pH (SU)	64	6.3	8.15	N/A
Nitrate as N (mg/L)	64	2.28	5.89	4.80
NVSS (mg/L)	64	0	15	2
Discharge 006 (Pond B-5)				
	No Discharge			
Discharge 007 (Pond C-2)				
	No Discharge			

[a]Abbreviations used are TRC: Total Residual Chlorine, TSS: Total Suspended Solids, NVSS: Nonvolatile Suspended Solids, BOD_5: Biochemical Oxygen Demand, mg/L: milligrams per liter, SU: Standard Units
[b]C_{min} = minimum measured concentration; C_{max} = maximum measured concentration; C_{mean} = mean measured concentration.

TABLE 2-9
NPDES MONITORING RESULTS: JUNE THROUGH DECEMBER 1991

	Number of Analyses	C_{min}[a]	C_{max}[a]	C_{mean}[a]
Discharge 001 (Pond B-3)				
Nitrates as N (mg/L)	88	0.15	13.3	4.48
Total Residual Chlorine (mg/L)	244	0	0.41	
Discharge 002 (Pond A-3)				
pH (SU)	39	7.17	8.95	N/A
Nitrates as N (mg/L)	39	0.71	3.33	1.62
Discharge 005 (Pond A-4)				
Total Chromium (μg/L)	8	<5	6	6
Discharge 006 (Pond B-5)				
Total Chromium (μg/L)	No Discharge			
Discharge 007 (Pond C-2)				
Total Chromium (μg/L)	3	<7	<7	<7
Discharge STP (995 Eff)				
pH (SU)	274	6.2	7.8	N/A
Total Suspended Solids (mg/L)	102	0	38	6
oil & grease (mg/L)	0	0	0	0
Total Phosphorus (mg/L)	111	<.1	2.52	0.39
Total Chromium (μg/L)	33	<5	8.3	5.9
$CBOD_5$ (mg/L)	107	0.1	13.7	3.1
Fecal Coliform (#/100ml)	116	<1	220	10

[a] C_{min} = minimum measured concentration; C_{max} = maximum measured concentration; C_{mean} = mean measured concentration.

TABLE 2-10
NPDES DISCHARGE MONITORING RESULTS: 1992

	Number of Analyses	C_{min}[a]	C_{max}[a]	C_{mean}[a]
Discharge 001 (Pond B-3)				
Nitrate as N (mg/L)	106	0.28	13.7	3.36
Total Residual Chlorine (mg/L)	366	0	1.9	0.03
Discharge 002 (Pond A-3)				
pH (SU)	55	7.16	8.48	N/A
Nitrate as N (mg/L)	56	0	3.8	1.7
Discharge 005 (Pond A-4)				
Total Chromium (μg/L)	10	<2.4	<7	<6.2
Discharge 007 (Pond C-2)				
Total Chromium (μg/L)	2	<7	<7	<7
Discharge STP (995 Eff)				
pH (SU)	366	4.11	7.88	N/A
Total Suspended Solids (mg/L)	151	0	18	5.7
Oil and Grease (mg/L)	0	0	0	0
Total Phosphorus (mg/L)	149	<0.01	6.1	0.23
Total Chromium (μg/L)	51	<2.4	11.9	5.5
Fecal Coliform (#/100ml)	146	<1	36	1.4
CBOD (mg/L)	146	0.1	15	2

[a]C_{min} = minimum measured concentration; C_{max} = maximum measured concentration; C_{mean} = mean measured concentration.

- In April 1991, a field reading of 0.71 mg/L for total residual chlorine was recorded for water discharged from Pond B-3 to Pond B-5. The permitted value is 0.5 mg/L, and notification by samplers per their procedure was not made at the time the reading was recorded, leading to the conclusion that it had been recorded in error.

- In May 1992, total residual chlorine (TRC) readings at the STP outfall were higher than normal, exceeding the capacity of the field measurement technique (2.0 mg/L). There is no daily maximum limit for TRC included as part of the permit terms for this outfall, although the results are reported. It was determined the STP was backflushing one of the clarifiers at the time the readings were taken, resulting in a high TRC content due to low flow conditions. The dechlorination equipment was corrected to remedy the periodic surges of high TRC during backflushing operations.

- In July of 1992, low flow conditions at the STP influent caused an imbalance in the dechlorination system (based on sulfur dioxide) and resulted in a low pH at the effluent. The condition was detected by samplers and corrected immediately by application of lime to the STP. The effluent pH was returned to above the minimum permit value of 6.0 within an hour after the condition had been detected.

All exceedances were communicated to EPA by telephone, followed by written details in the DMR. No Notices of Violation have been issued by EPA as a result of these incidents.

The CWA-mandated monitoring program for the STP is based on the contaminants commonly found in municipal STP discharges, and RFP's permit limitations are generally representative of those imposed on publicly owned treatment works (POTWs). RFP's discharge monitoring under this program shows that the STP is a typical wastewater treatment plant, discharging typical compounds in typical amounts. Occasional upsets in operation cause excess amounts of residual chlorine to enter the waters of the holding ponds on-site, and changing environmental conditions in the ponds such as algal blooms and animal populations cause periodic excesses in BOD_5 and fecal coliform. The program's monitoring of discharges and operating conditions has had results consistent with the STP's designation as a sanitary sewage treatment facility.

2.4.2.3 Water Quality Monitoring and Reporting Under the Agreement in Principle

Per the cooperative AIP[20], DOE and the State of Colorado agreed to: (1) perform joint monitoring of RFP waters and (2) confer regarding the safety of any off-site water discharges. The 1989 AIP was the primary driver for the Background Geochemical Characterization

Monitoring Program which was initiated in 1989 and completed in 1992[26] (refer to Section 2.4.1.1 for details of this program). The 1991 IAG also incorporated requirements for this background study. In addition, the pond water sampling program was upgraded and strengthened under the AIP. For example, water quality sampling procedures were formalized, and composite depth sampling was initiated at the ponds as a result of the AIP[20]. Parameters sampled and analyzed under the AIP are listed in Appendix C.

2.4.3 Ambient Water Quality Conditions (Site-specific)

This section describes various programs and data collection efforts to characterize ambient, or usual, water quality at RFP. Also included is a description of the water quality data collection and assessment efforts supporting EG&G testimony at the October and December, 1992 CWQCC standard-setting hearings for Segment 5 of Big Dry Creek.

The programs described include:

1. Surface Water and Sediment Monitoring Program,
2. Event-related Surface Water and Sediment Monitoring,
3. Surface Water Toxicity Monitoring,
4. Surface Water and Sediment Geochemical Characterization Reports, and
5. Groundwater Monitoring.

2.4.3.1 Surface Water and Sediment Monitoring Program

In January, 1993, the EG&G SWD Surface-Water and Sediment Monitoring Program Summary[29] was completed. This document describes the monitoring locations, sampling frequency, analytical parameters and regulatory requirements that constitute the general scope of the RFP monitoring programs as of December 24, 1992. The document also provides the Work Package structure associated with each monitoring program and a list of EG&G personnel that currently serve as contacts for each monitoring program. The report is intended to update and supersede previously-prepared summary and planning documents for RFP surface-water and sediment monitoring programs.

Current surface water and sediment monitoring programs include: (1) activities associated with the NPDES Stormwater Discharge Permit application; (2) all compliance-related monitoring activities including NPDES-FFCA and AIP; (3) operational monitoring under DOE orders; and (4) other activities including the Event-related Monitoring Program, Los Alamos National

Laboratory (LANL) special projects, pond effluent treatment special projects and various non-routine support activities involving water and sediment sampling. (See Appendix C for sampling parameters and locations.)

2.4.3.2 Event-related Surface Water and Sediment Monitoring Program

Two major event-related surface water studies have recently been completed at RFP: The Event-Related Surface Water Monitoring Report for Rocky Flats Plant for Water Years 1991 and 1992[28] and the Stormwater NPDES Permit Application Monitoring Program[27]. These are discussed below.

Several studies were conducted for the Zero Off-site Water Discharge study for RFP in response to the AIP. Task 3 of this study, begun in 1990, involved quantity and quality analyses of storm sewer flows, and a non-point source assessment. This program was expanded to include additional locations in 1991 and 1992. The Event-related Surface Water Monitoring Report for the Rocky Flats Plant for Water Years 1991 and 1992[28] presents data for the RFP Gaging Station and Stormwater Monitoring Network (Figure 2-8). Data presented in the report were collected from May 1991 to September 1992 at 12 gaging stations. Parameters sampled in this program include radionuclides, metals and suspended sediments.

Because of the limited quantity of data, only general conclusions were made based on observation of trends in the data rather than extensive statistical analysis. The interpretation of the data may change as additional data become available and as upgrades to the program are made. Additional data are also expected to facilitate the statistical quantification of significant differences in RFP water quality between stations and collectively between drainages.

Observation of overall constituent loads in Walnut Creek indicates they are higher than overall constituent loads in other RFP drainages, probably due to the runoff from impervious areas within the core area of the plant. Overall constituent loads measured at gauging stations upstream from the RFP A- and B-series detention ponds appear to be higher than overall constituent loads measured at gauging stations downstream from the detention ponds, indicating removal of constituents from the water column in the ponds.

In addition to the event-related study, the Stormwater NPDES Permit Application Monitoring Program for RFP was conducted by Advanced Sciences, Inc.[29] The resulting report describes the comprehensive results of the monitoring program involving water quality data and streamflow records of stormwater runoff events. Study aspects involved several monitoring components: (1) continuation and expansion of the operation of field instrumentation which records continuous flows and collects water quality samples during stormwater runoff or high flow events at selected sites for the purpose of characterizing runoff quantity and quality at RFP; and (2) maintenance of bulk-precipitation sample collectors and an evaporation pan. A total of 116 surface water samples and 19 bulk-precipitation samples were collected and analyzed during the 15-month period from October 1991 through December 1992 during 32 storm or high flow events. Sample locations included SW022, SW023, SW027, SW093, SW118 and SW998.

2.4.3.3 Surface Water Toxicity Monitoring

The Surface Water Toxicity Monitoring Program (SWTMP) was initiated in May 1991 to address regulatory requirements concerning potential toxicity of effluent discharges for normal and emergency operating conditions. The SWTMP includes both traditional WET testing, required by the current NPDES-FFCA permit and real-time instrumental techniques. The additional instrumental methods implemented at RFP are the Microtox® and respirometry. Both methods allow more frequent sampling and provide real-time data when compared to WET testing.

SWD implemented a baseline study from May 1991 through June 1992 that tested RFP surface waters and STP influent and effluent. The baseline study was designed to determine how effectively the Microtox® and respirometer would measure water quality, and their ability to predict WET specie responses. The Microtox® and WET test results did not correlate in the STP effluent over the study period. Ammonia in the STP effluent averages 20 mg/L during the year. The Microtox® organisms are not as sensitive to ammonia as the WET organisms. Therefore, the Microtox® is currently used as a quick test for unusual occurrences, in addition to routine RFP surface water sampling. If the results indicate a problem, further chemical analysis is performed.

Respirometry is the measurement of a broad range of synergistic effects of water chemistry in the STP influent by measuring the respiration rate of a micro-organism population in wastewater. If a chemical is present in toxic concentrations, respiration rates will decrease due to organism responses. At this time, the respirometer is the best measure of overall STP influent quality and treatability.

2.4.3.4 Surface Water and Sediment Geochemical Characterization Reports

SWD produced the 1989 and 1990 Surface Water and Sediment Geochemical Characterization Reports[30,31] which analyzed and interpreted surface water and sediment quality at RFP to provide a plant-wide overview of contaminants in these media. Another purpose of this program was to assess the significance and impacts of past and potential future contaminant releases to and transport via the surface water pathway. Variables monitored during this program included volatile and semi-volatile organics, pesticides, polychlorinated biphenyls (PCBs), metals, radionuclides, indicator and field variables. In addition, surface water stage and flow rates were monitored, when possible, during every collection of a water or sediment sample.

During 1989, 73 surface water stations and 25 sediment stations were sampled. Surface water stations were sampled on a monthly basis and sediment stations were monitored on a semi-annual basis. Overall results for 1989 indicated the highest concentrations of specific conductivity, metals and gross alpha and gross beta in the Solar Ponds area. The Solar Ponds area also contained the only semi-volatiles and PCBs detected in the study. Other areas that showed high concentrations of particular types of constituents were the landfill area for TDSs and the upper South Walnut Creek area for volatile organics.

The emphasis of the 1990 study was the identification of trends and processes affecting the nature and extent of contaminants in surface water and sediment. Data utilized in the report were retrieved from the Rocky Flats Environmental Database System (RFEDS). The data used for background characterization consisted primarily of surface water data from 98 sampling locations. Sediment data collected during 1990 were insufficient to conduct statistical analyses.

After verification of data, statistical and qualitative analyses were performed to characterize major ion chemistry, identify areal trends of collected constituents, determine differences in constituent concentrations between background stations and downstream stations, and investigate geochemical trends and relationships. General results of these analyses showed statistically significant differences from background concentrations/activities in each of the drainages at RFP. In addition, although several operations impact water quality at the site, the most serious source of contamination was again identified as the solar evaporation ponds. The results also indicated that contaminants including radionuclides might be transported from the old landfill, the 903 Pad and the Lip Area to the SID. Organic contaminants in RFP surface waters were generally found in seeps in OU 2.

2.4.3.5 October 1992 CWQCC Hearing

In October and December, 1992, the CWQCC held hearings to consider revisions to the surface water quality standards for Segment 5 of Big Dry Creek. In preparation for these hearings, DOE and EG&G compiled a database of surface water quality data from surface water monitoring stations designed to monitor seeps, springs, detention ponds and stormwater for the three drainages at RFP. The database consists of approximately 15,000 data points categorized by location, date and time of collection and parameter results (the parameters of interest were selected organics, metals and inorganics). Only validated data excluding laboratory quality assurance samples are contained in the database.

Although the database separated individual sampling points by location, documents prepared in support of the CWQCC hearings did not attempt to make location-specific determinations of water quality. Instead, EG&G prepared summary tables to identify a site-wide 85th percentile value for parameters of concern. For a given parameter, all numeric data were ranked, the rank was converted to a scale of 1 to 100, and the 85th value was selected. The only location-specific analysis involved preparation of two Geographic Information System-generated maps that showed the distributions of trichloroethylene (TCE) and zinc as a function of location along each of the drainages based on maximum values reported at the sampling locations. Some drainage-specific summaries of data were also prepared which indicated the number of Segment 4 stream standard exceedances per drainage.

The data analysis conducted indicated that for 9 analytes, the 85th percentile ranking exceeded the proposed Segment 5 standards. Based on this information, CWQCC set temporary modified standards for 8 of those 9 analytes at the 85th percentile ranking value based on empirical data. For un-ionized ammonia, CWQCC set a temporary modified standard at the maximum observed value. All other analyte limits were set at the proposed Segment 5 standards. The temporary modified standards are presented in Appendix A, Table 3.

2.4.3.6 Groundwater Monitoring

Groundwater monitoring at RFP was initiated in 1954 and has developed over the years to a present network of approximately 600 wells and piezometers. The wells are distributed throughout RFP in order to satisfy regulatory requirements and to assist in characterization efforts being performed as part of OU Remedial Investigation/RCRA Facility Investigation (RI/RFI) work plans. Groundwater samples are collected quarterly from selected alluvial and bedrock wells. Parameters monitored in RFP wells include metals, organics, radionuclides, and physical and biological constituents. For further information, the reader is referred to the Annual RCRA Groundwater Monitoring Report for Regulated Units at RFP and the Annual Environmental Monitoring Reports for RFP.

Groundwater data could be relevant to this IM/IRA Decision Document because of the strong relationship between groundwater and surface water flows affecting the ponds. For example, the Rocky Flats Plant Surface-Water and Sediment Monitoring Program Summary[30] suggests Woman Creek flow is lost to the alluvial groundwater system in the vicinity of Pond C-2 and might contribute to Pond C-2.

2.5 SUMMARY OF SITE RISKS

A Baseline Risk Assessment (BRA) was performed as part of this IM/IRA Decision Document. The following section describes the methods utilized and the results obtained in performing the Human Health Risk Assessment (HHRA). The other component of the BRA, the Environmental Evaluation, is described in Section 5.2. Summary statistics and pond water quality data and statistical methods used in the HHRA as well as supplemental information on risk assessment are contained in Appendix D.

The HHRA consisted of the following activities: (1) exposure assessment of COCs to a potentially exposed population, (2) identification of COCs for human health determination for each site, (3) human health toxicity assessment of these chemicals, and (4) risk characterization at each site based on exposure and toxicity assessments.

2.5.1 Pathway Exposure Assessment

2.5.1.1 Identification of Scenarios and Pathways

For each site chosen for the risk assessment, the on-site future residential scenario and the ingestion of surface water pathway were chosen for purposes of risk characterization. The residential scenario was selected because it was the most limiting scenario (i.e., would provide the most conservative/highest estimate of risk). Ingestion was judged to be the dominant pathway to receptors for contaminants from the surface water. Pathways via other media such as groundwater and surface soils were not considered because they were judged to be outside the scope of this IM/IRA Decision Document. The exposure scenario at each site consisted of a person consuming all of their drinking water, while at home, out of RFP ponds.

2.5.1.2 Intake Equation and Modeling

The equation used for ingestion of contaminated water is presented below.

$$\text{Intake (mg/kg/day)} = \frac{CW \times IR \times EF \times ED}{BW \times AT}$$

where:

CW	=	Chemical concentration in water (mg/liter)
IR	=	Ingestion rate (2 liter/day)
EF	=	Exposure frequency (350 days/year)
ED	=	Exposure duration (30 years)
BW	=	Body weight (70 kg)
AT	=	Averaging time (period over which exposure is averaged - 30 years-non-cancer, 70 years-cancer)

Using a subset of the same variables above, the equation was slightly modified for calculation of radionuclide intakes as follows:

Intake (pCi/L) = CW x IR x EF x ED

All exposure parameters were identified using EPA guidance[32]. In accordance with the Reasonable Maximum Exposure (RME) concept, some exposure parameters were used at their reasonable upper-bound values (e.g., exposure frequency and duration) and some were used at central tendency values (e.g., body weight). The combination of these variables resulted in estimates of the RME.

Accurate estimates of contaminant concentrations at points of human exposure are a prerequisite for evaluating the contaminant intake of potentially exposed individuals. The COC concentrations used in the equations were intended to be conservative estimates of mean values; therefore, the 95 percent upper confidence limits (UCLs) of the mean of lognormal distribution of the data were used. EG&G made an administrative decision to use the lognormal distribution for all data sets because it better represented the data than the normal distribution. The uncertainty associated with the calculated intake values for radionuclides, metals and inorganics, and organics are discussed in Section 2.5.2. The results of the intake calculations are provided with the risk characterization in Appendix D, Tables D-1.1 to D-1.8, in the column marked "Average Daily Intake."

2.5.2 Contaminants of Concern

For the purposes of HHRA, the surface water ponds were aggregated into eight sites for evaluation of COCs. Ponds that are connected by "flow through" stream sections or sections that are used for transfer were combined as one site based on the presumption of similar water quality in each of the combined ponds. The ponds were aggregated into the following sites:

- Site 1 - Ponds A-1 and A-2
- Site 2 - Ponds A-3 and A-4
- Site 3 - Ponds B-1 and B-2
- Site 4 - Pond B-3
- Site 5 - Ponds B-4 and B-5
- Site 6 - Pond C-1
- Site 7 - Pond C-2
- Site 8 - Landfill Pond (west end, Station SW-97)

The chemical concentration data used in the COC selection was obtained from the RFP pond water sampling program and the RFP Background Geochemical Study (see Section 2.4.1.1). The list of analytes which were used in the HHRA includes radionuclides, total metals, VOAs, semi-volatile organics (SVOAs) and pesticides. Site radionuclide data were collected between February 1990 and December 1992. Metals and inorganics data were collected between January 1990 to January 1993, and organics and pesticides data were collected from January 1990 to July 1993.

The background data set selected for the pond water was an aggregation of background stream locations both north and south of the RFP site. Surface water data from the following areas were used in the background data set: Rock Creek at SW004, SW005, SW006, McKay Ditch at SW007, upper Woman Creek at SW041, SW042, SW107, SW127 and Smart Ditch at SW130 and SW131. These stream locations were selected as most appropriate background for the pond water due to the similar geochemistry and the lack of data on any comparable uncontaminated pond location.

The COCs for Human Health were selected based on statistical comparisons of site data to site background data and literature background values (radionuclides and metals), comparisons to standards (organics and pesticides), and professional judgement. Because of the large percentage of nondetects and the presence of multiple detection limits in much of the site and background data sets, histograms of the detects and nondetects in the raw data were reviewed as a check of the statistical comparisons. The results of this selection process for each site are given in Appendix D, Tables D-1.1 through D-1.8. A summary of COCs selected at all sites is given in Table 2-11. The following sections describe the methods used for selection or rejection of chemicals as COCs and summarize the results for each class.

2.5.2.1 Radionuclides

Each site data set was compared to the background data set to test whether the site mean was greater than the background mean using the nonparametric scores test described in Appendix D. The site maximum detected value was also compared to the 95 percent upper tolerance limit (UTL) of the background data. If either the significance level of the scores test (p-value) was $\leq$ 0.05 or if the maximum detected value at the site was above the background UTL, then the analyte was flagged as a potential COC for human health. A final determination of COCs was made after comparing the box and whisker plots for all sites to background for all radionuclides. Radionuclide COCs that were identified at three or more sites include the uranium isotopes, plutonium-239, -240 and americium-241. In addition, tritium and strontium-89, -90 were selected as COCs at the Landfill Pond, and tritium was also selected at Site 5.

TABLE 2-11

HUMAN HEALTH RISK ASSESSMENT COC's BY POND

	SITE 1 A1, A2	SITE 2 A3, A4	SITE 3 B1, B2	SITE 4 B3	SITE 5 B4, B5	SITE 6 C1	SITE 7 C2	SITE 8 LANDFILL	COMMENTS
RADIONUCLIDES									
AMERICIUM-241	X		X	X					
CESIUM-137									
PLUTONIUM-239/240	X		X	X	X	X	X	X	
STRONTIUM-89,90								X	
TRITIUM					X			X	
URANIUM-233,234	X	X	X		X	X	X		
URANIUM-235	X	X	X			X	X		
URANIUM-238	X	X	X		X	X	X		
TOTAL METALS									
ALUMINUM									
ANTIMONY									
ARSENIC									
BARIUM		X				X	X	X	
BERYLLIUM									
CADMIUM									
CALCIUM									
CESIUM									
CHROMIUM								X	
COBALT								X	
COPPER									
IRON									
LEAD									
THIUM	X		X		X			X	
AGNESIUM									
MANGENESE								X	
MERCURY									
MOLYBDENUM								X	
NICKEL								X	
POTASSIUM									
SELENIUM									
SILICON									
SILVER								X	
SODIUM									
STRONTIUM	X		X		X	X	X	X	
THALLIUM									
TIN								X	
VANADIUM								X	
ZINC								X	
INORGANICS									
CYANIDE					X				
NITRATE					X		X		
NITRATE/NITRITE		X			X				
NITRITE		X			X				

TABLE 2-11,continued

HUMAN HEALTH RISK ASSESSMENT COC's BY POND

(page 2 of 3)

	SITE 1 A1, A2	SITE 2 A3, A4	SITE 3 B1, B2	SITE 4 B3	SITE 5 B4, B5	SITE 6 C1	SITE 7 C2	SITE 8 LANDFILL	COMMENTS
VOAs									
1,1,1 TRICHLOROETHANE									
1,1 DICHLOROETHANE								X	
1,1 DICHLOROETHENE									
1,2 DICHLOROETHENE								X	
2 - BUTANONE								X	
4 - METHYL- 2 - PENTANONE								X	
ACETONE			X		X			X	
CARBON DISULFIDE									
CHLOROFORM									
cis - 1,2 - DICHLOROETHENE			X						
ETHYL BENZENE								X	
METHYLENE CHLORIDE									
TETRACHLOROETHENE	X								
TOLUENE								X	
TOTAL XYLENES								X	
TRICHLOROETHENE			X						
VINYL ACETATE									
0 - XYLENE								X	
SVOAs									
2 - METHYLNAPTHALENE								X	
4 - METHYLPHENOL								X	
BIS (2 - ETHYLHEXYL) PHTHALATE					X				
NAPHTHALENE								X	
PESTICIDES/ PCBs									
HEPTACHLOR									
alpha - BHC									
alpha - CHLORDANE									
beta - BHC									
gamma - BHC (LINDANE)									
gamma - CHLORDANE									
SELECTED COMPOUNDS EPA 502.2									
1,1,1 - TRICHLOROETHANE							X		
1,1 - DICHLOROETHENE									
1,2,3 - TRICHLOROBENZENE									
1,2,4 - TRICHLOROBENZENE									
1,4 - DICHLOROBENZENE				X					
BENZENE, 1,2,4 - TRIMETHYL									
BROMODICHLOROMETHANE				X					
CARBON TETRACHLORIDE			X						
CHLOROFORM			X	X	X				
HEXACHLOROBUTADIENE									
METHYLENE CHLORIDE									
NAPHTHALENE									
TETRACHLOROETHENE	X		X	X	X				
TOLUENE									
TRICHLOROETHENE	X		X	X	X				
VINYL CHLORIDE			X						
cis - 1,2 - DICHLOROETHENE			X						
cis - 1,3 - DICHLOROPROPENE									
n - BUTYLBENZENE									

TABLE 2-11, continued

HUMAN HEALTH RISK ASSESSMENT COC's BY POND

(page 3 of 3)

	SITE 1 A1, A2	SITE 2 A3, A4	SITE 3 B1, B2	SITE 4 B3	SITE 5 B4, B5	SITE 6 C1	SITE 7 C2	SITE 8 LANDFILL	COMMENTS
HERBICIDES									
DICAMBA		X			X				
DICHLOROPROP									
TRI - PESTICIDES									
ATRAZINE	X	X			X		X		
PROPAZINE									
SIMAZINE		X			X				
SIMETRYN									

The level of uncertainty associated with the determination of COCs for radionuclides at each site is considered low. The scores test for determining whether site values were elevated above background is valid because there were no nondetects for radionuclides and there were an adequate number of data points in both the background and site data sets. This low level of uncertainty also applies to the calculated lognormal 95 percent UCL of the mean contaminant concentration at each site. Since these values were used to calculate contaminant intake and both carcinogenic and noncarcinogenic risk, the resulting intake and risk values are also considered to contain a low level of uncertainty.

2.5.2.2 Inorganics and Metals

The potential COCs for inorganics and metals for each site were selected using the same statistical tests described above for radionuclides. In addition, the histograms from Appendix D showing the values of both detects and nondetects for all the metals at the sites and background were reviewed in order to confirm the results of the statistical tests. Literature values (minimum, mean and maximum) for background surface water metal concentrations were also compared to each site data set. Metals were selected as COCs if the site data were elevated above site background and if the site values were not in the lower range of the literature values for background. The COC selection for the metals was complicated by the large numbers of nondetects in the sites and background data sets. The value of summary statistics and statistical testing was limited by the large number of nondetects and varying detection limits for each specific metal concentration data set at each site and in the background data set. Therefore, professional judgement was also used in selecting COCs based on detection frequency and detection limits.

For example, from Table D-1.1, lithium was determined to be a COC for Site 1. The background comparison scores test significance was 0.0001 (<0.05), which indicated contamination. Lithium was detected 13 times out of 13 samples at the site compared to 47 detects out of 98 samples in the background. The histogram indicated the detects in the site were higher than the detects in the background, and the detection limits were similar in the site and background. Finally, the site mean of 45 μg/L lithium was not in the lower portion of the background literature range of 0.075 to 37 μg/L. Therefore, lithium was considered a contaminant at Site 1.

Another example from Table D-1.1 is arsenic, which was not determined to be a COC. From the statistical and histogram site background comparisons, arsenic appeared to be slightly elevated above site background. However, the site mean of 3.9 μg/L arsenic was judged to be within the lower range of the background literature range of 1 to 10 μg/L arsenic. Therefore, arsenic was not selected as a COC.

The metal COCs occurring at more than one site are barium, lithium and strontium; the inorganic COCs include nitrate and nitrite at Sites 2, 5 and/or 7. At the Landfill Pond, nine additional metals were also selected.

The level of uncertainty associated with the COC determination results for metals and inorganics is considered low to moderate due to a high number of nondetects at multiple detection limits in the original background and site data sets. The scores test approach used to determine differences in background and site contaminant levels is considered valid when the number of nondetects is relatively low (<20 percent) and when the site and background have similar detection limits. The examination of histograms of the raw detect and nondetect data and the comparison of the data to literature background values was used as a confirmation of the statistical tests to lower the uncertainty of the COC determination. Since the lognormal 95 percent UCL for the mean COC concentration was calculated with a uniform replacement of nondetects and in some cases there was a large percent of nondetects, the resulting intake and risk values for metals and inorganics contain low to moderate uncertainty.

2.5.2.3 Organics

For VOAs, SVOAs and pesticides, no background levels were expected, so no background comparison was made. Instead, a comparison to standards and minimum detection frequency was used as a COC selection tool. Data sets which contained at least one detect that exceeded a standard or had at least a 5 percent detection rate were included as COCs. As an additional screen, data sets containing between 5 and 20 samples must have shown at least 2 detects (>5 percent detection) for the compound to be considered a COC. Because of the potential for lab contamination, background comparison screening was made for methylene chloride and bis(2-ethylhexyl) phthalate in addition to the screening performed on the other VOAs/SVOAs/pesticides.

Organic compounds selected as COCs at three or more sites are acetone, chloroform, tetrachloroethene and trichloroethene. Sites with the largest quantity of organics were Site 8 with 12 VOAs/SVOAs and Site 3 with 9 VOAs/selected compounds. Atrazine was identified as a COC for Sites 1, 2, 5 and 7, and simazine and dicamba were also identified as COCs at Sites 2 and 5.

The level of uncertainty associated with the COC determination of organics is considered moderate. The COC determination was based on an exceedance of a standard or a percent detect (>5 percent) since zero level background was assumed. The uncertainty is the result of low sample size and a few detection limits in excess of the standard against which the detection values were compared. In a few cases, the possibility exists for an organic to be present somewhat above the standard even though it is considered a non-detect; however, a chemical with 100 percent nondetects at a site was eliminated as a possible COC at that site.

The calculated lognormal 95 percent UCL for the mean for the organic compounds also carries a moderate uncertainty due to the low detection percentage in many cases. This moderate uncertainty is carried forward to the calculated intake and carcinogenic and noncarcinogenic risk values.

2.5.2.4 Summary of Potential/Known Contaminants by Pond

The summary of potential known contaminants by pond is contained in Table 2-11. Radionuclide COCs were identified in all ponds. Twelve metal COCs were identified in the Landfill Pond, but only barium, lithium and strontium were of concern in the other ponds. Inorganics of concern were identified at Sites 2, 5 and 7 only. The Landfill Pond contained a total of 12 organic COCs, Site 3 contained 9 organic COCs and the remaining sites contained up to 5 organic COCs. No pesticides or PCBs were identified as COCs at any site, although some herbicides and/or tripesticides were identified as COCs at Sites 1, 2, 5 and 7.

The COCs for pond water include all of the compounds with modified Big Dry Creek Segment 5 stream standards with the exception of iron and copper.

2.5.3 Toxicity Assessment

The purpose of this section is to provide the toxicity constants that were used for risk characterization and to summarize toxicological information for the radioactive and nonradioactive COCs at the pond water sites.

The toxicity constants used in this risk assessment were obtained from several sources. The primary source of information was EPA's Integrated Risk Information System (IRIS). IRIS contains only those toxicity values that have been verified by EPA's Reference Dose or Carcinogen Risk Assessment Verification Endeavor (CRAVE) Work Groups. The IRIS database is updated monthly and, per EPA's Risk Assessment Guidance for Superfund (RAGS)[32], supersedes all other sources of toxicity information. If the necessary data were not available in IRIS, EPA's Health Effects Assessment Summary Tables (HEAST)[33] were used. The tables are published annually and updated approximately two times per year. HEAST contains a comprehensive listing of provisional risk assessment criteria that have undergone review and have the concurrence of individual EPA Program Offices, but have not had enough review to receive agency-wide consensus.

In keeping with RAGS[32], the toxicity information is summarized for two broad categories of potential effects: noncarcinogenic and carcinogenic effects. These two categories were selected because of the slightly differing methodologies for estimating potential health risks associated with exposures to noncarcinogens and carcinogens.

Potential noncarcinogenic effects are evaluated by comparing daily intakes with chronic oral reference doses (RfDo's) developed by EPA. A chronic RfDo is an estimate (with uncertainty spanning perhaps an order of magnitude) of the daily oral intake that can be incurred during a lifetime, without an appreciable risk of a non-cancer effect being incurred in human populations, including sensitive subgroups. The RfDo is based on the assumption that thresholds exist for noncarcinogenic toxic effects (e.g., liver or kidney damage). It is a benchmark dose operationally derived by the application of one or more order of magnitude uncertainty factors to doses thought to represent a lowest or no observed adverse effect level in humans. Thus, there should be no adverse effects associated with chronic daily intakes below the RfDo value. Conversely, if chronic daily intakes exceed this threshold level, there is a potential that some adverse noncarcinogenic health effects might be observed in exposed individuals. For a more detailed discussion on RfDo's, see Appendix D. Tables D-2.1 through D-2.8 provide RfDo's available for each of the COCs identified at each site; however, RfDo's are not available from IRIS or HEAST for several of the COCs.

For chemical carcinogens, toxicity assessment and regulatory decisions are based on epidemiological studies, animal studies and mathematical modeling. Uncertainties in the toxicity assessment for chemical carcinogens are dealt with by classifying each chemical into one of several groups, according to the weight of the evidence from epidemiological studies and animal studies, as follows:

Group A – Human Carcinogen (sufficient evidence of carcinogenicity in humans)

Group B – Probable Human Carcinogen (B1–limited evidence of carcinogenicity in humans; B2–sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans)

Group C – Possible Human Carcinogen (limited evidence of carcinogenicity in the animals and inadequate or lack of human data)

Group D – Not Classifiable as to Human Carcinogenicity (inadequate or no evidence)

Group E – Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in adequate studies)

Quantitative risk assessment is performed on all Group A and B carcinogens, but is done on a case-by-case basis for Group C carcinogens. Oral cancer slope factors (SFo's) are chemical-specific dose-response data used in calculating carcinogenic risks. Chemical SFo's are extrapolated from animal experiments and are based on the 95th percentile value.

Radionuclide SFo's are best estimates (mean or median values) derived from human epidemiological studies. Tables D-2.1 through D-2.8 provide the available SFo values for each of the COCs identified at each pond water site, expressed as risk/pCi for radionuclides and as risk/(mg/kg/day) for other chemicals. A major limitation of this toxicity assessment is the lack of chemical-specific toxicity data for all COCs. In addition, many of the COCs do not have verified RfDo's or cancer Sfo's.

2.5.3.1 Radionuclides

An extensive body of literature exists that describes the health effects of radionuclides on humans and animals. Intensive research by national and international commissions has resulted in the establishment of universally accepted limits to which workers and the public may be exposed without clinically detectable effects. This literature has resulted in EPA classifying all radionuclides as Group A carcinogens because they emit ionizing radiation, which has been associated with increased cancer incidence in humans at high doses. These non-threshold SFo's account for the following: the amount of radionuclide transported into the bloodstream, the decay of radioactive progeny within the body, the distribution and retention of the radionuclide and its progeny (if any) in the body, the radiation dose delivered to specific organs and tissues, and the age and sex of the exposed individuals[33]. Principal adverse effects associated with exposure to ionizing radiation are carcinogenicity, mutagenicity and teratogenicity. Because cancer is considered to be the "limiting" effect of radionuclides, noncarcinogenic effects are not considered in this assessment. SFo's for radionuclide COCs are provided in Tables D-1.8 through D-1.8 according to site.

2.5.3.2 Metals and Inorganics

The cancer and non-cancer toxicity factors for the metals and inorganic compounds identified as COCs at each site above were taken from IRIS and HEAST as described above in Section 2.5.3. None of the metal or inorganic COCs had cancer slope factors listed in these references. The oral reference dose toxicity factors listed in the references and used in the risk calculations are given in Tables D-1.1 through D-1.8 in Appendix D.

2.5.3.3 Organics

The cancer and non-cancer toxicity factors for the VOAs, SVOAs and tri-pesticides identified as COCs at each site above were also taken from IRIS and HEAST as described in Section 2.5.3 Many of the organic COCs had both cancer slope factors and oral reference doses listed in the references. The cancer slope factors for TCE and PCE were obtained from the EPA Superfund Support Center since the values are pending in IRIS. The cancer slope factors and oral reference dose values for organics used in the risk calculations are given in Tables 3.1 through 3.8.

2.5.4 Risk Characterization

2.5.4.1 Method

Risk characterization estimates the magnitude of the potential adverse effects under study and presents summaries of the nature of the threats to public health. Risk characterization also addresses the nature and weight of evidence supporting these risk estimates and the magnitude of uncertainty surrounding those estimates. Results of exposure and toxicity assessments are combined to provide numerical estimates of health risk. These estimates are comparisons of exposure levels with appropriate RfDo's or estimates of the lifetime cancer risk with a given intake.

To obtain numerical estimates of lifetime excess cancer risk (LECR), the following calculations were used:

$$\text{RISK} = \text{Intake} \times \text{SF}$$

where:

Risk	=	Potential LECR (unitless)
SF	=	Slope factor, for chemicals $(mg/kg/day)^{-1}$, or radionuclides $(pCi)^{-1}$
Intake	=	Chemical (mg/kg/day), or radionuclide intake (pCi)

Cancer risks were summed separately across all potential chemical carcinogens and across all radionuclides considered in the risk assessment using the following equation:

$$\text{RISK}_T = \sum \text{RISK}_i$$

where:

RISK_T	=	Total cancer risk, expressed as a unitless probability
RISK_i	=	Risk estimate for the i^{th} contaminant

This equation is an approximation of the precise equation for combining risks to account for the probability of the same individual developing cancer as a consequence of exposure to two or more carcinogens. As stated in RAGS, the difference between the precise equation and this approximation is negligible for total cancer risks less than 0.1[32]. This risk summation assumes independence of action by the compounds involved.

Health risks associated with chronic exposure to individual noncarcinogenic compounds were evaluated by calculating hazard quotients. The non-cancer hazard quotient is the ratio of the intake rate to the RfDo, as follows:

$$HQ = INTAKE/RfDo$$

where:

HQ	=	Non-cancer hazard quotient
Intake	=	Chemical intake (mg/kg/day)
RfDo	=	Oral reference dose (mg/kg/day)

The hazard index (HI) for the sum of multiple chemicals is calculated using the following equation:

$$HI = \sum \frac{E_i}{RfDo_i}$$

where:

HI	=	Hazard index
E_i	=	Exposure level (intake) for the i^{th} toxicant
$RfDo_i$	=	Reference dose for the i^{th} toxicant

If the HQ or HI exceeds 1, there may be concern for potential health effects. However, it is important to note that the level of concern associated with exposure does not increase linearly as HQ or HI values exceed 1. For example, HQ = 10 is not ten times more likely to have adverse effects than an HQ of 1.

In addition to calculating cancer risks for the radionuclides, the committed effective dose rate was calculated for comparison to limits specified in DOE requirements. DOE Order 5400.5, "Radiation Protection of the Public and Environment" sets the limit of 100 mrem as the committed dose equivalent received in one year by a member of the public from all DOE activities. For the purpose of comparison with this DOE limit, the committed effective dose rate was calculated by multiplying the daily intake values (pCi/day) by the radionuclide-specific dose conversion factors (mrem/pCi) and 365 days/year to obtain a committed effective dose rate (mrem/year). The dose conversion factors were taken from Table 2.2 "Exposure-to-Dose Conversion Factors for Ingestion," listed in the EPA document Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion[34]. These radionuclide-specific terms were then summed to obtain each site total committed effective dose rate equivalent that was compared to the DOE limit of 100 mrem/year.

2.5.4.2 Discussion of Results of Risk Characterization by Site

The following subsections provide the results of the risk characterization by site. Tables D-2.1 through D-2.8 present the cumulative cancer risks from the COCs and their relative percent contributions to the total cancer risk. The tables also present the total HIs for noncarcinogens for each site.

For Site 1, the total cancer risk from radionuclides is 2.6×10^{-6}, which is at the lower end of EPA's acceptable risk range of 1×10^{-6} to 1×10^{-4} defined LECR. The Committed Effective Dose Rate Equivalent for all radionuclides at this intake is 2 mrem/year which is well under the DOE limit of 100 mrem/year for dose to the off-site individual. Uranium-238 dominates the cancer risk contributing 66 percent of the total risk. The total HI for the non-cancer risks associated with radionuclides was 0.02 or well below the HI of 1. The total LECR for non-radionuclides at Site 1 was 4.9×10^{-6} which is at the lower end of the EPA acceptable risk region.

2.5.4.2.1 Site 1 - Ponds A-1 and A-2 Risk Characterization

For Site 1, the total cancer risk from radionuclides is 2.6×10^{-6}, which is at the lower end of EPA's acceptable risk range of 1×10^{-6} to 1×10^{-4}, defined LECR. The Committed Effective Dose Rate Equivalent for all radionuclides at this intakes is 2 mrem/year which is well under the DOE limit of 100 mrem/year for dose to the off-site individual. Uranium-238 dominates the cancer risk contributing 66 percent of the total risk. The total HI for the non-cancer risks associated with non-radionuclides was 0.02 or about 50 times below the HI of 1. The total LECR for non-radionuclides at Site 1 was 4.9×10^{-6} which is at the lower end of the EPA acceptable risk region.

2.5.4.2.2 Site 2 - Ponds A-3 and A-4 Risk Characterization

For Site 2, the total cancer risk from radionuclides is 8.3×10^{-7}, which is below the lower end of EPA's acceptable risk range of 1×10^{-6} LECR. The Committed Effective Dose Rate Equivalent for all radionuclides at this intake is 0.67 mrem/year which is well under the DOE limit of 100 mrem/year for dose to the off-site individual. Again, uranium-238 dominates the cancer risk contributing 65 percent of the total risk. The total HI for the non-cancer risks was 0.04, well below the HI of 1. An LECR of 4.4×10^{-6} was calculated for non-radionuclides at Site 2. This level is also within the EPA acceptable range.

2.5.4.2.3 Site 3 - Ponds B-1 and B-2 Risk Characterization

For Site 3, the total cancer risk from radionuclides is $1.0x10^{6}$, which is at the lower end of EPA's acceptable risk range of $1x10^{-6}$ LECR. The Committed Effective Dose Rate Equivalent for all radionuclides at this intake is 0.94 mrem/year which is well under the DOE limit. Uranium-233, -234 and -238 dominate the cancer risk, contributing 70 percent of the total risk. The total HI for the non-cancer risks was 0.54, or about half the HI of 1. Acetone drives the non-cancer risk with an individual HQ of 0.43. An LECR of $1.4x10^{5}$ was calculated from the non-radionuclides at Site 3. This value is in the central region of the EPA acceptable range of 1E-6 to 1E-5. Vinyl chloride drives the risk contributing 66 percent of the total.

2.5.4.2.4 Site 4 - Pond B-3 Risk Characterization

For Site 4, the total cancer risk from radionuclides is $2.7x10^{7}$, which is below the lower end of EPA's acceptable risk range of $1x10^{-6}$ LECR. The Committed Effective Dose Rate Equivalent for all radionuclides at this intake is 0.27 mrem/year which is well under the DOE limit. Americium-241 and plutonium-239/240 dominate the risk with a 65 percent and 35 percent risk contribution, respectively. The total HI for the non-cancer risks was 0.012 or about 100 times below the HI of 1. The LECR for non-radionuclides was calculated at $9.9x10^{7}$ which is near $1x10^{-6}$ the lower end of the EPA acceptable risk range.

2.5.4.2.5 Site 5 - Ponds B-4 and B-5 Risk Characterization

For Site 5, the total cancer risk from radionuclides is $6.4x10^{7}$, which is below the lower end of EPA's acceptable risk range of $1x10^{-6}$ LECR. The Committed Effective Dose Rate Equivalent for all radionuclides at this intake is 0.42 mrem/year which is well under the DOE limit. Tritium contributes 26 percent of the total risk with isotopes of uranium contributing most of the remaining 75 percent of the total risk. The total HI for the non-cancer risks was 0.058 or about 15 times less than the HI of 1. An LECR of $7.5x10^{-6}$ was calculated for the non-radionuclides. This volume is well within the EPA acceptable risk range.

2.5.4.2.6 Site 6 - Pond C-1 Risk Characterization

For Site 6, the total cancer risk from radionuclides is $5.1x10^{7}$, which is below the lower end of EPA's acceptable risk range of $1x10^{-6}$. The Committed Effective Dose Rate Equivalent for all radionuclides at this intake was 0.45 mrem/year which is well under the DOE limit. Isotopes of uranium (uranium 233, 234, 235 and 238) dominate the risk, accounting for 95 percent of the total cancer risk. The total HI for the non-cancer risks was 0.06 or about 17 times less than the HI of 1. The LECR for the non-radionuclide was not calculated since the only COCs identified do not have cancer slope factors gives the references.

2.5.4.2.7 Site 7 - Pond C-2 Risk Characterization

For Site 7, the total cancer risk from radionuclides is 8.9×10^{-7}, which is below EPA's acceptable risk range of 1×10^{-6} LECR. The Committed Effective Dose Rate Equivalent for all radionuclides at this intake is 0.74 mrem/year which is well under the DOE limit. Uranium-238 dominates the cancer risk contributing 61 percent of the total. The total HI for the non-cancer risks was 0.07, much less than the HI of 1. The LECR of 8.5×10^{-6} for non-radionuclides was also within the EPA acceptable risk range.

2.5.4.2.8 Site 8 - Landfill Pond Risk Characterization

For Site 8, the total cancer risk from radionuclides is 9.1×10^{-7}, which is below the acceptable risk range limit for EPA Region VIII of 1×10^{-6} LECR. The Committed Effective Dose Rate Equivalent for all radionuclides at this intake is 0.174 mrem/year which is well under the DOE limit. Tritium contributes 48 percent of the total risk with strontium-89/90 contributing 50 percent of the total risk.

The total HI calculated for the non-cancer risks is 11.0 or about 10 times more than the HI of 1. The contaminant responsible for the elevated HI is manganese. The UCL for the mean concentration of 1735 μg/L manganese in the Landfill Pond results in a daily intake that is one order of magnitude above the RfDo for manganese. Other metals that are slightly elevated are vanadium (HQ = 0.2) and zinc (HQ = 0.37). From the human health perspective, based on a future on-site residential scenario, only manganese occurs above acceptable levels in the Landfill Pond. An LECR of 1.5×10^{-5} for non-radionuclides was calculated. This value is in the acceptable EPA risk range.

2.5.5 Existing Risk Assessments (ChemRisk)

As a result of mandates and funding provided for under the AIP, CDH initiated Phase I of health studies for RFP, namely the Toxicological Review and Dose Reconstruction Study project being conducted by the firm of ChemRisk Corporation. The primary purpose of the project is to reconstruct doses of materials of concern received by off-site individuals as a result of RFP operations from 1952 to 1989.

Review of available surface waterborne contaminant release and environmental monitoring data indicated it was possible plant- related releases may on some occasions have measurably increased gross alpha radioactivity in receiving reservoirs. However, measured alpha levels in these reservoirs did not differ from unaffected reservoirs in the area. For tritium, some measured increases were clearly attributable to RFP. The chemicals of concern retained for transport through the surface water medium included beryllium, plutonium, americium-241 and tritium. Both direct and indirect pathways of exposure were evaluated for these contaminants and ingestion was determined to be the only viable exposure pathway through surface water. Volatile solvents known to have been released to RFP ponds were considered unlikely to be transported off-site in surface waters to any significant extent because they readily evaporate.

Task 8, which was released at the end of October 1993, calculated doses for one-year exposures to tritium, plutonium and gross alpha through water ingestion. Phase II of the Health Studies for RFP is being performed by Radiological Assessments Corporation and involves completion of the toxicity assessment and risk characterization for the studies. Radiological Assessments Corporation will also conduct an independent review of ChemRisk's process and results. Phase II is expected to be completed in late 1995.

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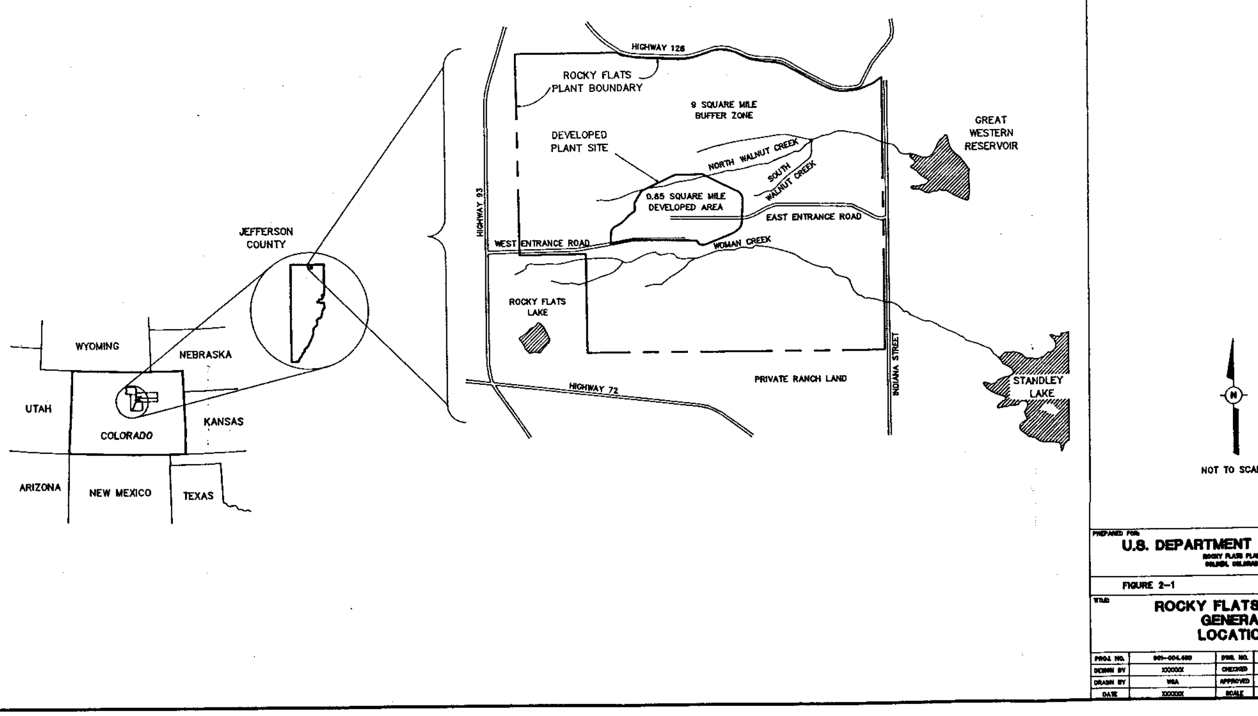

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ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 2-1

TITLE:

ROCKY FLATS PLANT GENERAL LOCATION

PROJ. NO.	901-004.400	DWG. NO.	XXXXXX	SHEET
DESIGN BY	XXXXXX	CHECKED	XXXXXX	
DRAWN BY	WSA	APPROVED	XXXXXX	OF
DATE	XXXXXX	SCALE	XXXXXX	

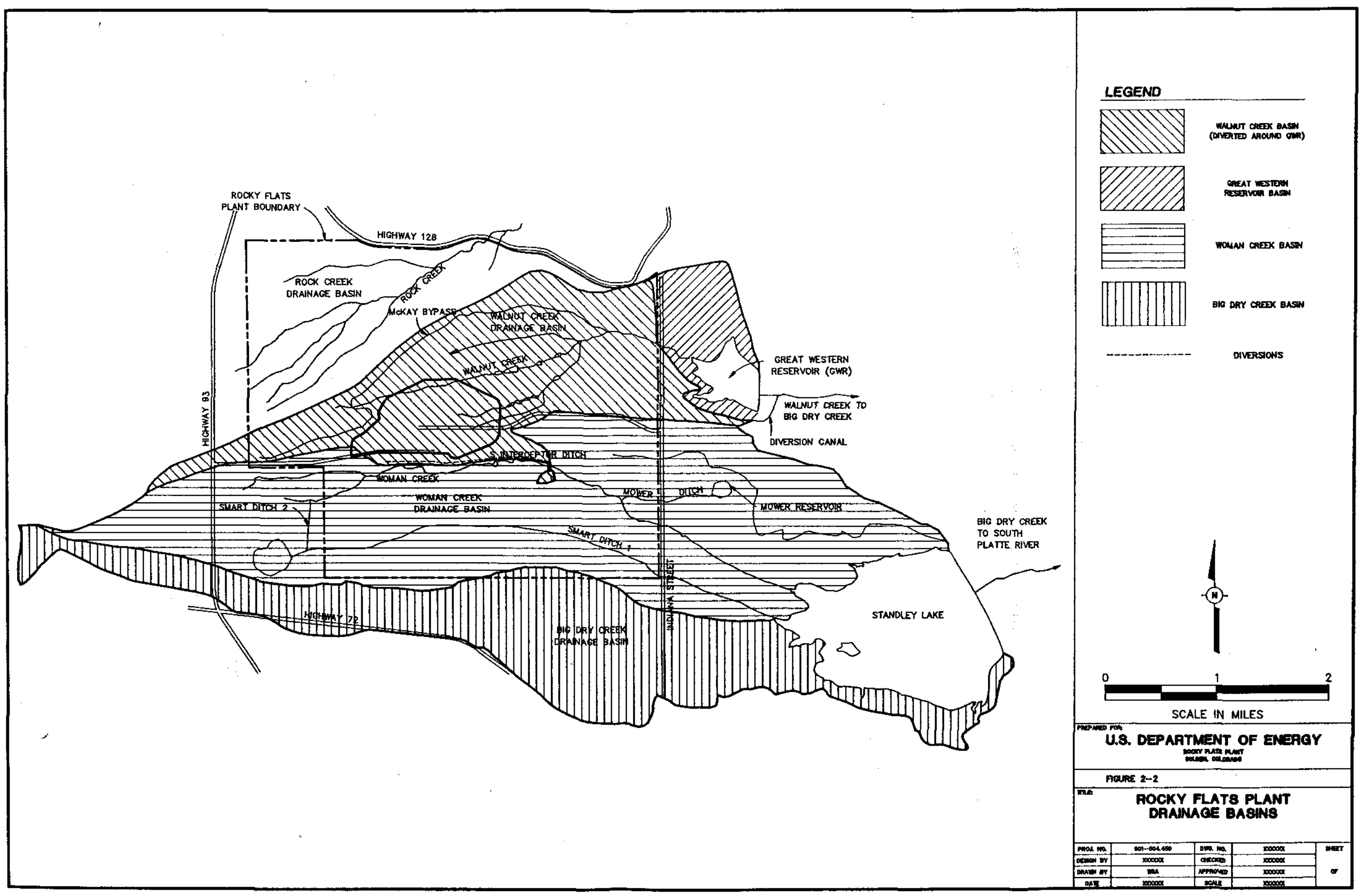
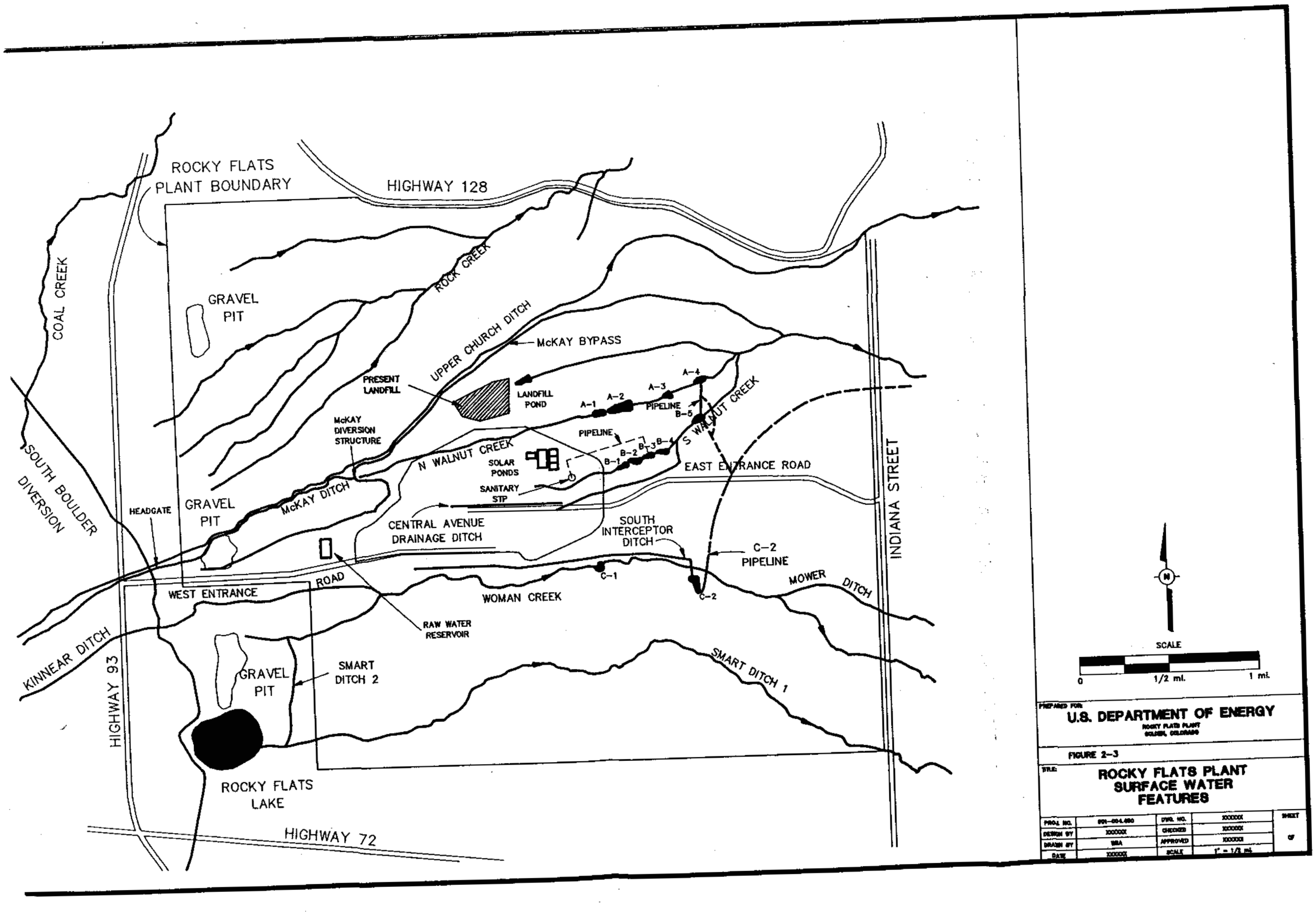
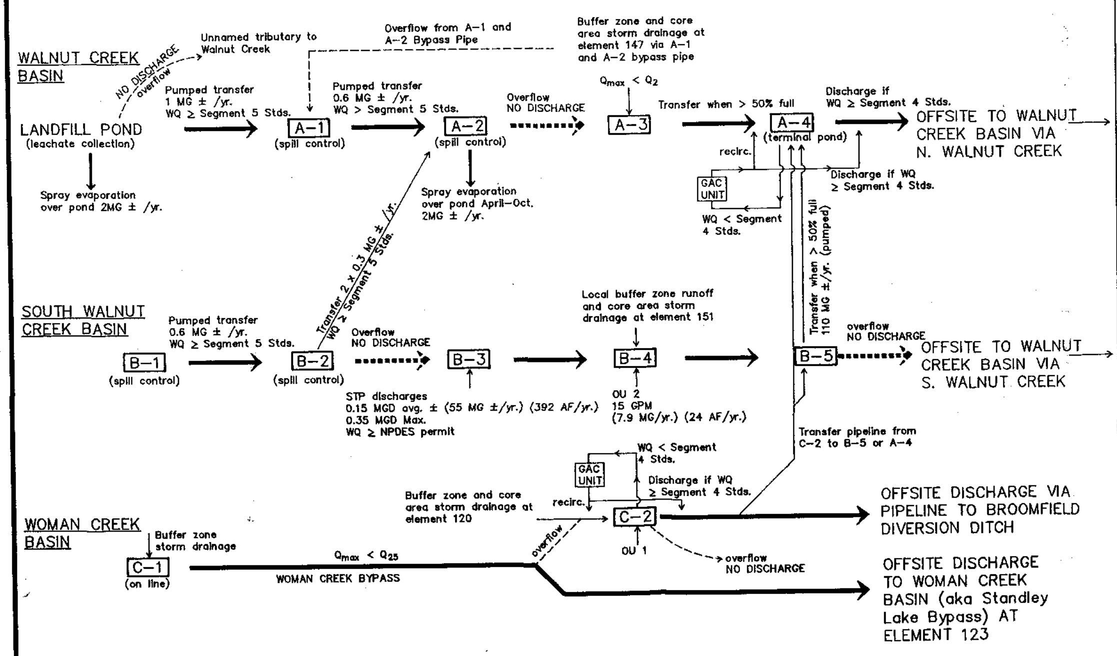


FIGURE 2-2

ROCKY FLATS PLANT DRAINAGE BASINS


ROCKY FLATS
PLANT BOUNDARY
HIGHWAY 128
COAL CREEK
GRAVEL
PIT
ROCK CREEK
UPPER CHURCH DITCH
McKAY BYPASS
PRESENT
LANDFILL
LANDFILL
POND
A-1
A-2
A-3
A-4
PIPELINE
B-5
S WALNUT CREEK
McKAY
DIVERSION
STRUCTURE
PIPELINE
B-1
B-2
B-3
B-4
N WALNUT CREEK
SOLAR
PONDS
SANITARY
STP
EAST ENTRANCE ROAD
INDIANA STREET
SOUTH BOULDER
DIVERSION
HEADGATE
GRAVEL
PIT
McKAY DITCH
CENTRAL AVENUE
DRAINAGE DITCH
SOUTH
INTERCEPTOR
DITCH
C-2
PIPELINE
C-1
C-2
MOWER
DITCH
WEST ENTRANCE
ROAD
WOMAN CREEK
RAW WATER
RESERVOIR
KINNEAR DITCH
HIGHWAY 93
GRAVEL
PIT
SMART
DITCH 2
SMART DITCH 1
ROCKY FLATS
LAKE
HIGHWAY 72
N
SCALE
0
1/2 mi.
1 mi.
U.S. DEPARTMENT OF ENERGY
FIGURE 2-3
ROCKY FLATS PLANT
SURFACE WATER
FEATURES



Note: "WQ ≥" indicates water quality meets standard.

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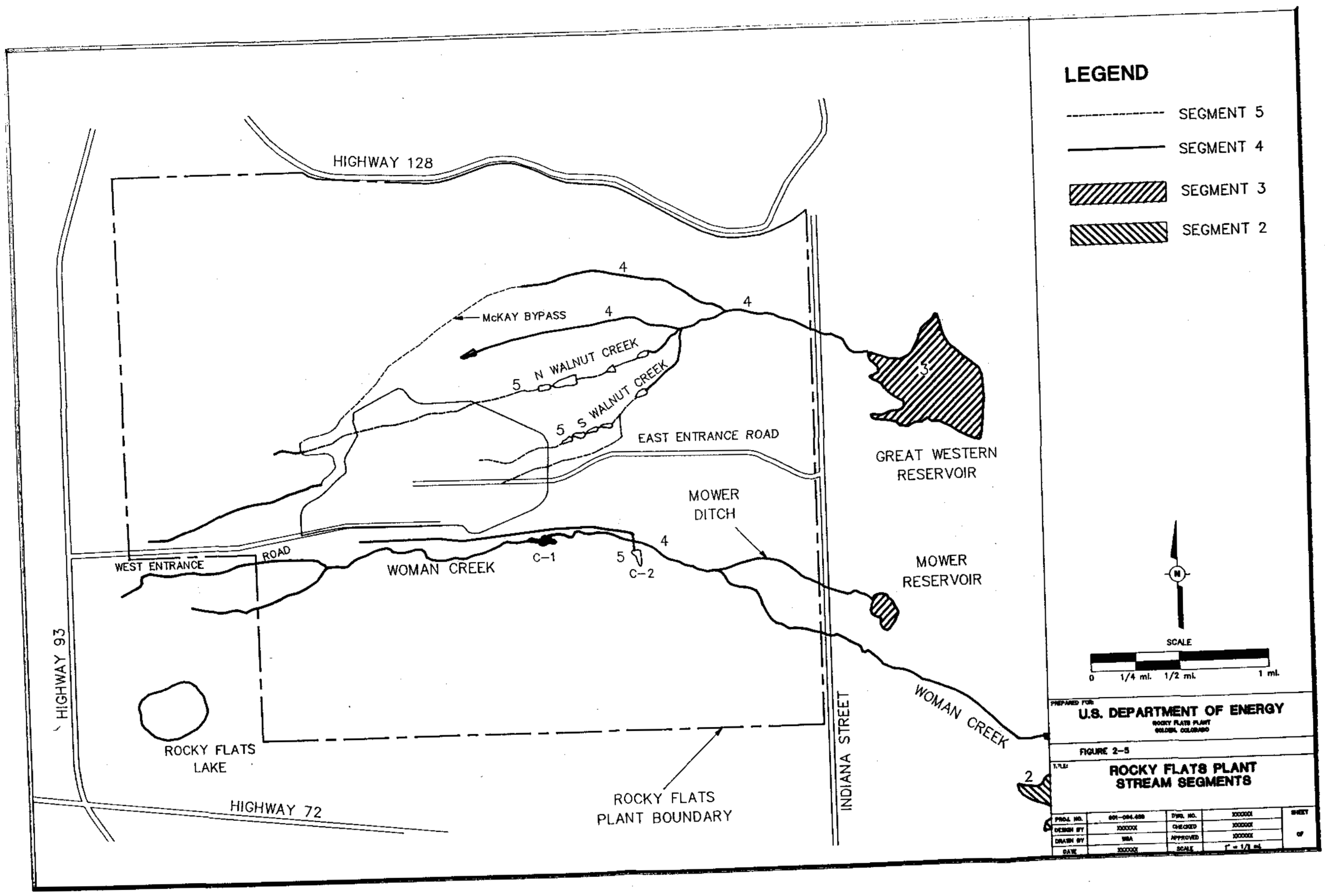
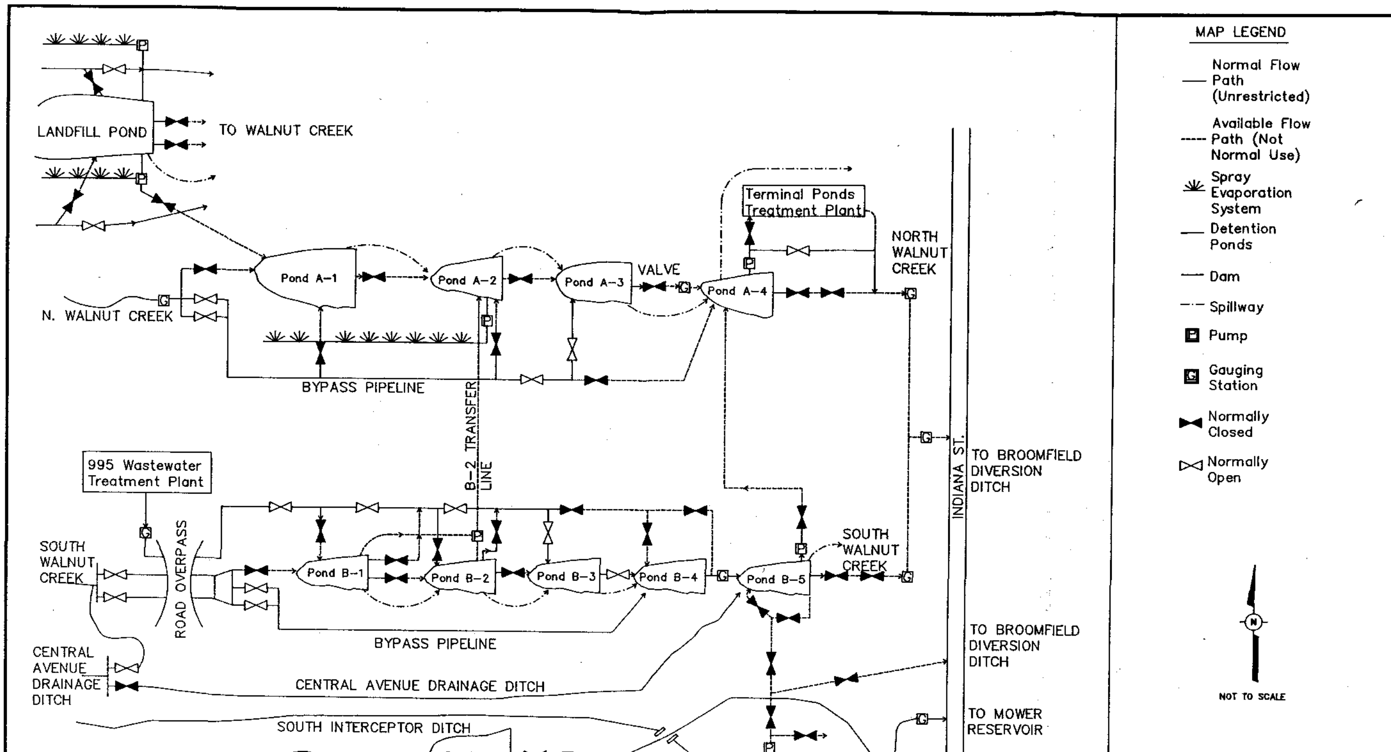
ROCKY FLATS PLANT GOLDEN, COLORADO

FIGURE 2-4

ROCKY FLATS PLANT MASS BALANCE ROUTING SCHEMATIC



LEGEND
SEGMENT 5
SEGMENT 4
SEGMENT 3
SEGMENT 2
HIGHWAY 128
McKAY BYPASS
4
4
4
N WALNUT CREEK
5
S WALNUT CREEK
5
EAST ENTRANCE ROAD
3
GREAT WESTERN RESERVOIR
MOWER DITCH
MOWER RESERVOIR
WEST ENTRANCE
ROAD
WOMAN CREEK
C-1
5
C-2
4
HIGHWAY 93
ROCKY FLATS LAKE
HIGHWAY 72
ROCKY FLATS PLANT BOUNDARY
INDIANA STREET
WOMAN CREEK
2
SCALE
0
1/4 mi.
1/2 mi.
1 mi.
N
U.S. DEPARTMENT OF ENERGY
FIGURE 2-5
ROCKY FLATS PLANT STREAM SEGMENTS



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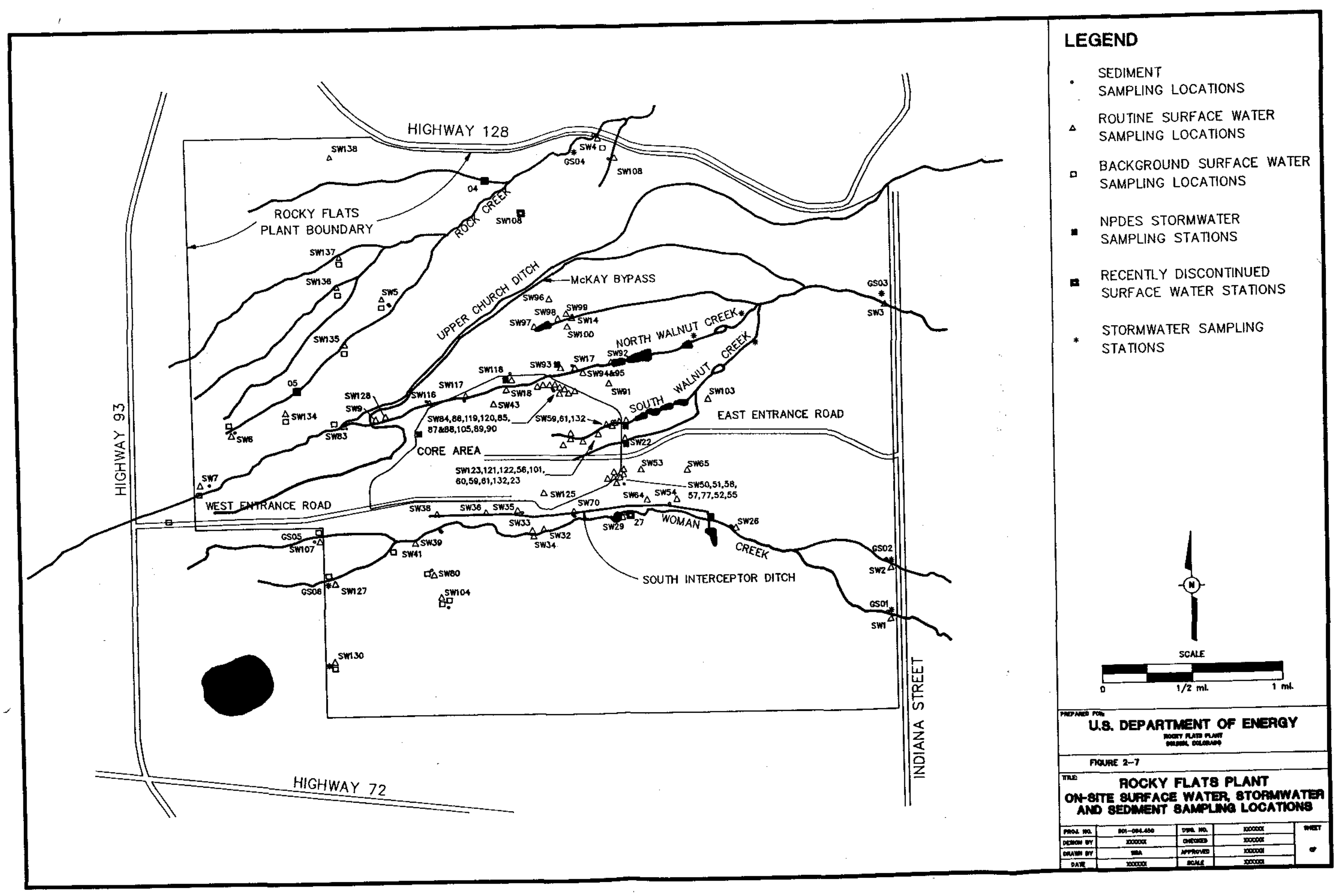
ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 2-6

TITLE:

ROCKY FLATS PLANT
A-, B-, AND C- SERIES PONDS
AND LANDFILL POND SCHEMATIC

PROJ. NO.	601-004.450	DWG. NO.	XXXXXX	SHEET
DESIGN BY	XXXXXX	CHECKED	XXXXXX	
DRAWN BY	WSA	APPROVED	XXXXXX	OF
DATE	XXXXXX	SCALE	XXXXXX	


LEGEND
SEDIMENT SAMPLING LOCATIONS
ROUTINE SURFACE WATER SAMPLING LOCATIONS
BACKGROUND SURFACE WATER SAMPLING LOCATIONS
NPDES STORMWATER SAMPLING STATIONS
RECENTLY DISCONTINUED SURFACE WATER STATIONS
STORMWATER SAMPLING STATIONS
HIGHWAY 128
HIGHWAY 93
HIGHWAY 72
INDIANA STREET
ROCKY FLATS PLANT BOUNDARY
ROCK CREEK
UPPER CHURCH DITCH
McKAY BYPASS
NORTH WALNUT CREEK
SOUTH WALNUT CREEK
EAST ENTRANCE ROAD
WEST ENTRANCE ROAD
CORE AREA
WOMAN CREEK
SOUTH INTERCEPTOR DITCH
SW84,86,119,120,85, 87&88,105,89,90
SW59,61,132
SW123,121,122,56,101, 60,59,61,132,23
SW50,51,58, 57,77,52,55
SCALE
0
1/2 mi.
1 mi.
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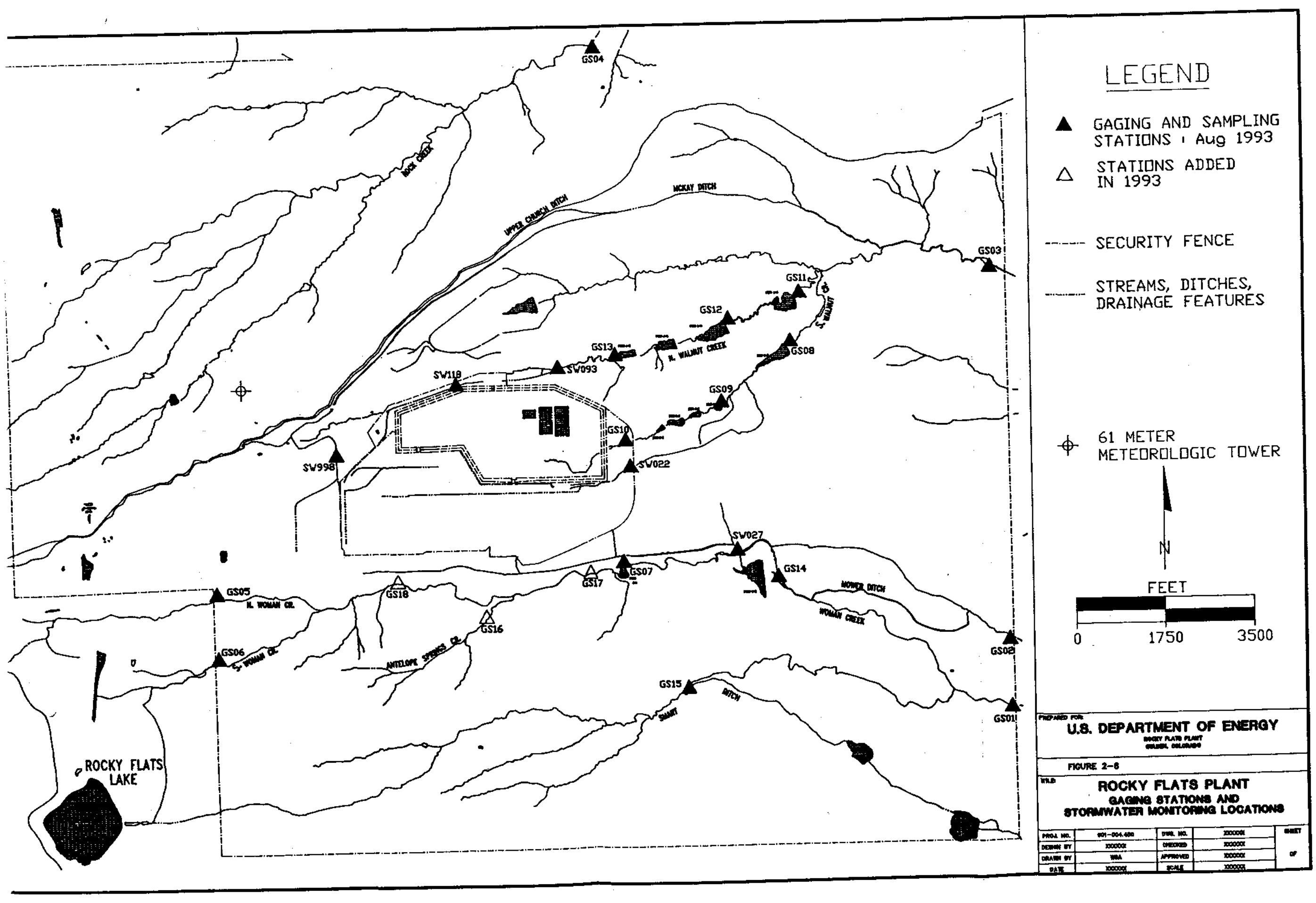
U.S. DEPARTMENT OF ENERGY
FIGURE 2-7
TITLE:
ROCKY FLATS PLANT
ON-SITE SURFACE WATER, STORMWATER AND SEDIMENT SAMPLING LOCATIONS


LEGEND
GAGING AND SAMPLING STATIONS : Aug 1993
STATIONS ADDED IN 1993
SECURITY FENCE
STREAMS, DITCHES, DRAINAGE FEATURES
61 METER METEOROLOGIC TOWER
N
FEET
0
1750
3500
GS04
GS03
GS11
GS12
GS13
SW093
GS08
SW118
GS09
GS10
SW022
SW998
SW027
GS14
GS05
GS18
GS17
GS07
GS16
GS06
GS02
GS15
GS01
ROCKY FLATS LAKE
UPPER CHURCH DITCH
MCKAY DITCH
N. WALNUT CREEK
N. WOMAN CR.
S. WOMAN CR.
ANTELOPE SPRINGS CR.
MOWER DITCH
WOMAN CREEK
PREPARED FOR:
U.S. DEPARTMENT OF ENERGY
FIGURE 2-6
ROCKY FLATS PLANT
GAGING STATIONS AND STORMWATER MONITORING LOCATIONS

CHAPTER 3
IDENTIFICATION AND ANALYSIS OF POTENTIAL BENCHMARKS

CHAPTER 3
IDENTIFICATION AND ANALYSIS OF POTENTIAL BENCHMARKS

3.1 INTRODUCTION

This chapter identifies chemical-, action- and location-specific benchmarks that are applicable or relevant and appropriate requirements for pond water management. The identification, analysis and selection of benchmarks for the management of Rocky Flats Plant (RFP) pond water ensures appropriate benchmarks have been chosen given the specific chemicals, management options and locations at which actions may be taken. Compliance with benchmarks selected in this document will be protective of human health and the environment, a primary objective of this Interim Measures/Interim Remedial Action (IM/IRA) Decision Document.

The benchmarks ultimately selected as part of this IM/IRA Decision Document per the IM/IRA Record of Decision (ROD) will establish enforceable requirements for pond water management and will replace the National Pollutant Discharge Elimination System (NPDES) requirements that have governed discharges from the RFP ponds for the last 9 years. By regulating the ponds through the IM/IRA process, the point and scope of compliance with enforceable standards will be changed from the discrete outfalls under the current NPDES permit to include ambient pond water in each individual pond. This change in approach will shift focus of the discharge monitoring requirements from gross parameters such as pH, Biological Oxygen Demand (BOD) and Carbonaceous Biochemical Oxygen Demand (CBOD) to a wider range of specific analytes, particularly metals, radionuclides and organics.

3.1.1 Benchmarks - Definition and Purpose

Section 121(d)(2) of the Comprehensive Environmental Response, Compensation and Liability Act[1] (CERCLA), as amended by the Superfund Amendments and Reauthorization Act[2] (SARA) requires that remedial actions comply with applicable or relevant and appropriate promulgated numeric standards, performance criteria, or other substantive requirements under other federal and state environmental laws.

Benchmarks can be chemical-specific, action-specific and/or location-specific. Each of these categories is discussed in more detail below. Any one remedial action may trigger chemical-specific, action-specific and/or location-specific requirements. Therefore, both the chemicals of concern and the potential remedial actions must be considered to determine the complete set of appropriate benchmarks.

3.1.2 Benchmarks Related to Pond Water Management Options

This chapter identifies and analyzes potential benchmarks pertinent to this IM/IRA Decision Document. These benchmarks will be associated with the specific Contaminants of Concern (COCs) identified in any pond and all potential pond water management operations, including discharges from upstream ponds to downstream ponds, other pond transfers, off-site discharges to Segment 4, and volume reduction methods such as spray evaporation or recycling.

3.2 POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS

3.2.1 Site-wide Benchmarks

Chemical-specific requirements set health- or risk-based concentration limits in various environmental media for specific compounds. The selected chemical-specific benchmarks will become the enforceable numeric standards for ambient pond-water quality, pond-water transfers, and off-site discharges. The site-wide compliance criteria supplied by EG&G (Benchmark Tables E-1.A through E-1.E of Appendix E) are a preliminary tool to be used in identifying and selecting proposed benchmarks. The tables were designed for site-wide application in accordance with the Interagency Agreement (IAG) and are current as of December 16, 1992. The tables identify preliminary chemical-specific benchmarks based on promulgated federal and state requirements, standards or criteria for groundwater, surface water, soil and air. The numeric standards come from the Safe Drinking Water Act (SDWA), the Clean Water Act (CWA) and statewide Colorado Water Quality Control Commission (CWQCC) standards under the Colorado Water Quality Control Act. It is important to note these site-wide benchmark tables are a starting point and do not identify all or the most current potential benchmarks developed under state laws and considered for this IM/IRA Decision Document. For example, temporary modifications to the CWQCC Segment 5 stream standards are not included in the Site-wide Benchmark tables but are clearly standards that must be evaluated. These standards are discussed in Section 3.2.4.

3.2.2 Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs)

MCLs are derived from the SDWA[3] and represent the maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet of a public water system (40 CFR 141.2[c][4]). They are enforceable standards that must be met at the tap of a publicly supplied water source. In accordance with Section 121(d)(2) of CERCLA[1], MCLGs have also been identified as potential benchmarks. MCLGs are unenforceable goals that are established at levels at which no known or anticipated adverse effects on human health will occur. While not applicable to the pond water, MCLs and MCLGs are potentially relevant and appropriate benchmarks for surface water that is currently or may in the future be a source of drinking water or tributary to a potential source of drinking water.

3.2.3 Ambient Water Quality Criteria (AWQC)

The AWQC developed under the CWA Section 304[5], like MCLGs, are unenforceable guidelines. They are used by states to establish water quality standards for surface water to protect aquatic life and human health (based on consumption of drinking water and fish). This IM/IRA involves discharge to surface water that has state use-protected designations of Aquatic Life Class II Warm Water, Water Supply, Recreation II and Agriculture. Although not applicable to the surface water at RFP, the AWQC may be considered relevant and appropriate if no other health-based standard exists.

3.2.4 Colorado Surface and Groundwater Quality Standards

As discussed in Section 2.2.2.2, surface water quality standards have been adopted by CWQCC for Segments 4 and 5. The standards for organic and inorganic substances and radionuclides are listed in Appendix A. The CWQCC has also established Basic Standards for Surface Water for discharges to water for which no site-specific standards have been established. These standards vary based on the classifications. Classifications of the stream segment include water supply, aquatic life and agriculture. For a constituent which has neither a site-specific nor a statewide standard, the "free from toxics" narrative standard is to be applied[6]. This narrative standard is to be interpreted and applied in accordance with Section 3.12.7(1)(c)(iv)[7] which requires regulating agencies to consider the existing and probable future beneficial uses of the water. According to CWQCC staff, this narrative would likely be interpreted by applying best engineering judgement to the control of the compound and would be negotiated by the relevant parties[8]. Lastly, CWQCC state-wide and site-specific standards for the protection of state groundwater may be relevant and appropriate for compounds without surface water standards, particularly if these groundwater standards were set to protect surface water.

3.2.5 RCRA MCLs

Owners or operators of facilities that treat, store, or dispose of hazardous waste must ensure that the hazardous constituents entering groundwater from a regulated unit do not exceed the concentration limits set forth in 6 CCR 1007-3[9] and 40 CFR 264.94[10] at the point of compliance in the uppermost aquifer. The concentration limits include 14 compounds (equivalent to and a subset of SDWA MCLs) and are identified in Table 1 of 40 CFR Part 264.94[10]. Background or Alternate Concentration Limits (ACLs) are to be used as the standards for the other RCRA 40 CFR Part 261[10] Appendix VIII constituents or 40 CFR Part 264[10] Appendix IX constituents. These concentration limits apply to RCRA "regulated units" subject to permitting (as defined in 40 CFR 264.90 including landfills, surface impoundments, waste piles and land treatment units) that received RCRA hazardous waste after May 19, 1980[10]. These RCRA regulations are not applicable because the ponds are not RCRA regulated units. They may be relevant and appropriate because surface water in the ponds needs to be managed so that contaminant levels in recharge to groundwater do not exceed these levels.

3.2.6 Air Quality Standards

Federal and state air pollution control standards would be applicable to any new air emissions from a remedial action. The Clean Air Act[11] establishes National Ambient Air Quality Standards (NAAQS) and National Emission Standards for Hazardous Air Pollutants (NESHAPs) for a very limited number of constituents. The majority of air quality limits are set by the Colorado Air Quality Control Commission (CAQCC). These regulations are summarized in Table E-2 in Appendix E. On-site remedial actions conducted under CERCLA jurisdiction do not require air quality permits, but the substantive requirements, i.e., emission limits, emission control technologies, and monitoring and reporting activities, must be met. Additionally, an Air Pollution Emission Notice (APEN) must be filed for each source that meets the description in CAQCC Regulation #3.

The new air emissions from CERCLA activities must be added to existing air emissions for the entire plant site to determine whether a threshold will be exceeded. Of particular concern are the total suspended particulates (TSP), PM-10 (particulate matter less than 10 microns in size), and NOx (nitrogen oxide) emissions from new diesel-fueled generators and water pumps. The use of a new generator to pump water may be limited if the addition of existing RFP plant site TSP, PM-10 or NOx emissions to the proposed IM/IRA emissions exceeds the threshold values.

3.3 POTENTIAL LOCATION-SPECIFIC REQUIREMENTS

Location-specific benchmarks are restrictions placed on the concentrations of hazardous substances or activities solely because of location. Some examples of special locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats. An example of a location-specific requirement is the CWA Section 404 requiring a permit for the discharge of dredged or fill material into wetlands. A summary of potential location-specific benchmarks from major state and federal environmental laws is presented in Table E-3, Appendix E.

3.4 POTENTIAL ACTION-SPECIFIC REQUIREMENTS

Performance, design and other action-specific requirements set controls or restrictions on the particular activities related to the management of hazardous substances or pollutants. These requirements are not triggered by the specific chemicals at the site, but rather by the proposed actions under the IM/IRA process. Action-specific benchmarks are technology- or activity-based requirements, such as Best Available Technology (BAT) citations of the Federal Water Pollution Control Act, or limitations on actions taken with respect to defined hazardous wastes. These requirements are triggered by particular remedial activities. Because there are usually several alternate actions for any remedial site, a variety of requirements may be applicable or relevant and appropriate. The potential action-specific requirements indicate how a remedial alternative can be achieved.

Table E-4 in Appendix E provides a matrix of potential action-specific requirements established under RCRA and CWA. RCRA sets forth action-specific requirements for material defined as hazardous waste under 40 CFR 261[10]. A defined hazardous waste, thought to have entered the Landfill Pond, is the listed F039 waste. F039 waste is defined as multi-source leachate from a hazardous waste unit, which is derived from the treatment, storage or disposal of more than one of the restricted wastes characterized as hazardous under 40 CFR 261 Subpart D[10]. As a defined hazardous waste, F039 leachate is subject to RCRA requirements and must be managed as hazardous waste.

Through the "contained-in" rule, the Environmental Protection Agency (EPA) and the Colorado Department of Health (CDH) have included in the definition of hazardous waste, media (such as groundwater, surface water and sediment) that contains a listed or characteristic hazardous waste. The contained-in policy requires that environmental media contaminated with a listed or characteristic hazardous waste be managed as a hazardous waste "until it no longer contains the waste." Thus, pond water containing a hazardous waste must be managed under RCRA requirements. EPA has not issued any definitive guidance as to when, or at what levels a waste no longer contains a hazardous waste. Instead, the EPA regional offices and authorized states may determine the levels on a case-by-case basis[12].

A March 3, 1993 letter from CDH to DOE[13] outlines CDH's interpretation of the contained-in rule specific to the pond water addressed in the IM/IRA Decision Document. In this letter, CDH explains that it will employ either a risk assessment or existing promulgated standards in making a determination as to whether water contains hazardous waste. The risk assessment approach requires a quantitative determination that the levels of contaminants present a health risk less than 10^{-6} for carcinogenic compounds or a hazard quotient less than 1.0 for non-carcinogenic compounds. Alternatively, concentration levels can be compared to standards and can be exempt from regulation if concentrations are less than the most stringent among CWQCC water quality standards, SDWA standards (i.e., MCLs) or CWA standards (i.e., Water Quality Criteria). The memo specifically states that if contaminant levels are at or below the risk levels and/or the appropriate standards, the media is no longer a hazardous waste.

Important standards that apply to defined hazardous waste are the RCRA land disposal restrictions (LDRs) and treatment standards. The LDRs establish treatment levels that must be met prior to land disposal of a hazardous waste. (It is important to note that, even after treatment, the hazardous waste must be disposed of in a unit meeting the requirements of RCRA Subtitle C.) Restricted wastes and treatment standards are listed in Table E-5 in Appendix E. Table E-5A lists restricted wastes and the concentrations of their associated constituents that must not be exceeded *by an extract of the waste* or its treatment residual. Table E-5B identifies restricted wastes and the concentrations of their associated constituents that must not be exceeded *by the waste itself.* Table E-5 standards may be applicable or relevant and appropriate to pond water management options involving treatment and disposal of hazardous waste or environmental media (such as pond water) containing hazardous waste.

3.5 ITEMS TO BE CONSIDERED OTHER THAN BENCHMARKS

In addition to the identified and proposed benchmarks, advisories, criteria or guidance may be identified as items to be considered (TBC) for a particular action or chemical if no promulgated benchmarks exist. As defined in 40 CFR 300.400(g)(3)[14], the TBC category consists of advisories, criteria or guidance developed by EPA and other federal agencies, or states that may be useful in developing CERCLA remedies. The use of TBCs is discretionary rather than mandatory. TBCs are considered in development of chemical-specific benchmarks for this IM/IRA Decision Document for compounds without any promulgated standards.

3.6 SUMMARY OF SELECTED BENCHMARKS

3.6.1 Basis for Selection

According to 40 CFR 300.430 (e)(2)(i)[14] remediation goals at a CERCLA site should establish acceptable exposure levels that protect human health and the environment. They are to be selected by considering benchmarks, including MCLGs under the Safe Drinking Water Act and AWQC under the Clean Water Act, the potential carcinogenic and non-carcinogenic risks at the site, and technical factors such as ability to detect contaminants. The proposed benchmarks, as listed in Tables 3-1 through 3-7, were selected based on consideration of these criteria.

3.6.2 Selected Ambient- or Chemical-specific Benchmarks

The chemical-specific benchmarks selected for each pond are shown in Tables 3-1 through 3-7. The following hierarchy was used to select the appropriate benchmark:

1. Safe Drinking Water Act MCLs. These standards are relevant and appropriate based on the current water supply designation of the stream segments in which the ponds reside.

2. In the absence of MCLs, state-wide surface water standards for streams with a water supply designation were selected.

3. In the absence of state-wide surface water standards, state-wide groundwater standards were selected.

Additional detail regarding compliance with these benchmarks during pond operations and on an annual basis is provided in Section 3.7.

3.6.3 Selected Location-specific Benchmarks

Location-specific benchmarks are limits placed on the concentration of hazardous substances or the execution of activities solely based on the location of the action. These may restrict or preclude certain remedial actions or may apply only to portions of the site.

Potential location-specific benchmarks are listed in Table E-3. Selected options associated with the Pond Water Management IM/IRA Decision Document regarding collection, storage or treatment of water will be required to comply with the applicable location specific benchmarks. Locations of selected collection, storage or treatment areas will be assessed according to the pertinent regulation prior to final selection of a site. The location-specific benchmarks that will apply to the selected option are fully discussed in the impact analysis section of Chapter 5.

3.6.4 Selected Action-specific Benchmarks

Performance, design or other action-specific requirements set controls or restrictions on particular kinds of activities related to management of hazardous substances or pollutants. These requirements are not triggered by the specific chemicals present but rather the particular IM/IRA options as discussed and evaluated in Chapter 4. The selected options, as outlined in Chapter 5, will undergo analysis in Chapter 5 to determine the selected action-specific benchmarks.

Important action-specific requirements that would be triggered by each of the considered options are the RCRA 40 CFR 264 and 265 requirements for treatment, storage and disposal of a defined hazardous waste as enumerated in Table E-4. These requirements would not be applicable or relevant and appropriate to pond water that complies with the Segment 4 or 5 standards. Instead, compliance with these standards demonstrates that the water does not contain hazardous waste[15]. These standards would be applicable to waters containing hazardous waste in concentrations that exceed Segment 5 standards.

Actions associated with pond water management will also require compliance with a combination of the following action-specific benchmarks and TBCs: emergency planning, preparedness and response for operations[16]; Best Management Practices[17] (40 CFR 125.104); environmental compliance issues coordination; environmental protection safety; health protection information reporting requirements[18] and dam safety requirements.

3.7 COMPLIANCE WITH BENCHMARKS

Compliance with the selected benchmarks from Section 3.6 involves a demonstration of water quality through an appropriate sampling and analysis program, a reporting function in which water quality, flow rate and other operational information is transmitted to regulatory agencies on a regular basis, and administrative limitations are placed on operational activities. Compliance with chemical-specific benchmarks will be demonstrated either statistically, or on a point value basis, depending on whether the water quality data is generated for ambient water quality investigations, or for operational purposes. Reporting functions ensure that compliance can be evaluated by outside parties, and any potential changes to compliance requirements can be identified. Compliance with reporting requirements is demonstrated by meeting specified deadlines. Three aspects of compliance are discussed within this section. These are:

1. Operational Compliance,

2. Regulatory Compliance, and

3. Reporting.

Compliance with administrative limitations selected as location-specific, and/or action-specific benchmarks will be accomplished through SOPs, or as part of the Implementation Plan for this IM/IRA Decision Document (see Chapter 6).

3.7.1 Operational Compliance

Compliance with water quality standards used for operational purposes will be determined by comparing analytical results against point values for the selected chemical-specific benchmark. A hierarchy has been established for determining the source from which operational point values are selected. This hierarchy is described below. Only those COCs listed as applicable to a specific pond will be evaluated in determining operational compliance. Tables 3.1 through 3.7 list pond-specific COCs versus defined point values.

- For discharges to Segment 4 from Ponds A-3, A-4, B-5 or C-2, analytical results for pond-specific COCs will be compared against SDWA MCLs for those constituents for which SDWA MCLs are published. COCs for which no SDWA MCLs are listed will be compared against statewide surface water standards for Domestic Water Supply. COCs for which no state-wide Domestic Water Supply standards exist will be compared against state-wide Groundwater Quality standards. COCs for which no listed values are available from any of the above sources will be reported only. (These compounds are generally chemicals which present negligible health risk and thus have not been addressed by various regulatory authorities.)

- For transfers between ponds within Segment 5 (all ponds) and for recycle operations at Pond C-2, analytical results for pond-specific COCs will be evaluated against SDWA MCLs state-wide Domestic Water Supply standards and state-wide Groundwater Quality standards according to the same hierarchy described below for discharge operations.

- For spray evaporation operations at Ponds A-1, A-2, B-1, B-2 and the Landfill Pond, analytical results for pond-specific COCs will be evaluated against SDWA MCLs for those constituents for which SDWA MCLs have been published, with the exception of 9 parameters which may or may not be COCs at individual ponds. These 9 parameters are those which were modified by the CWQCC during standard setting for Segment 5 of Big Dry Creek, and are based on site-specific ambient conditions. For these 9 parameters, Segment 5 point values are adopted.

  COCs for which no SDWA MCLs or modified Segment 5 values are listed will be evaluated against Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards according to the same hierarchy listed above for discharge operations.

Compliance is assumed, and operations will be conducted if analytical results are equal to or less than the defined point value. Values from a single analysis exceeding the defined point value are not necessarily assumed to be out of compliance. Minor exceedances of certain parameters may be allowable, and will be determined on a case-by-case basis by evaluating historic water quality fluctuations against the measured value. Measured values less than 2 standard deviations greater than the defined point value (based on historic values) will be evaluated as normal fluctuations for which no additional actions (i.e., treatment) are required. Measured values greater than 2 standard deviations higher than the defined point value will be assumed to be out-of-compliance, and will require treatment.

3.7.2 Regulatory Compliance

With the exception of the Landfill Pond, for which no stream segment classification has been made, all ponds under consideration within this IM/IRA Decision Document reside within Segment 5 of Big Dry Creek. Compliance with Segment 5 ambient water quality requirements will be determined on an annual basis by a statistical evaluation of all in-pond samples from all ponds, including the Landfill Pond, on a parameter-by-parameter basis. Compliance with Segment 5 values will be determined by taking the 85th percentile of these samples and comparing this number to the Segment 5 value. This method of determining compliance with Segment 5 standards is consistent with the way in which Segment 5 standards were originally established. Prior to setting Segment 5 standards, CWQCC reviewed historic site-specific water quality data and chose 85th percentile values for comparison purposes. This document adopts the same strategy. Any parameter not in compliance with Segment 5 values will be evaluated for future listing as a new COC (if not already listed) or for modification in future standards setting hearings. In addition, investigations into the possible source of the contaminant and potential remediation efforts will be initiated.

Discharge water quality will be determined on an annual basis by a statistical evaluation of all samples taken during discharges from Ponds A-3, A-4, B-5 and C-2. Compliance with Segment 4 standards will be determined by taking the 85th percentile of these samples and comparing this number on a parameter-by-parameter basis to the Segment 4 values. Any parameter not in compliance with Segment 4 values will be evaluated for future listing as a new COC (if not already listed) or for modification in future standards setting hearings. In addition, investigations into the possible source of the contaminant and potential remediation efforts will be initiated.

3.7.3 Reporting

An annual water quality compliance report will be generated listing the results of annual and quarterly sampling efforts (see Section 5.1.6) and the compliance evaluations for Segment 5 and Segment 4 standards described above. This report will be delivered to regulatory agencies in fulfillment of regulatory reporting requirements. A summary of operational data, including flows, total volumes, operations conducted, and non-routine occurrences, if any, will also be provided on an annual basis.

Non-routine occurrences will also be reported at the time of the event through the existing Occurrence Notification process. Other regulatory reporting required by existing agreements and procedures include Discharge Monitoring Reports under the NPDES permit, bio-monitoring results under the NPDES-Federal Facilities Compliance Agreement and discharge notifications by agreement with CDH.

REFERENCES

[1] Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 1980, 42 USC, §§ 9601-9675 (CERCLA §§ 101-405). Supplemented 1988.

[2] Superfund Amendments and Reauthorization Act of 1986 (SARA), 1986, Public Law 99-499, October 17, 1986.

[3] Safe Drinking Water Act, 1974, Title 42 USC, §§ 300f-300j-26 (PHSA §§ 1401-1465). Supplemented 1976, 1977, and 1986.

[4] Code of Federal Regulations, 1992, National Primary Drinking Water Regulations, 40 CFR Part 141.

[5] Federal Water Pollution Control Act, 1988, Commonly Called the "Clean Water Act", 33 USC, §§ 1251-1387 (FWPCA §§ 101-607).

[6] Colorado Department of Health - Water Quality Control Commission, 1993, The Basic Standards and Methodologies for Surface Water.

[7] Colorado Department of Health - Water Quality Control Commission, 1993 Classifications and Water Quality Standards for Ground Water 3.12.0.

[8] Anderson, Dennis, 1993, Telephone Conservation with Dennis Anderson of the Colorado Department of Health, Water Quality Control Division, October 7, 1993.

[9] Colorado Department of Health - Hazardous Materials and Waste Management, 1992, Colorado Hazardous Waste Regulations. 6 CCR 1007-3.

[10] Code of Federal Regulations, 1992, Subchapter I - Solid Wastes, 40 CFR Parts 240 through 281.

[11] Clean Air Act (CAA), 1988, 42 USC, §§ 7401-7671q (CAA §§ 101-618). Supplemented 1990.

[12] Federal Register, 1991, Land Disposal Restrictions; Potential Treatment Standards for Newly Identified and Listed Wastes and Contaminated Debris, Volume 56, No. 104, Pages 24444-24465, May 30.

[13] Colorado Department of Health, 1993, "Pond Water Management IM/IRA Information." Letter to Richard J. Schassburger of the U.S. Department of Energy from Gary W. Baughman, Chief Facilities Section Hazardous Waste Control Program for CDH, March 3.

[14] Code of Federal Regulations, 1992, Subchapter J - Superfund, Emergency Planning, and Community Right-to-Know Programs, 40 CFR Parts 300 though 373.

[15] DOE, 1993, Letter to Gary Baughman of CDH Hazardous Waste Facilities and Martin Hestmark, Rocky Flats Project Manager USEPA from James K. Hartman of the Department of Energy, April 14.

[16] DOE, 1991, DOE Order 5500.2B, Emergency Categories, Classes and Notification and Reporting Requirements.

[17] Code of Federal Regulations, 1992, Criteria and Standards for the National Pollutant Discharge Elimination System, 40 CFR 125.

[18] DOE, 1981, DOE Order 5484.1, Environmental Protection Safety and Health Protection Information Report Requirements.

[19] Colorado Department of Health - Water Quality Control Division - Radiation Control Division, 1992, Analytical Radiochemistry Workshop on Practical Quantitation Levels. January 10, 1992.

TABLE 3-1
SELECTED BENCHMARKS FOR PONDS A-1 AND A-2
(units $\mu g/L$ unless otherwise noted)

Contaminant	Mean Concentration	Lognormal 95% Upper Confidence Limit	Selected Benchmark	Source	Comment
RADIONUCLIDES					
Americium-241	0.018 pCi/L	0.034 pCi/L			
Plutonium-239/240	0.022 pCi/L	0.028 pCi/L	15 pCi/L	WQCC statewide surface water standard, Section 3.1.11(2) of 5 CCR 1002-8	Standard is for total plutonium
Uranium 233, 234	3.346 pCi/L	3.872 pCi/L	30 pCi/L	SDWA proposed MCL	Standard is for total uranium
Uranium-235	0.203 pCi/L	0.313 pCi/L	30 pCi/L	SDWA Proposed MCL	Standard is for total uranium
Uranium-238	4.917 pCi/L	5.765 pCi/L	30 pCi/L	SDWA Proposed MCL	Standard is for total uranium
METALS, INORGANICS, VOA/SVOA/PESTICIDES					
Lithium	44.777	48.778	2500	WQCC statewide groundwater standard - agriculture, Section 3.11.0 of 5 CCR 1002-8	
Strontium	339.615	394.417			
Tetrachloroethene	0.0792	0.23	76/5	WQCC Segment 5 Standard Section 3.8.0 of 5 CCR 1002-8, temporary modification until April 1, 1996/ SDWA MCL	Spray evaporation can occur if concentrations are less than the WQCC Segment 5 standard
Trichloroethene	0.0817	0.328	66/5	WQCC Segment 5, Standard Section 3.8.0 of 5 CCR 1002-8, temporary modification until April 1, 1996/ SDWA MCL	Spray evaporation can occur if concentrations are less than the WQCC Segment 5 standard
Atrazine	1.0458	1.815	3	SDWA MCL	

TABLE 3-2
SELECTED BENCHMARKS FOR PONDS A-3 AND A-4
(units μg/L unless otherwise noted)

Contaminant	Mean Concentration	Lognormal 95% Upper Confidence Limit	Selected Benchmark	Source	Comment
RADIONUCLIDES					
Uranium-233, 234	1.378 pCi/L	1.613 pCi/L	30 pCi/L	SDWA proposed MCL	Standard is for total uranium
Uranium-235	0.084 pCi/L	0.104 pCi/L	30 pCi/L	SDWA proposed MCL	Standard is for total uranium
Uranium 238	1.542 pCi/L	1.83 pCi/L	30 pCi/L	SDWA proposed MCL	Standard is for total uranium
METALS, INORGANICS, VOA/SVOA/PESTICIDES					
Barium	84.324	88.61	2000	SDWA MCL	
Nitrate/Nitrite	2.942	3.724	10,000	SDWA MCL	Measured as N
Nitrite	0.125	0.196	1000	SDWA MCL	Measured as N
Dicamba	0.475	3.5			
Atrazine	0.7281	1.525	3	SDWA MCL	
Simazine	0.1563	0.308	4	SDWA MCL	

TABl -3

SELECTED BENCHMARKS FOR PONDS B-1 AND B-2

(units μg/L unless otherwise noted)

Contaminant	Mean Concentration	Lognormal 95% Upper Confidence Limit	Selected Benchmark	Source	Comment
RADIONUCLIDES					
Americium-241	0.021 pCi/L	0.038 pCi/L			
Plutonium-239/240	0.05 pCi/L	0.079 pCi/L	15 pCi/L	WQCC statewide surface water standard, Section 3.1.11(2) of 5 CCR 1002-8	Standard is for total plutonium
Uranium 233, 234	1.37 pCi/L	1.76 pCi/L	30 pCi/L	SDWA proposed MCL	Standard is for total uranium
Uranium-235	0.092 pCi/L	0.125 pCi/L	30 pCi/L	SDWA Proposed MCL	Standard is for total uranium
Uranium-238	1.254 pCi/L	1.481 pCi/L	30 pCi/L	SDWA Proposed MCL	Standard is for total uranium
METALS, INORGANICS, VOA/SVOA/PESTICIDES					
Lithium	19.32	48.778	2500	WQCC statewide groundwater standard - agriculture, Section 3.11.0 of 5 CCR 1002-8	
Strontium	273	394.417			
Acetone	37.038	0.23			
Trichloroethene	4.375	0.328	66/5	WQCC Segment 5 Standard, Section 3.11.0 of 5 CCR 1002-8; temporary modification until April 1, 1996/ SDWA MCL	Spray evaporation can occur if concentrations are less than the WQCC Segment 5 standards
cis-1,2-Dichloroethene	3.3	1.815	70	SDWA MCL	
Carbon Tetrachloride	0.3083	1.103	18/5	WQCC Segment 5 Standard, Section 3.11.0 of 5 CCR 1002-8; temporary modification until April 1, 1996/ SDWA MCL	Spray evaporation can occur if concentrations are less than the WQCC Segment 5 standards

TABI -3
SELECTED BENCHMARKS FOR PONDS B-1 AND B-2
(units $\mu g/L$ unless otherwise noted)
(Continued)

Contaminant	Mean Concentration	Lognormal 95% Upper Confidence Limit	Selected Benchmark	Source	Comment
Chloroform	0.2158	0.708	6	WQCC statewide surface water standard - water supply, Section 3.1.11(3) of 5 CCR 1002-8	
Tetrachoroethene	0.2133	1.857	76/5	WQCC Segment 5 Standard, Section 3.11.0 of 5 CCR 1002-8; temporary modification until April 1, 1996/ SDWA MCL	Spray evaporation can occur if concentrations are less than the WQCC Segment 5 standards
Vinyl chloride	0.1783	0.414	2	SDWA MCL	

TABI -4
SELECTED BENCHMARKS FOR POND B-3
(units $\mu g/L$ unless otherwise noted)

Contaminant	Mean Concentration	Lognormal 95% Upper Confidence Limit	Selected Benchmark	Source	Comment
RADIONUCLIDES					
Americium-241	0.027 pCi/L	0.070 pCi/L			
Plutonium-239/240	0.018 pCi/L	0.038 pCi/L	15 pCi/L	WQCC statewide surface water standard, Section 3.1.11(2) of 5 CCR 1002-8	Standard is for total plutonium
METALS, INORGANICS, VOA/SVOA/PESTICIDES					
Nitrite	0.636	1.298	1000	SDWA MCL	Measured as N
1,4-Dichlorobenzene	0.092	0.243	75	SDWA MCL	
Bromodichloromethane	0.17	0.714			
Chloroform	2.9	3.809	6	WQCC Statewide surface water standard-water supply, Section 3.1.11(3) of 5 CCR 1002-8	
Tetrachloroethene	0.04	0.122	76/5	WQCC Segment 5 standard, Section 3.11.0 of 5 CCR 1002-8; temporary modification until April 1, 1996/SDWA MCL	Spray evaporation can occur if concentrations are less than the WQCC Segment 5 standard
Trichloroethene	0.078	0.442	66/5	WQCC Segment 5 Standard, Section 3.11.0 of 5 CCR 1002-8; temporary modification until April 1, 1996/ SDWA MCL	Spray evaporation can occur if concentrations are less than the WQCC Segment 5 standard

TABI -5

SELECTED BENCHMARKS FOR PONDS B-4 AND B-5

(units μg/L unless otherwise noted)

Contaminant	Mean Concentration	Lognormal 95% Upper Confidence Limit	Selected Benchmark	Source	Comment
RADIONUCLIDES					
Plutomium-239/240	0.009 pCi/L	0.012 pCi/L	15 pCi/L	WQCC statewide surface water standards, Section 3.1.11(2) of 5 CCR 1002-8	Standard is for total plutonium
Tritium	197.830 pCi/L	287.482 pCi/L	2000 pCi/L	WQCC statewide surface water standard, Section 3.1.11(2) of 5 CCR 1002-8	
Uranium 233, 234	0.906 pCi/L	1.079 pCi/L	30 pCi/L	SDWA proposed MCL	Standard is for total uranium
Uranium-238	0.774 pCi/L	0.897 pCi/L	30 pCi/L	SDWA proposed MCL	Standard is for total uranium
METALS, INORGANICS, VOA/SVOA/PESTICIDES					
Lithium	14.36	21.91	2500	WQCC statewide groundwater standard - agriculture, Section 3.11.0 of 5 CCR 1002-8	
Strontium	255	284.4			
Cyanide	9.359	14.752	200	SDWA MCL	Measured as free cyanide
Nitrate	2.767	3.642	10,000	SDWA MCL	Measured as N
Nitrate/Nitrite	3.359	4.975	10,000	SDWA MCL	Measured as N
Nitrite	0.409	0.576	1000	SDWA MCL	Measured as N
Acetone	15.36	20.3			
Bis (2-Ethylhexyl) Phthalate	6.316	6.316	6	SDWA MCL	
Chloroform	0.743	1.93			
Tetrachloroethene	0.134	0.205	76/5	WQCC Segment 5 standard, Section 3.11.0 of 5 CCR 1002-8; temporary modification until April 1, 1996/SDWA MCL	Spray evaporation can occur if concentrations are less than the WQCC Segment 5 standards

TAB! ,-5
SELECTED BENCHMARKS FOR PONDS B-4 AND B-5
(units $\mu g/L$ unless otherwise noted)
(Continued)

Contaminant	Mean Concentration	Lognormal 95% Upper Confidence Limit	Selected Benchmark	Source	Comment
Trichloroethene	0.3831	0.823	66/5	WQCC Segment 5 standard, Section 3.11.0 of 5 CCR 1002-8; temporary modification until April 1, 1996/SDWA MCL	Spray evaporation can occur if concentrations are less than the WQCC Segment 5 standards
Dicamba	0.2195	0.385			
Atrazine	0.556	0.857	3	SDWA MCL	
Simazine	0.1461	0.256	4	SDWA MCL	

TABl .6

SELECTED BENCHMARKS FOR POND C-2

(units $\mu g/L$ unless otherwise noted)

Contaminant	Mean Concentration	Lognormal 95% Upper Confi-dence Limit	Selected Benchmark	Source	Comment
RADIONUCLIDES					
Plutomium-239/240	0.022 pCi/L	0.029 pCi/L	15 pCi/L	WQCC statewide surface water standards, Section 3.1.11(2) of 5 CCR 1002-8	Standard is for total plutonium
Uranium 233, 234	1.211 pCi/L	1.48 pCi/L	30 pCi/L	SDWA proposed MCL	Standard is for total uranium
Uranium-235	0.128 pCi/L	0.185 pCi/L	30 pCi/L	SDWA proposed MCL	Standard is for total uranium
Uranium-238	1.514 pCi/L	1.849 pCi/L	30 pCi/L	SDWA proposed MCL	Standard is for total uranium
METALS, INORGANICS, VOA/SVOA/PESTICIDES					
Barium	83.86	92.25	2000	SDWA MCL	
Selenium	1.85	2.885	50	SDWA MCL	
Strontium	331.5	355.6			
Nitrate	104.4	N/A	10,000	SDWA MCL	Measured as N
1,1,1-Trichloroethane	0.1468	0.26	200	SDWA MCL	
Atrazine	0.2109	1.047	3	SDWA MCL	

TABI -7

SELECTED BENCHMARKS FOR THE LANDFILL POND

(units µg/L unless otherwise noted)

Contaminant	Mean Concentration	Lognormal 95% Upper Confidence Limit	Selected Benchmark	Source	Comment
RADIONUCLIDES					
Plutomium-239/240	0.006 pCi/L	0.008 pCi/L	15 pCi/L	WQCC statewide surface water standard, Section 3.1.11(2) of 5 CCR 1002-8	Standard is for total plutonium
Strontium-89,90	0.93 pCi/L	1.202 pCi/L	8 pCi/L	WQCC statewide surface water standard, Section 3.1.11(2) of 5 CCR 1002-8	Standard is for Strontium 90
Tritium	484.691 pCi/L	770.894 pCi/L	20,000 pCi/L	WQCC statewide surface water standard, Section 3.1.11(2) of 5 CCR 1002-8	
METALS, INORGANICS, VOA/SVOA/PESTICIDES					
Barium	637.4	737.5	2000	SDWA MCL	
Chromium	8.959	22.5	100	SDWA MCL	
Cobalt	7.419	12.65	50	WQCC Statewide groundwater standard-agriculture, Section 3.11.0 of 5 CCR 1002-8	
Lithium	46.22	55.86	2500	WQCC Statewide groundwater standard-agriculture, Section 3.11.0 of 5 CCR 1002-8	
Manganese	1619	1735	560(D)/ 50(D)	WQCC Segment 5 standard; temporary modification until April 1, 1996/WQCC Statewide Surface Water standard - water supply, Section 3.1.11, Table III of CCR 1002-8	D = Dissolved; Spray evaporation can occur if concentrations are less than the WQCC Segment 5 standard
Molybdenum	10.07	24.56	200	WQCC Statewide groundwater standard-agriculture, Section 3.11.0 of 5 CCR 1002-8	
Nickel	11.75	19.7	100	SDWA MCL	
Silver	6.682	9.152	100	SDWA Secondary MCL	

TABI -7

SELECTED BENCHMARKS FOR THE LANDFILL POND

(units $\mu g/L$ unless otherwise noted)

(Continued)

Contaminant	Mean Concentration	Lognormal 95% Upper Confi-dence Limit	Selected Benchmark	Source	Comment
Strontium	905.5	1052			
Tin	49.2	127.206			
Vanadium	25.02	50.854	100		
Zinc	3194.6	4009	350(TR)/7	WQCC Segment 5 standards; temporary modification until April 1, 1996/WQCC statewide surface water standards-water supply, Section 3.1.11, Table 3 of 5 CCR 1002-8	Spray evaporation can occur if concentra-tions are less than the WQCC Segment 5 standards
1,1 Dichloroethane	6.382	7.464	5	SDWA MCL	
1,2 Dichloroethene	4.353	5.611	70/100	SDWA MCL	CIS/TRANS isomer
2-Butanone	10.65	18.1			
4-Methyl-2-Pentanone	9.03	13.36			
Acetone	34.91	60.79			
Chloroethane	15.24	19.46			
Ethyl Benzene	12.97	15.08	700	SDWA MCL	
Toluene	44.32	53.7	1000	SDWA MCL	
Total Xylenes	14.76	17.3	10,000	SDWA MCL	
0-Xylene	5.167	9.81			
2-Methylnapthalene	22.33	34.18			
Naphthalene	20.67	30.97			

CHAPTER 4
SCREENING AND ANALYSIS OF POND WATER MANAGEMENT OPTIONS

CHAPTER 4
SCREENING AND ANALYSIS OF POND WATER MANAGEMENT OPTIONS

Chapter 4 describes the decision-making process used to select viable pond water management options for this Interim Measures/Interim Remedial Action (IM/IRA) Decision Document. This chapter develops pond water management options on a broad scale, and performs a two-level screening process that eliminates alternatives which are not feasible. Chapter 5 continues the option selection process with a qualitative analysis of options that pass the Chapter 4 screening process. The final proposed action(s) will be selected from those options evaluated in Chapter 5.

The options screening process must document the assumptions that apply to water sources influent to the ponds. The assumptions for water sources are as follow:

1. Discharges from the sewage treatment plant (STP) must comply with the effluent limitations established by the National Pollutant Discharge Elimination System (NPDES) permit. This permit is currently being re-negotiated, and final limits are unavailable. For this document, it is assumed the new permit will require STP discharges to comply with numeric water quality standards established by the Colorado Water Quality Control Commission (CWQCC) including newly adopted standards for radionuclides. Currently, these are the standards for Segment 5 of Big Dry Creek, South Platte River Basin.

2. Under current Clean Water Act (CWA) regulations, most industries are required to apply for "general" or "individual" stormwater-related NPDES permits[1]. These permits generally require the implementation of Best Management Practices (BMPs) to prevent pollutants from entering stormwater prior to their being discharged to receiving waters, and apply specific monitoring requirements to stormwater discharge points. However, numeric standards do not apply to the stormwater discharge points.

   The Rocky Flats Plant (RFP) has applied for, but has not yet received, a new NPDES permit for stormwater. This permit application contains seven stormwater discharge points, covering all outfalls from the core area of the plant site[2]. For this document, it is assumed stormwater discharges from the core area will be subject to the aforementioned BMP-level controls and monitoring requirements only, consistent with expected NPDES permit requirements. No numeric stream standards will apply to these discharges.

Through its existing Spill Prevention, Control and Countermeasures (SPCC)/ BMP Plan[3], RFP has identified and implemented many of the measures recommended by the U.S. Environmental Protection Agency (EPA) and the State of Colorado to limit the likelihood that significant pollution of pond water will occur from stormwater runoff. Stormwater runoff entering the ponds could exceed Segment 5 standards under certain scenarios; however, this possibility is addressed in Section 6.3, Proposed Pond Water Management Operations Plan.

3. RFP assumes that no water quality provisions or requirements apply to buffer zone runoff, prior to this runoff entering the pond system, aside from the recommendations of the 1993 Rocky Flats Watershed Management Plan (WMP)[4]. The WMP provides guidance on the use of pesticides at RFP, the protection of wetlands and habitat, mechanical weed control and erosion control. Such erosion control measures will help to stabilize soils and reduce the amount of soils which will enter the ponds.

4. Control of discharges from springs, seeps and runoff originating from Individual Hazardous Substance Sites (IHSSs) is outside the scope of this IM/IRA Decision Document. Although potentially influent to the pond system, these water sources are addressed by other plans such as the Operable Unit (OU) Remedial Investigation/Resource Conservation and Recovery Act (RCRA), Facility Investigation (RI/RFI) work plans, subsequent IM/IRAs and Corrective Measures Studies/Feasibility Studies (CMS/FS), site remediation-related documents and the site-wide groundwater monitoring program.

5. RFP conducts discharges from the OU 1 and OU 2 IM/IRA treatment systems in accordance with the criteria established by the specific OU 1 and OU 2 Applicable or Relevant and Appropriate Requirements (ARARs). These discharges, which are influent to the pond drainage systems, generally meet their respective ARARs, which are based on Segment 4 Stream Standards.

6. Interpond transfers, releases from an upstream pond to a downstream pond, and off-site discharges from the ponds must comply with the benchmarks established for this IM/IRA Decision Document. However, emergency conditions that have health and safety ramifications, although not anticipated, may require emergency transfers or discharges, and take precedence over normal water quality considerations. Conditions warranting emergency transfers or discharges are detailed in Standard Operation Procedures (SOPs) and the Emergency Preparedness Implementation Plan (EPIP)[5].

It important to note that this IM/IRA Decision Document will not directly regulate pond inflows, including STP effluent, stormwater runoff, spills and return flows from the IHSSs. Furthermore, it is not possible for this or any other document to ensure upstream control measures will guarantee that water sources influent to the ponds will comply with the adopted benchmarks. Therefore, the goal of the screening and analysis process is to select options that effectively manage potentially contaminated water sources in the event upstream controls fail.

Section 4.1 of this chapter describes the screening methodology employed in selecting potential options to accomplish this task. Sections 4.2 through 4.8 provide brief descriptions of each potential option, and present the justification for rejecting or retaining each option for further evaluation.

4.1 IM/IRA PLAN SCREENING PROCESS

Over 80 potential pond water management options were developed in "brainstorming" sessions with RFP representatives. This section describes the screening process used to evaluate the potential pond water management options and narrow the list of options to those most likely to achieve the objectives of the IM/IRA process. The screening process utilizes two types of screening criteria: (1) statutory criteria from Section 121 of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)[6] as promulgated by EPA in the National Contingency Plan (NCP), and (2) IM/IRA criteria; i.e., the goals and objectives of this document. These criteria are described in Sections 4.1.1 and 4.1.2, respectively, and are organized into primary and secondary screening elements, described in Sections 4.1.3 and 4.1.4, respectively. This multi-level approach resulted in a short list of 21 viable options which are analyzed further in Chapter 5. Table 4-1 lists and briefly describes the full set of options that were considered in the screening process. (Flow charts [Figures 4-1 and 4-2] show the primary and secondary screening processes schematically.) Table 4-2 shows the option screening results. Within Tables 4-1 and 4-2, each option is grouped with other options that have the same function (e.g., spill control, treatment, storage, etc.). Tables 4-1 and 4-2 and Figures 4-1 and 4-2 are located at the end of this chapter.

4.1.1 Statutory Criteria

The document, Guidance on Preparing Superfund Decision Documents, by the Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-02[7] and associated fact sheets describes nine criteria to be used in the analysis of alternatives for interim remedial actions. These nine criteria are used in this IM/IRA process to determine which alternatives will likely meet statutory criteria.

Application of these nine criteria (within a typical IM/IRA process) also presupposes that an RI/RFI or other detailed site characterization activities have already been completed. Although extensive and comprehensive surface water monitoring activities have taken place at RFP, the goals of these monitoring activities were different from the goals of this IM/IRA process. Since no RI/RFI or CMS/FS has been prepared for pond water management at RFP, characterization tasks that typically precede an IM/IRA process have been incorporated into this IM/IRA Decision Document to the extent possible.

The nine EPA criteria form the basis of the option screening process and later are used for comparative evaluations. The nine criteria are composed of two threshold criteria, five primary balancing criteria and two modifying criteria. These criteria are incorporated into the primary and secondary screening processes discussed in this chapter, as well as the qualitative analysis process discussed in Chapter 5. The criteria are as follow:

Threshold Criteria

1. Overall Protection of Human Health and the Environment

2. Compliance with Benchmarks

Primary Balancing Criteria

3. Long-term Effectiveness and Permanence

4. Reduction of Toxicity, Mobility or Volume through Treatment

5. Short-term Effectiveness

6. Ability to Implement

7. Cost

Modifying Criteria

8. State/EPA Acceptance

9. Community Acceptance

These criteria are incorporated into Figures 4-1 and 4-2; the critical questions considered by regulatory reviewers to evaluate whether these criteria are met are listed below.

4.1.1.1 EPA Criteria #1 - Overall Protection of Human Health and the Environment

- Does the alternative provide adequate protection?
- Are risks eliminated, reduced or controlled through treatment, engineering controls or institutional controls to levels that are protective of human health and environment?

4.1.1.2 EPA Criteria #2 - Compliance with Benchmarks

- Does the alternative meet all benchmarks selected for and applicable to this IM/IRA Decision Document or, if appropriate, provide the grounds for invoking a waiver?

4.1.1.3 EPA Criteria #3 - Long-term Effectiveness and Permanence

- Does the alternative maintain reliable protection of human health and the environment over time, after cleanup levels have been met?

(Note: This criteria has not been used in the primary and secondary screening process because it is not generally considered by EPA to be relevant to a temporary measure implemented as an interim action; however, the degree to which the option is consistent with and supports long-term actions is a key consideration in the comparative analysis of options given in Chapter 5.)

4.1.1.4 EPA Criteria #4 - Reduction of Toxicity, Mobility or Volume through Treatment

- What is the anticipated performance of the treatment technologies for each treatment alternative?

4.1.1.5 EPA Criteria #5 - Short-term Effectiveness

- Does the alternative have any adverse impacts on human health and the environment during the construction and implementation period?
- Can mitigation techniques minimize adverse effects?

- What are the methods that will achieve protection, and how long will it be until protection is achieved?

4.1.1.6 EPA Criteria #6 - Ability to Implement

- Is the alternative technically and administratively feasible?
- Are the services and materials available for a particular option?

4.1.1.7 EPA Criteria #7 - Cost

- What are the present worth, capital and operation and maintenance (O&M) costs for the alternative?

4.1.1.8 EPA Criteria #8 - State/EPA Acceptance

- Are regulatory agency comments and concerns addressed?
- Do the regulatory agencies accept the selected recommended remedy?

4.1.1.9 EPA Criteria #9 - Community Acceptance

- Are the public's comments and concerns addressed?

(Note: Specific responses to public and agency comments are addressed in the Responsiveness Summary section of the IM/IRA Record of Decision.)

The above EPA criteria, along with the IM/IRA criteria listed below, have been incorporated into the primary and secondary screens described in Section 4.1.3. The EPA and IM/IRA criteria are consolidated and rearranged in the primary and secondary screens to best reflect a logical IM/IRA screening procedure for pond water management.

4.1.2 IM/IRA Criteria

IM/IRA criteria focus the evaluation and selection process on alternatives that are directly applicable to the IM/IRA process. Any option retained for further evaluation must fall within the defined scope, goals and objectives of the IM/IRA Decision Document. This requirement is reflected both in primary and secondary screening mechanisms. Criteria associated with the defined scope, goals and objectives of the IM/IRA Decision Document include:

1. Does the option address on-site pond water management problems or issues?

2. Is the option compatible with anticipated CWA management practices?

3. Is the option independent of, but consistent with, OU actions?

4. Is the option interim; can the option be implemented within five years?

CERCLA requires that all interim actions should be consistent with, and not preclude the implementation of, the expected final remedy. Since OU actions are subject to CERCLA and RCRA, this requirement is addressed as part of IM/IRA criteria #3.

4.1.3 Primary Screening Process

The objective of the primary screening process is to use EPA and IM/IRA criteria to determine which alternatives should be analyzed in more detail via secondary screening, and which should be dropped from further consideration. The primary screening process can be viewed as a "fatal flaw" evaluation in which each option is evaluated against the requirements of the IM/IRA process.

Both EPA criteria and IM/IRA criteria, as described in Sections 4.1.1 and 4.1.2, were used in developing the primary screening elements. Descriptions of the seven primary screening elements, their relationship to the underlying EPA and IM/IRA criteria, and a justification for their use are given below. Figure 4-1 shows a flow chart of the primary option screening process.

4.1.3.1 Primary Screen #1 - Option is Protective of Human Health and the Environment

Primary Screen #1 relates directly to EPA Criteria #1. Options which pass this screen, at a minimum, do not increase overall risk to human health or the environment over existing management practices that have been found to be protective. Options that increase contaminant mobility or result in cross-media impacts do not meet the statutory intent of CERCLA. Such options are therefore unacceptable, or fail.

4.1.3.2 Primary Screen #2 - Option Complies with Numeric Benchmarks

Primary Screen #2 partially fulfills EPA Criteria #2. Proposed benchmarks selected in this IM/IRA Decision Document (see Chapter 3) are the applicable or relevant and appropriate requirements adopted from existing laws and regulations. Numeric benchmarks evaluated as part of Primary Screen #2 are chemical-specific and do not consider action and location-specific requirements. Action and location-specific requirements are addressed separately (see Primary

Screen #3). For the purposes of this screening element, options that do not meet the proposed numeric benchmarks are rejected.

4.1.3.3 Primary Screen #3 - Option Complies with Permits, Agreements, Laws and Regulations other than Numeric Benchmarks

Primary Screen #3, when combined with Primary Screen #2, fulfills the remaining requirements of EPA Criteria #2. Legal requirements controlling certain actions or actions at certain locations such as federal wetlands legislation, the Endangered Species Act, Bald Eagle Protection Act, or other laws or regulations, are specifically included as location or action-specific benchmarks in this IM/IRA Decision Document. These non-numeric requirements may prevent or delay certain options from being implemented. For example, the Bald Eagle Protection Act prohibits the construction or disturbance of land within bald eagle nesting areas. Similarly, the CWA prohibits construction efforts resulting in a net loss of wetlands greater than 1 acre. Options which would involve the violation of these or similar laws and regulations are rejected. Other possible constraints include the RFP RCRA Part B permit, the NPDES permit, and various agreements such as the Interagency Agreement (IAG), Agreement in Principle (AIP) and Federal Facilities Compliance Agreements (FFCAs).

4.1.3.4 Primary Screen #4 - Option is Technically Feasible

Primary Screen #4 relates to EPA Criteria #6. Options for which the technology does not yet exist will be impossible to implement within the desired time frame. IM/IRAs are by their nature short-term or interim measures, and are not intended to be research and development actions. Innovative or experimental technologies, once proven, can be incorporated into final actions as appropriate.

4.1.3.5 Primary Screen #5 - Option Addresses On-site Pond Water Management

Primary Screen #5 is designed to assume that IM/IRA options fall within the scope of the IM/IRA Decision Document. This IM/IRA Decision Document is not intended to address all actions or operations at RFP related to surface water runoff, but is focused on the surface water detention ponds. Options which address only surface water issues hydraulically upgradient or downgradient of the detention ponds are excluded from further consideration in this IM/IRA Decision Document. For example, deficiencies in STP operations are addressed by the NPDES-FFCA[8], and discharges from the STP are regulated by an individual NPDES[9] permit. Possible modifications to these operations would, therefore, not be the focus of any options which will be considered further in this IM/IRA Decision Document. Similarly, options which focus on remediation of soil, sediments or groundwater within the surface water detention ponds are not within the scope of this document; other plans and programs such as RI/RFI OU Work Plans address this in detail. Also, such options involving remediation cannot be achieved on an interim basis.

4.1.3.6 Primary Screen #6 - Option is Compatible with CWA Management Practices

Primary Screen #6 assures that options are consistent with administrative requirements of the CWA, which regulates stormwater management at industrial facilities. RFP must comply with the existing SPCC/BMP Plan[3], the Stormwater Pollution Prevention Plan (SPPP), and the Oil Pollution Prevention Plan (OPPP) which is being prepared under the auspices of the CWA. These documents define on-site source control, spill management and response actions designed to provide primary upstream control of potential water contaminants in accordance with 40 CFR 112.1, 112.3, 112.7, 122.2, 122.21, 122.26, 122.44, 125.100 and 125.101. Options which are not compatible with these requirements are likely to be redundant or contradictory and are rejected on that basis.

4.1.3.7 Primary Screen #7 - Option is Independent of OU Actions

Primary Screen #7 also relates to the scope of this IM/IRA Decision Document. Management of surface water sources which are directly traceable to OUs, or being addressed under current OU work plans, feasibility studies, and remedial investigations, are driven by schedules contained within the IAG and are outside the scope of this IM/IRA Decision Document. For example, remediation of pond sediments in the Walnut Creek drainage will be investigated, and if necessary, performed as part of OU 6 actions. Similarly, capture and treatment of leachate from the landfill will be investigated as part of OU 7. In addition, the need for and the selection of appropriate interim and final remedial actions at these sites must necessarily wait for required characterization and feasibility studies to be completed. Therefore, remedial action options which cannot be accomplished independent of defined OUs are excluded from further consideration within this document.

4.1.4 Secondary Screening Process

The secondary screening process uses appropriate EPA and IM/IRA criteria to eliminate options that probably will not achieve beneficial results. The three secondary screens that follow are used to indicate whether beneficial results are likely to be achieved. Options which can be implemented quickly, prevent environmental degradation, improve water management, and facilitate final actions will likely have beneficial results.

4.1.4.1 Secondary Screen #1 - Option Can Be Operative In Less Than Five Years

Secondary Screen #1 addresses EPA Criteria #6, and IM/IRA Criteria #4. In order for an option to provide discernable benefits, material and equipment must be purchased and installed, facilities must be constructed, and administrative or operational controls must be put in place. This IM/IRA Decision Document is, by definition, interim or short-term in nature and is designed to address immediate problems or concerns. Options that involve lengthy permitting actions, are dependent on completion of long-term IAG activities, or require congressionally-approved expenditures over multiple years are unlikely to achieve beneficial results in an interim fashion.

The identified time frame for this IM/IRA Decision Document is five years, after which, if appropriate, final remedial action plans for OUs 5, 6 and 7 will be implemented. Options which cannot be implemented within five years are beyond the scope of this IM/IRA Decision Document and are rejected from further consideration.

4.1.4.2 Secondary Screen #2 - Option Reduces Overall Risk to Public Health or Environment

Secondary Screen #2 involves assessing the option, on a conceptual level, to determine whether it will reduce risk to public health or the environment. This screen differs from Primary Screen #1 in that it focuses on reduction of risk rather than no increase in risk. Options which involve approved treatment technologies and do not relocate possible contaminants are generally considered to reduce risk. Secondary Screen #2 addresses EPA Criteria #1 and #4, which are designed to satisfy important statutory requirements of IM/IRAs listed in Section 121 of CERCLA[6]. For this IM/IRA Decision Document screening element, no numerical risk reduction values are calculated.

This screening element also complies with the statutory preference for treatment as a principle element of remedial actions by disregarding (for screening purposes) the effectiveness or efficiency of specific treatment technologies, allowing "treatment" to be evaluated qualitatively. Water-borne contaminants pose a risk to public health and the environment, so any option with the potential to reduce the volume or toxicity of contaminants through treatment will, by definition, reduce overall risk and therefore passes this screen. Options that enhance the ability to capture and hold potentially contaminated water will reduce contaminant mobility, thereby reducing overall risk, and also pass this screen.

Conversely, options which rely solely on dilution of contaminants, regardless of numeric risk level, will increase the volume of water potentially subject to treatment and are contrary to the intent of EPA Criteria #4. Such options are rejected. Similarly, engineering or institutional measures which rely on additional land-based containment facilities would not limit the potential mobility of contaminants as required by EPA Criteria #4, do not comply with the specific intent of this IM/IRA Decision Document to limit the spread of contamination, and are rejected.

Risks not related to direct chemical exposure are also addressed by this screening element. Even though quantitative risk values have not been determined for the risk posed by catastrophic events such as dam failure or major fire, the possibility that any option might contribute to these high-risk, low-probability events is considered in the context of their impact on pond water and the ability of the pond management system to protect downstream waters.

4.1.4.3 Secondary Screen #3 - Short-term Adverse Impacts of Option Can Be Mitigated

Secondary Screen #3 also addresses EPA Criteria #1 and #5. Most options, particularly those involving construction efforts, have predictable adverse effects on the environment. These effects include dust generation, destruction of habitat, oil spills from construction vehicles, dewatering or excavation of wetlands, increased sediment loading to streams via stormwater runoff, and other potential impacts. Generally these effects are short-term in nature and can be mitigated or controlled through proper engineering and construction management and result in little or no long-term damage.

The purpose of Secondary Screen #3 is to provide a final check on each option to ensure that no unacceptable short-term risks or long-term cross-media impacts will result. For example, excavation of radioactively- or chemically-contaminated pond sediments in the absence of physical control structures could lead to transport of these contaminants downstream, irrespective of institutional or administrative controls. The likely result would be elevated short-term public or environmental exposures, and/or the creation of new or enlarged contamination sites that would require additional remediation. Options that have the potential to create long-term adverse effects, or for which short-term risks are unacceptably high, are rejected from further consideration.

The following text evaluates various conceptual level options for pondwater management based on the screens described above. The evaluated options are briefly described in Table 4-1, and the outcome of the evaluation is summarized in Table 4-2. The options screened are organized into seven categories:

4.2 CWA-/NPDES-regulated Water Management
4.3 Operable Unit Interactions
4.4 Spill Control Options
4.5 Storage Options
4.6 Treatment Options
4.7 Alternative Water Transfer Options
4.8 Water Monitoring Options

Those options which pass the primary and secondary screening are discussed only briefly in this chapter because they are the focus of Chapter 5 and Appendix F. For those options which fail the screening process, the corresponding text in this chapter summarizes the components and evaluation of screening criteria.

4.2 CWA-/NPDES-REGULATED WATER MANAGEMENT REQUIREMENTS

An objective of this IM/IRA Decision Document is consistency with the Pollution Prevention Plans (PPPs) and BMPs initiated under the CWA, and with the requirements to be imposed by the new RFP NPDES combined permit for stormwater and STP effluent. The NPDES permit provides upstream controls for water entering the pond system. Consistency between numeric limits imposed on STP effluent by the NPDES permit and those imposed by this IM/IRA Decision Document's benchmarks is desirable to prevent a situation in which ambient water quality is *in compliance* at one location (the STP discharge point) and *out of compliance* at a different point just downstream, with no change in water quality.

For stormwater discharges, the new permit is expected to require RFP to prepare separate SPPPs and OPPPs, and to implement additional BMPs. An SPPP for RFP is being developed to follow the requirements of 40 CFR 122[10]. An OPPP is being developed to follow the requirements of 40 CFR 112[11]. A BMP Plan is a separate requirement of 40 CFR 125[12]. BMPs address the control of peak flows and water quality of runoff from the industrial plant site and raw-material storage areas to receiving waters.

All of the options listed in Section 4.2 pass both the primary and secondary screening criteria. As a group, these options are already being implemented to comply with existing and expected requirements of the CWA as well as specific provisions of the existing RFP NPDES permit[9]. The new RFP NPDES permit being negotiated is not expected to contain numeric standards for water quality that are significantly different from Segment 5 stream standards, nor is it expected to contain provisions which would delete plans and programs already in place. For the purposes of this document, these options are all "no action" alternatives. They are included for completeness, and to foster an awareness of existing upstream pollution control measures.

4.2.1 On-site Spill Collection, Routing and Storage

4.2.1.1 Implement Source Reduction BMPs

This option passes the screening criteria because it includes BMPs addressing housekeeping procedures, preventive maintenance operations and substitutions of hazardous chemicals with non-hazardous replacements. These BMPs are being implemented.

4.2.1.2 Implement Spill Prevention, Control & Countermeasures Plan

This option passes the screening criteria because it addresses response policies and procedures for the prevention, control and remediation of soils impacted by a spill as required by the CWA. An SPCC Plan exists and has been implemented at RFP.

4.2.1.3 Implement Spill Mitigation BMPs

This option passes the screening criteria because it implements BMPs for contaminant source reduction, spill response practices and spill recovery such as installation of drip pans in work areas and floor drain collection basins. These BMPs are currently being implemented.

4.2.2 Stormwater Collection, Routing and Storage

4.2.2.1 Prepare and Implement Stormwater Pollution Prevention Plan

This option passes the screening criteria because it addresses site-wide policies and practices designed to limit the transport of natural and man-made contaminants to stormwater. The SPPP is being finalized and will be implemented in Fiscal Year (FY) 1994.

4.2.2.2 Prepare and Implement Oil Pollution Prevention Plan

This option addresses policies and practices designed to limit the exposure of oil-containing equipment or vessels, such as tanks and tank farms, to stormwater flows. This OPPP is being prepared and will be implemented in FY 94.

4.2.2.3 Implement Exposure Minimization BMPs

This option passes the screening criteria because it includes BMPs for covering storage areas and managing containment practices and flow diversions to minimize stormwater contact with potential pollutants. These BMPs are currently being implemented.

4.2.3 STP Effluent Discharge & Routing

4.2.3.1 Implement Monitoring Requirements of NPDES-FFCA

This option passes the screening criteria because it addresses requirements of the NPDES-FFCA[8] pertaining to STP effluent that is influent to the ponds. Aspects of the NPDES-FFCA[8] addressing STP influent or operations prior to discharge are not considered.

4.3 OPERABLE UNIT INTERACTIONS

Options in this category were initially considered because they address the management of OU water sources which ultimately drain to the ponds. However, options which address the remediation of specific OUs are beyond the defined scope of this IM/IRA Decision Document and therefore do not pass the screening process. It is inherently redundant and potentially contradictory to also address these issues as part of this IM/IRA process. For example, even though groundwater sources are assumed to be contributing minor flows to the ponds, these sources are not fully characterized, are traceable to an existing OU, and would be remediated as part of the larger scope of OU actions driven by compliance schedules contained within the IAG[13].

All of the options listed in Table 4-2 under OU Interactions fail the primary screening criteria on the basis of their dependence on planned or ongoing OU RI/RFI and CMS/FS activities. The appropriateness of response actions associated with the above sources is determined by the lead agency during scoping or at other points in the RI/FS process[2] specific to the OU in question. Many of these options may be appropriate, but are necessarily deferred to other programs.

4.3.1 Drill Wells to Capture/Pump Groundwater

This option fails the screening criteria because pumping of groundwater is a source removal action, presumably associated with a specific OU for which characterization efforts and corrective measures evaluations (under the purview of the IAG) have not been completed. This option is also exclusively a groundwater action and is not pertinent to pond water management.

4.3.2 Capture Seep/Springs Flows and Pump to Existing OU Storage

This option fails the screening criteria because the source of seeps and springs which present water quality concerns can be traced directly to an OU or IHSS. Management of these water sources cannot be done independent of OU actions. In addition, the management of water sources which are physically beyond the pond system is beyond the scope of this IM/IRA

Decision Document. Pumping of these sources to an existing OU, and treatment of this water at the OU will also require a change to the specific OU Record of Decision (ROD) per the requirements of section 117(b) of CERCLA[6].

4.3.3 Capture and Store Landfill Leachate Flows

This option fails the screening criteria because it would require construction efforts within the boundaries of OU 7, which would require in-depth characterization of site conditions and calculation of potential worker exposure prior to commencing construction activities. These characterization steps cannot be accomplished independent of ongoing OU 7 activities. Characterization of OU 7 soil, sediment, leachate and water media are contained within OU 7 work plans, and remedial alternatives will be selected under the auspices of the OU 7 IM/IRA or CMS/FS. These activities are under the purview of the IAG, and are outside the defined scope of this IM/IRA Decision Document.

4.3.4 Capture and Store Individual Seep/Springs

This option fails the screening criteria because the source of seeps and springs which present water quality concerns can be traced directly to an OU or IHSS. Management of these water sources cannot be accomplished independent of OU actions. In addition, the management of water sources which are physically beyond the pond system is beyond the defined scope of this IM/IRA Decision Document.

4.3.5 Capture and Store Building Foundation Drain Water

This option fails the screening criteria because potentially contaminated groundwater intercepted by footing/foundation drains is already under the purview of a number of ongoing activities and programs. These activities and programs include a one-time sampling of footing/foundation drains conducted by the EG&G Rocky Flats, Inc. Surface Water Division (SWD) in 1993. The intent of this one-time sampling was to identify and separately manage any footing/ foundation drains that did not comply with Segment 5 stream standards. SWD is also implementing a Drain Identification Study to identify any high-risk areas in which contaminants within a building could reach footing/foundation drains (such as through cross-connections or floor cracks, etc.). Similarly, footing/foundation drains are being addressed by a number of RFP Environmental Restoration activities/projects, including OU 8, OU 9, the Integrated Operable Unit and the Industrial Area IM/IRA. This surfeit of projects addressing footing/foundation drains, and the fact these drains do not directly discharge to the drainage ponds, makes it unnecessary for the IM/IRA to consider these flows.

4.3.6 Reroute OUs 1 & 2 Treatment System Discharges to New On-site Location

This option fails the screening criteria because OU operations are controlled by the IM/IRA RODs. Changes to RODs must be documented according to Section 117(b) of CERCLA prior to implementation, and are therefore not independent of OU actions. In addition, changes to OU discharge locations or other discharge parameters do not directly address pond water management and are outside the scope of this IM/IRA Decision Document.

4.3.7 Reroute OUs 1 & 2 Treatment System Discharges to Off-site Location (or Segment 4)

This option fails the screening criteria for reasons similar to 4.3.6 above. Of particular note, the IM/IRAs for these two OUs do not specify Segment 4 water quality criteria as ARARs for their treatment system discharges. In order to meet these state-promulgated requirements, the RODs for these OUs would require amendment to adopt Segment 4 criteria as ARARs prior to implementing this option.

4.3.8 Recycle OUs 1 & 2 Treatment System Discharges to RFP Industrial Loop

As with Options 4.3.6 and 4.3.7, this option fails the screening criteria because changes in OU discharge locations do not address pond water management, are not independent of OU actions, and are therefore beyond the scope of this IM/IRA Decision Document. In addition, this option is feasible only on a limited basis due to the lack of usable capacity within the RFP industrial loop and competition from other recycle sources.

4.3.9 Evaporate Discharges from OUs 1 & 2 Treatment Systems

This option fails the screening criteria for reasons identical to Option 4.3.8, above.

4.4 SPILL CONTROL OPTIONS

Section 4.4 briefly discusses present programs to prevent spills at RFP and BMPs that will both help prevent spills and provide control measures in the event of a spill. These spill prevention programs at RFP are required by regulation and have been implemented. Ongoing efforts will identify the need for additional actions to further reduce the possibility of spills, but these programs are not used to meet any compliance criteria based on numeric standards.

Options evaluated as part of this section assume that, although prevention of spills is preferable to managing spills, no amount of spill prevention can eliminate the possibility of a spill. Spill control options are essentially storage options that allow capture of potentially contaminated water on a non-routine or emergency basis. Diversion facilities are an essential component of all of the options. Except for Option 4.4.5, diversion facilities are not specifically addressed or evaluated as stand-alone options.

4.4.1 Construct One Off-line Pond for Spill Control/Capture

A. Option Components and Basis of Conceptual Design

Storage - This option requires the construction of one centralized, off-line spill control pond sized in the range of the current spill pond capacity. The total live spill capacity of the four current spill ponds (A-1, A-2, B-1 and B-2) is 20.5 acre-feet. The C-2 pond is considered strategically located and adequately sized and would not be replaced.

Pumps and Piping - Since this concept employs one off-line pond to serve both the A- and B-series drainages, considerable pumping and piping would be required. A conceptual design for pipes and pumping would be similar to the design used for a centralized tank farm as described in Appendix F (Option 4.4.3) which specifies two 3.6-cfs pump stations. This option requires 6000 feet of 8-inch diameter polyvinyl chloride (PVC) pipe since the only suitable location for an off-line pond of 20.5 acre-feet is below the terminal pond A-4.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

This option fails the secondary screening criteria because of its inability to reduce overall risk to public health or the environment and because short term impacts of this option can not be mitigated.

The existing topography limits the potential location of a single off-line pond of adequate size to an area below the existing terminal pond A-4. A spill event from this pond during a major storm, resulting in overflow conditions, or catastrophic events such as a dam breach, will result in direct off-site discharge of contaminants. A spill control facility below existing catchments is considered an increased rather than reduced threat to the public and the environment. This option also represents a geographic increase to the extent of potential contamination, resulting in long term impacts requiring additional future remediation efforts.

4.4.2 Construct Off-line Ponds for Each Drainage for Spill Control/Capture

A. Option Components and Basis of Conceptual Design

Storage - This option includes the construction of 2 off-line spill control ponds (1 per basin).

These reservoirs would be sized such that their combined capacity is no less than the capacity currently available. The total live spill capacity of the 4 current spill ponds (A-1, A-2, B-1 and B-2) is 20.5 acre-feet. The C-2 pond is considered strategically located off-line and would not be replaced in this option.

Pumps and Piping - Since this concept employs off-line ponds, pumps would be required. A conceptual design for pipes and pumping would include 2 pumps at 3.6 cfs each. For this option 7000 feet of 8-inch diameter PVC pipe is specified since the only suitable off-line locations are below the terminal ponds (A-4 and B-5).

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

This option fails the secondary screening criteria because of its inability to reduce overall risk to public health or the environment and because short-term impacts of this option can not be mitigated.

The existing topography limits the potential location of a multiple off-line ponds of adequate size to an area below the existing terminal ponds A-4, B-5 or C-2. A spill event from this pond during a major storm, resulting in overflow conditions or catastrophic events such as a dam breach, will result in direct off-site discharge of contaminants. A spill control facility below existing catchments is considered an increased rather than reduced threat to the public and the environment. This option also represents a geographic increase to the extent of potential contamination, resulting in long-term impacts requiring additional future remediation efforts.

4.4.3 Construct Centralized Tank Farm for Spill Control/Capture

This option passes the primary and secondary screening criteria because a suitably-sized and suitably-located tank farm will be capable of capturing the majority of a spill, with overflows captured by an existing on-site pond, thus preventing downstream release of contaminants. Details of this option are contained in Appendix F (Option 4.4.3).

4.4.4 Construct Tanks for Spill Control/Capture on Each Drainage

This option passes the primary and secondary screening criteria. Suitably-sized and suitably-located spill control tanks would be capable of capturing the majority of a spill, and any overflows could be captured by an existing on-site pond, thus preventing downstream release of contaminants. Details of this option are contained in Appendix F (Option 4.4.4).

4.4.5 Construct Diversions at Individual Stormwater Outfalls for Spill Control/Capture

A. Option Components and Basis of Conceptual Design

Channel Construction - This option would involve the construction of several new diversion ditches throughout the plant site in order to direct minor spill flows from individual stormwater outfalls to small retention areas. These retention areas would allow quick isolation of a small spill and prevent mixing the spill with "dead" storage water in the existing spill control ponds.

Approximately 10 diversion ditches would be installed across the plant site and would require the construction of approximately 2000 linear feet of diversion ditch leading to the spill retention areas.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening because it does not directly address on-site pond water management. Spills are assumed to be conveyed by stormwater and at current design flow rates, the volume of runoff is likely to overwhelm a small control/capture area requiring subsequent downstream capture.

B.2 Secondary Screening

N/A

4.4.6 Construct Storage at Individual Stormwater Outfalls for Spill Control/Capture

A. Option Components and Basis of Conceptual Design

Tanks - This option would involve the sizing and placement of tanks or retention ponds at the 7 identified stormwater outfall locations where stormwater leaves the industrialized areas of RFP. The combined volume of these tanks or ponds would be similar to the combined live spill control volume of 20.5 acre-feet in the existing ponds and represents the volume generated by a 1- to 2-year storm event.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening because it does not directly address on-site pond water management, and is also questionable in regard to its technical feasibility. Topographic and geographic limitations make construction of adequately-sized retention ponds infeasible. Tank placement would require significant excavation and possible interference with other RFP operations and activities. Overflow from these tanks resulting from storms greater than the 2-year event would continue to enter normal drainage paths (and the ponds).

B.2 Secondary Screening

N/A

4.4.7 Utilize Existing Tanks for Spill Control/Capture

A. Option Components and Basis of Conceptual Design

Pumps - This option would involve the pumping of spill-contaminated water from new sumps upstream of the existing spill ponds to available existing tanks throughout RFP. The only tanks having adequate available capacity are those associated with the OU 4 treatment facility (1,380,000 gallons).

Pumps rated at 3.6 cfs would be required to transfer an incoming spill-contaminated flow to the tanks. One pump station would be located upstream of Pond A-1 and one upstream of the B-1 pond.

Pipes - An estimated 8000 feet of 8-inch diameter PVC pipe would be required to move spill-contaminated water from the sumps to the OU 4 tanks.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria. The use of the OU 4 tanks for surface water spills would represent a change of use for OU 4 facilities. A change to the OU 4 ROD would be required, per the IAG[13] and section 117(b) of CERCLA[6]. The option is therefore not independent of OU actions. Additionally, the technical feasibility of this option is questionable since it is unknown whether adequate usable storage capacity would be available when needed.

B.2 Secondary Screening

N/A

4.4.8 Utilize Existing Ponds A-1, A-2, B-1 and B-2 for Spill Control/Capture

This option passes the primary and secondary screening criteria, and is the "no additional action" option. The existing ponds have provided historically dependable spill control, are cost effective and are considered protective of human health and the environment. Downstream on-site catchment is available in the event of overflows. Details of this option are contained in Appendix F (Option 4.4.8).

4.4.9 Consolidate Existing Spill Control Ponds to One per Drainage

This option passes the primary and secondary screening criteria. This option involves abandoning one pond per drainage, allowing expedited closure of that pond. Assuming current spill control capacity is re-established, and downstream on-site catchment of potential overflows would be maintained, this option will continue to protect downstream receiving waters from spills. Details of this option are contained in Appendix F (Option 4.4.9).

4.4.10 Reuse "Solar Ponds" After Remediation

A. Option Components and Basis of Conceptual Design

Pumps - This option would involve the pumping of spill-contaminated water from new sumps upstream of the existing spill ponds to the solar ponds after they are remediated. Two 3.6-cfs pumps would be specified in order to transport spill-contaminated runoff.

Pipes - An estimated 6000 feet of 8-inch diameter PVC pipe will be required to reach from the new sumps to the remediated solar ponds.

Solar Ponds - This option would require the solar ponds to be reconstructed and lined after they are remediated.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria because it is not independent of OU 4 activities, and because use of the solar ponds for this purposes does not comply with the specific intent (as specified in the Interagency Agreement) to close the solar ponds and reclaim the site.

B.2 Secondary Screening

N/A

4.5 STORAGE OPTIONS

Given that water must be monitored for the presence of contaminants prior to being released to downstream receiving waters, water storage facilities are an essential component of compliance with the standards and goals of the water management program. Storage facilities must be capable of handling the design flows from water sources so that surface waters can be retained for a sufficient length of time to allow sampling, analysis and treatment as needed. Storage options evaluated within this section assume routine operations, typical ambient water quality (no known contaminants present) and normal flow paths. Three categories of storage options are presented in this section. These categories include: STP Effluent Storage Options, Replacement Ponds Options, and Stormwater Collection and Storage Options.

4.5.1 STP Effluent Storage Options

These options specifically address the STP effluent as a water source. Options include either tank storage or independent pond storage as described below.

4.5.1.1 Construct Storage Tanks for STP Effluent Only

This option passes the primary and secondary screening criteria because it allows downstream discharges to be monitored prior to release, allows transfer to a treatment system if needed, allows downstream on-site capture of overflows, and is technically feasible. Details of this option are contained in Appendix F (Option 4.5.1.1).

4.5.1.2 Construct Storage Pond for STP Effluent Only

A. Option Components and Basis of Conceptual Design

Storage - To remove STP effluent from the B-series ponds, replacement ponds must be sized large enough to manage STP effluent until it can be sampled, tested and approved for release. A reasonable turnaround time for a Segment 5 analyte suite including organics, metals and radionuclides is 21 days. Using a design flow of 0.15 million gallons per day (MGD) and a contingency factor of 25 percent results in a required storage volume of 4 million gallons (12.3 acre-feet). Batch sampling prior to release is assumed, thus a second pond of equal size is required to collect effluent while the first pond awaits sampling results. In addition, use of the emergency spill control ponds (A-1, A-2, B-1, B-2) would be required to evacuate an STP pond if it is contaminated. Inadequate spill pond capacity would require transfer to an "uncontaminated" containment pond or downstream release.

Pump - A 2.2-cfs pump station would be required in order to evacuate the water from the STP storage pond to the existing A- or B-series upper ponds if the STP effluent is contaminated.

Piping - The most suitable location for STP effluent ponds is below the terminal ponds. Approximately 2000 feet of 8-inch diameter PVC pipe would be required to connect new ponds to the STP and to the currently existing ponds.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

This option fails the secondary screening criteria because it fails to reduce overall risk to public health or the environment and because short-term impacts could not be mitigated. The most probable location for new ponds is downstream from the terminal ponds. Overflow of STP effluent storage ponds in this location increases the risk of direct off-site discharge of contaminants. In addition, new ponds will increase the geographic extent of potential contamination and require additional future remediation efforts.

4.5.2 Replacement Ponds System

All of the options described below involve abandonment of existing ponds and construction of new ponds to replace the functions currently served by existing ponds. Replacement ponds options include both on-site and off-site alternatives. "On-line" ponds are defined as ponds within natural drainages, "off-line" ponds are defined as ponds outside natural drainages, including associated floodplains.

4.5.2.1 Abandon Existing Ponds and Replace with On-line Stormwater Ponds for Each Drainage (On-site)

A. Option Components and Basis of Conceptual Design

Storage - This option requires construction of new on-line stormwater ponds with storage equivalent to the live storage currently existing in each of the basins which is:

A-series = 140 acre-feet total live storage
B-series = 72 acre-feet total live storage
C-series = 64 acre-feet total live storage

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

This option fails the secondary screening criteria because it does not reduce overall risk to public health or environment and because its short-term impacts could not be mitigated. Dewatered ponds present a risk of airborne transport of contaminated sediments. Abandoned but partially filled ponds pose higher health or environmental risks through degraded water quality resulting from stagnant conditions. The addition of new ponds will cause the geographic extent of potential contamination to increase and require additional future remediation efforts.

4.5.2.2 Abandon Existing Ponds and Replace with Off-line Stormwater Ponds for Each Drainage (On-site)

A. Option Components and Basis of Conceptual Design

Storage - This option requires construction of new off-line stormwater ponds with storage equivalent to the "live" storage currently existing in each of the basins which is:

A-series = 140 acre-feet total live storage
B-series = 72 acre-feet total live storage
C-series = 64 acre-feet total live storage

Pump - This option requires 3 very high-volume pumps to capture stormwater runoff and pump it to off-line ponds at the rate of inflow to the drainage.

Pipes - This option will require piping which is capable of delivering pumped water to the new ponds at the rate of inflow to the drainages.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria due to technical infeasibility because the required pumping rate in each drainage must equal or exceed the inflow rate in the drainage. For the 100-year storm, inflow rates are 580 cubic feet per second (cfs), 690 cfs and 250 cfs for the A-, B- and C-series drainages, respectively. This does not include additional upstream flows from Woman Creek that will flow in the C drainage during an event of this magnitude. It is not technically feasible to build pump stations of this size.

B.2 Secondary Screening

N/A

4.5.2.3 Abandon Existing Ponds and Replace with a Single, Large Reservoir Off-site

A. Option Components and Basis of Conceptual Design

Storage - This option would require the replacement of existing on-site storage with an equivalent off-site storage pond. The size of the reservoir would be 280 acre-feet which is the combined capacity of all of the A-, B- and C-series ponds.

Pump - This option requires 3 high-volume (3.6 cfs) pumps to capture runoff and pump it to an off-site pond.

Pipes - This option will require an estimated 15,000 feet of 8-inch diameter PVC pipe to carry water from the drainages to an off-site location.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria for multiple reasons. Most importantly, it does not allow monitoring of water prior to off-site release. This lack of monitoring would allow unmonitored off-site transport of contaminants, which is not consistent with CWA management practices and is not considered to be protective of human health and the environment.

Additionally, this option fails primary screening criteria because the required pumping rate in each drainage must equal or exceed the inflow rate in the drainage. For the 100-year storm, inflow rates will be 580 cfs, 690 cfs and 250 cfs for the A-, B- and C-series drainages, respectively. It is not technically feasible to build pump stations of this size.

B.2 Secondary Screening

N/A

4.5.2.4 Abandon Existing Ponds and Replace with a Single, Large Reservoir On-site

A. Option Components and Basis of Conceptual Design

Storage - This option would require a single large reservoir having storage equivalent to all of the existing storage ponds. The size of the reservoir would be 280 acre-feet which is the combined capacity of all of the A-, B- and C-series ponds.

Pump - The large reservoir would be placed on North Walnut Creek and pumping would occur from the other 2 drainage basins. This option requires 2 high-volume (3.6 cfs) pumps in order to capture stormwater runoff and pump it to the large reservoir.

Pipes - This option will require an estimated 5000 feet of 8-inch diameter PVC pipe per basin.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria because the required pumping rate in each drainage must equal or exceed the inflow rate in the drainage. For the 100-year storm, the inflow rates will be 580 cfs, 690 cfs and 250 cfs for the A-, B- and C-series drainages, respectively. This is not including the additional flows from Woman Creek that will flow in the C drainage during an event of this magnitude. It is not technically feasible to build pump stations of this size.

B.2 Secondary Screening

N/A

4.5.2.5 Abandon Existing Ponds and Replace with Tankage

A. Option Components and Basis of Conceptual Design

Storage - This option would require 250 acre-feet of tankage located at a centralized tank farm.

Pumps - This option requires 3 high-volume (3.6 cfs) pumps to capture stormwater runoff and pump it to the centralized tank farm.

Pipes - An estimated 7500 feet of 8-inch diameter PVC pipe would be required to move the stormwater from the 3 drainage basins to the centralized tank farm.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria on the basis of technical infeasibility and impracticality. A tank farm would require 81 tanks of a diameter of 60 feet and a height of 50 feet each, with a total volume roughly equal to that contained by Mile High Stadium.

Additionally, this option fails primary screening criteria because the required pumping rate in each drainage must equal or exceed the inflow rate in the drainage. For the 100-year storm, inflow rates will be 580 cfs, 690 cfs and 250 cfs for the A-, B- and C-series drainages, respectively. It is not technically feasible to build pump stations of this size.

B.2 Secondary Screening

N/A

4.5.3 Stormwater Collection and Storage Options

The options described below include construction of additional stormwater facilities, re-use of existing stormwater ponds and/or consolidation of existing stormwater ponds.

4.5.3.1 Maintain and Continue Using Existing On-line Stormwater Ponds

This option passes the primary and secondary screening criteria because the current configuration and operation of the ponds allows downstream discharges to be monitored prior to release and maintains multiple locations for catchment to isolate potential problems and prevent downstream release of contaminants. Details of this option are contained in Appendix F (Option 4.5.3.1).

4.5.3.2 Maintain Existing Ponds and Add Off-line Stormwater Containment Pond On-site

A. Option Components and Basis of Conceptual Design

Storage - A new pond of 32 acre-feet capacity would be constructed for this option. This capacity represents the deficiency of the A- and B-series ponds to contain the 6-hour, 100-year magnitude runoff if the maximum pond storage level exists as a starting condition for all ponds. The new pond would be located between the existing A- and B-series ponds.

Pump - A .2-cfs pump from Pond A-4 to the new pond would be required.

Piping - An estimated 2000 feet of 6-inch PVC pipe would be required between A-4 and the new pond.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

This option fails the secondary screening criteria because its short-term impacts could not be mitigated. The addition of a new pond will increase the geographic extent of potential contamination requiring future remediation efforts.

4.5.3.3 Maintain Existing Ponds and Add On-line Stormwater Containment Pond(s) to Each Drainage

A. Option Components and Basis of Conceptual Design

Storage - This option would add new, lined on-line ponds in each of the three drainages, providing additional redundancy and greater storage capacity for stormwater control. Lined ponds provide improved isolation of stormwater from groundwater.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

This option fails the secondary screening criteria because its short-term impacts could not be mitigated. The addition of new ponds will cause the geographic extent of potential contamination to increase and require additional future remediation efforts.

4.5.3.4 Consolidate Existing Stormwater Ponds to One Per Drainage

This option passes the primary and secondary screening criteria under the assumption that total storage capacity of a consolidated pond scenario would be expanded over existing capacity. Full monitoring prior to release of downstream discharges would be maintained. Details of this option are contained in Appendix F (Option 4.5.3.4).

4.5.3.5 Consolidate Existing On-line Ponds and Add Off-line Pond(s)

A. Option Components and Basis of Conceptual Design

Storage - This option combines features of Option 4.5.3.4 (consolidate existing stormwater ponds to one per drainage) with Option 4.5.3.2 (maintain existing ponds and add off-line stormwater containment pond(s) on-site). Ponds A-3, B-3 and B-4 would be removed. Pond A-4 volume would be increased by 35 acre-feet (a 35 percent enlargement) requiring a vertical increase in the dam height of 7.5 feet. Pond B-5 volume would be increased by 1 acre-foot (a 2 percent enlargement) requiring a vertical increase in the dam height of 0.2 feet.

Pump - A .2-cfs pump from the terminal pond to the new pond would be required.

Piping - An estimated 2000 feet of 6-inch diameter PVC pipe would be required between the terminal pond and the new off-line pond.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

This option fails the secondary screening criteria because it fails to mitigate short-term impacts. The addition of a new pond will cause the geographic extent of potential contamination to increase and require additional future remediation efforts.

4.5.3.6 Utilize Existing On-line, Off-site Reservoir (Great Western) for Stormwater and Effluent Storage

A. Option Components and Basis of Conceptual Design

Storage - Great Western Reservoir has sufficient capacity to manage the stormwater from South Walnut Creek, North Walnut Creek and Woman Creek.

Pumps - One high-volume (3.6 cfs) pump would be required to pump stormwater from the Woman Creek basin to the Walnut Creek basin.

Pipes - Approximately 1/2 mile of 8-inch diameter PVC pipe would be required to transport the water from Woman Creek to Walnut Creek for this option.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria. This option does not allow monitoring of water prior to off-site release from RFP. This lack of monitoring would allow unmonitored off-site transport of contaminants and is not considered protective of human health and the environment. In addition, this is an off-site option and does not specifically address on-site pond water management.

B.2 Secondary Screening

N/A

4.6 TREATMENT OPTIONS

This section evaluates potential options for treating water that does not meet the water quality criteria adopted for this IM/IRA Decision Document. Screening of the options in this section assumes that treatment is needed; i.e., the water does not meet standards for the receiving water to which it would be discharged (Segment 4 or Segment 5). This section considers locations and facilities conceptually and does not evaluate specific technologies.

4.6.1 Construct Mobile Treatment Units for Multi-pond Use

This option passes the primary and secondary screening criteria because mobile treatment units ensure that treatment appropriate to the contaminant is performed prior to the water being released. Treatment of this type can be installed quickly at any location required and can target only those analytes necessary. Details of this option are contained in Appendix F (Option 4.6.1).

4.6.2 Construct Individual Treatment Facilities at Each Pond

This option passes the primary and secondary screening criteria because individual treatment facilities at each pond would ensure water quality problems at any pond could be addressed immediately. Details of this option are contained in Appendix F (Option 4.6.2).

4.6.3 Construct Waste Injection Well

A. Option Components and Basis of Conceptual Design

Wells - At least one injection well located in an appropriate geologic formation and in the proximity of the ponds to minimize piping requirements would be required. A minimum injection capacity of about 1 MGD would be required.

Piping - At a minimum, 4000 feet of 8-inch diameter piping would be required to transfer pond water to a centrally-located injection well.

Controls - Automatic/Manual controls would be required to distribute pond water and to regulate injection rates.

Pumping - Pumps at each pond would be required with pumping capacities of approximately 1.1 cfs each.

B. Screening Criteria

B.1 Primary Screening

Groundwater protection standards established by the State of Colorado are too stringent for a pond water management practice of this nature. Groundwater in this region is classified as "domestic supply." Injection of contaminated pond water is unlikely to comply with these standards and is not considered to be protective of human health or the environment. The difficulty of locating suitable injection formations, if any exist, and the time required to permit and implement this option will prohibit the use of injection wells.

B.2 Secondary Screening

N/A

4.6.4 Use Biological Treatment via Constructed Wetlands

A. Option Components and Basis of Conceptual Design

Wetlands - This option requires approximately 100-200 acres of constructed wetland to treat 1 MGD.

Piping - At a minimum, 10,500 feet of 8-inch diameter piping would be required to transfer pond water to constructed wetlands.

Controls - Automatic/Manual controls would be required to distribute pond water to the wetland and to regulate distribution rates.

Pump Station - Pump stations at each pond would be required with a pumping capacity in the range of 1.1 cfs each.

B. Screening Criteria

B.1 Primary Screening

Although technical feasibility and protection of human health and the environment are questionable based on the limited history on the reliability of biological treatment, this option was assumed to pass the primary screening criteria.

B.2 Secondary Screening

This option would not reduce overall risks to public health or the environment, and does not mitigate short-term impacts. Constructed wetland technology does not offer the reliability required for pond water management. Constructed wetlands are less effective during winter months, and are generally sensitive to environmental conditions. The risk of system failure, due to a variety of environmental and meteorological factors, is too high in light of the objective of providing reliable pond management options. Furthermore, constructed wetlands become sinks for many of the contaminants removed (e.g., heavy metals), often require remediation and need a constant source of water to remain viable.

4.6.5 Use Land Treatment at Off-site Location

A. Option Components and Basis of Conceptual Design

Spray Application - This option utilizes spray nozzles, drains, valves and sprinkler piping for an application rate of 1 MGD of pond water.

Piping - At a minimum, 17,000 feet of 8-inch diameter piping would be required to transfer pond water to land application areas.

Pump Stations - A pump station at each pond would be required with pumping capacities at about .2 cfs each.

Controls - Automatic/Manual controls would be required to distribute pond water and to regulate land application rates.

B. Screening Criteria

B.1 Primary Screening

Land treatment systems are generally not recognized as appropriate technology for non-biodegradable Contaminants of Concern (COCs) which may be present in pond water (e.g., heavy metals, radionuclides, etc.). Furthermore, land treatment does not comply with RCRA land disposal restrictions. Land treatment would tend to redistribute such COCs rather than remove them from the environment. This option is not protective of human health and the environment.

B.2 Secondary Screening

N/A

4.6.6 Use Land Treatment at On-site Location

A. Option Components and Basis of Conceptual Design

Spray Injection - Spray nozzles, drains, valves and sprinkler piping for 1 MGD of wastewater would be required.

Piping - At a minimum, 10,500 feet of 8-inch diameter piping would be required to transfer pond water to land application areas.

Pump Station - A pump station at each pond would be required with pumping capacities in the range of .2 cfs.

Controls - Automatic/Manual controls would be required to distribute pond water and to regulate land application rates.

B. Screening Criteria

B.1 Primary Screening

Land treatment systems are generally not recognized as appropriate technology for non-biodegradable COCs which may be present in pond water (e.g., heavy metals, radionuclides, etc.). Furthermore, land treatment does not comply with RCRA land disposal restrictions. Land treatment would tend to redistribute such COCs rather than remove them from the environment. This option is not protective of human health and the environment.

B.2 Secondary Screening

N/A

4.6.7 Use Existing OU Treatment Facilities

This option passes the primary and secondary screening criteria, but only for limited volumes and flow rates. The option is not technically feasible for large volumes because of the limited available capacity of the OU treatment facilities. Also, these OU treatment facilities are site- and contaminant-specific treatment systems, which may not provide the range of treatment required. Although this option would require OU-specific actions or decisions prior to implementation, the option was assumed to pass Primary Screen #7 (independent of OU actions) because evaluation of treatment options for pond water can be done irrespective of IAG or other OU-specific requirements. In other words, no IAG schedules or OU-specific work plans address the *management* of pond water; therefore, options addressing the management (including treatment) of pond water are independent from the IAG and/or OU actions, even if a pond management option involves the use of OU facilities. Details of this option are contained in Appendix F (Option 4.6.7).

4.6.8 Expand Existing OU Treatment Facilities

This option passes the primary and secondary screening criteria because expanding the treatment capabilities of the existing OU facilities (both in terms of capacity and technology) would allow pond water to be treated at these locations to meet the applicable standards. Although this option would require OU-specific actions or decisions prior to implementation, the option was assumed to pass Primary Screen #7 (independent of OU actions) because evaluation of treatment options for pond water can be done irrespective of IAG or other OU-specific requirements. In other words, no IAG schedules or OU-specific work plans address the *management* of pond water; therefore, options addressing the management (including treatment) of pond water are independent from the IAG and/or OU actions, even if a pond management option involves the use of OU facilities. Details of this option are contained in Appendix F (Option 4.6.8).

4.6.9 Consolidate Treatment Facilities at Pond A-4 for Use by Entire Pond System

This option passes the primary and secondary screening criteria because it ensures all discharges comply with applicable standards. A centralized treatment facility, capable of treating the full range of potential contaminants, could accept water via pipeline from numerous locations. Details of this option are contained in Appendix F (Option 4.6.9).

4.6.10 Consolidate Treatment at the Existing STP

A. Option Components and Basis of Conceptual Design

Treatment Facilities - The existing RFP STP would be used for this option. Each stormwater pond would be connected by pumps and piping to the existing STP.

Piping - At a minimum, 15,000 feet of 8-inch diameter piping would be required to transfer pond water to the RFP STP.

Pump Stations - A pump station at each pond would be required with pumping capacities of about .2 cfs each.

Controls - Automatic/Manual controls would be required to pump pond water to the STP.

B. Screening Criteria

B.1 Primary Screening

Use of the existing STP is not technically feasible because there is not sufficient available treatment capacity. Also, pond water does not contain enough organic material for treatment in an activated sludge plant unless other high organic content wastes are present in sufficient quantities. The existing RFP STP periodically requires the use of additives to supplement the already low organic content of the influent. Substantial discharges (e.g., 1 MGD) of additional dilute influent will exacerbate this condition and potentially disrupt the STP operation.

B.2 Secondary Screening

N/A

4.6.11 Consolidate Treatment at an Expanded STP

A. Option Components and Basis of Conceptual Design

This option is comparable to Option 4.6.10 but would expand the existing STP capacity by approximately 1 MGD.

Treatment Facilities - The existing RFP STP would be used for this option. Each stormwater pond would be connected by pumps and piping to the existing STP.

Piping - At a minimum, 15,000 feet of 8-inch diameter piping would be required to transfer pond water to the STP.

Pump Stations - A pump station at each pond would be required with pumping capacities of about .2 cfs each.

Controls - Automatic/Manual controls would be required to pump pond water to the STP.

B. Screening Criteria

B.1 Primary Screening

As discussed for Option 4.6.10, activated sludge processes are not appropriate for substantial quantities of relatively low organic content pond water.

B.2 Secondary Screening

N/A

4.6.12 Treat Water Off-site at Northglenn STP

A. Option Components and Basis of Conceptual Design

Treatment Facilities - The Northglenn sewage treatment plant would be used for this option.

Piping - This option involves installation of sufficient piping to connect RFP to the Northglenn sanitary sewer system.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

Although viable as a long-term option, installing a pipeline to a publicly-owned treatment works (POTW) is unlikely to be accomplished within the 5-year IM/IRA time frame. Permitting, right-of-way acquisition, environmental impact analysis, water rights, public, municipal and regulatory agency review, and long-range capital funding issues must be resolved before construction can begin. Additionally, the concept of off-site treatment of runoff or STP effluents from RFP have historically been unacceptable to the residents served by off-site facilities. Although the risk of contamination of the collection system or POTW would be extremely low, this option does involve discharge without pre-treatment or pre-discharge monitoring to Segment 4 criteria as is currently done. Thus, the risk posed by water contained in the pipe, should it escape, is higher than for water leaving RFP under Segment 5 requirements.

4.6.13 Treat Water Off-site at Arvada STP

A. Option Components and Basis of Conceptual Design

Treatment Facilities - The Arvada STP would be used for this option.

Piping - This option involves installation of sufficient piping to connect RFP to the Arvada sanitary sewer system.

Other Components - Pump stations, on-site flow leveling storage, on-site flood storage of 550 acre-feet and connection to Arvada sewage collection system.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

Although viable as a long-term option, installing a pipeline to a POTW is unlikely to be accomplished within the 5-year IM/IRA time frame. Permitting, right-of-way acquisition, environmental impact analysis, water rights, public, municipal and regulatory agency review, and long-range capital funding issues must be resolved before construction can begin. Additionally, the concept of off-site treatment of runoff or STP effluents from the RFP facility have historically been unacceptable to the residents served by off-site facilities. Although the risk of contamination of the collection system or POTW would be extremely low, this option does involve discharge without pre-treatment or pre-discharge monitoring to Segment 4 criteria as is currently done. Thus, the risk posed by water contained in the pipe, should it escape, is higher than for water leaving RFP under Segment 5 requirements.

4.6.14 Treat Water Off-site at Westminster STP

A. Option Components and Basis of Conceptual Design

Treatment Facilities - The Westminster STP would be used for this option.

Piping - This option involves installation of sufficient piping to connect RFP to the Westminster sanitary sewer system.

Other Components - Pump stations, on-site flow leveling storage, on-site flood storage of 550 acre-feet and connection to Westminster sewer collection system.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

Although viable as a long-term option, installing a pipeline to a POTW is unlikely to be accomplished within the 5-year IM/IRA time frame. Permitting, right-of-way acquisition, environmental impact analysis, water rights, public, municipal and regulatory agency review, and long-range capital funding issues must be resolved before construction can begin. Additionally, the concept of off-site treatment of runoff or STP effluents from RFP have historically been unacceptable to the residents served by off-site facilities. Although the risk of contamination of the collection system or POTW would be extremely low, this option does involve discharge without pre-treatment or pre-discharge monitoring to Segment 4 criteria as is currently done. Thus, the risk posed by water contained in the pipe, should it escape, is higher than for water leaving RFP under Segment 5 requirements.

4.6.15 Treat Water Off-site at Superior/Rock Creek STP

A. Option Components and Basis of Conceptual Design

Treatment Facilities - The Superior/Rock Creek STP would be used for this option.

Piping - This option involves installation of sufficient piping and facilities to connect RFP to the Superior/Rock Creek STP collection system.

Other Components - Pump stations, on-site flow leveling storage, on-site flood storage of 550 acre-feet and connection to Superior/Rock Creek sewer collection system.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

Although viable as a long-term option, installing a pipeline to a POTW is unlikely to be accomplished within the 5-year IM/IRA time frame. Permitting, right-of-way acquisition, environmental impact analysis, water rights, public, municipal and regulatory agency review, and long-range capital funding issues must be resolved before construction can begin. Additionally, the concept of off-site treatment of runoff or STP effluents from RFP have historically been unacceptable to the residents served by off-site facilities. Although the risk of contamination of the collection system or POTW would be extremely low, this option does involve discharge without pre-treatment or pre-discharge monitoring to Segment 4 criteria as is currently done. Thus, the risk posed by water contained in the pipe, should it escape, is higher than for water leaving RFP under Segment 5 requirements.

4.6.16 Treat Water Off-site at Denver/Metro STP

A. Option Components and Basis of Conceptual Design

Treatment Facilities - The Denver/Metro STP would be used for this option.

Piping - This option involves installation of sufficient piping and facilities to connect RFP to the Denver/Metro STP collection system.

Other Components - Pipeline conduits under major highways and railroad, collection pipelines from Ponds A-4, B-5 and C-2, on-site flood storage to allow for controlled release of stormwater and on-site flow leveling storage.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

Although viable as a long-term option, installing a pipeline to a POTW is unlikely to be accomplished within the 5-year IM/IRA time frame. Permitting, right-of-way acquisition, environmental impact analysis, water rights, public, municipal and regulatory agency review, and long-range capital funding issues must be resolved before construction can begin. Additionally, the concept of off-site treatment of runoff or STP effluents from RFP have historically been unacceptable to the residents served by off-site facilities. Although the risk of contamination of the collection system or POTW would be extremely low, this option does involve discharge without pre-treatment or pre-discharge monitoring to Segment 4 criteria as is currently done. Thus, the risk posed by water contained in the pipe, should it escape, is higher than for water leaving RFP under Segment 5 requirements.

4.6.17 Treat Water Off-site at Broomfield STP

A. Option Components and Basis of Conceptual Design

Treatment Facilities - The Broomfield STP would be used for this option.

Piping - This option involves installation of sufficient piping and facilities to connect RFP to the Broomfield STP collection system.

Other Components - Expansion of the Broomfield STP and interconnected reservoirs to provide storage balancing.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria based on technical feasibility. The Broomfield STP does not currently have the capacity to accept additional flows of the magnitude expected from RFP.

B.2 Secondary Screening

N/A

4.6.18 Treat Water Off-site at Denver Water Department Potable Reuse Plant

A. Option Components and Basis of Conceptual Design

Treatment Facilities - The Denver Water Department's Potable Reuse Plant would be used for this option.

Piping - This option involves installation of sufficient piping and facilities to connect RFP to the Denver Water Department's Reuse Plant.

Other Components - Pipeline borings under major highways and railroad, collection pipeline from Ponds A-4, B-5 and C-2, on-site storage for flow leveling and interconnected reservoirs for storage balancing. (This treatment facility is currently decommissioned and would require start-up and staffing.)

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria based on technical feasibility. The Denver Water Department's Reuse Plant is designed to recycle sanitary wastewaters on an experimental basis. Additionally, wastes generated by the respective treatment processes would potentially contain hazardous substances such as heavy metals and radionuclides. Handling and disposal of these wastes can be difficult if not impossible at a facility not designed for such activities and will require special permitting.

B.2 Secondary Screening

N/A

4.6.19 Construct Potable Water Treatment Plant to Treat All Water Leaving RFP

A. Option Components and Basis of Conceptual Design

Treatment Facilities - This option involves construction of a new facility at RFP employing water treatment technology with a treatment capacity of approximately 5 MGD.

Piping - At a minimum, 15,000 feet of 8-inch diameter piping would be required to transfer pond water to a new plant located at a downgradient site near RFP's eastern boundary in the Walnut Creek drainage.

Pump Stations - A pump station in the Woman Creek drainage would be required with a pumping capacity of about 1.1 cfs to lift water to the Walnut Creek drainage. A second pump station with a 1.1 cfs capacity would be required to the Walnut Creek drainage.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

Although a viable option, construction and permitting a treatment facility within the 5-year IM/IRA time frame is unlikely. To construct a treatment facility of this scope and magnitude would require considerable planning, design and review time.

4.7 ALTERNATIVE WATER TRANSFER OPTIONS

This section evaluates the final disposition of pond water under the terms of this IM/IRA Decision Document. Alternative water transfer options include both internal transfers, which keep the water on-site, and external transfers, defined as off-site discharges. With the exception of Options 4.7.2.1 and 4.7.2.2, all options in this section assume applicable benchmarks have been met prior to conducting transfer operations.

4.7.1 Internal (On-site) Transfers

The options described below are designed to keep water within the boundaries of RFP to the maximum extent possible, and allow transfers between ponds to maintain operational capabilities. Water balance considerations require that transfers occur and on-site water disposal methods be available in order to maximize the ability to capture potentially contaminated water and minimize the likelihood of off-site discharges of untested water. Disposal methods such as evaporation or recycling are the key operational aspects being evaluated in this section.

4.7.1.1 Recycle STP Effluent for On-site Industrial Use

This option passes the screening criteria but is impossible to fully implement. The potential use of recycled STP effluent within the RFP industrial water system is limited by RFP industrial water needs. Total annual industrial water use is estimated at 17 million gallons. Total annual STP effluent is approximately 55 million gallons. Although this option will not eliminate the STP effluent entirely, it will reduce the volume of water to be controlled on-site. Details of this option are contained in Appendix F (Option 4.7.1.1).

4.7.1.2 Recycle Pond Water to RFP Industrial Water Supply

This option passes the screening criteria; however, the demand for recycled water in future industrial processes is limited (see discussion in 4.7.1.1). Total annual stormwater volumes are approximately 120 million gallons. Although this option will not eliminate the STP effluent entirely, it will reduce the volume of water to be controlled on-site. Details of this option are contained in Appendix F (Option 4.7.1.2).

4.7.1.3 Transfer Pond Water to New Shallow Evaporation Ponds

A. Option Components and Basis of Conceptual Design

Storage - This option requires construction of approximately 900 acres of new lined and bermed shallow evaporation ponds within the RFP buffer zone, capable of evaporating the combined volume of annual STP effluent, average annual runoff and half the 100-year, 24-hour storm event (approximately 750 acre-feet).

Pump Stations and Piping - New pump stations of 1.1 cfs capacity at Ponds A-4, B-5 and C-2 would be required to transfer water to the new evaporation ponds.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

This option fails the secondary screening because evaporation ponds do not offer the reliability required for pond water management and have the potential to spread contaminants to new areas, increasing the geographic extent of land surfaces which will require further remediation. Therefore, this option does not reduce overall risk and produces short-term adverse impacts.

4.7.1.4 Directly Spray Evaporate Pond Water (Aerosol Spray Method) On-site

This option passes the primary and secondary screening criteria because direct spray evaporation of water over its source pond reduces the volume of water retained in the pond, thereby reducing the need to transfer or discharge the pond. Overall risk by to human health or the environment is reduced by decreasing water volumes to be managed and by keeping contaminants within the pond and drainage of origin. Details of this option are contained in Appendix F (Option 4.7.1.4).

4.7.1.5 Mechanically Evaporate Pond Water (Evaporative Coolers) On-site

This option passes the primary and secondary screening criteria because mechanical evaporation of water reduces the volume of water to be discharged or transferred, thereby reducing overall risk. Details of this option are contained in Appendix F (Option 4.7.1.5).

4.7.1.6 Land Irrigate Pond Water On-site for Evapotranspiration

A. Option Components and Basis of Conceptual Design

This option involves direct irrigation of approximately 1 MGD to on-site areas of the RFP buffer zone to promote evapotranspiration through crops or vegetative cover.

Pumps - This option requires 1.1 cfs pump stations at Ponds A-4, B-5 and C-2 to transfer pond water to the irrigation piping network.

Piping - This option requires approximately 15,000 feet of 6-inch PVC to distribute water to irrigation systems.

Irrigation Systems - Spray Irrigation systems would cover approximately 1400 acres.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

This option fails the secondary screening criteria because evapotranspiration to reduce the volume of discharges from RFP does not offer the reliability required for pond water management. The potential for the accumulation of contaminants in soils does not reduce overall risk to human health or the environment and may result in long-term impacts requiring future remediation.

4.7.1.7 Transfer Pond Water to On-site Wetlands

A. Option Components and Basis of Conceptual Design

Storage - This option requires additional on-site storage, including a reservoir on the Rock Creek drainage where constructed wetlands would be located.

Pumps and Piping - This option requires pumps and piping from the existing ponds within each drainage (A, B and C) to the Rock Creek drainage. Pumps would have a capacity of about 3.6 cfs each in order to provide adequate flow leveling and achieve zero discharge conditions.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

This option fails the secondary screening criteria. New or enlarged wetlands can be beneficial by increasing riparian habitat and evapotranspiration while reducing the total volume of off-site discharges. However, the potential for bio-accumulation, or evapoconcentration of contaminants just meeting applicable water quality standards can result in segment standard exceedances within the wetland itself. Constructed wetlands do not offer the reliability required for pond water management, are less effective during winter months and are generally sensitive to environmental conditions. This increases rather than reduces overall risk to the environment, and may result in long-term adverse impacts requiring future remediation.

4.7.1.8 Transfer Interior Ponds to Pond A-3 to Maintain Spill Control Capacity

This option passes the screening criteria because it ensures that designated spill control ponds A-1, A-2, B-1 and B-2 are operated in order to maintain maximum available capacity at all times. The potential for overflow of individual spill control ponds is reduced compared to existing operating condition, thereby reducing the risk of uncontrolled releases of contaminated water from these ponds. Details of this option are contained in Appendix F (Option 4.7.1.8).

4.7.2 External (Off-site) Discharges

All of the options described below permanently remove water from the control and management of RFP personnel. All options assume applicable water quality criteria have been met prior to discharge.

4.7.2.1 Discharge Stormwater Directly to Segment 4 Without Capture in Ponds

A. Option Components and Basis of Conceptual Design

Storage - This option involves the installation of collection/diversion sumps at each of 7 stormwater outfalls from the RFP core area.

Piping - A gravity pipeline network from 7 stormwater outfalls in the core area will bypass the existing pond system and discharge directly to Segment 4 below ponds. Approximately 15,000 feet of 8-inch PVC would be required.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria. Direct stormwater discharges to Segment 4 (i.e., rerouting stormwater discharges around the ponds) does not allow monitoring for compliance with Segment 4 or 5 standards prior to discharge as required by the benchmarks for this IM/IRA Decision Document and does not meet the intent of other agreements such as the AIP and FFCA.

Bypassing existing secondary catchment creates the potential for direct downstream release of spills and sediment-laden stormwater which makes this option not protective of human health and the environment.

B.2 Secondary Screening

N/A

4.7.2.2 Discharge STP Effluent Directly to Segment 4 Without Capture in Ponds

A. Option Components and Basis of Conceptual Design

This option involves abandoning Pond B-3 which currently receives STP effluent and directly discharging effluent downstream beyond the pond system.

Piping - A 2000-foot extension of the existing gravity pipeline between the STP and Pond B-3 to a new discharge location below Pond B-5 would be required.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

This option fails the secondary screening criteria. Discharges from the STP are assumed to comply with applicable NPDES permit requirements and Segment 5 standards. However, increased risks to public health and the environment result from the potential for STP upsets to transport contaminants beyond the existing secondary catchment capability of Pond B-3.

4.7.2.3 Discharge Pond Water to Off-site Wetlands Systems

A. Option Components and Basis of Conceptual Design

Water from RFP ponds would be discharged via gravity pipeline to an off-site location for use as source water for new constructed wetlands of approximately 640 acres, or to improve existing wetlands. The potential locations for new or improved off-site wetlands are all downgradient of RFP, thus no pumping facilities are necessary.

Conceptual pipeline length is two miles or more. No specific downstream wetlands locations have been identified.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria because it does not address on-site pond water management. Downstream wetlands would be built, administered and controlled by downstream governmental entities.

B.2 Secondary Screening

N/A

4.7.2.4 Pipe Pond Water to South Platte River at Big Dry Creek

A. Option Components and Basis of Conceptual Design

Storage - This option requires 550 acre-feet of additional on-site storage for flood attenuation and controlled releases of stormwater.

Pumps and Piping - This option requires an approximately 45-mile buried pipeline from RFP to the confluence with the South Platte River, including conduits under major highways and railroads.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

Direct discharges to Big Dry Creek or the South Platte River must meet Segment 1 water quality criteria. Segment 1 criteria are less stringent than Segment 4 or Segment 5 criteria that currently apply to RFP pond discharges. Irrespective of public input, the high cost of this option coupled with the necessary involvement of off-site governmental entities (Broomfield, Westminster, Thornton, Jefferson County, State of Colorado) with an inherent distrust of RFP make it improbable that this option can be implemented within the specified 5-year time frame.

4.7.2.5 Pipe Pond Water to South Platte River at 120th Avenue

A. Option Components and Basis of Conceptual Design

Storage - This option requires 550 acre-feet of additional on-site storage for flood attenuation and controlled release of stormwater.

Pumps and Piping - This option requires approximately 24 miles of buried pipeline from RFP to the confluence with the South Platte River, including conduits under major highways and railroads.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

Direct discharges to South Platte at 120th Avenue must meet Segment 1 water quality criteria. Segment 1 criteria are less stringent than Segment 4 or Segment 5 criteria that currently apply to RFP pond discharges. Irrespective of risk levels and/or public input, the high cost of this option coupled with the necessary involvement of off-site governmental entities (Broomfield, Westminster, Thornton, Jefferson County, State of Colorado) with an inherent distrust of RFP make it improbable that this option can be implemented within the specified 5-year time frame.

4.7.2.6 Pipe Pond Water to Clear Creek

A. Option Components and Basis of Conceptual Design

Storage - This option requires 550 acre-feet of additional on-site storage for flood attenuation and controlled release of stormwater.

Pumps and Piping - This option requires buried pipeline from RFP to Clear Creek, including conduits under major highways and railroads.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria.

B.2 Secondary Screening

Direct discharges to Clear Creek must meet less stringent water quality criteria than Segment 4 or Segment 5 criteria that currently apply to RFP pond discharges. This option would also be expected to meet with stiff public opposition. Irrespective of risk levels and/or public input, the high cost of this option coupled with the necessary involvement of off-site governmental entities (Jefferson County, State of Colorado) with an inherent distrust of RFP make it improbable that this option can be implemented within the specified 5-year time frame.

4.7.2.7 Bypass Pond Water around Municipal Reservoirs in Off-site Pipeline

A. Option Components and Basis of Conceptual Design

Storage - In this option, a new 550 acre-feet detention reservoir on Woman Creek would be constructed to attenuate flood water for later release via pump and pipeline to the Walnut Creek drainage.

Pumps and Piping - A gravity pipeline around Great Western Reservoir would be constructed and a separate pumping system and pipeline would transfer water from the new Woman Creek Reservoir to the pipeline around Great Western Reservoir.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening criteria because it is specifically an off-site option to address protection of downstream reservoirs. As such, it does not address on-site pond water management as required by the criteria adopted for this IM/IRA Decision Document.

B.2 Secondary Screening

N/A

4.7.2.8 Discharge All Ponds to Segment 4

A. Option Components and Basis of Conceptual Design

Piping - In this option, a gravity pipeline will be installed parallel to and within both the A- and B-series drainages (North Walnut Creek and South Walnut Creek), capable of accepting pumped inputs from each of the upper A- and B-series ponds. A discharge pipe will be installed at the Landfill Pond, terminating in the drainage below the Landfill Pond dam. Piping to discharge Pond C-2 to Woman Creek currently exists. This concept will eliminate sampling required for transfers from upstream ponds to the terminal ponds for discharge. When pond water complies with benchmarks, it can be directly discharged.

Pumps - Each pond would require a pump and suction piping to transfer water from the pond to its respective discharge location or connection to discharge piping header.

B. Screening Criteria

B.1 Primary Screening

This option passes the primary screening criteria under the specific assumption that all discharged water would be monitored for, and in compliance with, Segment 4 water quality standards prior to discharge.

B.2 Secondary Screening

This option fails the secondary screening criteria on the basis of risk reduction. Ponds A-1, A-2, B-1, B-2 and the Landfill Pond have historically been operated and maintained as non-discharging ponds. These ponds have also been used to capture and hold potentially contaminated water, and are generally assumed to contain contaminants within the sediments of these ponds. Even though water quality would meet Segment 4 criteria *where sampled*, the potential for sediment disturbances prior to or during discharge will continue to exist. Thus, direct discharge of these ponds represents an increased risk to human health and the environment over current conditions.

4.7.2.9 Discharge Stormwater Ponds to Segment 4

This option passes the screening criteria because it requires certain ponds (A-3 and B-5) to attain better water quality prior to release than currently required for interpond transfers to Pond A-4. Pumping and associated diesel pump air emissions are also reduced. Details of this option are contained in Appendix F (Option 4.7.2.9).

4.7.2.10 Pipe Water from Pond C-2 to Walnut Creek in On-site Pipeline

This option passes the primary and secondary screening criteria because the operational flexibility to transfer water from Pond C-2 to the A- and B-series ponds or Walnut Creek reduces the potential for Pond C-2 overflows and enhances overall stormwater control capabilities. This option also reduces overall risk to public health and the environment by eliminating RFP discharges to a drinking water supply (Standley Lake). Details of this option are contained in Appendix F (Option 4.7.2.10).

4.8 MONITORING OPTIONS

Water monitoring options must be capable of providing timely operational guidance and detecting abnormal conditions as quickly as possible so the impact on pond water is minimized and the quality of transfers and discharges is protected. Monitoring policies, as reflected by the options listed below, assume redundant capabilities to divert, store and treat suspect water (if necessary) will remain available under any management scheme. This assumption is important because real-time monitoring for the parameters of highest interest (organics and radionuclides) is technologically unavailable at the low detection levels required. Thus, some period of time between detection and response (i.e., treatment) will always exist and protection of water quality via demonstration of compliance with applicable requirements necessitates holding the water until analytical results are received.

Monitoring options in this section are listed and screened on the basis of location in order to account for both water quality and operational considerations. The frequency and level of detail (i.e. analytical suite) proposed for individual locations passing the screening criteria are more fully discussed in Chapter 5.

4.8.1 Monitor Seeps/Springs

A. Option Components and Basis of Conceptual Design

Seep and spring water would be sampled and analyzed for hazardous waste constituents and/or Segment 5 water quality criteria. Flow monitoring would require construction of a collection sump and/or impermeable cut-off wall (to direct water to the sump) because of the very low flow of these sources. The number of seep locations has not been estimated.

B. Screening Criteria

B.1 Primary Screening

This option fails the primary screening because it does not address pond water management and is not independent of OU actions. Monitoring of seeps and springs is not warranted or pertinent to pond water management, unless the seeps and springs are the source of suspected contaminants. Investigations to determine the presence of contaminated groundwaters which would be the source of contaminated seeps and springs are specific OU actions beyond the scope of this IM/IRA Decision Document.

B.2 Secondary Screening

N/A

4.8.2 Monitor Upgradient Groundwater

A. Option Components and Basis of Conceptual Design

Monitoring wells would be installed upgradient (i.e., the side slopes) to each pond, and upgradient of known seeps and springs. The number of monitoring wells has not been estimated.

B. Screening Criteria

B.1 Primary Screening

Groundwater monitoring is currently being conducted on a site-wide basis under the auspices of the IAG[13] and supports OU-specific RI/RFI work efforts. Additional groundwater monitoring does not address pond water management issues, is not independent of OU actions and is outside the scope of this IM/IRA Decision Document.

B.2 Secondary Screening

N/A

4.8.3 Monitor Influent Streams

This option passes the primary and secondary screening criteria. Influent stream flow monitoring is essential to effective operational management of the ponds. Although real-time water quality monitoring at low detection limits is technologically unavailable, real-time monitoring of indicator parameters can provide early warning of potential water quality problems. Details of this option are contained in Appendix F (Option 4.8.3).

4.8.4 Monitor Ponds

This option passes the primary and secondary screening criteria. Water quality monitoring within the ponds ensures potential water quality problems will be detected prior to interpond transfers or downstream releases and promotes compliance with the chemical-specific benchmarks adopted for this IM/IRA Decision Document. Operational monitoring of pond volumes, dam piezometer levels and physical parameters such as temperature, pH and dissolved oxygen ensure that operations personnel are routinely informed of changing conditions and can take appropriate action in a timely fashion. Details of this option are contained in Appendix F (Option 4.8.4).

4.8.5 Monitor On-site Water Transfers

This option passes the primary and secondary screening criteria. Water quality monitoring of transfers provides a check on water quality against pond-specific monitoring conducted prior to the transfer, to ensure significant changes in water quality have not occurred. Flow monitoring of transfers supports operational control of pond volumes. Details of this option are contained in Appendix F (Option 4.8.5).

4.8.6 Monitor Off-site Water Discharges

This monitoring option passes the primary and secondary screening criteria. Water quality monitoring of discharges provides a final check on water quality against chemical-specific benchmarks adopted by this IM/IRA Decision Document, achieves regulatory compliance and may identify previously undetected problems. Flow monitoring provides valuable information to on-site and off-site water managers. Details of this option are contained in Appendix F (Option 4.8.6).

REFERENCES

[1] Federal Water Pollution Control Act, 1988, Commonly Called the "Clean Water Act", 33 USC §§ 1251-1387 (FWPCA § 101-607).

[2] Department of Energy, 1992, Application to the Environmental Protection Agency for Authorization to Discharge Under the National Pollutant Discharge Elimination System.

[3] EG&G Rocky Flats, 1992, Spill Prevention Control Countermeasures and Best Management Practices (SPCC/BMP) Plan.

[4] Department of Energy, 1993, Watershed Management Plan for Rocky Flats.

[5] EG&G Rocky Flats, 1992, Emergency Preparedness Implementation Plan for Water Detention Pond Dam Failure. 1-15200-EPIP-12.14.

[6] Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 1980, Title 42 USC, §§ 9601-9675 (CERCLA §§ 101-405). Supplemented 1988.

[7] Environmental Protection Agency Office of Solid Waste and Emergency Responses, 1992, OSWER Directive 9355.3-02.

[8] Department of Energy, 1991, NPDES Federal Facility Compliance Agreement (FFCA).

[9] Environmental Protection Agency, 1984, Authorization to Discharge Under the National Pollutant Discharge Elimination System. Permit No. CO-0001333. (NPDES Permit).

[10] Code of Federal Regulations (CFR), 1992, EPA Administered Permit Programs: The National Pollutant Discharge Elimination System, 40 CFR 122.

[11] Code of Federal Regulations (CFR), 1992, Oil Pollution Prevention, 40 CFR 112.

[12] Code of Federal Regulations (CFR), 1992, Criteria and Standards for the National Pollutant Discharge Elimination System, 40 CFR 125.

[13] Department of Energy, United States Environmental Protection Agency Region VIII, and State of Colorado, 1991, Rocky Flats Interagency Agreement (IAG).

TABLE 4-1

COMPILATION OF POND WATER MANAGEMENT OPTIONS, PRIOR TO APPLICATION OF PRIMARY SCREENING PROCEDURE

REFERENCE SECTION	OPTION	DESCRIPTION
4.2	**CWA/NPDES Regulated Water Management**	**See Text discussion, Section 4.2**
4.2.1	**On-site Spill Collection, Routing and Storage**	
4.2.1.1	Implement source reduction BMPs	Includes measures such as good housekeeping, preventive maintenance and chemical substitution.
4.2.1.2	Implement Spill Prevention Control & Countermeasures Plan (SPCC)	Exists and is currently implemented.
4.2.1.3	Implement spill mitigation BMPs	Includes items such as drip pans, cleaning storm drains and spill response procedures.
4.2.2	**Stormwater Collection, Routing and Storage**	
4.2.2.1	Prepare and implement Stormwater Pollution Prevention Plan (SPPP)	Finalize and implement SPPP in Fiscal Year (FY) 1994.
4.2.2.2	Prepare and implement Oil Pollution Prevention Plan (OPPP)	Prepare and implement OPPP in FY 1994.
4.2.2.3	Implement exposure minimization BMPs	Includes covering and secondary containment activities, segregating flows, and recycling vehicle wash water.
4.2.3	**STP Effluent Discharge and Routing**	
4.2.3.1	Implement monitoring requirements of NPDES-FFCA	Continue special monitoring requirements, such as biomonitoring, that are currently in place.
4.3	**Operable Unit (OU) Interactions**	**See text discussion, Section 4.3**
4.3.1	Drill wells to capture/pump groundwater	Drill wells to capture contaminated groundwater.
4.3.2	Capture seep/springs flow and pump to existing OU storage	Build sumps and pumping stations at seeps and springs to transfer water to OU treatment facilities.
4.3.3	Capture and store landfill leachate flows	Build cutoff walls, pumping facilities and tanks to collect and store landfill leachate.
4.3.4	Capture and store individual seeps/springs	Build sumps and tanks at seeps/springs to capture contaminated water.
4.3.5	Capture and store building foundation drain water	Build sumps and tanks to capture water from building foundation drains prior to entering the surface water drainage system.

TABLE 4-1
COMPILATION OF POND WATER MANAGEMENT OPTIONS,
PRIOR TO APPLICATION OF PRIMARY SCREENING PROCEDURE
(Continued)

REFERENCE SECTION	OPTION	DESCRIPTION
4.3.6	Reroute OUs 1 & 2 treatment system discharges to new on-site location	Discharge treated OU water to on-site land areas (rather than to on-site ponds).
4.3.7	Reroute OUs 1 & 2 treatment system discharges to off-site location (or Segment 4)	Discharge treated OU water directly off-site via pipeline or to land area off-site or by pipeline to Segment 4 on-site.
4.3.8	Recycle OUs 1 & 2 treatment system discharges to RFP industrial loop	Discharge treated OU water to industrial water system for reuse.
4.3.9	Evaporate discharges from OUs 1 and 2 treatment systems	Evaporate treated OU water by mechanical or spray evaporation.
4.4	**Spill Control Options**	
4.4.1	Construct one off-line pond for spill control/capture	Rely on one new pond for spill control rather than four existing small ponds. Abandon existing ponds.
4.4.2	Construct off-line ponds for each drainage for spill control/capture	Construct multiple off-line ponds of adequate size to handle spills in drainages or to STP influent. Abandon existing ponds.
4.4.3	Construct centralized tank farm for spill control/capture	Construct a tank farm that would capture the majority of a spill event. Overflow would be routed to existing ponds.
4.4.4	Construct tanks for spill control/capture on each drainage	Locate suitably sized spill-control tanks to collect the majority of a spill output. Overflow would be routed to an existing on-site pond.
4.4.5	Construct diversions at individual stormwater outfalls for spill control/capture	Build sumps, diversion gates and pipelines to keep contaminated stormwater away from the streams.
4.4.6	Construct storage at individual stormwater outfalls for spill control/capture	Build sumps, pumping facilities and tanks to capture potentially contaminated stormwater prior to entering streams.
4.4.7	Utilize existing tanks for spill control/capture	Pump spills or contaminated water to existing on-site tanks.
4.4.8	Utilize existing Ponds A-1, A-2 and B-1, B-2 for spill control/capture	No action alternative. Continue using upper A- and B-series ponds for spill containment.
4.4.9	Consolidate existing spill control ponds to one per drainage	Consolidate Ponds A-1/A-2 and B-1/B-2 to one pond per drainage. Maintain spill capacity.

TABLE 4-1
COMPILATION OF POND WATER MANAGEMENT OPTIONS,
PRIOR TO APPLICATION OF PRIMARY SCREENING PROCEDURE
(Continued)

REFERENCE SECTION	OPTION	DESCRIPTION
4.4.10	Reuse "solar ponds" after remediation	Use remediated "solar ponds" as spill storage facilities.
4.5	**Storage Options**	
4.5.1	**STP Effluent Storage Options**	
4.5.1.1	Construct storage tanks for STP effluent only	Off-line tank to store STP effluent for sampling and analysis prior to downstream discharges.
4.5.1.2	Construct storage pond for STP effluent only	Construct a dedicated off-line pond to hold STP effluent for sampling and analysis prior to discharge off-site.
4.5.2	**Replacement Pond Options**	
4.5.2.1	Abandon existing stormwater ponds and replace with on-line stormwater ponds for each drainage (on-site)	Construct 2 or more new on-line stormwater pond to replace A-3, A-4, B-3, B-4 and B-5. Old ponds would be removed and remediated.
4.5.2.2	Abandon existing stormwater ponds and replace with new off-line stormwater ponds for each drainage (on-site)	Construct 2 or more new off-line stormwater reservoir ponds to replace A-3, A-4, B-3, B-4 and B-5.
4.5.2.3	Abandon existing ponds and replace with a single, large reservoir off-site	New reservoir off-site.
4.5.2.4	Abandon existing ponds and replace with a single, large reservoir on-site	Construction of a 100-year flood detention reservoir for all flows on Woman Creek.
4.5.2.5	Abandon existing ponds and replace with tankage	Use storage tanks to contain stormwater and spills.
4.5.3	**Stormwater Collection and Storage Options**	
4.5.3.1	Maintain and continue using existing on-line stormwater ponds	Construct improvements to bypass pipes, ditches and dams, but leave existing system in place.
4.5.3.2	Maintain existing stormwater ponds and add off-line stormwater containment pond (on-site)	Construct new off-line ponds for core area stormwater capture in addition to improvements noted in 4.5.3.1, above.
4.5.3.3	Maintain existing stormwater ponds and add on-line stormwater containment pond(s) to each drainage	Add new lined ponds downstream of existing ponds, and continue using existing ponds.

TABLE 4-1
COMPILATION OF POND WATER MANAGEMENT OPTIONS,
PRIOR TO APPLICATION OF PRIMARY SCREENING PROCEDURE
(Continued)

REFERENCE SECTION	OPTION	DESCRIPTION
4.5.3.4	Consolidate existing stormwater ponds to one per drainage	Eliminate some stormwater ponds based on water mass balance.
4.5.3.5	Consolidate existing on-line ponds and add off-line pond(s)	Create new off-line ponds based on water mass balance needs. Eliminate existing ponds which are not required for collection/storage.
4.5.3.6	Utilize existing on-line, off-site reservoir (Great Western) for stormwater and effluent storage	Great Western Reservoir would serve as a terminal reservoir facility.
4.6 Treatment Options		
4.6.1	Construct mobile treatment units for multi-pond use	Trailer-mounted type facility which can be used at any pond.
4.6.2	Construct individual treatment facilities at each pond	Individual treatment facilities at each pond would treat water to meet water quality standards.
4.6.3	Construct waste injection well	Inject water not meeting Segment 4 or Segment 5 standards into wells on-site.
4.6.4	Use biological treatment via constructed wetlands	Construct new wetlands for advanced biological treatment.
4.6.5	Use land treatment at off-site location	Pipeline to off-site location for land application, including on-site storage for controlled release.
4.6.6	Use land treatment at on-site location	Land application at on-site location for water requiring treatment.
4.6.7	Use existing OU treatment facilities	Use existing capacity of OU 1, OU 2 and/or OU 4 treatment facilities.
4.6.8	Expand existing OU treatment facilities	Expand capacity of OU 1, OU 2 and/or OU 4 treatment facilities.
4.6.9	Consolidate treatment facilities at Pond A-4 for use by entire pond system	Pipelines from various ponds to the A-4 facility. Upgraded treatment capacilities of A-4 facility.
4.6.10	Consolidate treatment at the existing STP	Direct treatment of consolidated STP and stormwater flows by RFP STP. Discharge to Segment 4 or Segment 5.
4.6.11	Consolidate treatment at an expanded STP	Direct treatment of consolidated STP and stormwater flows by RFP STP. Discharge to Segment 4 or Segment 5.

TABLE 4-1
COMPILATION OF POND WATER MANAGEMENT OPTIONS,
PRIOR TO APPLICATION OF PRIMARY SCREENING PROCEDURE
(Continued)

REFERENCE SECTION	OPTION	DESCRIPTION
4.6.12	Treat water off-site at Northglenn STP	Direct discharge via gravity pipeline to Northglenn sewage collection system. Discharges would meet pre-treatment standards only.
4.6.13	Treat water off-site at Arvada STP	Pipeline to Arvada/Metro STP, including on-site storage for controlled release.
4.6.14	Treat water off-site at Westminster STP	Pipeline connecting to Westminster/Metro STP, including on-site storage for controlled release.
4.6.15	Treat water off-site at Superior/Rock Creek STP	Pipeline to Superior/Rock Creek STP including on-site storage for controlled release.
4.6.16	Treat water off-site at Denver/Metro STP	Denver Metro Sewage Treatment Plant direct pipeline.
4.6.17	Treat water off-site at Broomfield STP	Pipeline to Broomfield STP.
4.6.18	Treat water off-site at Denver Water Department Potable Reuse Plant	A gravity-flow pressure pipeline for stormwater and STP effluent directly to the Denver Water Department Reuse Plant. Discharge to the South Platte River via the Denver Metro STP.
4.6.19	Construct potable water treatment plant to treat all water leaving the plant	All water treated prior to off-site discharge.
4.7	**Alternative Water Transfer Options**	
4.7.1	**Internal (On-site) Transfers**	
4.7.1.1	Recycle STP effluent for on-site industrial use	Recycle STP effluent for on-site industrial use.
4.7.1.2	Recycle pond water to RFP industrial water supply	On-site reuse of pond water in the industrial water system.
4.7.1.3	Transfer pond water to new shallow evaporation ponds	On-site evaporation (zero discharge) utilizing shallow-lined evaporation ponds with a surface adequate to assure that pond evaporation would be equivalent to the discharge design flow in the critical year.
4.7.1.4	Directly spray evaporate pond water (aerosol spray method) on-site	On-site evaporation utilizing aerosol spray.

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COMPILATION OF POND WATER MANAGEMENT OPTIONS,
PRIOR TO APPLICATION OF PRIMARY SCREENING PROCEDURE
(Continued)

REFERENCE SECTION	OPTION	DESCRIPTION
4.7.1.5	Mechanically evaporate pond water (evaporative coolers) on-site	On-site evaporation of the drainage and treated water utilizing a series of cooling towers.
4.7.1.6	Land irrigate pond water on-site for evapotranspiration	On-site evapotranspiration/evaporation (zero discharge) utilizing land irrigation systems to sustain vegetative cover.
4.7.1.7	Transfer pond water to on-site wetlands	On-site evapotranspiration/evaporation (zero discharge) utilizing wetlands and additional reservoirs.
4.7.1.8	Transfer interior ponds to Pond A-3 to maintain spill control capacity	Pump water meeting Segment 5 standards to Pond A-3 for eventual discharge.
4.7.2	**External (Off-site) Discharges**	
4.7.2.1	Discharge stormwater directly to Segment 4 without capture in ponds	Direct discharge of stormwater bypassing existing ponds.
4.7.2.2	Discharge STP effluent directly to Segment 4 without capture in ponds	Direct discharge of STP discharges bypassing existing ponds. Discharges would meet Segment 4 standards.
4.7.2.3	Discharge pond water to off-site wetlands systems	Discharge water meeting wetland water quality standars to off-site wetland system.
4.7.2.4	Pipe pond water to South Platte River at Big Dry Creek	Pipeline for conveyance of stormwater and STP effluent to the South Platte River via Big Dry Creek, including on-site storage off-line for controlled release.
4.7.2.5	Pipe pond water to South Platte River at 120th Avenue	Pipeline for conveyance for stormwater and STP effluent to South Platte River along 120th Avenue, including on-site off-line storage for controlled release.
4.7.2.6	Pipe pond water to Clear Creek	Pipeline to Clear Creek.
4.7.2.7	Bypass pond water around municipal reservoirs in off-site pipeline	Pipeline bypass of municipal reservoirs with discharge directed to Big Dry Creek.
4.7.2.8	Discharge all ponds to Segment 4	Sample and analyze all pond for Segment 4 standards. Discharge all ponds via new pipelines to Segment 4.
4.7.2.9	Discharge stormwater ponds to Segment 4	Discharge Ponds A-3, A-4, B-5 and C-2 to Segment 4 after sampling and analysis to Segment 4 standards.

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COMPILATION OF POND WATER MANAGEMENT OPTIONS, PRIOR TO APPLICATION OF PRIMARY SCREENING PROCEDURE
(Continued)

REFERENCE SECTION	OPTION	DESCRIPTION
4.7.2.10	Pipe water from Pond C-2 to Walnut Creek in on-site pipeline	Pipeline to transfer (and discharge) C-2 water directly to Walnut Creek.
4.8	**Monitoring Options**	
4.8.1	Monitor seeps/springs	Sample and analyze seeps and springs for water quality and monitor flow rate of seeps and springs.
4.8.2	Monitor upgradient groundwater	Monitor upgradient groundwater for water quality.
4.8.3	Monitor influent streams	Monitor streams influent to ponds for flow rate and water quality.
4.8.4	Monitor ponds	Monitor pool level, piezometric head levels and sample and analyze pond water quality.
4.8.5	Monitor on-site water transfers	Sample and analyze pond water quality prior to transfer and monitor transfer flow rates.
4.8.6	Monitor off-site water discharges	Sample and analyze pond water quality before discharge off-site and monitor discharge flow rate.

TABLE 4-2
PRIMARY AND SECONDARY SCREENING PROCESSES FOR POND WATER MANAGEMENT ALTERNATIVES - TABULAR SUMMARY

REFERENCE SECTION	OPTION	PRIMARY SCREENING CRITERIA FROM FIGURE 4-1							PRIMARY SCREENING DECISION	SECONDARY SCREENING CRITERIA FROM FIGURE 4-2			SECONDARY SCREENING DECISION
		PROTECTS HUMAN HEALTH & ENVIRONMENT	COMPLIES WITH BENCHMARKS	COMPLIES WITH PERMITS, AGREEMENTS, LAWS & REGS OTHER THAN BENCHMARKS	TECHNICALLY FEASIBLE	ADDRESSES ON-SITE POND WATER MANAGEMENT	CONSISTENT WITH CLEAN WATER ACT MANAGEMENT PRACTICES	INDEPENDENT OF OPERABLE UNIT ACTIONS		CAN BE OPERATIVE IN LESS THAN FIVE YEARS	REDUCES OVERALL RISK TO PUBLIC HEALTH OR ENVIRONMENT	SHORT-TERM ADVERSE IMPACTS OF OPTION CAN BE MITIGATED	
4.2	**CWA/NPDES Regulated Water Management**												**See text discussion, Section 4.2**
4.2.1	**On-site Spill Collection, Routing and Storage**												
4.2.1.1	Implement source reduction BMPs	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.2.1.2	Implement Spill Prevention, Control & Countermeasures Plan (SPCC)	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.2.1.3	Implement spill mitigation BMPs	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.2.2	**Stormwater Collection, Routing and Storage**												
4.2.2.1	Prepare and implement Stormwater Pollution Prevention Plan (SPPP)	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.2.2.2	Prepare and implement Oil Pollution Prevention Plan (OPPP)	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.2.2.3	Implement exposure minimization BMPs	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.2.3	**STP Effluent Discharge and Routing**												
4.2.3.1	Implement monitoring requirements of NPDES-FFCA	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.3	**Operable Unit (OU) Interactions**												**See text discussion, Section 4.3**
4.3.1	Drill wells to capture/pump groundwater	✓	✓	✓	✓	No	✓	No	Reject	-	-	-	
4.3.2	Capture seep/springs flows and pump to existing OU storage	✓	✓	✓	?	No	✓	No	Reject	-	-	-	
4.3.3	Capture and store landfill leachate flows	✓	?	✓	✓	✓	✓	No	Reject	-	-	-	
4.3.4	Capture and store individual seep/springs	✓	✓	✓	?	No	✓	No	Reject	-	-	-	
4.3.5	Capture & store building foundation drain water	✓	✓	✓	✓	No	✓	No	Reject	-	-	-	
4.3.6	Reroute OUs 1 & 2 treatment system discharges to new on-site location	✓	?	✓	✓	✓	✓	No	Reject	-	-	-	
4.3.7	Reroute OUs 1 & 2 treatment system discharges to off-site location (or Segment 4)	✓	?	✓	✓	✓	✓	No	Reject	-	-	-	
4.3.8	Recycle OUs 1 & 2 treatment system discharges to RFP industrial loop	✓	?	✓	?	✓	✓	No	Reject	-	-	-	
4.3.9	Evaporate discharges from OUs 1 & 2 treatment systems	✓	?	✓	✓	No	✓	No	Reject	-	-	-	

✓ = fulfills criterion   ? = requires further evaluation   - = previously rejected, no evaluation required

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TABLE 4-2
PRIMARY AND SECONDARY SCREENING PROCESSES FOR POND WATER MANAGEMENT ALTERNATIVES - TABULAR SUMMARY
(Continued)

EFER- ENCE CTION	OPTION	PRIMARY SCREENING CRITERIA FROM FIGURE 4-1							PRIMARY SCREENING DECISION	SECONDARY SCREENING CRITERIA FROM FIGURE 4-2			SECONDARY SCREENING DECISION
		PROTECTS HUMAN *HEALTH &* ENVIRON-MENT	COMPLIES WITH BENCH-MARKS	COMPLIES WITH PERMITS, AGREEMENTS, LAWS & REGS OTHER THAN BENCHMARKS	TECH-NICALLY FEAS-IBLE	ADDRESSES ON-SITE POND *WATER* MANAGE-MENT	CONSIST-ENT WITH CLEAN WATER ACT MANAGE-MENT PRACTICES	INDEPEN-DENT OF OPERABLE UNIT ACTIONS		CAN BE OPERA-TIVE IN LESS THAN FIVE YEARS	REDUCES OVERALL RISK TO PUBLIC *HEALTH* OR ENVIRON-MENT	SHORT-TERM ADVERSE IMPACTS OF OPTION CAN BE MITIGATED	
4	**Spill Control Options**												**See text discussion, Section 4.4**
4.4.1	Construct one off-line pond for spill control/capture	✓	✓	✓	✓	✓	✓	✓	Accept	✓	No	No	Reject
4.4.2	Construct off-line ponds for each drainage for spill control/capture	✓	✓	✓	✓	✓	✓	✓	Accept	✓	No	No	Reject
4.4.3	Construct centralized tank farm for spill control/capture	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.4.4	Construct tanks for spill control/capture on each drainage	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.4.5	Construct diversions at individual stormwater outfalls for spill control/capture	✓	✓	✓	✓	No	✓	✓	Reject	-	-	-	
4.4.6	Construct storage at individual stormwater outfalls for spill control/capture	✓	✓	✓	No	No	✓	✓	Reject	-	-	-	
4.4.7	Utilize existing tanks for spill control/capture	✓	✓	No	No	✓	✓	No	Reject	-	-	-	
4.4.8	Utilize existing Ponds A-1, A-2 and B-1, B-2 for spill control/capture	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.4.9	Consolidate existing spill control ponds to one per drainage	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
.4.10	Reuse "solar ponds" after remediation	✓	✓	No	✓	✓	✓	No	Reject	-	-	-	
5	**Storage Options**												**See text discussion, Section 4.5**
5.1	**STP Effluent Storage Options**												
.5.1.1	Construct storage tanks for STP effluent only	✓	✓	✓	✓	✓	✓	✓	Accept	✓	No	No	Reject
.5.1.2	Construct storage pond for STP effluent only	✓	✓	✓	✓	✓	✓	✓	Accept	✓	No	No	Reject
5.2	**Replacement Pond Options**												
.5.2.1	Abandon existing ponds and replace with on-line stormwater ponds for each drainage (on-site)	✓	✓	✓	✓	✓	✓	✓	Accept	✓	No	No	Reject
.5.2.2	Abandon existing ponds and replace *with off-line stormwater* ponds for each drainage (on-site)	✓	✓	✓	No	✓	✓	✓	Reject	-	-	-	
.5.2.3	Abandon existing ponds and replace with a single, large reservoir off-site	No	✓	No	No	✓	No	✓	Reject	-	-	-	

✓ = fulfills criterion ? = requires further evaluation - = previously rejected, no evaluation required

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TABLE 4-2
PRIMARY AND SECONDARY SCREENING PROCESSES FOR POND WATER MANAGEMENT ALTERNATIVES - TABULAR SUMMARY
(Continued)

REFERENCE SECTION	OPTION	PRIMARY SCREENING CRITERIA FROM FIGURE 4-1							PRIMARY SCREENING DECISION	SECONDARY SCREENING CRITERIA FROM FIGURE 4-2			SECONDARY SCREENING DECISION
		PROTECTS HUMAN HEALTH & ENVIRONMENT	COMPLIES WITH BENCHMARKS	COMPLIES WITH PERMITS, AGREEMENTS, LAWS & REGS OTHER THAN BENCHMARKS	TECHNICALLY FEASIBLE	ADDRESSES ON-SITE POND WATER MANAGEMENT	CONSISTENT WITH CLEAN WATER ACT MANAGEMENT PRACTICES	INDEPENDENT OF OPERABLE UNIT ACTIONS		CAN BE OPERATIVE IN LESS THAN FIVE YEARS	REDUCES OVERALL RISK TO PUBLIC HEALTH OR ENVIRONMENT	SHORT-TERM ADVERSE IMPACTS OF OPTION CAN BE MITIGATED	
4.5.2.4	Abandon existing ponds and replace with a single, large reservoir *on-site*	✓	✓	✓	No	✓	✓	✓	Reject	-	-	-	
4.5.2.5	Abandon existing ponds and replace with tankage	✓	✓	✓	No	✓	✓	✓	Reject	-	-	-	
4.5.3	**Stormwater Collection and Storage Options**												
4.5.3.1	Maintain and continue using existing on-line stormwater ponds	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.5.3.2	Maintain existing ponds and add off-line stormwater containment pond on-site	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	No	Reject
4.5.3.3	Maintain existing ponds and add on-line stormwater containment pond(s) to each drainage	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	No	Reject
4.5.3.4	Consolidate existing stormwater ponds to one per drainage	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.5.3.5	Consolidate existing on-line ponds and add off-line pond(s)	✓	✓	✓	✓	✓	✓	✓	Accept	✓	-	No	Reject
4.5.3.6	Utilize existing on-line, off-site reservoir (Great Western) for stormwater and effluent storage	✓	✓	No	✓	No	✓	No	Reject	-	-	-	
4.6	**Treatment Options**												**See text discussion, Section 4.6**
4.6.1	Construct mobile treatment units for multi-pond use	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.6.2	Construct individual treatment facilities at each pond	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.6.3	Construct waste injection well	No	No	No	✓	✓	✓	✓	Reject	-	-	-	
4.6.4	Use biological treatment via constructed wetlands	?	✓	✓	?	✓	✓	✓	Accept	✓	No	No	Reject
4.6.5	Use land treatment at off-site location	No	✓	No	✓	✓	✓	✓	Reject	-	-	-	
4.6.6	Use land treatment at on-site location	No	✓	No	✓	✓	✓	✓	Reject	-	-	-	
4.6.7	Use existing OU treatment facilities	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.6.8	Expand existing OU treatment facilities	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.6.9	Consolidate treatment facilities at Pond A-4 for use by entire pond system	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept

✓ = fulfills criterion ? = requires further evaluation - = previously rejected, no evaluation required

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TABLE 4-2
PRIMARY AND SECONDARY SCREENING PROCESSES FOR POND WATER MANAGEMENT ALTERNATIVES - TABULAR SUMMARY
(Continued)

REFERENCE SECTION	OPTION	PRIMARY SCREENING CRITERIA FROM FIGURE 4-1							PRIMARY SCREENING DECISION	SECONDARY SCREENING CRITERIA FROM FIGURE 4-2			SECONDARY SCREENING DECISION
		PROTECTS HUMAN HEALTH & ENVIRONMENT	COMPLIES WITH BENCHMARKS	COMPLIES WITH PERMITS, AGREEMENTS, LAWS & REGS OTHER THAN BENCHMARKS	TECHNICALLY FEASIBLE	ADDRESSES ON-SITE POND WATER MANAGEMENT	CONSISTENT WITH CLEAN WATER ACT MANAGEMENT PRACTICES	INDEPENDENT OF OPERABLE UNIT ACTIONS		CAN BE OPERATIVE IN LESS THAN FIVE YEARS	REDUCES OVERALL RISK TO PUBLIC HEALTH OR ENVIRONMENT	SHORT-TERM ADVERSE IMPACTS OF OPTION CAN BE MITIGATED	
4.6.10	Consolidate treatment at the existing STP	✓	✓	✓	No	✓	✓	✓	Reject	-	-	-	
4.6.11	Consolidate treatment at an expanded STP	✓	✓	✓	No	✓	✓	✓	Reject	-	-	-	
4.6.12	Treat water off-site at Northglenn STP	✓	✓	✓	✓	✓	✓	✓	Accept	No	No	✓	Reject
4.6.13	Treat water off-site at Arvada STP	✓	✓	✓	✓	✓	✓	✓	Accept	No	No	✓	Reject
4.6.14	Treat water off-site at Westminster STP	✓	✓	✓	✓	✓	✓	✓	Accept	No	No	✓	Reject
4.6.15	Treat water off-site at Superior/Rock Creek STP	✓	✓	✓	✓	✓	✓	✓	Accept	No	No	✓	Reject
4.6.16	Treat water off-site at Denver/Metro STP	✓	✓	✓	✓	✓	✓	✓	Accept	No	No	✓	Reject
4.6.17	Treat water off-site at Broomfield STP	✓	✓	✓	No	✓	✓	✓	Reject	-	-	-	
4.6.18	Treat water off-site at Denver Water Department Potable Reuse Plant	✓	✓	✓	No	✓	✓	✓	Reject	-	-	-	
4.6.19	Construct potable water treatment plant to treat all water leaving RFP	✓	✓	✓	✓	✓	✓	✓	Accept	No	✓	✓	Reject
4.7	**Alternative Water Transfer Options**												**See text discussion, Section 4.7**
4.7.1	**Internal (On-site) Transfers**												
4.7.1.1	Recycle STP effluent for on-site industrial use	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.7.1.2	Recycle pond water to RFP industrial water supply	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.7.1.3	Transfer pond water to new shallow evaporation ponds	✓	✓	✓	✓	✓	✓	✓	Accept	✓	No	No	Reject
4.7.1.4	Directly spray evaporate pond water (aerosol spray method) on-site	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.7.1.5	Mechanically evaporate pond water (evaporative coolers) on-site	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.7.1.6	Land irrigate pond water on-site for evapotranspiration	✓	✓	✓	?	✓	✓	✓	Accept	✓	No	No	Reject
4.7.1.7	Transfer pond water to on-site wetlands	✓	✓	✓	✓	✓	✓	✓	Accept	✓	No	No	Reject
4.7.1.8	Transfer interior ponds to Pond A-3 to maintain spill control capacity	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept

✓ = fulfills criterion ? = requires further evaluation - = previously rejected, no evaluation required

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TABLE 4-2
PRIMARY AND SECONDARY SCREENING PROCESSES FOR POND WATER MANAGEMENT ALTERNATIVES - TABULAR SUMMARY
(Continued)

REFERENCE SECTION	OPTION	PRIMARY SCREENING CRITERIA FROM FIGURE 4-1							PRIMARY SCREENING DECISION	SECONDARY SCREENING CRITERIA FROM FIGURE 4-2			SECONDARY SCREENING DECISION
		PROTECTS HUMAN HEALTH & ENVIRONMENT	COMPLIES WITH BENCHMARKS	COMPLIES WITH PERMITS, AGREEMENTS, LAWS & REGS OTHER THAN BENCHMARKS	TECHNICALLY FEASIBLE	ADDRESSES ON-SITE POND WATER MANAGEMENT	CONSISTENT WITH CLEAN WATER ACT MANAGEMENT PRACTICES	INDEPENDENT OF OPERABLE UNIT ACTIONS		CAN BE OPERATIVE IN LESS THAN FIVE YEARS	REDUCES OVERALL RISK TO PUBLIC HEALTH OR ENVIRONMENT	SHORT-TERM ADVERSE IMPACTS OF OPTION CAN BE MITIGATED	
4.7.2	**External (Off-site) Discharges**												
4.7.2.1	Discharge stormwater directly to Segment 4 without capture in ponds	No	No	No	✓	✓	✓	✓	Reject	-	-	-	-
4.7.2.2	Discharge STP effluent directly to Segment 4 without capture in ponds	✓	✓	✓	✓	✓	✓	✓	Accept	✓	No	✓	Reject
4.7.2.3	Discharge pond water to off-site wetlands system	✓	✓	✓	✓	No	✓	✓	Reject	-	-	-	
4.7.2.4	Pipe pond water to South Platte River at Big Dry Creek	✓	✓	✓	✓	✓	✓	✓	Accept	No	✓	✓	Reject
4.7.2.5	Pipe pond water to South Platte River at 120th Avenue	✓	✓	✓	✓	✓	✓	✓	Accept	No	✓	✓	Reject
4.7.2.6	Pipe pond water to Clear Creek	✓	✓	✓	✓	✓	✓	✓	Accept	No	No	✓	Reject
4.7.2.7	Bypass pond water around municipal reservoirs in off-site pipeline	✓	✓	✓	✓	No	✓	✓	Reject	-	-	-	
4.7.2.8	Discharge all ponds to Segment 4	✓	✓	✓	✓	✓	✓	✓	Accept	✓	No	✓	Reject
4.7.2.9	Discharge stormwater ponds to Segment 4	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.7.2.10	Pipe water from Pond C-2 to Walnut Creek in on-site pipeline	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.8	**Monitoring Options**												**See text discussion, Section 4.8**
4.8.1	Monitor seeps/springs	✓	✓	✓	✓	No	✓	No	Reject	-	-	-	
4.8.2	Monitor upgradient groundwater	✓	✓	✓	✓	No	✓	No	Reject	-	-	-	
4.8.3	Monitor influent streams	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.8.4	Monitor ponds	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.8.5	Monitor on-site water transfers	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept
4.8.6	Monitor off-site water discharges	✓	✓	✓	✓	✓	✓	✓	Accept	✓	✓	✓	Accept

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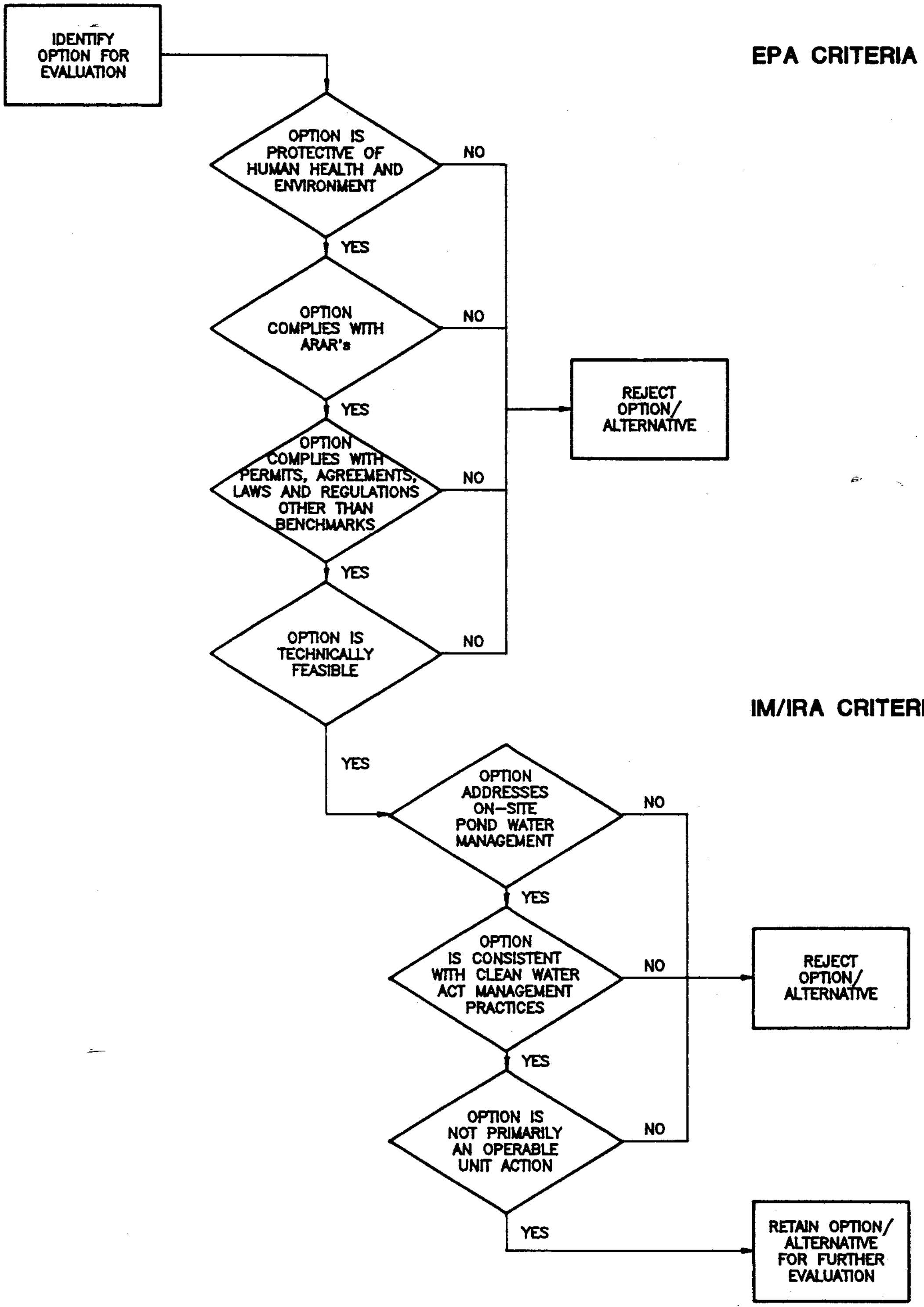
✓ = fulfills criterion ? = requires further evaluation - = previously rejected, no evaluation required



PREPARED FOR:

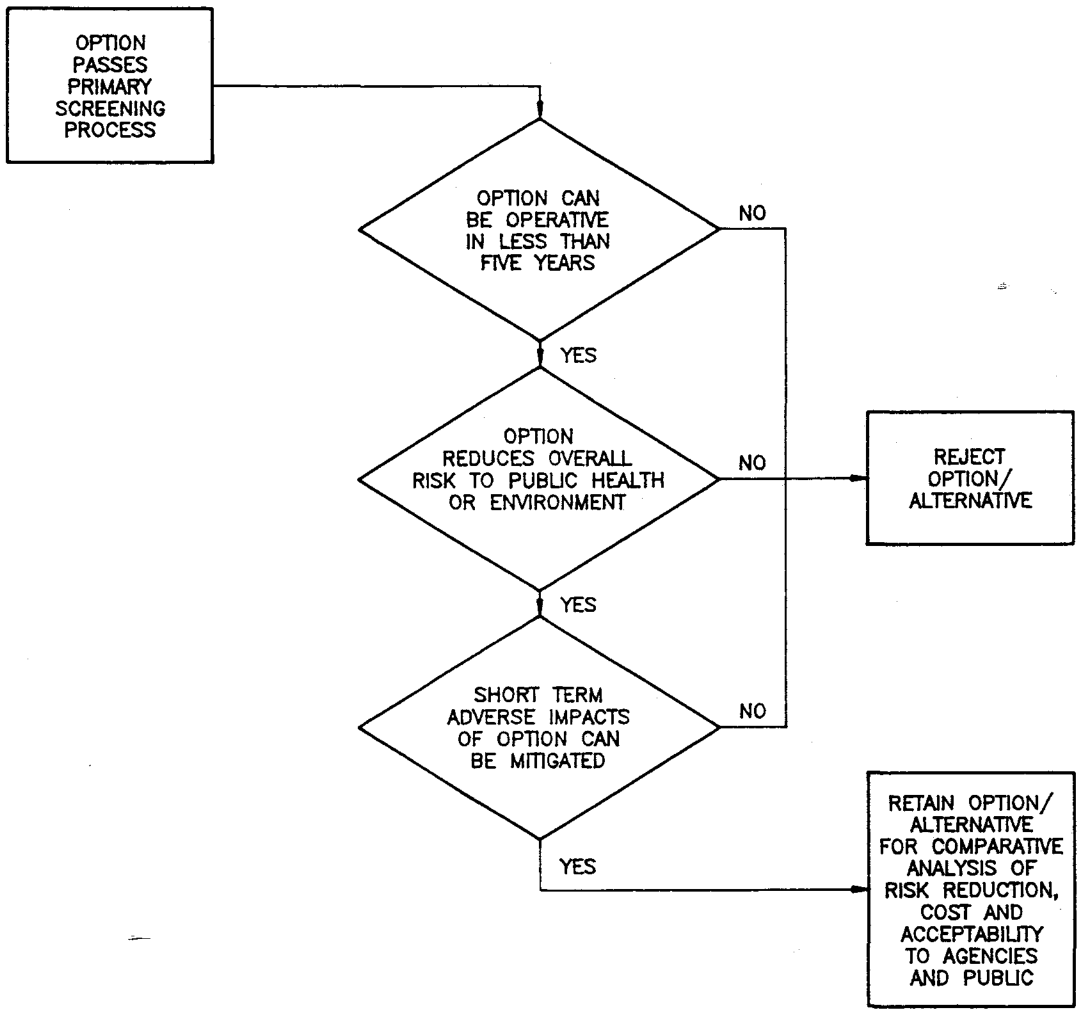
U.S. DEPARTMENT OF ENERGY

ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 4-1

TITLE:

ROCKY FLATS PLANT PRIMARY SCREENING PROCESS FOR IM/IRA OPTIONS/ALTERNATIVES



PREPARED FOR:

U.S. DEPARTMENT OF ENERGY

ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 4–2

TITLE:

ROCKY FLATS PLANT SECONDARY SCREENING PROCESS FOR IM/IRA OPTIONS/ALTERNATIVES

CHAPTER 5
PROPOSED ACTIONS

CHAPTER 5
PROPOSED ACTIONS

This chapter analyzes the retained options from Chapter 4 and selects from them proposed actions. Proposed actions selected in this Interim Measures/Interim Remedial Action (IM/IRA) Decision Document must be protective of human health and the environment, technically and regulatorily defensible, able to achieve compliance with imposed water quality benchmarks, and possible to implement in the desired time frame. All of the options which pass the primary and secondary screening processes of Chapter 4 conceptually meet these constraints. Figures 5-1 and 5-2 show a schedule of, and the location for, proposed actions.

This IM/IRA Decision Document uses the following criteria to conduct the analysis of options to maximize the efficiency, effectiveness and overall success of IM/IRA proposed actions. These analysis and selection criteria are derived from the Environmental Protection Agency (EPA) and IM/IRA criteria described in Chapter 4 and are summarized as follows:

1. Risk Reduction. Options with demonstrably high risk reduction potential are preferred over those options with limited or indeterminate risk reduction potential. As part of the statutory determinations required by the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), the selected remedy should eliminate, reduce or control risks through treatment, engineering controls, or institutional controls to ensure adequate protection of human health and the environment. Where treatment is not warranted based on health-based risk levels, methods to reduce risk include restricting migration of contaminants (or potential contaminants) and managing potential contaminants to achieve a high degree of certainty that future exposures which could harm human health or the environment will not occur. Risk reduction criteria reflect a preference for permanent solutions that rely on proven technology rather than experimental or unproven technology.

2. Funding and Scheduling Constraints. Consistent with the goals, objectives and time frame for interim actions, this criteria addresses the preference for multiple, smaller-scale projects which achieve remedial action objectives and can be funded and completed in shorter time frames. For example, options exceeding $10 million in total cost are not desirable as interim actions because they generally require greater than two years to complete, which could preclude implementation of expected final remedies. High-cost options would also be more difficult to implement due to budget limitations imposed by Congress and competition from other high-priority environmental projects.

3. Cost-effectiveness. This IM/IRA Decision Document prefers options with low cost which would provide immediate, recognizable benefits over options with high cost and deferred or indeterminate benefits. Cost effectiveness is evaluated by qualitatively assessing probable benefits of the option versus estimated costs. This qualitative measure of cost-effectiveness addresses the statutory preference for remedies that provide overall effectiveness proportionate to cost and which provide reasonable value for the money spent. Costs are for "normal" construction operations and do not account for inflation.

4. Versatility. This criteria addresses the interrelationship of short-term effectiveness with long-term effectiveness and permanence, both of which are evaluation criteria listed by EPA. This IM/IRA Decision Document prefers options which would address multiple pond water management concerns for long time frames over those that would have limited utility and shorter life. Included in this versatility analysis is an evaluation of operability, manpower requirements, and the degree to which the option can reduce the potential for human error or ensure fail-safe operation. Versatile options or a combination of options would also tend to be efficient and cost-effective.

5. Operable Unit (OU) Interactions. Selected options should be consistent with and foster implementation of the expected final remedies for OUs 5, 6 and 7.

6. Waste Generation. This criteria assesses the preference for options which would avoid generating new wastes which require treatment, immobilization and disposal. This criteria aims at the program goal of protecting human health and the environment by minimizing untreated wastes and addresses the statutory preference for permanent solutions and the use of alternate treatment technologies or resource recovery technologies to the "maximum extent practicable."

Another criteria for evaluating proposed actions is their acceptability to regulatory agencies and the public. This information will become available after agency review and public comment periods. Agency and public comments on the options evaluated in this IM/IRA Decision Document will be addressed in the Responsiveness Summary of the Record of Decision (ROD).

A comparison of each option against these criteria identifies that option with the most favorable characteristics, which is selected as the proposed action. The final proposed action is a combination of options from individual categories. Changes to the proposed action may be made if public comments or additional data indicate that such a change is appropriate.

5.1 SUMMARY OF SELECTED POND WATER MANAGEMENT OPTIONS

The following sections discuss the individual selected options for each category and the reasoning behind the selections. A discussion of the design basis, costs and comparative analysis criteria for each of the retained options from Chapter 4 is included in Appendix F. A summary section which describes the final combined option is located at the end of this chapter.

All OU interaction options were rejected in the primary screening process in Chapter 4. No further discussion of these options will be made within this Decision Document.

5.1.1 Clean Water Act (CWA)/National Pollutant Discharge Elimination System (NPDES) Interactions

This IM/IRA Decision Document focuses on activities that are not already regulated by the CWA, the NPDES-FFCA or the NPDES permit. Nonetheless, those options listed under the CWA/ NPDES category include source control plans and Best Management Practices (BMPs) which are critically important to controlling the quality of pond water as it enters the jurisdiction of this IM/IRA Decision Document. For this reason, the selected option for this category is to assume all of these programs will continue under existing administrative controls. Because these options are outside the jurisdiction of this IM/IRA Decision Document, they will not be discussed further.

5.1.2 Spill Control Interactions

The following four spill control options pass the primary and secondary screening process and are subjected to the comparative analysis summarized below and detailed in Appendix F.

- 4.4.3 Construct centralized tank farm for spill control/capture
- 4.4.4 Construct tanks for spill control/capture on each drainage
- 4.4.8 Utilize existing Ponds A-1, A-2, B-1 and B-2 for spill control/capture
- 4.4.9 Consolidate existing spill control ponds to one per drainage

Option 4.4.8 is selected because it provides the greatest versatility and the largest capacity for spill control capture at the lowest cost. This option would also impact the existing OU plans the least.

Utilizing existing Ponds A-1, A-2, B-1 and B-2 for spill control and storage would provide the highest volume of spill storage at the lowest cost. All other options would be less protective of human health and the environment. Large tanks capable of storing the design flow rates would be prohibitively expensive, and small tanks would provide inadequate storage to effectively contain expected water volumes. Consolidating ponds to one per drainage would reduce overall potential spill capture volume below what currently exists.

Utilizing the existing ponds would maintain gravity-controlled stormwater diversion facilities. All tank options, however, would require pumping at flow rates difficult to achieve under design flow conditions. The series arrangement of the existing ponds (at least two ponds per drainage) allows isolation of a potential spill to its respective drainage, and to only one pond in the drainage, unless high flows are encountered. In addition, potential sewage treatment plant (STP) upsets can be routed to either of the B-1 or B-2 ponds through gravity pipelines. This arrangement is more versatile than the other spill control options.

The selected option for spill control would have no impact on existing OU plans or schedules. Consolidating ponds to one per drainage would require expedited characterization and remediation efforts within OU 6. The feasibility of expediting these OU 6 efforts is outside the scope of this document. Tank construction would require land disturbance within or close to identified Individual Hazardous Substance Sites (IHSSs).

5.1.3 Selected Water Collection and Storage Option

The following three storage options passed the primary and secondary screening processes and are subjected to comparative analysis:

4.5.1.1	Construct storage tanks for STP effluent only
4.5.3.1	Maintain and continue using existing on-line stormwater ponds
4.5.3.4	Consolidate existing stormwater ponds to one per drainage

Option 4.5.3.1 is selected because it provides adequate risk reduction, has the greatest versatility and impacts the existing OU plans and schedules the least. The estimated costs for Option 4.5.3.1 are greater than Option 4.5.3.4 and less than Option 4.5.1.1. However, the cost components of the selected option are key improvements which will reduce risk and integrate with OU plans to a greater extent than the other options evaluated. Detailed discussions of these options are provided in Appendix F.

The purpose of water collection and storage facilities is to routinely collect and hold STP effluent and stormwater that are assumed to be in compliance with applicable standards, in order to allow time for final monitoring prior to release. The assumption that these waters are "clean" is key, in that suspect waters should be directed to spill containment facilities in accordance with existing spill control plans and BMPs. Consequently, the selected option is to maintain the existing ponds (A-3, A-4, B-5 and C-2) and implement various improvements to the bypasses around spill control ponds which will ensure the reliability of stormwater collection facilities. The selected option will also analyze the need to upgrade the dams for safe, high-volume storage over extended periods of time.

Due to the low risks posed by ambient pond water quality and the existence of significant upstream control measures, the selected option is protective of human health and the environment. The current A- and B-series arrangement of the ponds on Walnut Creek provides greater protection, in terms of higher storage capacity and the ability to isolate flows, than would be achievable by consolidating ponds to one per drainage. Although STP tankage could reduce risks by removing the most likely source of contaminants from the pond system, construction of tankage would not be cost-effective for routine collection of STP effluent. The low potential for exceedances in water quality standards presented by STP effluent and the large dedicated tankage volume which would be required to allow routine monitoring prior to discharge make this option not cost-effective.

Option 4.5.3.1 also has the greatest versatility. The ponds accept STP effluent and stormwater, provide for inter-pond transfers in order to maintain safe storage volumes, and provide redundancy for catchment of potentially-contaminated water (see Figure 5-1).

The selected option would have no impact on existing plans and schedules for OUs 5 and 6 and would be consistent with current long-term goals to maintain stormwater catchment during the decommissioning of RFP. No wastes would be generated by the selected option, with the exception of captured stormwater sediments and a minor amount of low-hazard excavated material resulting from the construction of improvements to the terminal dams and bypasses.

5.1.4 Selected Treatment Option

The following five treatment options pass the primary and secondary screening options and are subjected to comparative analysis herein:

- 4.6.1 Construct mobile treatment units for multi-pond use
- 4.6.2 Construct individual treatment facilities at each pond
- 4.6.7 Use existing OU treatment facilities

4.6.8 Expand existing OU treatment facilities
4.6.9 Consolidate treatment facilities at Pond A-4 for use by entire pond system

Of these five options, 4.6.1 and 4.6.9 are selected as preferred options. Together, these options are complementary and provide adequate levels of risk reduction at the lowest cost, have the greatest versatility, and impact existing OU plans and schedules the least. The selected options complement one another by providing on-line treatment capacity as well as mobile treatment capabilities as needed. Option 4.6.2 is not selected primarily because of unfavorable cost effectiveness. Detailed discussions of these options are provided in Appendix F.

Mobile treatment units would offer a strategic and relatively inexpensive method for addressing pond water contamination. Although they would be of relatively small capacity, mobile units could be used at multiple sites thereby optimizing the cost-effectiveness of capital expenditures. Each mobile unit would be capable of treatment capacities ranging from 15 to 50 gpm. Units could be configured in parallel to increase treatment capacity as needed. Methods of implementation include construction of mobile systems or arrangement of service contracts with companies providing mobile treatment services. Contracted treatment services could include waste disposal, and long distance pumping and piping costs would be eliminated. Contracted services could reduce capital expenditures; however, fees may be necessary to ensure adequate and timely on-call services. Mobile units would provide great versatility because they offer multi-stage treatment systems that can be used at multiple locations. Risk reduction would be optimized because mobile units allow quick response with appropriate treatment technologies.

Consolidation of treatment at Pond A-4 would provide the opportunity to use a currently available treatment option with substantial capacity (1.7 million gallons per day [MGD]). Furthermore, the advantageous location of the A-4 treatment facility would preclude the need for an extensive pumping and piping system to convey pond water for treatment. Metal and radionuclide treatment stages could be added to the A-4 facility to expand treatment capabilities. Because the sole objective of this facility would be pond water treatment, conflicts with other treatment objectives, such as would be the case if other OU treatment facilities were used, would be avoided. The A-4 treatment facility could be upgraded to provide optimal, comprehensive pond water treatment.

5.1.5 Selected Water Transfer Option

The following six alternative water transfer options pass the primary and secondary screening processes and are subjected to comparative analysis herein:

4.7.1.1	Recycle STP effluent for on-site industrial use
4.7.1.2	Recycle pond water to the Rocky Flats Plant (RFP) industrial water supply
4.7.1.4	Directly spray evaporate pond water on-site
4.7.1.5	Mechanically evaporate pond water on-site
4.7.1.8	Transfer interior ponds to Pond A-3 to maintain spill control capacity
4.7.2.9	Discharge stormwater ponds to Segment 4

Selected options include limited implementation of Options 4.7.1.2, 4.7.1.4 and full implementation of options 4.7.1.8 and 4.7.2.9. Options 4.7.1.1 and 4.7.1.5 are not selected primarily because they lack significant risk reduction and are too expensive. Detailed discussions of these options are provided in Appendix F.

The selected water transfer options reduce risks by minimizing the volume of pond water retained in Ponds A-1, A-2, B-1, B-2 and the Landfill Pond, by minimizing transfers and discharges from Pond C-2 and by requiring discharges from Ponds A-3 and B-5 to meet more stringent requirements than are currently applied. All of the selected options are more cost-effective than competing alternatives.

Additional spray evaporation systems at Ponds A-1, A-2, B-1, B-2 and the Landfill Pond will control pond levels such that transfers from these ponds can be minimized or eliminated. Spray evaporation systems installed on stormwater ponds would provide minimal reduction on a percentage basis, are not considered cost-effective and may increase algae growth. Mechanical evaporation of water at any location is not cost-effective compared to spray evaporation.

Recycling stormwater from Pond C-2 to the RFP Industrial Water System will reduce and perhaps eliminate off-site discharges of water from this pond. Limitations on available industrial water needs make total recycling of Pond C-2 unachievable; however, reducing Pond C-2 transfers and discharges is feasible. Recycling of STP effluent has higher risk than recycling of pond water, due to the higher potential contaminant concentrations and the low, but real, possibility of STP upsets.

Piping pond water from Pond C-2 to a discharge point on Walnut Creek in conjunction with option 4.7.1.2 will permanently eliminate further discharges from Pond C-2 to Woman Creek.

Discharging all stormwater ponds to Segment 4 will require that Ponds A-3 and B-5 meet Segment 4 water quality standards and other benchmarks selected in Chapter 3. These two ponds are currently transferred to Pond A-4 after analysis for a limited suite of Segment 5 standards. This is a less stringent requirement than for discharges to Segment 4, thus discharges of A-3 and B-5 to Segment 4 requires higher water quality, and presumably are more protective. In addition, discharges of A-3 and B-5 to Segment 4 is cost-effective because these water sources would no longer be sampled, analyzed, and physically handled (pumped) twice as is currently the case.

5.1.6 Selected Water Monitoring Option

The following four options pertaining to water monitoring locations pass the primary and secondary screening processes and are subjected to comparative analysis herein.

- 4.8.3 Monitor influent streams
- 4.8.4 Monitor ponds
- 4.8.5 Monitor on-site water transfers
- 4.8.6 Monitor off-site water discharges

The selected water monitoring option includes limited implementation of Options 4.8.3, 4.8.4, 4.8.5 and 4.8.6. Detailed discussions of these options are provided in Appendix F.

The discussion that follows is organized into two categories: (1) routine water monitoring, and (2) operational monitoring for activities such as transfer or discharge. This is a slightly different format than presented earlier in this chapter and has been adopted for this section for the following reasons:

- The intent of this section is to propose a monitoring *program* that includes both water quality monitoring, and monitoring of physical conditions. This program should be as efficient as possible while ensuring high quality discharges and early detection of potential problems.

- The selected monitoring program includes certain aspects of each of the accepted options. All aspects of water monitoring are not relevant or necessary at all locations.

- Routine and operational monitoring are driven by different internal and external requirements.

5.1.6.1 Routine Water Monitoring

The selected routine water monitoring option includes the following aspects:

1. Monitor influent streams in real-time for flow only.

2. Monitor Ponds A-3, A-4, B-5 and C-2 in real-time for retained volumes.

3. Monitor other ponds weekly and after storm events.

4. Monitor dam piezometers in real-time and field-verify a minimum of once per week for internal piezometric surface.

5. Monitor Ponds A-3, A-4, B-5 and C-2 for indicator water quality parameters (i.e., dissolved oxygen, temperature, pH, conductivity) on a real-time basis.

6. Monitor all ponds, except C-1, B-3 and B-4 against benchmarks identified in Table 3-1 for the following analytes on a quarterly basis: gross alpha and gross beta, ammonia, nitrate, nitrite, sulfate, sulfide, total dissolved solids (TDS), total suspended solids (TSS), carbonate, bicarbonate, chloride, fluoride, selected semi-volatile organics, selected volatile organics, cyanide, Hazardous Substance List (HSL) metals, plutonium, americium and uranium.

7. Monitor all ponds annually after the spring runoff (late April to early June) for a full suite of analytes, and against the benchmarks identified in Table 3-1.

Real-time monitoring technologies that allow for early detection of water quality problems at influent streams are technologically unavailable. Routine sampling and analysis of all influent streams is ineffective because by the time influent water is sampled and analyzed, the water would have reached the pond and the advantage of early detection at the influent stream would be lost. Therefore, influent stream water quality monitoring (Option 4.8.3) was not selected.

Routine pond water quality monitoring more frequently than proposed would be redundant considering the operational monitoring proposed in Section 5.1.6.2, and is not selected. Routine monitoring of indicator parameters combined with pre-operational sampling and analysis will provide an adequate and reliable method of detecting potential water quality problems.

5.1.6.2 Operational Monitoring

The selected option for operational monitoring is to conduct monitoring activities based on the specific pond in question. Allowable operational activities, including spray evaporation, recycling, transfers, and discharges, will be determined by analytical results. The selected operational monitoring option includes the following aspects:

1. Monitor pond water quality prior to conducting operations.

2. Monitor inflow and outflow rates, weather conditions, and indicator water quality parameters in real-time during operations.

Prior to initiating any operational activities involving the movement of water, pond water would be sampled and analyzed only for the COCs pertinent to that pond, as listed in Table 2-10. Analytical results would be compared to point values for the selected benchmarks identified in Tables 3-1 through 3-7. The decision to spray evaporate, recycle, transfer, or discharge would be based upon compliance with the selected point value benchmarks. If the pond water meets these benchmarks, operations would be initiated. If the pond water is not in compliance based on this comparison, treatment options would be initiated.

Flow rates, pond volumes and indicator water quality parameters (temperature, pH, dissolved oxygen and conductivity) would be monitored on a real-time basis at all ponds where operations are in progress. Climatic conditions would also be monitored to control actual operations. Operations would be discontinued when significant new inflows occur, during high winds (in the case of spray evaporation), or if indicator parameters are outside normal ranges, indicating potential water quality problems.

5.1.6.3 Combined Monitoring Program

The combined monitoring program described above would be protective of human health and the environment and would ensure that water quality meets strict standards designed for the protection of public drinking water prior to the conduct of any operational activities that could expose people or the environment to contaminants. This program would also be cost-effective because it would not require routine in-depth monitoring for constituents not found, or for analyte levels which are not justified based on human health risk, and would eliminate duplicate monitoring for both routine and operational activities. The final monitoring program that is selected for this IM/IRA Decision Document will be dependent on the proposed actions which are adopted and will be negotiated with the regulatory agencies.

5.1.7 Summary of Combined Selected Options

The baseline risk assessment concluded that conditions in the ponds and pond water management practices in general pose no unacceptable risks to human health and the environment. Thus, the proposed actions listed below provide additional protective measures, but do not propose any removal actions. Figure 5-1 provides a schematic of proposed actions and Figure 5-2 shows their locations.

Components of the proposed actions are referenced by number on the legend on Figure 5-1 and include the following (the option number is referenced in parenthesis):

1. Maintain Ponds A-1, A-2, B-1 and B-2 for use as spill control facilities (Options 4.4.8 and 4.7.1.8).

2. Install new spray evaporation systems at Ponds A-1, A-2, B-1, B-2 and Landfill Pond to reduce retained volumes and alleviate the need to transfer water between spill control ponds (Option 4.7.1.4).

3. Monitor spray evaporation operations for operational benchmarks identified in Tables 3-1 through 3-9 (Option 4.8.4).

4. Maintain Ponds A-3, A-4, B-4, B-5 and C-2 as stormwater storage discharge facilities (Options 4.5.3.1 and 4.7.2.9).

5. Install piezometers at terminal ponds A-4, B-5 and C-2 to monitor the phreatic water surface within these dams as recommended in the U.S. Army Corps of Engineers Report (Option 4.5.3.1).

6. Change the water management operational procedures for Dams A-4, B-5 and C-2 to maintain safe storage volumes according to the recommendations of the U.S. Army Corps of Engineers (Option 4.5.3.1).

7. Monitor transfers between all ponds for operational benchmarks identified in Tables 3-1 through 3-7 (Option 4.8.5).

8. Monitor off-site discharges from Ponds A-3, A-4, B-5 and C-2 for operational benchmarks identified in Tables 3-1 through 3-7 (Option 4.8.6).

9. Upgrade or replace the large diameter culverts that bypass water from North Walnut Creek and South Walnut Creek around spill control Ponds A-1, A-2, B-1, B-2 and B-3 to establish the 100-year design flow capacity (Option 4.5.3.1).

10. Upgrade the South Interceptor Ditch and Woman Creek bypass around Pond C-2 to reestablish the 100-year design flow capacity (Option 4.5.3.1).

11. Construct facilities to recycle water from Pond C-2 to the RFP industrial water system (Option 4.7.1.2).

12. Construct an extension to the C-2 to B-5/A-4 transfer pipeline, allowing discharge of C-2 water below Pond A-4 or B-5 (Option 4.7.2.10).

13. Implement a long-term service contract with a private company to provide mobile treatment services on an on-call basis (Option 4.6.1).

14. Maintain and upgrade the existing filtration/granular activated carbon (GAC) treatment system at Pond A-4 for use in discharge "polishing," as needed (Option 4.6.9).

These proposed actions are protective of human health and the environment, cost-effective and utilize treatment systems as needed to address water quality concerns. In summary, these proposed actions will comply with benchmarks, satisfy the statutory requirements of Section 121 of CERCLA[3] and are consistent with long-range, site-wide remediation objectives for RFP.

5.2 ENVIRONMENTAL IMPACTS OF SELECTED OPTIONS

Section 5.2 continues the option selection process of Chapter 5 with a comparative analysis of environmental impacts of the options that passed the screening process described in Chapter 4. These selected options represent alterations in current operations and are termed "proposed actions" for this environmental analysis. The proposed actions analyzed for this section are summarized in Section 5.1.7.

This evaluation of the proposed actions considers the environmental issues of concern delineated pursuant to the National Environmental Policy Act (NEPA) in order to integrate program-level NEPA documentation into this IM/IRA Decision Document. Although many of these concerns have been addressed in previous sections, this section allows easy identification of NEPA evaluation factors. This section also fulfills CERCLA requirements to ensure that selected remedies protect the environment, as well as human health.

In evaluating environmental effects, both beneficial and adverse impacts relative to affected resources from the proposed pond management actions are considered. The resources evaluated are air quality, water quality, terrestrial and aquatic biota, threatened and endangered species, personnel exposure, cultural resources, wetlands and floodplains, commitment of resources, and cumulative impacts. Baseline conditions for these resources are discussed in Section 5.3 of this IM/IRA Decision Document.

The effects of the proposed actions on resources are evaluated based on the objectives of pond management and the focus of the subject interim action. Overall, the purpose of pond management operations is to control discharge of effluent such that downstream water levels are not significantly altered and to ensure the quality of the downstream water. These operations involve temporary holding actions, sampling, monitoring, treatment, and emergency spill control.

As noted in Chapter 4, the focus of the IM/IRA Decision Document is to identify actions that enhance the purpose of the current operations and effectively manage potentially contaminated water sources in the event that upstream controls fail. Potential contaminants have been noted in this document, although formal characterization of OUs 5, 6 and 7 has not been completed. This environmental analysis of the selected options is based on whether these actions resolve environmental issues identified for the "No Action" alternative, and takes into consideration the established time frame of these IM/IRA actions (2-5 years).

5.2.1 Air

Proposed actions with the potential to affect air quality involve expansion of spray evaporation operations to other ponds in the pond system, initiation of aeration operations at terminal ponds and proposed use of combustion engines. In addition, those proposed actions involving construction have the potential to affect air quality by resuspending pond sediments.

It is noted in Section 5.3 that air emissions from current pond management operations are very limited and overall air quality benefits from the sedimentation function and volume management provided by the ponds. Emissions from current operations are generated by spray evaporation occurring at Pond A-2 and the Landfill Pond. Analytical sampling for volatile and semi-volatile organic compounds was conducted at both ponds in the spring of 1993. Results from this sampling were used to project total emissions from spray evaporation operations. These projections indicate estimated volatile organic compounds emissions for the two ponds are well below reporting levels and do not contribute materially to cumulative RFP total emissions.

Expansion of spray evaporation operations to Ponds A-1, B-1 and B-2 and initiating aeration operations at A-3 and the terminal ponds have the potential to more than double the air emissions currently generated by pond management. However, emissions doubled from these two operations would still be below reporting levels and, therefore, would not contribute materially to cumulative RFP total emissions.

Construction activities associated with dam upgrades and system installation could disturb pond sediments, allowing pond sediments to dry and become airborne. Airborne pond sediments are of concern because of the potential for contaminated sediments to be dispersed off-site by wind or to contaminate an area on-site currently considered clean. To ensure such activities do not adversely impact the environment, the Plan for Prevention of Contaminant Dispersion (PPCD) was mandated by the IAG and finalized in late 1991. The PPCD is applicable to intrusive field activities conducted as part of IM/IRA actions. It provides project-specific procedures for managing even minor excavations, such as those noted above. The PPCD procedures would be integrated into any final plans concerning construction activities associated with pond management.

A certain amount of vehicular emissions and fugitive dust is associated with construction equipment. Because construction activity produces fugitive dust that remains near ground level, air quality impacts will likely be limited to RFP or areas in close proximity to the facility. Fugitive dust can be mitigated through a combination of control technology and generally-accepted work practices. Vehicular emissions are controlled through Title II of the Clean Air Act[4].

Finally, an increase in the use of generators for intake and discharge activities is likely with implementation of the proposed actions. Although minimal in amount, emissions from these generators are of concern if, when added to existing RFP nitrogen oxide (NOx) emissions, the proposed actions cause the NOx emissions total to exceed the threshold. At that point, RFP may be required to prepare an Air Pollutant Emission Notice (APEN) or Prevention of Significant Deterioration Permit (PSD), unless otherwise directed by EPA or CDH. RFP Air Quality Division personnel have projected total emissions for these activities (Appendix G) and have concluded that preparation of an APEN will be likely on only one of the six generators.

5.2.2 Water

The source of any low concentration of contaminants entering the ponds is from RFP activities. As with the No Action alternative, the major function of the proposed actions is to provide best management practices for achieving water quality standards. Given this purpose, the proposed actions would have a positive impact on water quality.

RFP consistently meets or exceeds the quality required by Segment 4 standards for waters discharged off-site. Proposed monitoring, treatment, and transfer actions would improve the quality of waters handled on-site within the pond system. Detention of water in the pond system for a designated period allows sedimentation to occur. Sedimentation effectively settles potentially-contaminated suspended solids, removing them from the water column for as long as the sediments are not resuspended by disturbance (see Section 5.3.2). Through volume management, sediments remain covered with water and are not exposed to wind or water erosion.

Impacts to surface and groundwater quality could occur during dewatering for excavations and during installation of piezometers or wells through resuspension of sediments. Installation of wells may allow surface water runoff or contaminants to seep down the wellhead although this is unlikely given the strict protocols regarding well construction, expressly designed to prevent such cross-contamination. Resuspension of sediments into the water column would impede the scheduling for discharges and transfers, which could have an adverse impact on water quality and associated resources if an emergency occurred. For this reason, all final plans for construction activities associated with dam upgrades and system installation would be preceded by a consultation with the OU Project Manager. Procedures from the Watershed Management Plan for Rocky Flats[5] would also be integrated into any final plans.

The proposed action of retaining use of Ponds A-1, A-2, B-1, and B-2 for spill control (an emergency measure to provide backup to upgradient secondary containment) is not anticipated to have an adverse impact on water quality and is addressed in more detail in Section 5.3.2.

5.2.3 Terrestrial and Aquatic

Construction activities have the potential to adversely affect water quality by resuspending sediments and causing turbidity. Turbidity can adversely affect aquatic biota directly or can affect their food sources or habitat by decreasing sunlight. Decreased sunlight impedes the photosynthetic process, diminishing oxygen available to fish. Lack of oxygen will also kill macroinvertebrates and aquatic plant species, leaving no food base for fish. Suspended sediments in turbid waters may clog or abrade fish gills, creating respiratory deficiencies.

Algal blooms are a naturally occurring condition, but may create an adverse situation for certain aquatic biota because they deplete the dissolved oxygen from the water, making it unavailable to fish and other species. Lack of aeration in the ponds exacerbates this effect. Algal blooms are a notable problem in Ponds B-3, B-4, B-5, and A-4.

5.2.4 Threatened and Endangered Species

Specific information on threatened and endangered species is presented in Section 5.3.4. A number of federally-designated and state-designated species are of interest regarding pond management operations. Impacts from the proposed actions, for the most part, mirror those delineated for the No Action alternative. In general, pond management operations have minimal effect on these species when precautions are taken. However, once site-specific plans for any construction activities associated with the proposed actions are known, these plans would be submitted to RFP Design Review for verification that threatened and endangered species would not be impacted.

The proposed action to construct facilities to recycle water from Pond C-2 to the RFP industrial water system could potentially affect threatened and endangered species downstream of RFP. Recycling the proposed amount of water (10 to 20 MG) would effectively remove this volume of water from the watershed of the South Platte River, which supports threatened and endangered species downstream near the Nebraska state line. This is unlikely, however, because the proposed 10 to 20 MG of recycled water represents only a fraction of 1 percent of the annual flows in the South Platte River.

NEPA documentation pertaining specifically to Construction of the Pond C-2 Discharge Minimization Project is currently under review by DOE. Therefore, reference should be made to this document regarding impacts from this proposed action. Pending decision on this document, questions should be directed to the RFP Ecology and NEPA Division.

5.2.5 Personnel Exposure

Members of the public could be affected by airborne releases of volatile organic compounds from spray evaporation of pond water. The potential risk of this activity was evaluated using as an example pond water from B-2. This analysis is contained in Appendix G and shows that both carcinogenic and noncarcinogenic risks are far below levels of concern. Given that chemical concentrations are of a similar order of magnitude at other ponds, the risks associated with spray evaporation at all ponds would be comparably low.

The analysis in Appendix G models a release of contaminants due to spray evaporation of Pond B-2. The contaminants volatilize from pond water, travel to an off-site receptor in a Gaussian plume, and are then inhaled by the receptor. The results of the analysis are that the carcinogenic risk due to spray evaporation of Pond B-2 is 2.7E-10, and the hazard index is 4.5E-7. Since hazard indices below 1.0 and risks below the range of 1.0E-4 to 1.0E-6 are considered acceptable, the risk and hazard calculated here are very low, as stated above.

Assumptions used to develop this analysis were as follows:

1. The evaporator will be operated for 10 hours per day, 125 days per year, for 30 years, at an average flow rate of 1000 gallons per minute.

2. The wind speed will be 4.7 meters per second, and the Pasquill stability class will be D.

3. The receptor will be at a distance of 1600 meters from the source.

4. The receptors breathing rate is 20 m^3 per day.

5. The receptor has a mass of 70 kilograms.

6. The analytical suite of contaminants that was tested for was a list of 34 volatile organics, of which four were determined to be present: methylene chloride, acetone, 1,2-dichloroethene and trichloroethene. These four chemicals were evaluated in the analysis.

In addition, personnel could be exposed to additional hazards from the ponds if there were to be a spill on plant site into an area which ultimately drains to the ponds. In Appendix G, three spill scenarios are analyzed: (1) a carbon tetrachloride spill into North Walnut Creek, eventually ending up in Ponds A-1 and A-2; (2) a trichloroethylene (TCE) spill into the South Interceptor Ditch, eventually ending up in Pond C-2; and (3) a nitric acid spill into South Walnut Creek, eventually ending up in Ponds B-1 and B-2. For each scenario, three options were investigated: (1) leaving the ponds in their current configuration, (2) replacing the two ponds with a single pond (except for the TCE spill, which has a single interceptor pond in the current configuration), and (3) diverting the spill to an interceptor tank. The effects upon a hypothetical future resident who was drinking 2 liters per day of water obtained directly from the contaminated pond(s), was analyzed for all options. Table 5-1 summarizes the lifetime excess cancer risks (LECR) and hazard indices resulting from all three scenarios, under the three options.

TABLE 5-1
COMPARISON OF RISKS AND HAZARD INDICES
FOR A FUTURE ON-SITE RESIDENT RECEPTOR
FROM DIFFERENT CHEMICAL SPILLS

	Existing Ponds	Single Pond	Tanks
Carbon Tetrachloride	LECR = 1.7E-5	LECR = 1.7E-5	LECR = 4.9E-6
TCE	HI = 0.071	Not analyzed	HI = 0.071
Nitric Acid	HI = 0.54	HI = 0.54	HI = 0.54

It is noted that there is no reduction of hazard or risk obtained by converting two ponds into a single pond, so that the construction of a single pond is not justifiable from the standpoint of human health effects alone. The construction of tanks results in no reduction of hazard, and a small reduction in cancer risk.

5.2.6 Cultural Resources

A formal cultural resource inventory was conducted at RFP (see Section 5.3.6). Historic properties were not found within proximity of the ponds. Thus, adverse impacts to cultural resources from the proposed actions are not anticipated.

However, construction activities, such as excavation and trenching, have the potential to unearth previously undiscovered sites. In the event that unknown properties are identified during a construction activity, the Colorado State Historic Preservation Officer would be consulted prior to continuation of construction, as required by the Section 106 process of the National Historic Preservation Act.

5.2.7 Wetlands and Floodplains

The following section discusses the potential impact the proposed actions may have on the wetlands and floodplains of RFP.

5.2.7.1 Wetlands

Wetlands that currently exist (Section 5.3.7) around the pond areas have developed as a result of the operation of the pond system since it was initiated in the early 1950s. Although these wetlands developed around man-made water features, they do add to the total area of wetlands at RFP and are subject to the wetland protection provisions of the Clean Water Act.

Any change in pond management operations affecting a wetland would consider the following issues. First, the analysis of impacts on wetlands should acknowledge that the size of a wetland is not the basis of its significance. Alteration of a small wetland area may prove significant depending upon its type, location, and prevalence.

Second, the most recent federal policy regarding wetlands supports the goal of "no net loss," even for those wetlands that have developed around manmade features, such as the ponds. Until the formal delineation of wetlands at RFP has been completed and a comprehensive wetland management program for RFP is adopted by DOE, any proposed actions would be analyzed in an initial consultation with EPA and RFP Ecology and NEPA Division personnel. This consultation would determine what, if any, mitigation is required.

Several of the proposed actions could affect wetlands. Those actions involving construction activities within wetland areas have the potential to destroy these wetlands, unless mitigative efforts are implemented with the construction. As suggested previously, EPA and RFP Ecology and NEPA Division personnel would be consulted by Surface Water Division (SWD) personnel regarding proposed construction activities to determine what, if any, mitigation is required for even minor excavations and surface disturbances.

Volume management and associated actions (i.e., spray evaporation, aeration, recycling and downstream discharges) affect wetland area and type through ongoing fluctuations. An increase in volume may drown some species of wetland vegetation, depending on the length of submersion. Conversely, a decrease in volume may dry some species. Some spray evaporation operations may create artificially-supported wetland. Actual wetland area may increase or decrease over short periods of time.

As this vegetation is affected, wildlife using it as habitat or a food source will, in turn, be affected. These effects are not necessarily adverse or beneficial based on ecological succession. Section 5.3.7.1 describes the ecological succession occurring as a result of fluctuating pond levels.

5.2.7.2 Floodplains

The ponds are all located within the 100-year floodplain, as classified by the U.S. Army Corps of Engineers. The function of pond management is an acceptable land use within such a floodplain. Flood handling capability and the intended function of the pond system, as noted in Section 5.3.7, are not complementary, in that both cannot be accomplished simultaneously with optimal results. However, there are proposed actions that will address this situation.

1. Upgrade or replace the large diameter culverts that bypass water from North Walnut Creek and South Walnut Creek around spill control Ponds A-1, A-2, B-1 and B-2 to establish the 100-year design flow capacity.

2. Upgrade the South Interceptor Ditch and Woman Creek bypass around Pond C-2 to reestablish the 100-year design flow capacity.

While the terminal ponds and most of the diversion and interceptor ditches are designed to handle a 100-year, 6-hour storm event, certain drainage structures located upstream of the ponds are not. Some structures predating 1980 used 25-year storm event design criteria and require upgrading to adequately handle flows. Increasing the capability of the bypasses to carry the 100-year, 6-hour storm event would lessen the likelihood that flood water would inundate and thereby negate the functions of the spill control ponds. The proposed actions would also have a beneficial effect on the adjacent environment, preventing or minimizing soil erosion due to flood washing.

The construction of these upgrades or replacements may be covered by the 1993 environmental assessment, Surface Water Structures Maintenance at Rocky Flats. This draft is currently under review by DOE. Tentatively, it would apply to routine maintenance activities and "like replacement within a wetland." Preliminary details and specifications for the specific projects associated with these proposed actions would be submitted to RFP Design Review for a determination of whether or what additional compliance with NEPA is required.

5.2.8 Commitment of Resources

The fundamental resource involved in pond management operations, as identified in Section 5.3.8, is water. Overall, current operation of the ponds does not significantly alter downstream water quality, flow patterns, and/or volumes. However, flow rates downstream may be impacted by the proposed action to, "construct facilities to recycle water from Pond C-2 to the RFP industrial water system." Recycling the proposed amount of water would effectively remove this volume of water from the watershed of the South Platte River, which supports threatened and endangered species downstream near the Nebraska state line.

NEPA documentation pertaining specifically to Construction of the Pond C-2 Discharge Minimization Project is currently under review by DOE. Therefore, reference should be made to this document regarding impacts from this proposed action. Pending decision on this document, questions would be directed to RFP Ecology and NEPA Division.

As with the No Action alternative, other resources would be committed to implement the proposed actions. These include displacement or temporary loss of vegetation due to construction activities and an unspecified number of labor hours.

In addition, a certain amount of energy is expended to operate discharge pumps, spray evaporation equipment, and associated vehicles for personnel. The proposed installation of additional spray evaporation, aeration, recycling and monitoring equipment would incrementally increase the energy expended to conduct pond management. Relative to plant-wide energy use, this increase is minimal.

5.2.9 Cumulative Impacts

This evaluation of the proposed actions considered environmental issues of concern delineated pursuant to the NEPA in order to integrate program-level NEPA documentation into this IM/IRA Decision Document.

Impacts to affected resources from these proposed actions are anticipated to be negligible if mitigative measures are taken. These mitigative measures would be developed based on the recommended consultation with the appropriate regulatory personnel and RFP NEPA specialists regarding site-specific and project-specific plans.

Expansion of spray evaporation operations to Ponds A-1, B-1, and B-2 and initiating aeration operations at A-3 and the terminal ponds have the potential to more than double the air emissions currently generated by pond management. However, emissions doubled from these two operations would still be below reporting levels and, therefore, would not contribute materially to cumulative RFP total emissions.

Construction activities associated with dam upgrades and system installation could disturb pond sediments, allowing pond sediments to dry and become airborne. To ensure that such activities do not adversely impact the environment, the PPCD procedures would be integrated into any final plans concerning construction activities associated with pond management.

An increase in the use of generators for intake and discharge activities is likely with implementation of the proposed actions. These emissions would be minimal in amount. RFP Air Quality Division personnel have projected total emissions for these activities and have concluded that preparation of an APEN would be likely on only one of the six generators.

The source of any low concentration of contaminants potentially affecting water quality of the ponds is from RFP activities. As with the No Action alternative, the major function of the proposed actions is to provide best management practices for achieving state water quality standards. Given this purpose, the proposed actions would have a positive impact on water quality.

RFP consistently meets or exceeds Segment 4 standards for waters discharged off-site. Proposed monitoring, treatment and transfer actions would improve the quality of waters handled on-site within the pond system.

Impacts to surface and groundwater quality could occur during dewatering for excavations and during installation of wells through resuspension of sediments. All final plans for construction activities associated with dam upgrades and system installation should be preceded by a consultation with the OU Project Manager. Procedures from the Watershed Management Plan for Rocky Flats[5] should also be integrated into any final plans.

The proposed action of retaining use of Ponds A-1, A-2, B-1 and B-2 for spill control (an emergency measure to back-up upgradient secondary containment) is not anticipated to have an adverse impact on water quality.

Construction activities have the potential to adversely affect terrestrial and aquatic biota by resuspending these sediments and causing turbidity. Turbidity can adversely affect aquatic biota directly or can affect their food sources or habitat.

Algal blooms are a naturally occurring condition, but may create an adverse situation for certain aquatic biota because they deplete the dissolved oxygen from the water, making it unavailable to fish and other species. Lack of aeration in the ponds exacerbates this effect. Relative to proposed actions, installation of aeration equipment is proposed for Ponds A-3, A-4, B-5 and C-2, and would have a beneficial effect on certain aquatic species within these ponds. Moreover, addition of Ponds B-3 and B-4 to the list of ponds to be aerated would effectively reduce the level of this condition within the pond system from acute to normal.

In general, pond management operations have minimal effect on potential threatened and endangered species when precautions are taken. Once site-specific plans for any construction activities associated with the proposed actions are known, these plans should be submitted to RFP Design Review for verification that threatened and endangered species would not be impacted.

NEPA documentation pertaining specifically to Construction of the Pond C-2 Discharge Minimization Project is currently under review by DOE. Therefore reference should be made to this document regarding impacts to threatened and endangered species from this proposed action.

Spray evaporation of pond water would result in a negligible increase in risk to on-site workers. Risk to personnel during spills is unaffected by the proposed pond management options.

A formal cultural resources inventory was conducted at RFP. Historic properties were not found within proximity of the ponds. Thus, adverse impacts to cultural resources from the proposed actions are not anticipated[6].

However, construction activities, such as excavation and trenching, have the potential to unearth previously undiscovered sites. In the event that unknown properties are identified during a construction activity, the Colorado State Historic Preservation Officer would be consulted prior to continuation of construction.

Wetlands that currently exist around the pond areas have developed as a result of the operation of the pond system since it was initiated in the early 1950s. Volume management and associated actions (i.e., spray evaporation, aeration, recycling and downstream discharges) affect wetland area and type through ongoing fluctuations. Actual wetland area may increase or decrease over short periods of time. These effects are not necessarily adverse or beneficial based on ecological succession.

Several of the proposed actions involve construction activities within wetland areas that have the potential to destroy these wetlands, unless mitigative efforts are implemented with the construction. EPA and RFP Ecology and NEPA Division personnel should be consulted regarding proposed construction activities to determine what, if any, mitigation is required for even minor excavations and surface disturbances.

The ponds are all located within the 100-year floodplain, as classified by the U.S. Army Corps of Engineers. The function of pond management is an acceptable land use within such a floodplain. Flood handling capability and the intended function of the pond system are not complimentary, in that both cannot be accomplished simultaneously with optimal results. However, proposed actions (i.e., upgrade/replace bypass culverts) will increase the capability of the bypasses to carry the 100-year, 6-hour storm event which would lessen the likelihood that flood water would negate the functions of the noted ponds. This would have a beneficial effect on the adjacent environment.

The construction of these upgrades or replacements may be covered by the 1993 environmental assessment, Surface Water Structures Maintenance at Rocky Flats. This draft is currently under review by DOE. Preliminary details and specifications for the specific projects associated with these proposed actions should be submitted to RFP Design Review for a determination of whether or what additional compliance is required.

5.3 ENVIRONMENTAL EVALUATION OF "NO ACTION"

This section evaluates the environmental effects of the "No Action" alternative. This alternative is defined as *maintaining pond management operations as currently practiced until such time as RFP mission changes prompt an alteration in such operations*. Alterations in the operations are considered proposed actions, and are not considered in this section.

The overall goal of current pond management operations is to control discharge of effluent such that downstream water levels are not significantly altered and to ensure the quality of the downstream water. These operations involve, primarily, temporary holding actions, emergency spill control, sampling and monitoring. Current operations are described in more detail in Section 2.2.

In evaluating environmental effects, both beneficial and adverse impacts from the current pond management operation are considered relative to affected resources. The resources evaluated are air quality, water quality, terrestrial and aquatic biota, threatened and endangered species, personnel exposure, cultural resources, wetlands and floodplains, commitment of resources, and cumulative impacts.

This evaluation of No Action considers environmental issues of concern delineated pursuant to NEPA in order to integrate program level-NEPA documentation into this IM/IRA Decision Document.

5.3.1 Air

RFP is subject to compliance with the Clean Air Act[4] and 5400-series DOE Orders. Air emissions from current pond management operations are very limited. Overall, air quality benefits from the pond function of sedimentation. Contaminants present in the stormwater runoff and wastewater, primarily, settle on pond bottoms and are kept submerged by volume management such that they do not become airborne.

As part of the current pond management practices, volume management operations at Pond A-2 and the Landfill Pond may create air emissions from spray evaporation activity. Volatile organics may be emitted during actual spray procedures and NOx emissions may arise from diesel-fueled generators and water pumps (see Section 3.2.6).

Typical spray evaporation operations take place from May to September, during daylight hours only, seven days a week, evaporating approximately 5000 gallons per day at each location. Estimated actual water evaporation at each location is 900,000 gallons annually. Analytical sampling for volatile organic and semi-volatile organic compounds was conducted at both locations in the spring of 1993. These samples were analyzed by General Laboratory, an EPA-registered laboratory.

Results from this analysis were used by EG&G Air Quality Division personnel to project total emissions from spray evaporation operations. Maximum concentration levels of each compound were added together. Emissions were calculated based on the total concentration level of the compounds and pertinent operating parameters. Estimated maximum volatile organic compounds emissions for the two locations were found to be as follows:

Landfill Pond	13 pounds/year
Pond A-2	11 pounds/year

Colorado air quality regulations require reporting if total volatile organic compounds emissions exceed 2000 pounds per year. In addition, several compounds listed in the sampling data are also "non-criteria reportable pollutants" as set forth in the regulations. These compounds must be reported if they exceed 250 pounds per year individually. The 250 pounds per year de minimis level is based on a reporting scenario established in Appendix A of the Colorado Air Quality Control Regulation No. 3[7] that takes into account the distance of the source from the property boundary.

Spray evaporation operations emit loads significantly below both of these reporting levels. Because of their small size, total emissions from spray evaporation operations do not contribute materially to cumulative RFP total emissions because the operations are considered to be insignificant sources. Analytical results and computations are presented in Appendix G of this document.

5.3.2 Water

Under the No Action alternative, the operation of the ponds does not *create* significant contaminants that adversely affect the water quality. Rather, the major function of the current pond management plan is to implement best management practices to achieve state water quality standards.

Pond management operations are conducted such that water quality is maintained or improved. Detention of water in the pond system for a designated period allows sedimentation to occur. Sedimentation effectively settles potentially-contaminated suspended solids, removing them from the water column for as long as the sediments are not resuspended by disturbance[8]. Transuranic radionuclides are highly insoluble, and tend to bond to soil particles[8], and are, therefore, removed from the water column via sedimentation. Through volume management, potentially-contaminated sediments are kept covered with water so that sediments are not exposed to wind erosion.

The No Action alternative avoids significant alterations in operations that may result in adverse effects which presently do not exist (e.g., construction activities in certain pond areas may resuspend sediments within the water column; a pond closure or complete discharge may expose sediments to wind erosion).

Sampling has shown occasional plutonium concentrations greater than the Segment 4 Standards in Pond C-2. Since it is possible to transfer Pond C-2 water by pipeline to either Pond B-5 or Pond A-4, transferring may have an adverse effect on water quality in Pond B-5 or Pond A-4. However, a transfer of this type is limited to emergency operations only. Typically, volume management on Pond C-2 involves discharge to the Broomfield Diversion Ditch only after sampling shows state water quality standards have been met and after obtaining concurrence from CDH and NPDES Permit bypass approval from EPA.

Use of Ponds A-1, A-2, B-1 and B-2 for spill containment is an emergency measure. Tanks, pipes, material transfers, and other potential origins of a spill are provided with secondary containment or are subject to measures set forth in the RFP Spill Prevention Control and Countermeasure Plan and related documents. The impact on water released off-site is not expected to be detrimental since these ponds can be isolated from the rest of the surface water management system and the management system can administer effective methods of treating any water contaminated by a spill.

Discharge operations, also an IM/IRA Decision Document concern, are implemented only after sampling shows that state water quality standards have been met and after obtaining CDH concurrence. In addition, the outlet works at most ponds are no longer used for discharge because their use would pull water off the bottom of the ponds. This action has the potential of resuspending sediments from the bottom of the pond into the discharge. Since 1990, discharge operations have been conducted with a suspended intake line attached to a pump that discharges water from the surface and mid-level portions of the ponds.

5.3.3 Terrestrial and Aquatic

As noted in Chapter 4, since 1989 the water columns within the ponds have met or exceeded current water quality standards. The existence of certain biotic receptors in these ponds is evidence of *de minimis* risk associated with potential contaminants in the ponds. A concern in several ponds is over-productivity due to added nutrients from treated domestic waste.

Biota in the B-series ponds are affected by conditions that allow algal blooms to occur in Ponds B-3, B-4, B-5 and A-4 during the summer months. Several factors contribute to the occurrence of this condition. Discharge from the STP's tertiary treatment introduces a nutrient-rich mixture into the ponds. Nitrogen and phosphorus common to most wastewater treatment plant discharges enter B-3 and downstream ponds. This mixture combined with longer daylight hours and higher summer temperatures facilitate increased algal productivity.

The STP discharges approximately 150,000 gallons per day, which is typical for a facility serving 7000 people. The STP discharge meets the required water quality standards. As discussed in Chapter 2, impacts from the condition described would occur in most situations where a wastewater treatment plant discharged a large amount of effluent into a small, non-flowing receiving area.

Relative to the algal blooms, phosphorus is typically the limiting nutrient. State water quality standards have established a maximum (12 mg/L) and average (8 mg/L) phosphorus level for wastewater discharge. Recent sampling in RFP ponds located below the STP showed a maximum phosphorus level of 3.3 mg/L and an average of 1.4 mg/L, both substantially below standards.

However, these standards are high compared to phosphorus levels that cause eutrophication. total phosphorus concentrations of less than 0.1 mg/L are representative of hyper-eutrophic waters.

The impact from this condition is that as the algae die and accumulate at the bottom they begin to decay, depleting any dissolved oxygen in the water during the night. The algae remaining in the zone of light penetration produces oxygen saturation conditions during the day, but during the night this oxygen is quickly depleted.

These conditions cause extreme diurnal changes in pH. The NPDES permit allows pH variation from 6-9 standard units, but historic eutrophic conditions in Pond A-4 have caused a pH high of 9.5 to 10 standard units during the daylight hours.

The incidence of algal blooms could be reduced in a variety of ways without interfering with the function of the pond system. Such means include shortening holding times or reducing phosphorus levels discharged from the STP.

5.3.4 Threatened and Endangered Species

A few federally-designated and state-designated species are of interest regarding current pond management operations.

5.3.4.1 Endangered Species

The bald eagle and the peregrine falcon are both federally-designated as "endangered." The bald eagle, according to the Baseline Biological Characterization of the Terrestrial and Aquatic Habitats at RFP[9], may occur as an irregular visitor during the winter, or as a migrant during spring and fall migration. This species has not been observed to roost or actively pursue prey on RFP, although individuals have been observed perching on utility poles in the northern portion of the buffer zone. In 1993, three individual adult bald eagles were observed at or near RFP.

Smaller mammals are the key item in the eagle diet. Often these eagles opt to steal the kill of the ferruginous hawk, rather than kill their own prey. They will also eat larger fish species, such as the bass in Pond A-2. Typically, the other ponds support only smaller fish species. It has not been demonstrated that bald eagles feed from the RFP pond system. Given the limited fish population of the pond system, pond management operations are expected to have minimal effect on any individual bald eagle species. Further, there is currently no bald eagle critical habitat associated with the ponds.

The baseline study[9] indicates that the peregrine falcon occurs as a migrant at RFP, although none have been observed during the breeding season. The U.S. Fish & Wildlife Service developed a Peregrine Falcon Recovery Plan that discourages land-use practices and/or development that may adversely affect the character of habitat or prey base within approximate 10-mile radius of a falcon's nesting cliff. The existence of two potential nesting cliffs within this radius has been documented[9]; therefore, all of RFP may be considered potential foraging habitat.

Primarily, these falcons will prey on waterfowl which, in turn, would potentially feed on fish species that might be found in the ponds. Falcons do not eat fish. Mammals are not typical prey. Impacts to falcons from pond management would, as with the eagle, be expected to be minimal due to the limited fish population and the diminutive area of the pond system.

5.3.4.2 Threatened Species

In compliance with the Endangered Species Act, RFP is in the second year of a three-year protocol to determine the presence of Ute ladies'-tresses, a rare plant species, within the plant site. Individuals of this species were not observed throughout the first year of this survey. Riparian areas were identified in a 1992 Report of Findings[10] as being potential suitable habitat for this plant. Pond operations do not pose a barrier to distribution of this plant on RFP.

5.3.4.3 Candidate Species

The ferruginous hawk is listed as a Category 2 species on the federally-designated Candidate List. This species of hawk is a common winter resident and/or seasonal migrant, although it has been documented by the baseline study[9] as being observed adjacent to the industrial area of RFP during the winter, spring, and early summer of 1990 and 1991.

Most observations of the ferruginous hawk have been near prairie dog colonies southeast and northeast of RFP. Nesting activities were not observed; however, a juvenile male resided in this vicinity for a six week period in late spring and early summer of 1991. It was noted to be hunting primarily in the riparian zone of Woman Creek and along the 881 Hillside area, which is directly south of the industrial area.

This hawk nests in large trees or on cliffs. As noted previously, the bald eagle is known to seek out the habitat of the ferruginous hawk and steal its kill. Consequently, bald eagles may be indirectly affected by impacts on this hawk. However, the primary prey of the Ferruginous hawk is terrestrial and not common near the ponds.

The loggerhead shrike is also a Category 2 predatory bird species that is commonly observed on RFP during seasonal migration periods. This shrike principally eats insects and small mammals, neither of which are affected by pond management operations.

Preble's meadow jumping mouse, a Category 2 mammal, has been observed in the bottom- land of Woman Creek and Walnut Creek, but would not be affected by the water level fluctuations or other operations associated with pond management.

5.3.4.4 Colorado Species of Concern

Three bird species that might be observed at RFP during migration periods have been classified by the Colorado Department of Wildlife as Species of Concern within the state. They are Barrow's goldeneye, the greater sandhill crane, and the American white pelican. The Barrow's goldeneye is a possible winter resident on the ponds, although it does not nest there. It feeds on aquatic plants. The greater sandhill crane may occur during seasonal migration and would be expected to be associated with terrestrial areas. White pelicans are possible migrants in the pond areas during seasonal migration. They feed on larger fish species. None of these species have been observed at RFP.

The forktip threeawn, a member of the grass family, is limited to a few sites on RFP according to the baseline study[9]. It prefers sandstone outcrops and bare, disturbed areas and has been observed in a disturbed site along the railroad tracks southwest of the industrial area. The baseline study indicates this plant is rare in Colorado (although common in surrounding states) and, thus, it carries the C0-3 designation. The greatest risk to this plant on RFP is from competing plant species of advanced successional stages. This plant does not occur near the ponds and is not affected by the pond management operations.

5.3.5 Personnel Exposure

Applicable pathways are inhalation of volatilized contaminants, dermal absorption of contaminants and direct exposure to ionizing radiation. No produce or livestock are grown on-site, and there is no fishing in surface water ponds, so ingestion of contaminated food is not an applicable pathway. Ingestion of contaminated water is not applicable because water is provided from a municipal supply on-site.

A maximally exposed worker would be located adjacent to the ponds. The workers that are currently adjacent to the ponds for the maximum time of exposure are Riedel subcontractors, engaged in pumping Pond B-5 water to Pond A-4. The inorganics and metals, and all radionuclides except tritium, will not volatilize. The only contaminants that could be released to the atmosphere via volatilization, and therefore be a potential pathway for personnel exposures, are the volatile organics and tritium.

Dermal absorption could potentially occur as a result of direct dermal contact with pond water through sampling operations. After the initial contact, a fraction of each contaminant could migrate through the skin and contact the bloodstream. This is a low frequency occurrence because, even though sampling is done daily during discharge conditions, pond water contact is unusual during sampling because samplers wear protective gloves. The sampling typically results in a possible exposure of less than an hour. The skin forms an effective barrier so contaminants are largely excluded from bloodstream contact.

The radionuclides in the ponds will produce particles as they decay. Some of these particles will be emitted from the ponds and could impinge upon any receptor in the immediate vicinity. A worker could experience this pathway while he was in the immediate vicinity of the ponds. To produce an effect, these particles would have to pass through an amount of water equivalent to the radionuclides' depth, the water surface tension, a distance of air between the pond surface and the receptor, and lastly the receptor's skin. The majority of radiation will be alpha particles, which will not penetrate the full water-air-skin pathway. Clothing will cover most of the worker, and provide an additional amount of protection for the worker, further reducing the expected exposure.

For all pathways, the personnel exposure due to pond water contaminants will be governed by specific RFP programs designed to protect employees. These programs include Industrial Hygiene, Nuclear Safety Engineering, Occupational Safety and Radiological Health. No operations will take place unless the safety programs have reviewed those operations and determined that they meet all applicable safety requirements.

This oversight is accomplished through the use of procedural compliance. All operations involving hazardous and/or radioactive materials will be governed by procedures, and these procedures will be reviewed by the applicable safety organizations prior to implementation. By this mechanism, the operations procedures, as well as Conduct of Operations[11], Integrated Work Control Program[12] and Conduct of Engineering Manual[13] procedures will be used to ensure a safe working environment.

5.3.6 Cultural Resources

A cultural resource inventory for RFP was completed in July 1991[6]. The study located six previously-identified historic sites and identified 45 new cultural resources on the RFP site. The report concluded none of the sites was eligible for the National Register of Historic Places, and recommended no further work be done on any of the cultural resources. The Colorado State Historic Preservation Officer concurred with that recommendation.

In addition, current pond management operations do not involve any activity, such as construction, that would unearth any undiscovered historic sites. Therefore, it is not anticipated adverse effects to historic properties would occur due to implementation of current pond management.

5.3.7 Wetlands and Floodplains

The following section discusses the presence, status and potential impact on wetlands and floodplains relative to current pond management practices.

5.3.7.1 Wetlands

At the time this IM/IRA Decision Document was being prepared, a formal U.S. Corps of Engineers wetland delineation of RFP had not been completed. Current wetland areas have been classified according to the U.S. Fish & Wildlife Service Classification System and are described in Wetlands Assessment, Rocky Flats Plant Site[14].

According to this assessment, the Walnut Creek drainage wetlands include palustrine emergent wetlands and palustrine scrub-shrub in and along lower gradient stream segments and around the perimeter of ponds. A few palustrine flat wetlands (seeps) are found on the north facing slope downstream of Pond B-5. The A- and B-series ponds and the Landfill Pond, all in Walnut Creek, contain permanent water.

Wetland area along the Woman Creek drainage includes palustrine emergent wetlands, palustrine scrub-shrub wetlands, palustrine flat wetlands, and areas of open water. Palustrine emergent wetlands are found along the stream channels, in the South Interceptor Ditch, and around the perimeter of the ponds. Areas of palustrine wetlands along stream channels and around the perimeter of ponds that are dominated by willows and/or leadplant are classified as scrub-shrub wetlands. Just north of Pond C-2, smaller palustrine flat wetland areas occur.

According to the U.S. Army Corps of Engineers[15], palustrine wetlands are nontidal wetlands dominated by trees, shrubs, persistent emergents, or emergent mosses and lichens. Emergent vegetation designates erect, rooted, herbaceous vegetation. While not ecologically-unique, the palustrine wetlands associated with the pond system are valued for their various physical, chemical, and biological processes/attributes (functions), which may include: wildlife diversity/abundance, aquatic diversity/abundance, sediment stabilization, nutrient removal/transformation.

Wetlands that currently exist around the pond areas have developed as a result of the operation of the pond system since it was initiated in the early 1950s. Although these wetlands developed around manmade features, they do add to the total area of wetlands at RFP. Pond management operations are in compliance with wetland protection provisions of the Clean Water Act.

Basically, impacts to wetlands in the pond areas are due to volume fluctuations. An increase in volume may drown some species of wetland vegetation, depending on time submerged. Conversely, a decrease in volume may dry some species. Actual wetland area may increase or decrease over short periods of time. As this vegetation is affected, wildlife using it as habitat or foodstuffs will, in turn, be affected.

These impacts are not necessarily adverse or beneficial. Wetlands typically pass through various ecological successional stages as physical conditions change. The duration of these stages can last years or lifetimes. Many types of wetlands are not, in fact, climax communities, but interim successional stages[16].

It is likely natural wetlands occurring along the streams would also represent interim stages, since both Walnut Creek and Woman Creek are ephemeral. Current pond management (as discussed in Section 5.3.7.2) involves volume manipulation of the ponds. Water levels are maintained at between 20 to 50 percent; therefore, wetlands are unlikely to completely dry out. Therefore, current operations do not produce adverse impacts on surrounding wetlands.

5.3.7.2 Floodplains

The ponds are all located within the 100-year floodplain, as classified by the U.S. Army Corps of Engineers. The function of pond management is an acceptable land use within such a floodplain. In general, however, flood handling capability and the intended functions of the pond system are not complementary; both cannot be accomplished simultaneously with optimal results.

With regard to flood handling capability, the 100-year, 6-hour storm event is currently used as the design and/or modeling criteria in designing or evaluating drainage plans and structures. This criterion is used because it postulates a shorter event of greater intensity, which tends to produce the greatest problems with drainage systems. Upgrades and additions to the drainage system implemented since approximately 1979 have used this design criteria.

The terminal ponds are designed to handle 100-year, 6-hour storm events. The calculated volume of runoff from a 100-year, 6-hour event at the subject terminal ponds is correlated with actual pond design volumes:

Pond	Calculated Volume of Runoff	Actual Pond Design Volumes
A-4	21.3 million gallons	32.5 million gallons
B-5	23.6 million gallons	24.0 million gallons
C-2	9.3 million gallons	22.7 million gallons

A significant volume of runoff from a 100-year, 6-hour storm event would be carried *around* the RFP core area by the McKay Diversion Structure. Almost 100 million gallons of runoff would flow through this bypass, thereby not entering the pond system.

Although the pond design volumes are adequate to handle a significant storm event, the volume margins are reduced when pond functions are being implemented. As described previously, one of the primary functions of the pond management system is to control discharge such that downstream water levels are not significantly altered; RFP water must be returned to the South Platte drainage basin (according to the contract with the Denver Water Board). Also, the pond system controls effluent which may contain contaminants, holding water so sedimentation and sampling can occur.

In order to maintain volume levels that will accommodate these two functions, as well as emergency spill containment, the current pond management procedures (e.g., spray evaporation, transfers, off-site discharge) are calculated to keep pond volumes below a maximum of 50 percent. In addition, ponds are managed to retain pond volumes at approximately a 20-30 percent minimum to keep sediments covered.

Drainage structures located upstream of the terminal ponds are currently not capable of handling a 100-year, 6-hour storm event. A primary reason is lack of maintenance. Wetland vegetation has grown in front of inlets, ditches contain sediment, and culverts are damaged. Certain maintenance is routine and categorically excluded from the NEPA process. However, an Environmental Assessment is currently being prepared which addresses surface water structures maintenance at RFP taking place in floodplain and wetland areas. If a Finding of No Significant Impact is approved, it is expected that maintenance in such areas will begin.

5.3.8 Commitment of Resources

The fundamental resource involved in the current pond management activities is water. Operation of the ponds does not significantly alter downstream water quality, flow patterns, and/or volumes. Discharge flow rates are controlled such that the integrity of downstream conveyance or containment structures is not compromised.

Some water evaporates and is potentially lost from the South Platte drainage basin. Most of the water intake is returned to the system as discharge. Annual raw water intake for RFP in 1992 was about 118,989,000 gallons[17]. This gallonage represents both water going through the raw water system (process source) and through the water treatment system (potable source). According to the Rocky Flats Plant Site Environmental Report: January Through December 1992[18], total discharge for 1992 was 178,345,000 gallons.

Raw water used in the process system is sometimes recycled within the system and some evaporates through the cooling towers. The remaining amount, in addition to all of the potable water collected in the sanitary sewer system, goes through the STP. Total discharge from the STP for 1992 was 51,902,000 gallons. Surface water runoff from precipitation accounts for the additional discharge.

In addition to water resources, a certain amount of energy is expended to operate, for example, discharge pumps, spray evaporation equipment, and associated vehicles for personnel. Energy is also expended indirectly in the production of goods required for water treatment, discharge and monitoring.

An unspecified number of labor hours are utilized to conduct all of the management operations related to the ponds. This would include the various sampling, monitoring, and documentation activities necessary for compliance.

Surface water drainage is somewhat disrupted by pond management operations. Potable and process water is removed, used, treated, discharged, and returned, for the most part, to the drainage basin. Surface water runoff from the core area is contained temporarily for treatment, but then is discharged, as appropriate, to the drainage basin. A large amount of surface water runoff is diverted around RFP, and is not removed from its original drainage basin.

The vegetation existing around the ponds is primarily native and has not been altered. That small amount of vegetation displaced or removed due to construction and operational activities could effectively be restored to native condition, if land use density remained the same. Types and amounts of wildlife present at RFP have not been significantly altered by pond management operations. Some population decrease may be attributed to damming streams, although, since streams are intermittent, certain species may have moved onto the site that would not normally be there. As with vegetation, wildlife that has fluctuated with ecological succession (influenced by pond management operations) would likely return to native conditions if native vegetation is restored, and both land use and land-use density were restored.

5.3.9 Cumulative Impacts

This evaluation of "No Action" considered environmental issues of concern delineated pursuant to the NEPA in order to integrate program level-NEPA documentation into this IM/IRA Decision Document. The current pond management plan (the No Action alternative) operates the pond system such that related impacts to potentially affected resources are negligible.

Air emissions from the current pond management operations are very limited, are below reportable quantities, and do not contribute to cumulative RFP total emissions. Further, the operation of the ponds does not create significant contaminants that adversely affect the water quality (the source is primarily other RFP activities). Rather, the major purpose of the current operations is to provide methods for achieving relevant and state water quality standards. Under current operations, pond management has a positive impact on water quality.

The existence of certain biotic receptors in the ponds is evidence of *de minimis* risk associated with potential contaminants in the water column. Terrestrial and aquatic biota may be affected by the decay process of algal blooms, which are prominent due to a nutrient-rich mixture being introduced into a small, non-flowing receiving area by STP effluent (which is in compliance with relevant standards). This decay limits the availability of dissolved oxygen and promotes the presence of fish species (e.g., minnows) that can inhabit this type of environment. The effect on biota from this condition is that species that feed on minnows are more abundant and the various birds and mammals that would feed on larger fish species are absent or occur in limited numbers. Biological succession is inhibited and a natural sequence species-diversity does not develop.

Federally-designated endangered and candidate species have been sighted at or near RFP. As currently managed, however, the ponds have not been demonstrated to support a significant prey base for bald eagles and peregrine falcons and there is presently no critical habitat associated with the ponds. The primary prey of the ferruginous hawk is terrestrial and not common near the ponds. The loggerhead shrike principally eats insects and small mammals, neither of which are affected by pond management operations. Preble's meadow jumping mouse would not be affected by the water level fluctuations or other operations associated with pond management.

State-designated Species of Concern include three bird species: Barrow's goldeneye, greater sandhill crane, and white pelicans. None of these species have been observed at RFP. The Forktip Threeawn, a member of the grass family, is limited to a few sites on RFP. The greatest risk to this plant on RFP is from competing plant species of advanced successional stages. This plant does not occur near the ponds and is not affected by the pond management operations.

Personnel exposure through inhalation of volatilized contaminants, dermal absorption of contaminants, and direct exposure to ionizing radiation is insignificant.

A cultural resource inventory concluded that the cultural resource sites located at RFP were not eligible for the National Register of Historic Places. In addition, current pond management operations do not involve any activity, such as construction, that would unearth any undiscovered historic sites. Therefore, it is not anticipated that adverse effects to historic properties would occur due to implementation of current pond management.

A formal wetland delineation for RFP has not been completed. Preliminary investigations indicate that wetlands that currently exist around the pond areas have developed as a result of the operation of the pond system since it was initiated in the early 1950s. Although these wetlands developed around manmade features, they do add to the total area of wetlands at RFP. There are no known threatened and/or endangered species inhabiting these wetlands. Pond management operations are in compliance with wetland protection provisions of the Clean Water Act.

Impacts to wetlands in the pond areas are due to volume fluctuations. An increase in volume may drown some species of wetland vegetation, depending on time submerged. Conversely, a decrease in volume may dry some species. Actual wetland area may increase or decrease over short periods of time. As this vegetation is affected, wildlife using it as habitat or foodstuffs will, in turn, be affected. These impacts are not necessarily adverse or beneficial. Current pond management involves volume management of the ponds. Water levels are maintained at between 20 to 50 percent; therefore, wetlands are unlikely to completely dry out. Therefore, current operations do not produce significant impacts on surrounding wetlands.

The ponds are all located within 100-year floodplain, as classified by the U.S. Federal Emergency Management Administration. The function of pond management is an acceptable land use within such a floodplain. In general, however, flood handling capability and the intended functions of the pond system are not complimentary; both cannot be accomplished simultaneously with optimal results.

Flooding actions would increase the turbidity (resuspension of sediments) of pond waters and could cause problems as long as contaminated sediments are contained in pond bottoms. Current pond management obligations are incapable of addressing this problem. This impact is considered beyond the scope of this document and should be considered in the planning of OU remedial efforts.

In considering environmental impacts from the current pond management operations, there are certain external forces that indirectly affect the impacts noted in this report. As development continues around the undeveloped RFP buffer zone (i.e., potentially making off-site wildlife and vegetation habitat unavailable) an undue burden may be placed on this buffer zone by wildlife and/or vegetation "looking for a place to live." This condition could ultimately tax the buffer zone ecosystem thereby increasing the significance of current impacts or currently non-significant impacts.

REFERENCES

[1] EPA, 1985, Methods for Measuring the Acute Toxicity of Effluents to Aquatic Organisms.

[2] EPA, 1993, Region VIII EPA NPDES Acute Test Conditions - Static Renewal Whole Effluent Toxicity.

[3] Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 1980, 42 USC §§ 9601-9675 (CERCLA §§ 101-405). Supplemented 1988.

[4] Clean Air Act, 1988, 42 USC §§ 7401-7671q (CAA §§ 101-618). Supplemented 1990.

[5] Department of Energy, 1993, Watershed Management Plan for Rocky Flats.

[6] Department of Energy, 1991, Cultural Resources Class III Survey of the Department Energy Rocky Flats Plant, Northern Jefferson and Boulder Counties, Colorado.

[7] Colorado Department of Health - Air Quality Control Division, 1993, Colorado Air Quality Control Regulation No. 3, Air Pollution Notices, Construction Permits and Fees, Operating Permits, Including the Prevention of Significant Degradation (PSD).

[8] Department of Energy (DOE), 1980, Final Environmental Impact Statement Rocky Flats Plant Site, Golden, Jefferson County, Colorado: Final Statement to ERDA 1545-D.

[9] Department of Energy, 1992, Baseline Biological Characteristics of Terrestrial and Aquatic Habitats at the Rocky Flats Plant - Final Report.

[10] Department of Energy, 1992, Report of Findings: Ute Ladies'-Tresses, Rocky Flats Buffer Zone, Jefferson County, Colorado.

[11] EG&G Rocky Flats, 1993, Conduct of Operations Manual, 1-31000-COOP. This manual is continually being updated.

[12] EG&G Rocky Flats, 1993, Integrated Work Control Program Manual, 1-74000-IWCP-TOC. This manual is continually being updated.

[13] EG&G Rocky Flats, 1993, Conduct of Engineering Manual, COEM. This manual is continually being updated.

[14] Department of Energy, 1991, Wetlands Assessment, Rocky Flats Plant Site.

[15] Army Corps of Engineers, Paul Adamus, et. al., 1987, Wetland Evaluation Technique (WET) Volume II, Methodology.

[16] Hammer, Donald A., 1992, Creating Freshwater Wetlands.

[17] Padgett, Philip, 1993, Telephone Conservation with Mr. Philip Padgett, Rocky Flats Plant, Plant Services, August 6, 1993.

[18] Department of Energy, 1993, Rocky Flats Plant Site Environmental Report for 1992.

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LEGEND TO SCHEMATIC OF PROPOSED ACTIONS
ON FIGURE 5-1

1. Maintain Ponds A-1, A-2, B-1 and B-2 for use as spill control facilities (Options 4.4.8 and 4.7.1.8).

2. Install new spray evaporation systems at Ponds A-1, A-2, B-1, B-2 and Landfill Pond to reduce retained volumes and alleviate the need to transfer water between spill control ponds (Option 4.7.1.4).

3. Monitor spray evaporation operational benchmarks in Tables 3-1 through 3-7 (Option 4.8.4).

4. Maintain Ponds A-3, A-4, B-4, B-5 and C-2 as stormwater storage discharge facilities (Options 4.5.3.1 and 4.7.2.9).

5. Install piezometers at terminal ponds A-4, B-5 and C-2 to monitor the phreatic water surface within these dams as recommended in the U.S. Army Corps of Engineers Report (Option 4.5.3.1).

6. Change the water management operational procedures for Dams A-4, B-5 and C-2 to maintain safe storage volumes according to the recommendations of the U.S. Army Corps of Engineers (Option 4.5.3.1).

7. Monitor transfers between all ponds for operational benchmarks identified in Tables 3-1 through 3-7 (Option 4.8.5).

8. Monitor off-site discharges from Ponds A-3, A-4, B-5 and C-2 for operational benchmarks identified in Tables 3-1 through 3-7 (Option 4.8.6).

9. Upgrade or replace the large diameter culverts that bypass water from North Walnut Creek and South Walnut Creek around spill control Ponds A-1, A-2, B-1, B-2 and B-3 to establish the 100-year design flow capacity (Option 4.5.3.1).

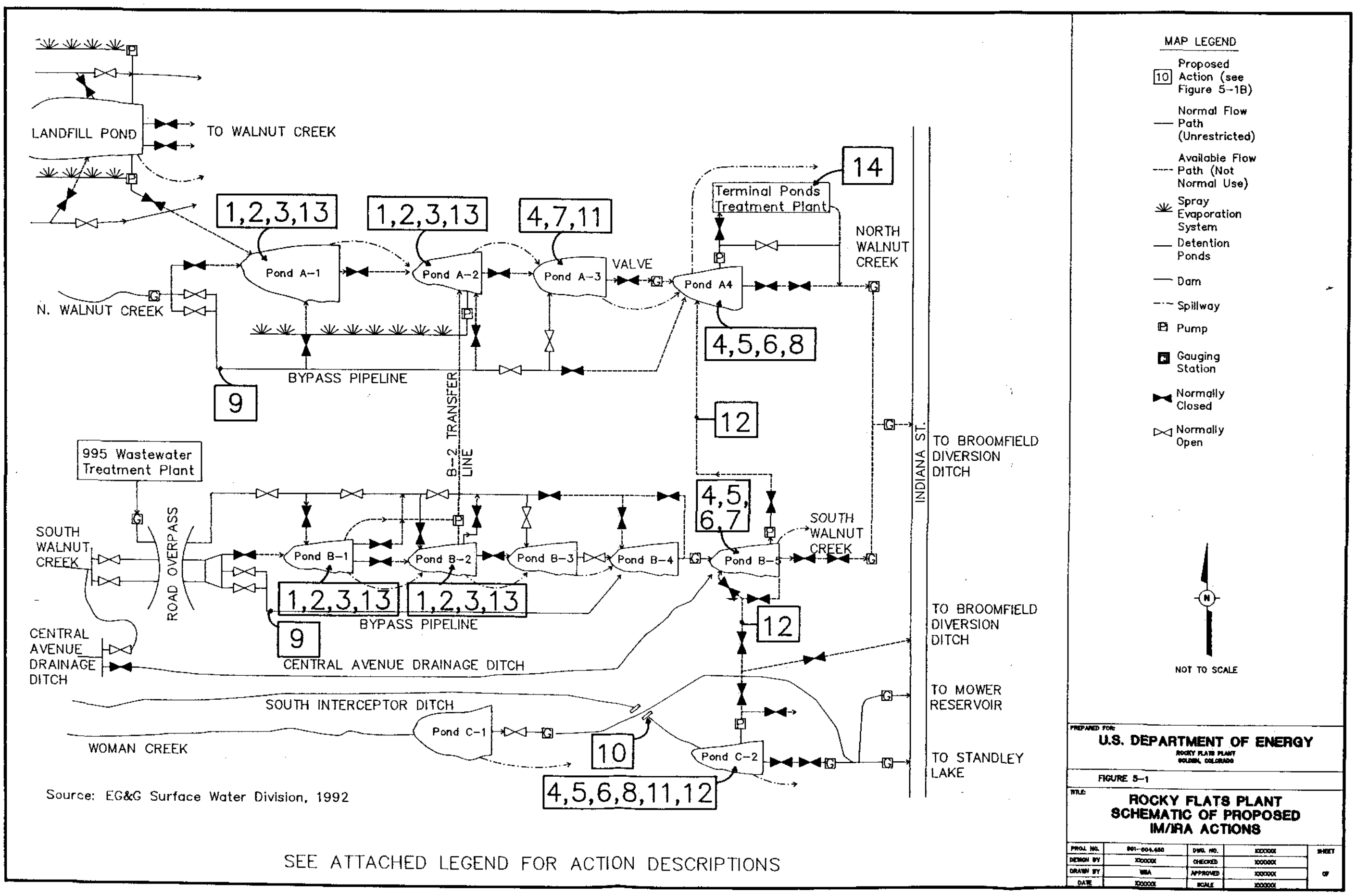
10. Upgrade the South Interceptor Ditch and Woman Creek bypass around Pond C-2 to reestablish the 100-year design flow capacity (Option 4.5.3.1).

11. Construct facilities to recycle water from Pond C-2 to the RFP industrial water system (Option 4.7.1.2).

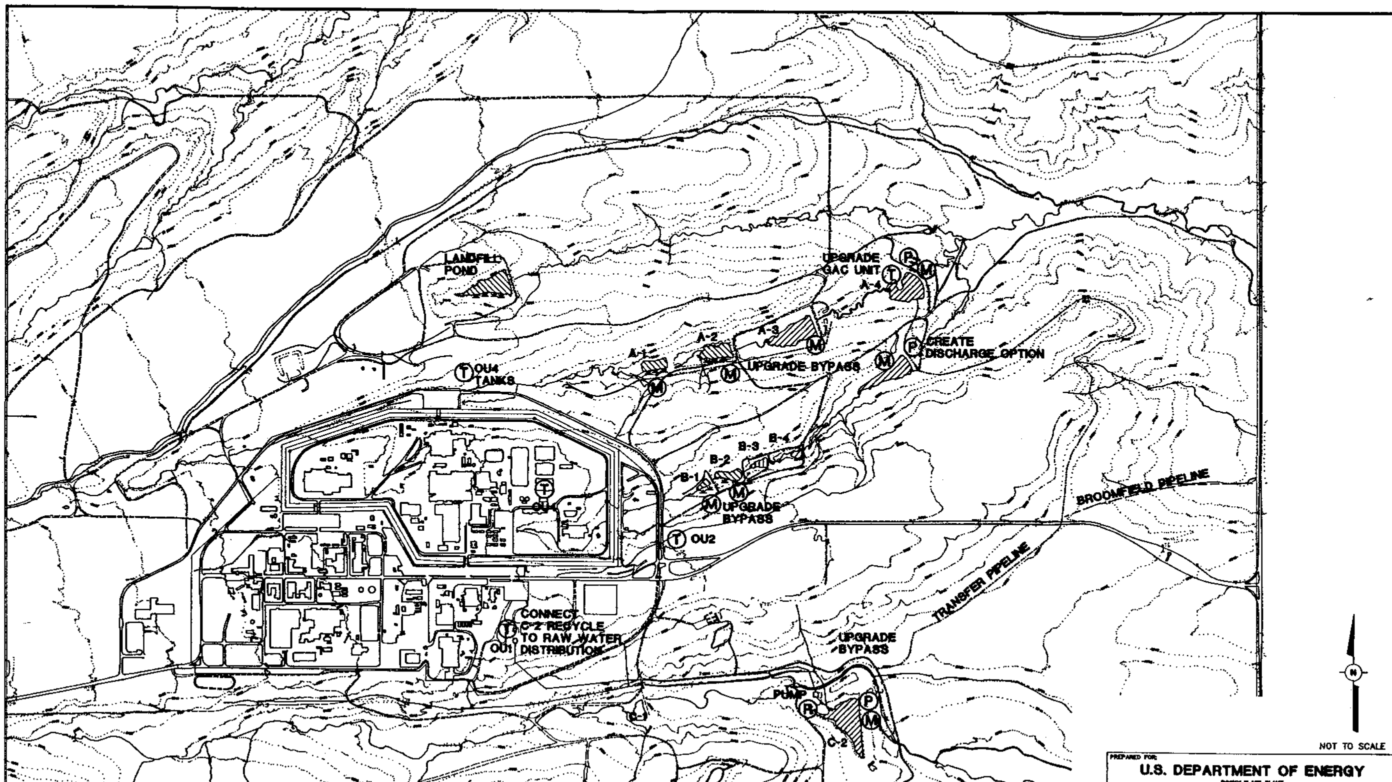
12. Construct an extension to the C-2 to B-5/A-4 transfer pipeline, allowing discharge of C-2 water below Pond A-4 or B-5 (Option 4.7.2.10).

13. Implement a long-term service contract with a private company to provide mobile treatment services on an on-call basis (Option 4.6.1).

14. Maintain and upgrade the existing filtration/granular activated carbon (GAC) treatment system at Pond A-4 for use in discharge "polishing," as needed (Option 4.6.9).



LANDFILL POND
TO WALNUT CREEK
1,2,3,13
1,2,3,13
4,7,11
14
Terminal Ponds Treatment Plant
NORTH WALNUT CREEK
Pond A-1
Pond A-2
Pond A-3
VALVE
Pond A4
N. WALNUT CREEK
4,5,6,8
BYPASS PIPELINE
9
B-2 TRANSFER LINE
12
995 Wastewater Treatment Plant
SOUTH WALNUT CREEK
ROAD OVERPASS
Pond B-1
Pond B-2
Pond B-3
Pond B-4
Pond B-5
4,5, 6,7
SOUTH WALNUT CREEK
1,2,3,13
1,2,3,13
BYPASS PIPELINE
9
12
INDIANA ST.
TO BROOMFIELD DIVERSION DITCH
TO BROOMFIELD DIVERSION DITCH
CENTRAL AVENUE DRAINAGE DITCH
CENTRAL AVENUE DRAINAGE DITCH
SOUTH INTERCEPTOR DITCH
TO MOWER RESERVOIR
Pond C-1
10
WOMAN CREEK
Pond C-2
TO STANDLEY LAKE
4,5,6,8,11,12
Source: EG&G Surface Water Division, 1992
SEE ATTACHED LEGEND FOR ACTION DESCRIPTIONS
MAP LEGEND
10 Proposed Action (see Figure 5-1B)
Normal Flow Path (Unrestricted)
Available Flow Path (Not Normal Use)
Spray Evaporation System
Detention Ponds
Dam
Spillway
Pump
Gauging Station
Normally Closed
Normally Open
N
NOT TO SCALE
PREPARED FOR:
U.S. DEPARTMENT OF ENERGY
FIGURE 5-1
ROCKY FLATS PLANT SCHEMATIC OF PROPOSED IM/IRA ACTIONS



LEGEND:

- STP EFFLUENT STORAGE
- SPILL CONTROL / CAPTURE
- STORMWATER STORAGE
- SPRAY EVAPORATION
- (P) PEIZOMETERS
- (M) MONITORING POINT
- (T) TREATMENT FACILITY
- (R) RECYCLE SYSTEM TO RFP RAW WATER DISTRIBUTION

NOT SHOWN: UTILIZE MOBILE TREATMENT SERVICES AS NECESSARY

RESOLVE REGULATORY ISSUES REGARDING USE OF OPERABLE UNIT (OU) TREATMENT FACILITIES FOR POND WATER

PREPARED FOR:

U.S. DEPARTMENT OF ENERGY

ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 5-2

TITLE:

ROCKY FLATS PLANT LOCATIONS OF PROPOSED ACTIONS

PROJ. NO.	801-004.450	DWG. NO.	XXXXXX	SHEET
DESIGN BY	XXXXXX	CHECKED	XXXXXX	
DRAWN BY	WSA	APPROVED	XXXXXX	OF
DATE	XXXXXX	SCALE	XXXXXX	

CHAPTER 6
IMPLEMENTATION PLAN

CHAPTER 6
IMPLEMENTATION PLAN

This chapter presents the proposed implementation plan for the Pond Water Management Interim Measure/Interim Remedial Action (IM/IRA) selected proposed actions. Implementation involves a combination of activities which include the following:

1. Developing revised or new Standard Operating Procedures (SOPs) for Pond Water Management functions and activities.

2. Constructing physical improvements to Pond Water Management facilities.

3. Conducting research efforts and/or new studies to guide improvements in operational management.

4. Implementing technology improvements to enhance water treatment and water monitoring capabilities.

The selected proposed actions for this IM/IRA process are listed in Section 5.1.7. Implementation of many of the selected proposed actions and the proposed schedules for completion are predicated on timely internal and external review/approval, the availability of funding, timely receipt of permits or permit modifications (if needed), and agreements between the parties that statutory authorities exist which require completion of the proposed actions. These assumptions and qualifications have a profound effect on the proposed schedule(s) and are discussed in Section 6.1.

Each of the selected proposed actions listed in Section 5.1.7 fits into one of the above four general categories. These categories, and the proposed actions applicable to each category, are discussed in Section 6.2. Included in this discussion is a proposed schedule, with milestones, for completion of individual proposed actions and a description of precursor activities which must also be accomplished.

The final section of this chapter, Section 6.3, outlines a proposed Pond Water Management Operations Plan. This Operations Plan delineates the operational strategy for each of the eleven ponds discussed in this IM/IRA Decision Document and provides decision trees that specify operational management decisions at any point in the pond water management system. Once finalized and approved through the Record of Decision (ROD), this Operations Plan will guide all future pond water management activities.

6.1 ASSUMPTIONS AND QUALIFICATIONS

Implementation of the IM/IRA selected proposed options depends on document and responsiveness summary approval by all parties (Department of Energy [DOE], Environmental Protection Agency [EPA] and Colorado Department of Health [CDH]) and issuance of a ROD by EPA. Once approved, the IM/IRA Decision Document becomes a legally enforceable "contract" between DOE and regulatory agencies, under the terms and conditions of the Interagency Agreement (IAG).

It is also assumed that by including an Environmental Evaluation of the selected options within the IM/IRA Decision Document (see Section 5.2), the statutory requirements of the National Environmental Policy Act (NEPA) have been met, and no additional environmental documentation (under NEPA) is required to implement the selected options.

Similarly, approval of the Decision Document is assumed to be equivalent to an operating permit for pond water management activities, and no other permits or permit modifications are required. Conducting pond water management under the auspices of the IM/IRA, including compliance with chemical-, action- and location-specific benchmarks, allows regulatory oversight and control under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), obviating the need for permits under the Resource Conservation and Recovery Act (RCRA) or the Clean Water Act (CWA) through the National Pollutant Discharge Elimination System (NPDES). Indeed, a main objective of this document is to provide a regulatory mechanism to replace the NPDES permit for stormwater Ponds A-3, A-4, B-5 and C-2.

Implementation of the selected options will require the commitment of significant resources. The proposed schedule of tasks and milestones in Section 6.2 assumes that funding will be made available to accomplish these tasks within the specified time frame, consistent with paragraphs 250 and 251 of the IAG. However, the Anti Deficiency Act (31 USC § 1341) does not allow the federal government or its agencies to commit to obligations, including compliance schedules, for which no funding has been appropriated. Per paragraph 255 of the IAG, resolution of this issue, should it occur, will be negotiated and/or adjudicated between the parties at the time it occurs.

Finally, DOE reserves its rights under paragraphs 248 and 249 of the IAG. These rights, as they pertain to this IM/IRA Decision Document, include DOE's right to challenge any decision affecting remedy selection with respect to the scope or schedule of implementation efforts, and *force majeure* events beyond the control of DOE.

6.2 PROPOSED SCHEDULE OF TASKS AND MILESTONES

Since it is not possible to determine with any certainty the exact time at which a final approved ROD for this IM/IRA Decision Document will be issued, the schedule of implementation tasks and associated milestones is given in terms of durations rather than specific dates. A final schedule, with specific dates, will be adopted once the ROD is finalized.

As listed previously, implementation activities fall into one of four categories which are discussed separately in the sections that follow. Each section contains a separate schedule of tasks and milestones for activities pertinent to that section. Option numbers from Section 5.1.7 are given in parenthesis where appropriate to cross-reference listed activities to the specific options from which they are derived.

6.2.1 Development of Standard Operating Procedures (SOPs)

An extensive list of SOPs currently exists to guide pond water management activities. These SOPs were developed to implement the requirements of higher level policies or program plans, which in turn are driven by DOE orders and federal and state laws, regulations and agreements. The two high-level documents most pertinent to pond water management activities are the Environmental Protection Requirements Manual (1-25000-EPR) and the Emergency Preparedness Implementation Plan (1-15200-EPIP). These documents cite specific low-level procedures to be followed in conducting specific plant-wide environmental activities. Low-level procedures pertinent to pond water management operations are listed and described in Appendix G.

Implementation activities associated with SOPs include incorporating an approved Pond Water Management Operations Plan into the Environmental Protection Requirements Manual, revisions to existing procedures to reflect new operating requirements adopted by this Decision Document, and creation of new procedures for new activities or facilities implemented as part of this IM/IRA.

Specific activities for this section, and a proposed schedule for completion of these activities, is given in Table 6-1.

TABLE 6-1
DEVELOPMENT OF SOPs FOR STANDARD OPERATING PROCEDURES ACTIVITIES AND SCHEDULES

Activities	Schedule for Completion
Approved Pond Water Management Operations Plan	Concurrent with approval of ROD
Incorporate Pond Water Management Operations Plan into Environmental Protection Requirements Manual	8 weeks after approval of ROD
Approval of revised SOPs to reflect new requirements of Operations Plan (Options 4.5.3.1, 4.8.4, 4.8.5, 4.8.6)	6 weeks after inclusion of Operations Plan in EPRM
Approval of new SOPs to cover operation of A-4 treatment facilities (Option 4.6.9)	8 weeks after inclusion of Operations Plan in EPRM
Approval of new SOP to cover installation, operation and maintenance of real-time monitoring equipment	10 weeks after inclusion of Operations Plan in EPRM
Approval of new SOP to cover reporting of and response to real-time monitoring data	12 weeks after inclusion of Operations Plan in EPRM
Approval of new SOP to cover operation of mobile treatment units (Option 4.6.1)	16 weeks after inclusion of Operations Plan in EPRM

6.2.2 Construction Efforts

Construction efforts include both new facilities and improvements and repairs to existing facilities. New construction includes pipelines (or pipeline extensions) from Ponds B-5 and A-3 to Segment 4 (i.e., below ponds), installation of additional piezometer wells at Ponds A-4 and C-2, installation of additional real-time monitoring equipment at all ponds and piezometer locations, construction of a water recycle system for Pond C-2, and construction of new spray evaporation systems at Ponds B-1, B-2, A-1, A-2 and the Landfill Pond. Improvements and repairs consist of excavating and reestablishing the 100-year flow capacity of the South Interceptor Ditch and Woman Creek Bypass around C-2, and replacing the existing A-series bypass pipe with a larger capacity pipe.

Specific construction activities and proposed schedule are listed in Table 6-2.

TABLE 6-2
CONSTRUCTION ACTIVITIES AND SCHEDULE

Activities	Schedule for Completion
Install pipeline extension and valves for discharge of Pond B-5 to Segment 4 (Option 4.7.2.9)	weeks duration from completion of work request.
Install pump/pipeline for discharge of Pond A-3 to Segment 4 (Option 4.7.2.9)	10 weeks duration from completion of work request.
Install pump/pipeline for discharge of Pond A-2 to Pond A-3 (Option 4.7.1.8)	10 weeks duration from completion of work request.
Prepare complete scope and estimates for: • A-1 bypass replacement (Option 4.5.3.1) • Additional piezometers at A-3, A-4 and C-2 (Option 4.5.3.1) • Spray evaporation systems at Ponds A-1, A-2, B-1, and the Landfill Pond (Option 4.7.1.4) • Woman Creek bypass improvements (Option 4.5.3.1)	14 weeks from approval of ROD
Obtain funding approval for: • A-1 bypass replacement • Additional piezometers at A-3, A-4 and C-2 • Spray evaporation systems at Ponds A-1, A-2, B-1, B-2 and the Landfill Pond • Real-time monitoring equipment (Option 4.8.6) • Woman Creek bypass improvements	To be determined
Begin design of individual projects	2 weeks after funding approval
Complete design of individual projects	To be determined
Complete construction of individual projects	To be determined
Complete S.O. Testing of individual projects	To be determined

(Note: Projects to upgrade the South Interceptor Ditch [Option 4.5.3.1] and construct a recycle system for Pond C-2 [Option 4.7.1.2] are currently in progress.)

6.2.3 New Research/Studies

New research/studies include the following activities:

1. Continued research on low-level radionuclide treatment technology.

2. Continued research on low-level radionuclide real-time monitoring technology.

3. Monitoring of new dam piezometers, and evaluation of geotechnical data to determine whether dam structural upgrades are warranted.

Research activities are contingent on funding availability, therefore no schedule for completion of these activities is specified. Activities associated with low level radionuclide monitoring and treatment may also be performed as part of Sitewide Treatability Studies under the IAG. Instrumentation of existing piezometers is currently in progress. The need for new piezometers, and instrumentation of these new piezometers will be determined by evaluating information generated by the existing piezometer monitoring program.

6.2.4 Technology Improvements

Technology improvements include implementation of new technologies after research studies are complete, and implementation of existing technologies at new locations. Activities/ Milestones and proposed schedules are given in Table 6-3.

TABLE 6-3
TECHNOLOGY IMPROVEMENTS ACTIVITIES AND SCHEDULE

	Activities	Schedule for Completion
(1)	Investigate equipment needs for constructing mobile treatment facilities and investigate availability/capability of contracted mobile treatment facilities (Option 4.6.1)	12 weeks after approval of ROD
	Make decision on whether to construct or contract for mobile treatment facilities.	12 weeks after approval of ROD
	Obtain funding approval for mobile treatment system contract or treatment equipment purchase	To be determined
	Prepare and distribute request for proposals or solicitation of bids	8 weeks duration after funding approval
	Receive bids or proposals and conduct Technical Evaluation	6 weeks after request for proposals or bid solicitation
	Complete procurement	To be determined

TABLE 6-3
TECHNOLOGY IMPROVEMENTS ACTIVITIES AND SCHEDULE
(Continued)

	Activities	Schedule for Completion
(2)	Investigate equipment requirements for upgrades to A-4 treatment facility (Option 4.6.9)	12 weeks after approval of ROD
	Receive funding approval for equipment upgrades	To be determined
	Prepare specifications and solicit bids for new equipment	6 weeks after funding approval
	Receive bids and conduct Technical Evaluation	6 weeks after bid solicitation
	Complete procurement	To be determined
	Complete installation of new equipment at A-4 facility	14 weeks after receipt of equipment

6.3 PROPOSED POND WATER MANAGEMENT OPERATIONS PLAN

This final section outlines a proposed operations plan for each of the eleven ponds considered in this IM/IRA Decision Document. The major operational aspects applicable to individual ponds are detailed below. Individual ponds are single components of the overall pond water management system; however, Operations Plans for the individual ponds are similar, since all of these ponds, except the Landfill Pond, reside within Segment 5 of Big Dry Creek, South Platte River Basin, and have similar water quality criteria applied to them. For operational purposes, the Landfill Pond is evaluated similarly to all other ponds, since any discharges from the Landfill Pond will also enter Segment 5. Decision trees showing major operational decision points for individual ponds, and for the drainages and/or inputs to the pond system, have been prepared to reflect the systematic approach to pond water management desired by this IM/IRA Decision Document. These decision trees are included as Figures 6-1 through 6-8.

Operations are described as "normal" or "emergency," based on a combination of retained volume, weather conditions, dam safety concerns, and water quality considerations. Normal operations are defined as those operations that are conducted on a routine and relatively continuous basis, guided by SOPs, and in the absence of water quality problems. Emergency operations are defined as specific actions or operations taken in response to abnormal, non-routine occurrences. The transition from normal operations to emergency operations occurs in response to specified Action Levels, or in response to confirmed water contamination.

Action Levels list elevations or volumes at which operational decisions become less a function of water quality considerations (as for normal operations mode) and more a function of weather conditions and dam safety concerns. Two Action Levels are specified for each pond.

Action Level 1 is the volume at which a larger storm event (generally the 25 year event) will result in overtopping of the dam and uncontrolled release of water will occur. The monitoring frequency for pond levels and dam conditions is increased to three times per week, and weather forecasts are immediately evaluated. If dam problems are not observed, and precipitation is forecast to be minimal, normal operational mode is maintained. If dam problems are observed, or significant precipitation is forecast, emergency operations mode is initiated.

Action Level 2 is triggered by a pond level that is within 1/2 foot of the spillway elevation (for non discharge ponds), or within 1 foot of the spillway elevation (for discharge ponds), and at which any additional water inputs or minor storm events will result in overtopping of the dam. Monitoring of pond levels and dam conditions is conducted daily, and emergency operations are initiated unless extenuating circumstances exist. Extenuating circumstances include:

1. Positive knowledge of unacceptable concentrations of contaminants in the pond. In this case, transfers or discharges will be postponed until the last possible moment, unless dam safety considerations take precedent.

2. Analytical results demonstrating acceptable water quality are received concurrent with reaching the Action Level, no dam problems are observed and no precipitation is forecast. In this case, normal operations will be followed.

6.3.1 Pond A-1

Pond A-1 will potentially receive water from non-routine diversions of North Walnut Creek and from the Landfill Pond under emergency conditions. Pond A-1 will be maintained and used as the primary emergency spill control pond for the North Walnut Creek drainage until such time as OU 6 remediation efforts warrant its removal or replacement. The Operations Plan for Pond A-1 is given in Table 6-4.

TABLE 6-4
POND A-1 OPERATIONS PLAN

	Elevation	Volume	%Full	Operational Mode
Maximum (spillway) Capacity	5929.1 ft	1.40 Mgal	100%	Emergency
Action Level	25828.6 ft	1.23 Mgal	88%	Emergency*
Action Level	15828.1 ft	1.06 Mgal	76%	Normal*
Preferred Operations Range	5827.3 ft 5825.9 ft	0.84 Mgal 0.42 Mgal	60% 30%	Normal*
Minimum Pool	5824.5 ft	0.14 Mgal	10%	Normal

* Modified by water quality considerations.

Normal Operation

Pond A-1 will maintain a minimum pool elevation of approximately 5824.5 feet, so that sediments do not dry out and become a potential source of fugitive dust emissions. Pre-operational sampling will be initiated at any time the pond exceeds 30 percent volume.

Sampling and analysis for Pond A-1 specific COCs (see Table 2-11) will be conducted prior to initiating actual operations. Pre-operational sampling will not be conducted until inflows or precipitation has ceased, unless Action Level 1 has been reached. New, or additional samples will always be taken at Action Level 1, regardless of inflow conditions. Analytical results will determine the allowable course or courses of action. (See also Section 3.7.) Allowable operations versus analytical results are as follows in Table 6-5.

TABLE 6-5
POND A-1 ANALYTICAL RESULTS AND ALLOWABLE OPERATIONS

Analytical Results	Allowable Operations
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable	Transfer to Pond A-2, OR Conduct Spray Evaporation
COCs meet SDWA MCLs (or modified Segment 5 standards for 9 parameters), Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable.	Conduct Spray Evaporation
COCs do not meet the above criteria	Treatment (To be determined in conjunction with Regulatory Agencies)

The preferred operation at Pond A-1 is to transfer water meeting standards to Pond A-2. Alternatively, small volume may be controlled by spray evaporation, assuming the new spray system is in place and operational (Option 4.7.1.4). Transfers will always take precedent when the pond volume is above 60 percent capacity, or during weather conditions which are not conducive to spray evaporation. Spray evaporation operations, transfer operations, monitoring, and reporting will be in accordance with adopted benchmarks and approved SOPs.

Emergency Operations

Pond A-1 will be transferred to Pond A-2, prior to receipt of analytical results, under the following conditions:

1. The water elevation is within 0.5 feet of the spillway elevation, and further precipitation or inflow is predicted.

   OR

2. The water elevation is at spillway elevation (uncontrolled overflow is imminent).

   OR

3. Any one or more of the following Dam Safety/Stability conditions exist, regardless of pond elevation:

   - Turbid seepage at or near the toe of the dam.
   - Transverse cracking on embankment crest or abutments.
   - Escarpments or slumping on the embankment crest, embankment slopes, or side slopes.
   - Leakage or seepage at the outlet works.
   - Abrupt piezometer response.

Treatment of water in Pond A-1, if required, is automatically considered an emergency operation. Unless other emergency conditions take precedent, treatment operations will commence as soon possible using mobile treatment units. Treatment system discharges will be recycled to Pond A-1 until analytical results indicate applicable benchmarks for transfer to Pond A-2 have been met. Once benchmarks have been achieved, treatment system discharges will be sent directly to Pond A-2.

Uncontrolled overflow of confirmed contaminated water from Pond A-1 to Pond A-2 is to be avoided if Pond A-2 is at a level where it may overflow to Pond A-3. If treatment systems are not in place, overflow of Pond A-1 is imminent, and the volume of Pond A-2 is above Action Level 1, Pond A-1 water may be transferred under emergency conditions to emergency spill control ponds B-1 or B-2 as needed.

6.3.2 Pond A-2

Pond A-2 will be maintained as a secondary emergency spill control pond, until such time as OU 6 remediation efforts warrant its removal or replacement. Pond A-2 will potentially receive pumped inputs from Pond A-1, Pond B-2 and the Landfill Pond under emergency conditions. (See also Section 3.7.) The Operation Plan for Pond A-2 is given below in Table 6-6.

TABLE 6-6
POND A-2 OPERATIONS PLAN

	Elevation	Volume	%Full	Operational Mode
Maximum (spillway) Capacity	5816.9 ft	6.03 Mgal	100%	Emergency
Action Level 2	5816.4 ft	5.57 Mgal	93%	Emergency*
Action Level 1	5816.1 ft	5.33 Mgal	89%	Normal*
Preferred Operations Range	5813.7 ft	3.64 Mgal	60%	Normal*
	5810.4 ft	1.81 Mgal	30%	
Minimum Pool	5806.7 ft	0.60 Mgal	10%	Normal

* Modified by water quality considerations.

Normal Operations

A minimum pool elevation of 5806.7 feet (10 percent) will be maintained to prevent pond sediments from drying out and becoming a potential source of fugitive dust emissions. Pre-operational sampling will be initiated at any time the pond exceeds 30 percent volume.

Sampling and analysis for Pond A-2 specific COCs (see Table 2-11) will be conducted prior to initiating actual operations. Pre-operational sampling will not be conducted until inflows or precipitation has ceased, unless Action Level 1 has been reached. New, or additional samples will always be taken at Action Level 1, regardless of inflow condition. Analytical results will determine the allowable course or courses of action. (See also Section 3.7.) Allowable operations versus analytical results are in Table 6-7.

TABLE 6-7
POND A-2 ANALYTICAL RESULTS VERSUS OPERATIONS

Analytical Results	Allowable Operations
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable	Transfer to Pond A-3, OR Conduct Spray Evaporation
COCs meet SDWA MCLs (or modified Segment 5 standards for 9 parameters), Statewide Domestic Water Suppoly standards, or Statewide Groundwater Quality standards, as applicable	Conduct Spray Evaporation
COCs do not meet the above criteria	Treatment (To be determined in conjunction with Regulatory Agencies)

Within the preferred operations range pond volume will generally be controlled by transfers to Pond A-3, with minor water volumes controlled by spray evaporation. Transfers will always take precedent when the pond volume is above 60 percent capacity, or during weather conditions which are not conducive to spray evaporation. Spray evaporation operations, transfer operations, monitoring, and reporting will be in accordance with adopted benchmarks (see Sections 3.6 and 3.7) and approved SOPs.

Emergency Operations

Pond A-2 will be transferred to Pond A-3, prior to receipt of final analytical results, only if preliminary analytical results do not indicate probable contamination, and only under the following conditions:

1. The water elevation is within 0.5 feet of the spillway elevation, and further precipitation or inflow is predicted.

   OR

2. The water elevation is at spillway elevation (uncontrolled overflow is imminent).

   OR

3. Any one or more of the following Dam Safety/Stability conditions exist, regardless of pond elevation:

- Turbid seepage at or near the toe of the dam.
- Transverse cracking on embankment crest or abutments.
- Escarpments or slumping on the embankment crest, embankment slopes, or side slopes.
- Leakage or seepage at the outlet works.
- Abrupt piezometer response.

Treatment of water in Pond A-2, if required, is automatically considered an emergency operation. Unless other emergency conditions take precedent, treatment operations will commence as soon possible using mobile treatment units, with treatment system discharges returned to Pond A-2 until water quality analysis indicates standards for transfer to Pond A-3 have been met. Treatment system discharges will then be pumped directly to Pond A-3.

Uncontrolled overflow of confirmed contaminated water from Pond A-2 to Pond A-3 is to be avoided if at all possible. If treatment systems are not in place, and overflow is imminent, contaminated A-2 water may be transferred under emergency conditions to any other emergency spill control pond (A-1, B-1, B-2) as needed.

6.3.3 Pond A-3

Pond A-3 will receive normal baseflow and stormwater runoff from the North Walnut Creek drainage, and transfers from Pond A-2 meeting applicable water quality standards. Discharges from Pond A-3 will be routed either by pipeline or through Pond A-4 to Segment 4. The Operations Plan for Pond A-3 is given below in Table 6-8.

TABLE 6-8
POND A-3 OPERATIONS PLAN

	Elevation	Volume	%Full	Operational Mode
Maximum (spillway) Capacity	5793.0 ft	12.40 Mgal	100%	Emergency
Action Level 2	5792.5 ft	11.64 Mgal	94%	Emergency*
Action Level 1	5790.1 ft	8.44 Mgal	76%	Normal*
Preferred Operations Range	5788.1 ft	6.20 Mgal	60%	Normal*
	5781.5 ft	1.29 Mgal	10%	
Minimum Pool	5781.5 ft	1.29 Mgal	10%	Normal

* Modified by water quality considerations.

Normal Operations

Inflows, pond levels and dam piezometers will be monitored per SOPs. Pre-discharge sampling of Pond A-3 will be initiated at any time the volume reaches 25 percent of capacity. Pre-discharge sampling will not be conducted until transfers from Pond A-2 have ceased, and at least 24 hours have passed since the end of a storm event which is providing stormwater inflows to Pond A-3. Analysis for Pond A-3 specific COCs (see Table 2-11) will be conducted prior to initiating actual operations. Analytical results will determine the allowable course or courses of action. (See also Section 3.7.) Allowable operations versus analytical results are as follows in Table 6-9.

TABLE 6-9
POND A-3 ANALYTICAL RESULTS VERSUS OPERATIONS

Analytical Results	Allowable Operations
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable	Discharge to Pond A-4 with flow through, OR Direct Discharge to Segment 4 via pipeline
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, for all parameters except the nine modified Segment 5 parameters, as applicable, but do meet modified Segment 5 standards for the 9 specified parameters.	Evaluate further - possible treatment, possible discharge
COCs do not meet the above criteria	Pipe to A-4 Facility for Direct Treatment OR, Transfer to Pond A-4 for Batch Treatment (Note: Treatment to be determined in conjunction with Regulatory Agencies)

The preferred method of conducting normal discharge of Pond A-3 is through the outlet works for A-3 at the same time that the outlet works for Pond A-4 is open, allowing direct flow through to North Walnut Creek. Alternatively, Pond A-3 may be discharged via pump and pipeline directly to North Walnut Creek below the A-4 dam. Discharge from Pond A-3 will be temporarily discontinued (and the outlet works for both A-4 and A-3 will be closed if open) if precipitation greater than one-quarter inch has fallen within the last 24 hours. Discharge will be re-initiated without re-sampling only if all four of the following conditions are met:

1. At least 24 hours has passed since the end of the storm event.

2. No spill events affecting the North Walnut Creek basin are suspected.

3. No transfers from Pond A-2 have occurred.

4. Total increase in Pond A-3 due to the storm is less than 15 percent (1.93 Mgal).

If Pond A-3 was previously discharging through Pond A-4, and Pond A-4 is receiving or has received other inflows, Pond A-3 discharge may be re-initiated using the direct pipeline method. If these conditions are not met, or if more than 7 days have passed since discharge was discontinued, regardless of inflows, Pond A-3 will be held and resampled.

Emergency Operations

Emergency releases of Pond A-3 to Pond A-4, prior to receipt of final analytical results, will occur under the following conditions:

1. The water elevation is within 0.5 feet of the spillway elevation, and further precipitation or inflow is predicted.

   OR

2. The water elevation is at spillway elevation (uncontrolled overflow is imminent).

   OR

3. Any one or more of the following Dam Safety/Stability conditions exist, regardless of pond elevation:

   - Turbid seepage at or near the toe of the dam.
   - Transverse cracking on embankment crest or abutments.
   - Escarpments or slumping on the embankment crest, embankment slopes, or side slopes.
   - Leakage or seepage at the outlet works.
   - Abrupt piezometer response.

   OR

4. Overtopping of Pond A-2 is imminent (see below).

If the potential exists for overflow of Pond A-2 to Pond A-3, every effort will be made to minimize the potentially impacted water volume in Pond A-3 subject to potential contamination from Pond A-2. Since Pond A-3 water quality is routinely of high quality, Pond A-3 will be released to Pond A-4 to avoid potential future treatment of a much larger than volume of water than is necessary.

Treatment of water in Pond A-3, if required, is automatically considered an emergency operation. Unless other emergency conditions take precedent, treatment operations will commence as soon as possible. Water in Pond A-3 requiring treatment will be transferred to Pond A-4 for further batch treatment, or directly to the A-4 treatment facility.

6.3.4 Pond A-4

Pond A-4 will receive routine discharges from Pond A-3 and non-routine transfers from Ponds A-3, B-5 and/or C-2 only. Pond A-4 will be used to pass through routine discharges from Pond A-3, for storage of emergency stormwater overflows from A-3, B-5 and/or C-2, and/or for storage of questionable stormwater from ponds A-3, B-5 and/or C-2 that may require treatment prior to discharge. Pond A-4 will discharge directly to North Walnut Creek below the A-4 dam. The Operations Plan for Pond A-4 is given below in Table 6-10.

TABLE 6-10
POND A-4 OPERATIONS PLAN

	Elevation	Volume	%Full	Operational Mode
Maximum (spillway) Capacity	5757.9 ft	32.50 Mgal	100%	Emergency
Action Level 2	5756.9 ft	29.73 Mgal	92%	Emergency*
OR				
Crest Piezometer (DH-A1) Safety Elevation	5735.0 ft			Emergency*
Toe Piezometer (DH-A2) Safety Elevation	Not Specified			
Action Level 1	5751.8 ft	17.77 Mgal	55%	Normal*
Preferred Operations Range	5751.8 ft 5741.0 ft	17.77 Mgal 3.24 Mgal	55% 10%	Normal*
Minimum Pool	5741.0 ft	3.24 Mgal	10%	Normal

* Modified by water quality considerations.

Normal Operations

The water level in Pond A-4 will be maintained as close to 10 percent volume as possible in order to maximize available emergency storage capacity. The preferred operations plan for Pond A-4 is to conduct pre-discharge sampling for pond-specific COCs (see Table 2-11) concurrently with pre-discharge sampling for Pond A-3, and to discharge Pond A-4 through its outlet works concurrently with discharges from Pond A-3. Sampling will always be initiated when Action Level 1 is reached. Inflows, piezometer levels, and indicator water quality parameters will be monitored per adopted benchmarks and SOPs. Analytical results will determine the allowable course or courses of action. (See also Section 3.7.) Allowable operations versus analytical results are as follows in Table 6-11.

TABLE 6-11
POND A-4 ANALYTICAL RESULTS VERSUS OPERATIONS

Analytical Results	Allowable Operations
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable	Discharge to Segment 4 with or without flow through from Pond A-3, OR Discharge to Segment 4 via pipeline
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, for all parameters except the nine modified Segment 5 parameters, as applicable, but do meet modified Segment 5 standards for the 9 specified parameters.	Evaluate further - possible treatment, possible discharge
COCs do not meet the above criteria	Pump to A-4 Facility for Treatment and Discharge (Note: Treatment to be determined in conjunction with Regulatory Agencies)

Discharges of Pond A-4 will be discontinued when any transfer from Pond B-5 or Pond C-2 is being conducted. New inflows, other than direct precipitation or discharges from Pond A-3 under normal flowthrough conditions, will require resampling prior to discharge.

Emergency Operations

Emergency conditions at Pond A-4 include potential uncontrolled overflow, dam safety or dam stability concerns, and the presence of contamination in the pond requiring the initiation of treatment operations. Emergency discharge of Pond A-4 to North Walnut Creek, prior to the receipt of analytical results, will occur only under the following conditions:

1. The water elevation is within 1.0 feet of the spillway elevation, further precipitation or inflow is predicted, and preliminary water quality analysis indicates no contamination.

   OR

2. The water elevation is at spillway elevation (uncontrolled overflow is imminent) and preliminary water quality analysis indicates no contamination.

   OR

3. Any one or more of the following Dam Safety/Stability conditions exist, regardless of pond elevation or water quality:

   - Turbid seepage at or near the toe of the dam.
   - Transverse cracking on embankment crest or abutments.
   - Escarpments or slumping on the embankment crest, embankment slopes, or side slopes.
   - Leakage or seepage at the outlet works.
   - Abrupt piezometer response.

The above emergency operations are subject to modification by the SOP for Water Detention Pond Dam Failure (1-15200-EPIP-12.14) which is part of the RFP Emergency Preparedness Implementation Plan. In the case of discrepancies between the above described operations, and the SOP, the SOP will take precedent.

Emergency discharge of Pond A-4, routed through the A-4 treatment facilities, will occur when the water elevation is within 1.0 feet of the spillway elevation, further precipitation or inflow is predicted, and preliminary water quality analysis is inconclusive or indicates probable contamination.

The confirmed presence of contaminants in Pond A-4 requiring treatment is automatically considered an emergency condition. Unless other emergency conditions take precedent, treatment operations will commence as soon as possible using the existing A-4 treatment facilities, with treatment system discharges returned to Pond A-4 until water quality analysis indicates standards for discharge have been met. Treatment system discharges will then be pumped directly to North Walnut Creek below the A-4 dam.

6.3.5 Pond B-1

Pond B-1 will be maintained and used as the primary emergency spill control pond for South Walnut Creek until such time as OU 6 remediation efforts warrant its removal or replacement. Pond B-1 will receive stormwater diversions from the Central Avenue ditch and piped diversions of questionable STP effluent. The Operations Plan for Pond B-1 is given below in Table 6-12.

TABLE 6-12
POND B-1 OPERATIONS PLAN

	Elevation	Volume	%Full	Operational Mode
Maximum (spillway) Capacity	5882.0 ft	1.14 Mgal	100%	Emergency
Action Level 2	5881.5 ft	1.00 Mgal	88%	Emergency*
Action Level 1	5880.7 ft	0.80 Mgal	70%	Normal*
Preferred Operations Range	5880.3 ft 5878.6 ft	0.69 Mgal 0.34 Mgal	60% 30%	Normal*
Minimum Pool	5877.0 ft	0.11 Mgal	10%	Normal

* Modified by water quality considerations.

Normal Operations

A minimum pool elevation of 5877 feet (10 percent) will be maintained in Pond B-1 so that sediments do not dry out and become a potential source of fugitive dust emissions. Pre-operational sampling will be initiated at any time the pond exceeds 30 percent volume.

Sampling and analysis for Pond B-1 specific COCs (see Table 2-11) will be conducted prior to initiating actual operations. Pre-operational sampling will not be conducted until inflows or precipitation has ceased, unless Action level 1 has been reached. New, or additional sampling will always be conducted at Action Level 1 regardless of inflow conditions. Analytical results will determine the allowable course or courses of action. (See also Section 3.7.) Allowable operations versus analytical results are as follows in Table 6-13.

TABLE 6-13
POND B-1 ANALYTICAL RESULTS VERSUS OPERATIONS

Analytical Results	Allowable Operations
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable	Transfer to Pond B-2, OR Conduct Spray Evaporation
COCs meet SDWA MCLs (or modified Segment 5 standards for 9 parameters), Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable.	Conduct Spray Evaporation
COCs do not meet the above criteria	Treatment (To be determined in conjunction with Regulatory Agencies)

The preferred operation at pond B-1 is to transfer water meeting standards to Pond B-2. Alternatively, small volume may be controlled by spray evaporation, assuming the new spray system is in place and operational (Option 4.7.1.4). Transfers will always take precedent when the pond level is above 60 percent capacity, or during weather conditions which are not conducive to spray evaporation. Spray evaporation operations, transfer operations, monitoring, and reporting will be in accordance with adopted benchmarks (see Section 3.6) and approved SOPs.

Emergency Operations

Pond B-1 will be transferred to Pond B-2, prior to receipt of analytical results, under the following conditions:

1. The water elevation is within 0.5 feet of the spillway elevation, and further precipitation or inflow is predicted.

   OR

2. The water elevation is at spillway elevation, regardless of inflow conditions (uncontrolled overflow is imminent).

   OR

3. Any one or more of the following Dam Safety/Stability conditions exist, regardless of pond elevation:

   - Turbid seepage at or near the toe of the dam.
   - Transverse cracking on embankment crest or abutments.
   - Escarpments or slumping on the embankment crest, embankment slopes, or side slopes.
   - Leakage or seepage at the outlet works.
   - Abrupt piezometer response.

Treatment of water in Pond B-1, if required, is automatically considered an emergency operation. Unless other emergency conditions take precedent, treatment operations will commence as soon as possible using mobile treatment units, with treatment system discharges returned to Pond B-1 until water quality analysis indicates applicable benchmarks for transfer to Pond B-2 have been met. Once benchmarks have been achieved, treatment system discharges will be pumped directly to Pond B-2. Monitoring and reporting for Pond B-1 will be conducted in accordance with approved SOPs.

Uncontrolled overflow of confirmed contaminated water from Pond B-1 to Pond B-2 is to be avoided if Pond B-2 is at a level where it may overflow to Pond B-3. If treatment systems are not in place, overflow of Pond B-1 is imminent, and the volume of Pond B-2 is above Action Level 1, Pond B-1 water may be transferred under emergency conditions to emergency spill control ponds A-1, and/or A-2 as needed.

6.3.6 Pond B-2

Pond B-2 will be maintained and used as a secondary emergency spill control pond for South Walnut Creek until such time as OU 6 remediation efforts warrant its removal or replacement. Pond B-2 will potentially receive pumped transfers from Pond B-1 or direct inputs from the STP. The Operations Plan for Pond B-2 is given below in Table 6-14

TABLE 6-14
POND B-2 OPERATIONS PLAN

	Elevation	Volume	%Full	Operational Mode
Maximum (spillway) Capacity	5868.9 ft	1.50 Mgal	100%	Emergency
Action Level 2	5868.4 ft	1.38 Mgal	92%	Emergency*
Action Level 1	5867.6 ft	1.17 Mgal	78%	Normal*
Preferred Operations Range	5866.6 ft 5864.5 ft	0.91 Mgal 0.45 Mgal	60% 30%	Normal*
Minimum Pool	5862.4 ft	0.14 Mgal	10%	Normal

* Modified by water quality considerations.

Normal Operations

A minimum pool elevation of 5862.4 feet (10 percent) will be maintained in Pond B-2 so that sediments do not dry out and become a potential source of fugitive dust emissions. Pre-operational sampling will be initiated at any time the pond exceeds 30 percent volume.

Sampling and analysis for Pond B-2 specific COCs (see Table 2-11) will be conducted prior to initiating actual operations. Pre-operational sampling will not be conducted until inflows/ precipitation has ceased, unless Action level 1 has been reached. New, or additional sampling will always be conducted at Action Level 1 regardless of inflow conditions. Analytical results will determine the allowable course or courses of action. (See also Section 3.7.) Allowable operations versus analytical results are as follows in Table 6-15.

TABLE 6-15
POND B-2 ANALYTICAL RESULTS VERSUS OEPRATIONS

Analytical Results	Allowable Operations
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable	Transfer to Pond B-3, OR Transfer to Pond A-2, OR Conduct Spray Evaporation
COCs meet SDWA MCLs (or modified Segment 5 standards for 9 parameters), Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable.	Transfer to Pond A-2, OR Conduct Spray Evaporation
COCs do not meet the above criteria	Treatment (To be determined in conjunction with Regulatory Agencies)

The preferred operation at pond B-2 is to transfer water meeting standards to Pond B-3. Alternatively, small volume may be controlled by spray evaporation, assuming new spray system are in place and operational (Option 4.7.1.4), or may be transferred to Pond A-2 if a spray evaporation system is operational at that pond. Transfers will always take precedent when the pond level is above 60 percent capacity, or during weather conditions which are not conducive to spray evaporation. Spray evaporation operations, transfer operations, monitoring, and reporting will be in accordance with adopted benchmarks (see Section 3.6) and approved SOPs.

Emergency Operations

Pond B-2 will be transferred to Pond A-2, prior to receipt of analytical results, under the following conditions:

1. The water elevation is within 0.5 feet of the spillway elevation, and further precipitation or inflow is predicted.

   OR

2. The water elevation is at spillway elevation, regardless of inflow conditions (uncontrolled overflow is imminent).

   OR

3. Any one or more of the following Dam Safety/Stability conditions exist, regardless of pond elevation:

   - Turbid seepage at or near the toe of the dam.
   - Transverse cracking on embankment crest or abutments.
   - Escarpments or slumping on the embankment crest, embankment slopes, or side slopes.
   - Leakage or seepage at the outlet works.
   - Abrupt piezometer response.

Treatment of water in Pond B-2, if required, is automatically considered an emergency operation. Unless other emergency conditions take precedent, treatment operations will commence as soon possible using mobile treatment units, with treatment system discharges returned to Pond B-2 until water quality analysis indicates applicable benchmarks for transfer to Pond B-3 have been met. Once benchmarks have been achieved, treatment system discharges will be pumped directly to Pond B-3. Monitoring and reporting for Pond B-2 will be conducted in accordance with approved SOPs.

Uncontrolled overflow of confirmed contaminated water from Pond B-2 to Pond B-3 is to be avoided if at all possible. If treatment systems are not in place, overflow of Pond B-2 is imminent, Pond B-2 water may be transferred under emergency conditions to any other emergency spill control ponds (B-1, A-1, and/or A-2) as needed.

6.3.7 Pond B-3

Pond B-3 will continue to receive routine discharges of treated STP effluent on a daily basis. Pond B-3 will also receive infrequent, short term transfers from Pond B-2, after the water in Pond B-2 has been tested against applicable water quality criteria. Routine daily discharge of Pond B-3 to Pond B-4 will occur during daylight hours only to allow visual inspection for abnormal conditions.

A contamination event in Pond B-3 is unlikely, due to the stringent monitoring requirements placed on both potential influent sources (Pond B-2 or the STP). The most credible source of a contamination event in Pond B-3 is an upset condition at the STP. Effluent monitoring at the STP (as required by the NPDES permit) provides a high degree of confidence that upset conditions will be detected almost immediately. Under STP upset conditions, STP effluent will be re-directed to Pond B-1 or Pond B-2. Pond B-3 discharges will also be discontinued, and the pond will be sampled and analyzed.

Once upset conditions have cleared, STP effluent will be directed to Pond B-4 by opening (and closing) the appropriate valves on the STP discharge pipe. Any treatment needed at Pond B-3 will be accomplished using mobile treatment units. Treatment system discharges will be recycled to Pond B-3 until water quality analysis indicates applicable benchmarks for transfer to Pond B-4 have been met. Once benchmarks have been achieved, treatment system discharges will be pumped directly to Pond B-4 until Pond B-3 is emptied of its volume. Re-initiation of normal STP discharges to Pond B-3 will occur after treatment operations have ceased.

6.3.8 Pond B-4

Pond B-4 will receive daily discharges from Pond B-3, and stormwater runoff through the B-1 bypass pipe. No active management of Pond B-4 will occur. Pond B-4 has no usable storage volume, is maintained at 100 percent volume at all times, and discharges over its spillway directly to Pond B-5.

6.3.9 Pond B-5

Pond B-5 will be maintained as the primary stormwater detention pond for the South Walnut Creek drainage. Pond B-5 will receive STP effluent via Ponds B-3 and B-4, and normal stormwater runoff from the South Walnut Creek drainage basin, including the Central Avenue Ditch. Pond B-5 can also accept water transfers from Pond C-2 via pipeline. Pond B-5 can discharge directly to South Walnut Creek through its outlet works, or can be pumped to South Walnut Creek or to Pond A-4. The Operations Plan for Pond B-5 is given below in Table 6-16.

TABLE 6-16
POND B-5 OPERATIONS PLAN

	Elevation	Volume	%Full	Operational Mode
Maximum (spillway) Capacity	5804.0 ft	24.19 Mgal	100%	Emergency
Action Level 2 OR	5803.0 ft	22.26 Mgal	92%	Emergency*
Crest Piezometer (WH-2) Safety Elevation	5785.0 ft			Emergency*
Toe Piezometer (WH-4) Safety Elevation	5757.0 ft			Emergency*
Action Level 1	5798.4 ft	17.08 Mgal	71%	Normal*
Preferred Operations Range	5798.4 ft	13.25 Mgal	55%	Normal*
Minimum Pool	5784.9 ft	2.43 Mgal	10%	Normal

* Modified by water quality considerations.

Normal Operations

The water level in Pond B-5 will be maintained as close to 10 percent volume as possible in order to maximize available stormwater storage capacity. Inflows, piezometer levels, and indicator water quality parameters will be monitored per adopted benchmarks and SOP's. The preferred operations plan for Pond B-5 is to perform daily discharges concurrent with daily discharges from Pond B-3, matching both the flow and total volume of the releases from Pond B-3. Daily discharges from Pond B-5 in conjunction with discharges from Pond B-3 will be conducted during daylight hours only.

Discharges from Pond B-5 will be discontinued if precipitation greater than one-quarter inch has fallen within the past 24 hours. Discharge will be re-initiated without re-sampling only if all four of the following conditions are met:

1. At least 24 hours has passed since the end of the storm event.

2. No spill events affecting the South Walnut Creek basin are suspected.

3. No transfers from Pond C-2 have occurred.

4. Total increase in Pond B-5 due to the storm is less than 15 percent (3.6 Mgal).

If any of the above conditions are not met, or if more than seven days have passed since discharge was discontinued, Pond B-5 will be held and sampled for pond-specific COCs (see Table 2-11) prior to initiating discharge. Analytical results will determine the allowable course or courses of action. (See also Section 3.7.) Allowable operations versus analytical results are as follows in Table 6-17.

TABLE 6-17
POND B-5 ANALYTICAL RESULTS VERSUS OPERATIONS

Analytical Results	Allowable Operations
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable	Discharge Pond B-5 through the outlet works to Segment 4, OR Discharge to Segment 4 via pipeline
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, for all parameters except the nine modified Segment 5 parameters, as applicable, but do meet modified Segment 5 standards for the 9 specified parameters.	Evaluate further - possible treatment, possible discharge
COCs do not meet the above criteria	Transfer to Pond A-4 for batch treatment (Note: Treatment to be determined in conjunction with Regulatory Agencies)

If necessary, the flow rate of discharge from B-5 will be increased over the flow rate from Pond B-3 so as to re-achieve a 10 percent volume as soon as possible, subject to drawdown limitations imposed by dam stability concerns.

Emergency Operations

Emergency conditions at Pond B-5 include potential uncontrolled overflow, dam safety/dam stability concerns, and the presence of contamination in the pond requiring the initiation of treatment operations. Emergency discharge of Pond B-5 through the outlet works to South Walnut Creek, or by pipeline to Pond A-4, or both, prior to the receipt of analytical results, will occur under the following conditions:

1. Any one or more of the following Dam Safety/Stability conditions exist, regardless of pond elevation or water quality:

   - Turbid seepage at or near the toe of the dam.
   - Transverse cracking on embankment crest or abutments.
   - Escarpments or slumping on the embankment crest, embankment slopes, or side slopes.
   - Leakage or seepage at the outlet works.
   - Abrupt piezometer response.

2. The water elevation is at spillway elevation, regardless of inflow conditions (uncontrolled overflow is imminent).

Emergency transfer of Pond B-5 to Pond A-4 *only* will occur when the water elevation is within 1.0 feet of the spillway elevation, further precipitation or inflow is predicted, there are no dam safety concerns, and preliminary water quality analysis is inconclusive or indicates probable contamination.

The above emergency operations are subject to modification by the SOP for Water Detention Pond Dam Failure (1-15200-EPIP-12.14) which is part of the RFP Emergency Preparedness Implementation Plan. In the case of discrepancies between the above described operations, and the SOP, the SOP will take precedent.

The confirmed presence of contaminants requiring treatment is automatically considered an emergency condition. Unless other emergency conditions take precedent, water in Pond B-5 requiring treatment will be transferred to Pond A-4 for treatment at the A-4 treatment facility.

Inflows, pond level, dam piezometers and ambient pond water quality will be monitored per approved SOPs. Discharges from Pond B-5 to Segment 4 will be conducted in accordance with the adopted benchmarks and approved SOPs for Pond B-5 discharges, including monitoring and reporting provisions.

6.3.10 Pond C-2

Pond C-2 will be maintained as the primary stormwater detention pond for runoff originating from the south side of the developed plant site. Pond C-2 will receive stormwater runoff, and effluent from the OU 1 treatment facilities, through the South Interceptor Ditch. The Operations Plan for Pond C-2 is given below in Table 6-18.

TABLE 6-18
POND C-2 OPERATIONS PLAN

	Elevation	Volume	%Full	Operational Mode
Maximum (spillway) Capacity	5765.3 ft	22.60 Mgal	100%	Emergency
Action Level 2	5764.3 ft	19.96 Mgal	88%	Emergency*
OR				
Crest Piezometer (DH-C1) Safety Elevation	5755.0 ft			Emergency*
Toe Piezometer (DH-C2) Safety Elevation	5737.0 ft			Emergency*
Action Level 1	5760.9 ft	12.43 Mgal	55%	Normal*
Preferred Operations Range	5760.9 ft	12.43 Mgal	55%	Normal*
	5753.4 ft	2.32 Mgal	10%	
Minimum Pool	5753.4 ft	2.32 Mgal	10%	Normal

* Modified by water quality considerations.

Normal Operations

Pond C-2 will be maintained between 10 and 30 percent volume in order to maximize available stormwater storage capacity while allowing sufficient availability for recycling. The preferred operations plan for Pond C-2 is to recycle as much water as possible from Pond C-2 to the RFP Industrial Water System, and discharge any excess water to Segment 4 via pipeline to South Walnut Creek.

Pre-discharge or pre-recycle sampling will be initiated at any time the pond is above 20 percent. Analysis for Pond C-2 specific COCs (see Table 2-11) will be conducted prior to initiating actual operations. Analytical results will determine the allowable course or courses of action. (See also Section 3.7.) Allowable operations versus analytical results are as follows in Table 6-19.

TABLE 6-19
POND C-2 ANALYTICAL RESULTS VERSUS OPERATIONS

Analytical Results	Allowable Operations
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable	Discharge Pond C-2 to South Walnut Creek below Pond B-5 via pipeline, AND/OR, Recycle
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, for all parameters except the nine modified Segment 5 parameters, as applicable, but do meet modified Segment 5 standards for the 9 specified parameters.	Evaluate further - possible treatment, possible recycle, possible discharge
COCs do not meet the above criteria	Treatment at Pond C-2, OR Transfer to Pond A-4 for batch treatment (Note: Treatment to be determined in conjunction with Regulatory Agencies)

Discharges and recycle operations from Pond C-2 will be discontinued if precipitation greater than one-quarter inch has fallen within the past 24 hours. Discharge will be re-initiated without re-sampling only if all three of the following conditions are met:

1. At least 24 hours has passed since the end of the storm event.
2. No spill events affecting the South Interceptor Ditch are suspected.
3. Total increase in Pond C-2 due to the storm is less than 15 percent (3.4 Mgal).

If any of the above conditions are not met, or if more than seven days have passed since discharge was discontinued, Pond C-2 will be held and re-sampled for pond-specific COCs (see Table 2-11) prior to initiating discharge.

Inflows, pond level, dam piezometers and ambient water quality will be monitored per approved SOPs. Recycle operations from Pond C-2 to the RFP Industrial Water System will be accomplished in accordance with recycle system SOPs. Discharges from Pond C-2 to Segment 4 will be done in accordance with benchmarks and/or SOPs for these operations, including monitoring and reporting provisions.

Emergency Operations

Emergency conditions at Pond C-2 include potential uncontrolled overflow, dam safety/dam stability concerns, and the presence of contamination in the pond requiring the initiation of treatment operations. Emergency discharge of Pond C-2 to Woman Creek, prior to the receipt of analytical results, will occur when any one or more of the following Dam Safety/Stability conditions exist, regardless of pond elevation or water quality:

- Turbid seepage at or near the toe of the dam.
- Transverse cracking on embankment crest or abutments.
- Escarpments or slumping on the embankment crest, embankment slopes, or side slopes.
- Leakage or seepage at the outlet works.
- Abrupt piezometer response.

Emergency transfer of Pond C-2 to *Pond A-4 only* will occur when the water elevation is within 1.0 feet of the spillway elevation, further precipitation or inflow is predicted, and preliminary water quality analysis is inconclusive or indicates probable contamination.

Emergency transfer of Pond C-2 to *Pond B-5 or A-4* will occur under the following conditions:

1. The water elevation is within 1.0 feet of the spillway elevation, and further precipitation or inflow is predicted.

   OR

2. The water elevation is at spillway elevation, regardless of inflow conditions (uncontrolled overflow is imminent).

The above emergency operations are subject to modification by the SOP for Water Detention Pond Dam Failure (1-15200-EPIP-12.14) which is part of the RFP Emergency Preparedness Implementation Plan. In the case of discrepancies between the above described operations, and the SOP, the SOP will take precedent.

The confirmed presence of contaminants requiring treatment is automatically considered an emergency condition. Water in Pond C-2 requiring treatment will be treated using existing equipment at Pond C-2, if possible, or transferred to Pond A-4 for treatment at the A-4 treatment facility. Unless other emergency conditions take precedent, water in Pond C-2 requiring treatment will be transferred to Pond A-4 for treatment at the A-4 treatment facility.

For water treated at Pond C-2, treatment system discharges will be recycled to the pond until analytical results indicate benchmarks for discharge to Segment 4 have been met. Once compliance with these benchmarks has been demonstrated, treatment system discharges will be pumped directly to South Walnut Creek below Pond B-5.

6.3.11 Landfill Pond

The Landfill Pond will receive direct precipitation and occasional leachate flows from the landfill until such time as OU 7 remedial actions are conducted, and this pond is either removed or replaced. The Operations Plan for the Landfill Pond is given below in Table 6-20.

TABLE 6-20
LANDFILL POND OPERATIONS PLAN

	Elevation	Volume	%Full	Operational Mode
Maximum (spillway) Capacity	5921.0 ft	7.52 Mgal	100%	Emergency
Action Level 2	5920.5 ft	6.86 Mgal	95%	Emergency*
Action Level 1	5916.8 ft	4.36 Mgal	60%	Normal*
Preferred Operations Range	5916.8 ft 5912.5 ft	4.36 Mgal 2.27 Mgal	60% 30%	Normal*
Minimum Pool	5906.8 ft	0.73 Mgal	10%	Normal

* Modified by water quality considerations.

Normal Operations

A minimum pool level of 5806.8 feet (10 percent) will be maintained such that sediments do not dry out and become a potential source of airborne dust emissions. Pond level will normally be controlled by spray evaporation from the east end of the pond only. Spray evaporation will be conducted in accordance with adopted benchmarks and approved SOPs. Pre-operational sampling will be initiated at any time the pond exceeds 30 percent volume.

Analysis for Landfill Pond-specific COCs (see Table 2-11) will be conducted prior to initiating actual operations. Pre-operational sampling will not be conducted until precipitation has ceased, or Action Level 1 has been reached. New or additional samples will always be taken at Action Level 2. Analytical results will determine the allowable course or courses of action. (See also Section 3.7.) Allowable operations versus analytical results are as follows in Table 6-21.

TABLE 6-21
LANDFILL POND ANALYTICAL RESULTS VERSUS OPERATIONS

Analytical Results	Allowable Operations
COCs meet SDWA MCLs, Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable	Transfer to Pond A-1, OR Transfer to Pond A-2, OR Conduct Spray Evaporation
COCs meet SDWA MCLs (or modified Segment 5 standards for 9 parameters), Statewide Domestic Water Supply standards, or Statewide Groundwater Quality standards, as applicable.	Conduct Spray Evaporation
COCs do not meet the above criteria	Treatment (To be determined in conjunction with Regulatory Agencies)

The preferred operation at the Landfill Pond is to transfer water meeting standards to Pond A-2. Alternatively, small volumes may be controlled by spray evaporation. Transfers will always take precedent above 60 percent capacity, or during weather conditions which are not conducive to spray evaporation. Spray evaporation operations, transfer operations, monitoring, and reporting will be in accordance with adopted benchmarks (see Section 3.6) and approved SOPs.

Pond level and dam piezometers will be monitored per approved SOPs. Water quality monitoring will be conducted at both the west and east end of the pond per approved SOPs.

Emergency Operations

The Landfill Pond will be transferred to Pond A-1 or A-2, prior to receipt of analytical results, under the following conditions:

1. The water elevation is within 0.5 feet of the spillway elevation, and further precipitation or inflow is predicted.

   OR

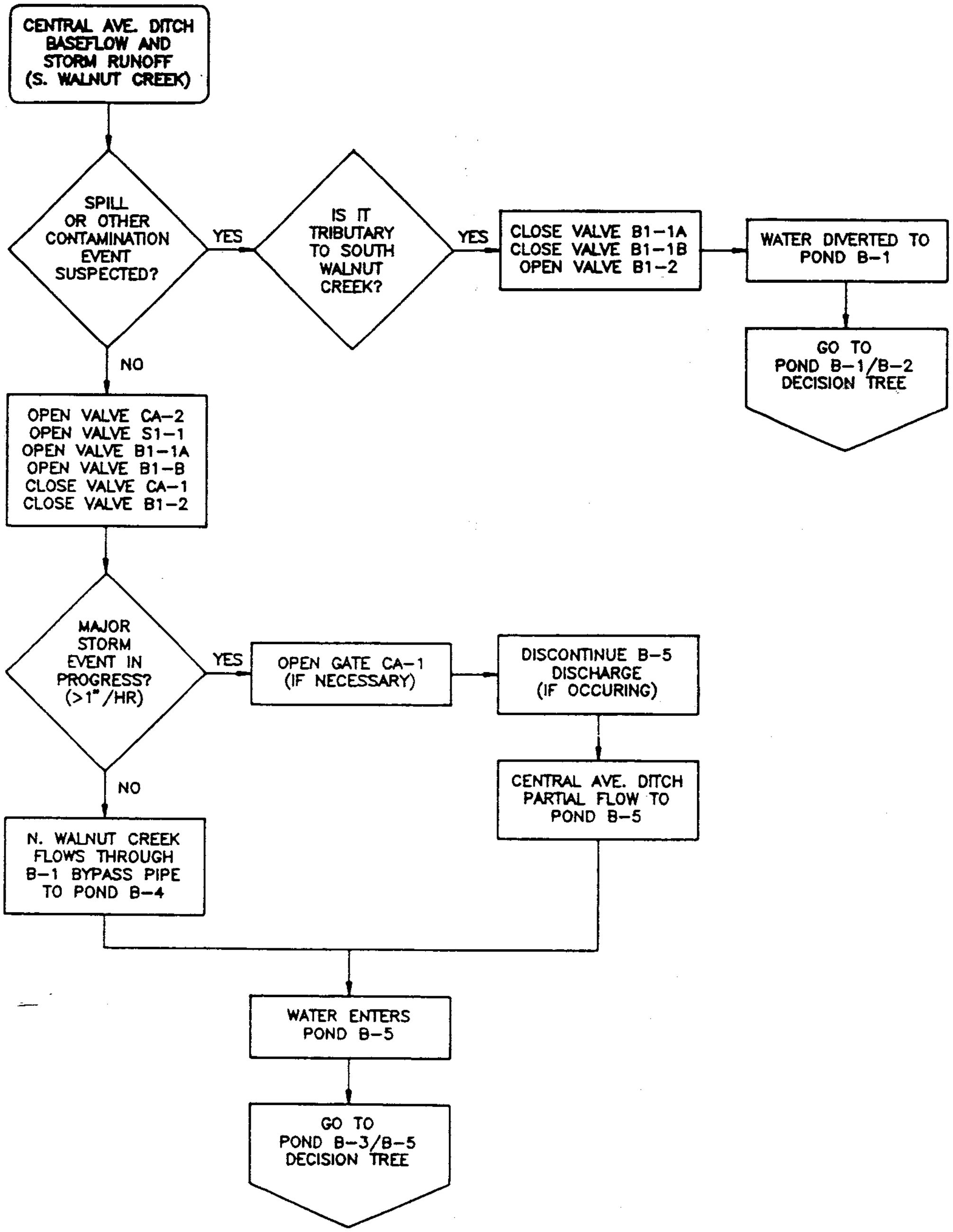
2. The water elevation is at spillway elevation (uncontrolled overflow is imminent).

   OR

3. Any one or more of the following Dam Safety/Stability conditions exist, regardless of pond elevation:

   - Turbid seepage at or near the toe of the dam.
   - Transverse cracking on embankment crest or abutments.
   - Escarpments or slumping on the embankment crest, embankment slopes, or side slopes.
   - Leakage or seepage at the outlet works.
   - Abrupt piezometer response.

Treatment of water at the Landfill Pond is automatically considered an emergency operation. Unless other emergency conditions take precedent, treatment operations will commence as soon possible after contaminant identification and selection of equipment. Within the preferred operations range, treatment of contaminated waters in the Landfill Pond will be accomplished using mobile treatment units, with treatment system discharges returned to the pond until water quality analysis indicates transfer operations to Pond A-1 or A-2 can be conducted. Once compliance with benchmarks for transfer has been demonstrated, treatment system discharges will be piped directly to Pond A-1 or A-2.



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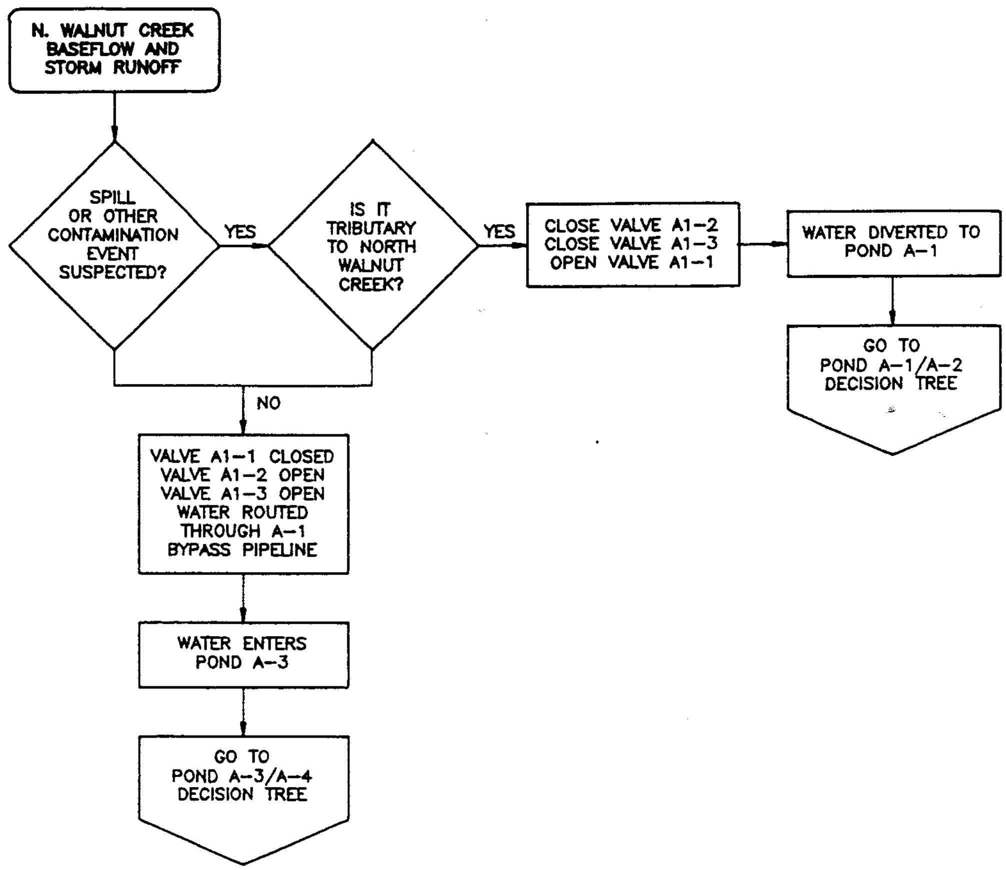
ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 8.1

TITLE:

ROCKY FLATS PLANT SOUTH WALNUT CREEK DECISION TREE

PROJ. NO.	801-004.450	DWG. NO.	XXXXXX	SHEET
DESIGN BY	EWM	CHECKED	XXXXXX	
DRAWN BY	KAL	APPROVED	XXXXXX	OF
DATE	NOVEMBER 18, 1993	SCALE	XXXXXX	



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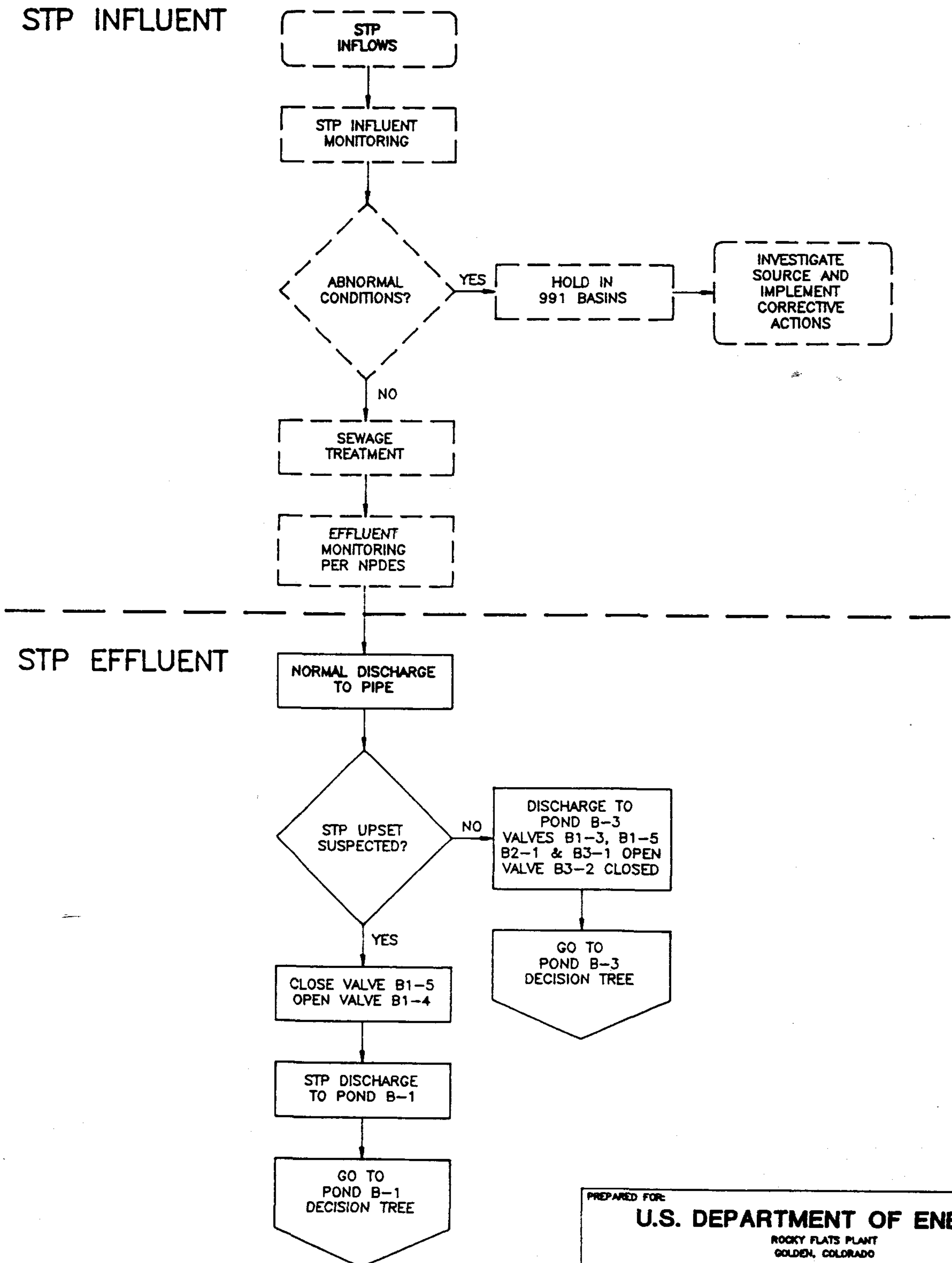
ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 6.2

TITLE:

**ROCKY FLATS PLANT
NORTH WALNUT CREEK
DECISION TREE**

PROJ. NO.	901-004.450	DWG. NO.	XXXXXX	SHEET
DESIGN BY	EWM	CHECKED	XXXXXX	
DRAWN BY	KAL	APPROVED	XXXXXX	OF
DATE	NOVEMBER 18, 1993	SCALE	XXXXXX	



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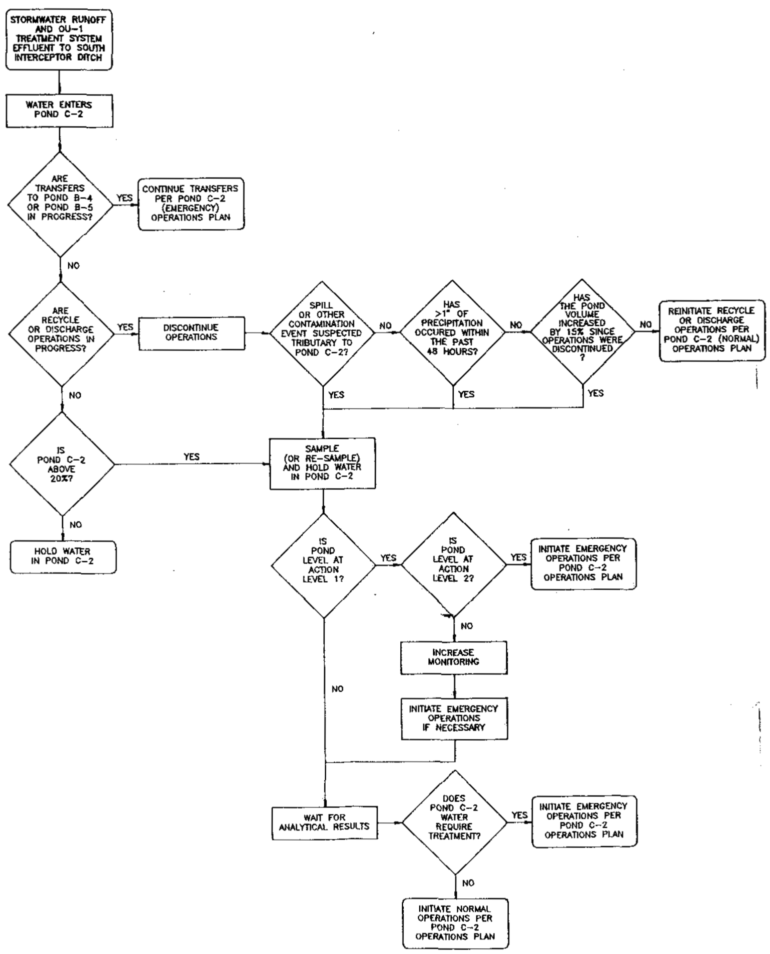
ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 6.3

TITLE:

ROCKY FLATS PLANT STP INFLUENT AND EFFLUENT DECISION TREE

PROJ. NO.	901-004.450	DWG. NO.	XXXXXX	SHEET
DESIGN BY	EWM	CHECKED	XXXXXX	
DRAWN BY	KAL	APPROVED	XXXXXX	OF
DATE	NOVEMBER 19, 1993	SCALE	XXXXXX	



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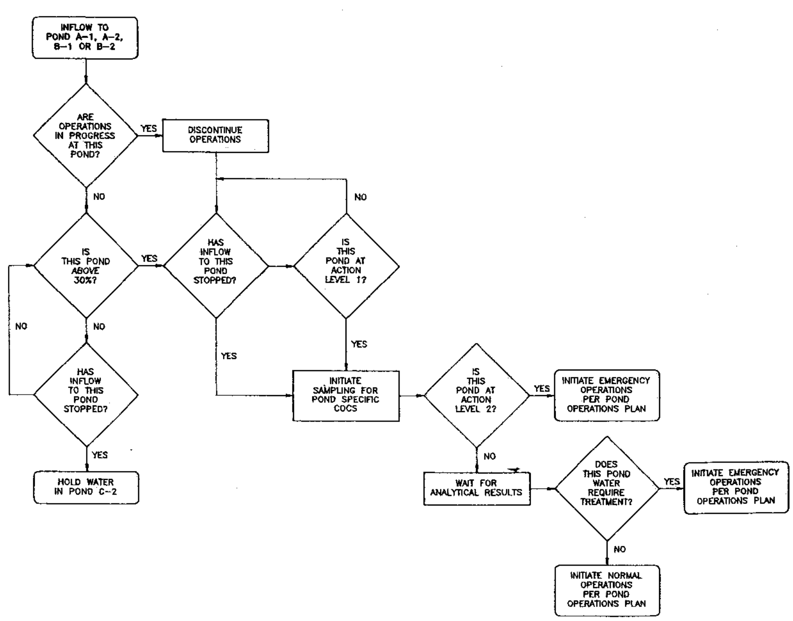
ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 6.5

TITLE:

ROCKY FLATS PLANT POND C-2 DECISION TREE

PROJ. NO.	901-004.450	DWG. NO.	XXXXXX	SHEET
DESIGN BY	EWM	CHECKED	XXXXXX	
DRAWN BY	KAL	APPROVED	XXXXXX	OF
DATE	NOVEMBER 10, 1993	SCALE	XXXXXX	



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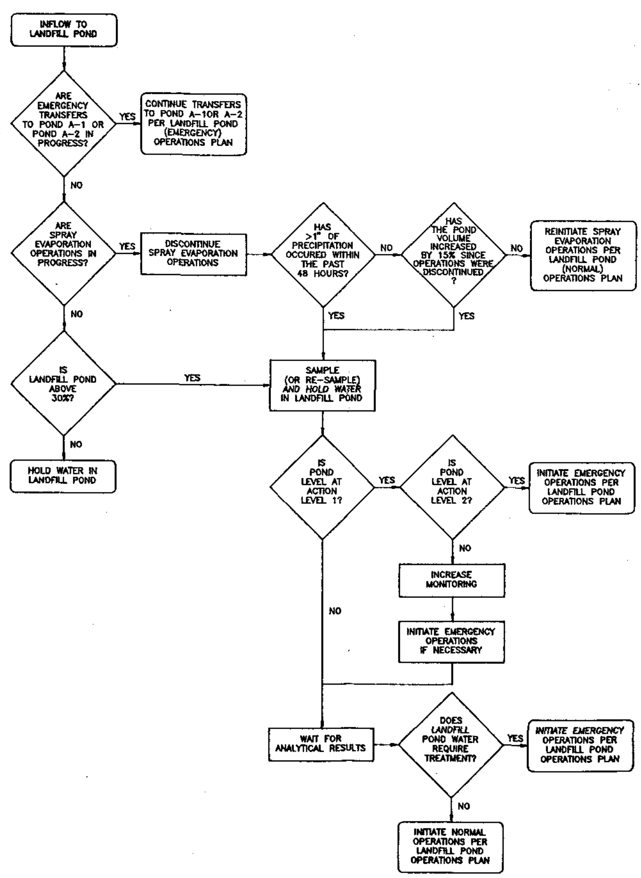
ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 9.4

TITLE:

ROCKY FLATS PLANT
POND A-1/A-2 AND POND B-1/B-2
DECISION TREE

PROJ. NO.	901-004.450	DWG. NO.	XXXXXX	SHEET
DESIGN BY	EWM	CHECKED	XXXXXX	
DRAWN BY	KAL	APPROVED	XXXXXX	OF
DATE	NOVEMBER 16, 1993	SCALE	XXXXXX	



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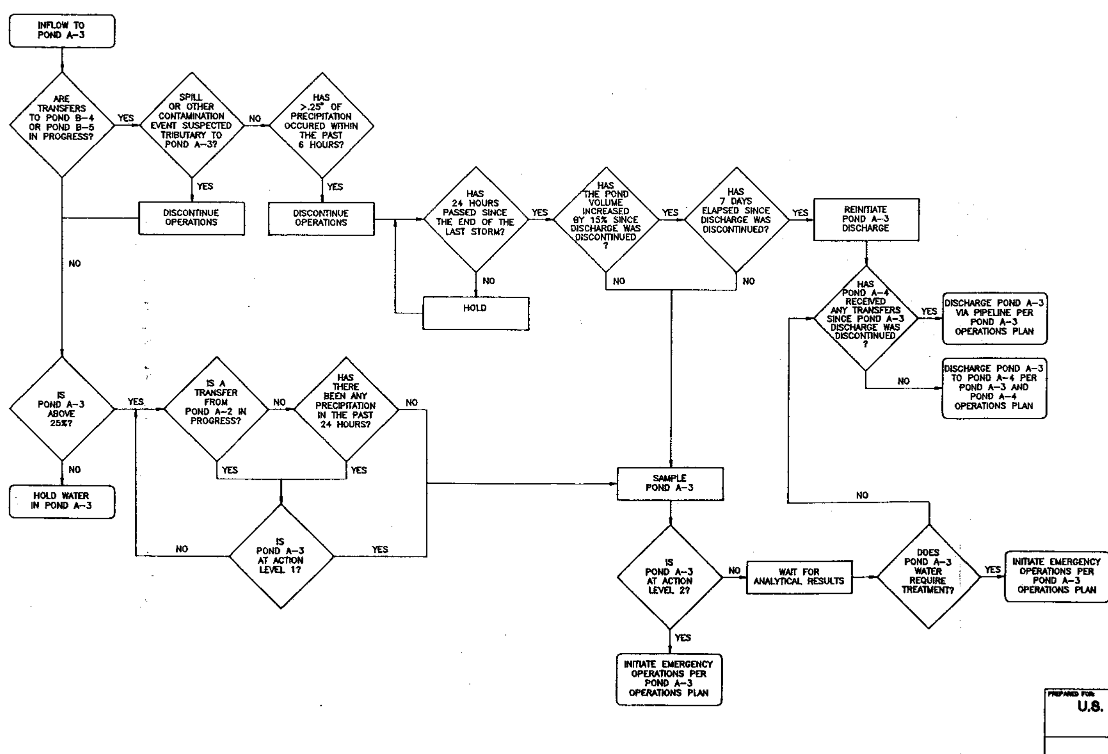
ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE [illegible]

TITLE:

ROCKY FLATS PLANT
LANDFILL POND
DECISION TREE

PROJ. NO.	[illegible]	DWG. NO.	XXXXXX	SHEET
DESIGN BY	[illegible]	CHECKED	XXXXXX	
DRAWN BY	KAL	APPROVED	XXXXXX	OF
DATE	NOVEMBER [illegible]	SCALE	XXXXXX	



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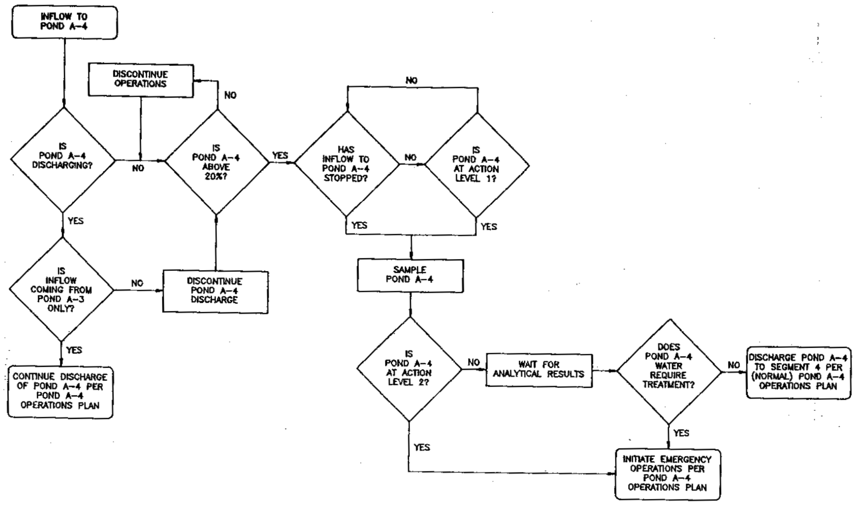
ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE [illegible]

TITLE:

**ROCKY FLATS PLANT
POND A-3
DECISION TREE**

PROJ. NO.	[illegible]	DWG. NO.	XXXXXX	SHEET
DESIGN BY	[illegible]	CHECKED	XXXXXX	
DRAWN BY	KAL	APPROVED	XXXXXX	OF
DATE	NOVEMBER [illegible]	SCALE	XXXXXX	



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ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 6.8

TITLE:

ROCKY FLATS PLANT
POND A-4
DECISION TREE

PROJ. NO.	801-004.450	DWG. NO.	XXXXXX	SHEE
DESIGN BY	EWM	CHECKED	XXXXXX	
DRAWN BY	KAL	APPROVED	XXXXXX	OF
DATE	NOVEMBER 16, 1993	SCALE	XXXXXX	

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