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RCRA Facility Investigation – Remedial Investigation/ Corrective Measures Study – Feasibility Study Report for the Rocky Flats Environmental Technology Site

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ACRONYMS AND ABBREVATIONS

°C	degrees Celsius
µg	microgram
µg/dL	micrograms per deciliter
µg/kg	micrograms per kilogram (may be found as ug/kg)
µg/L	micrograms per liter (may be found as ug/L)
µg/m^3	microgram per cubic meter
µm	micrometer
4,4'-DDT	4,4'-dichylorodiphenyltrichloroethane
A	Action-specific ARAR
AA	Accelerated Action
AA	atomic absorption
ac-ft	acre-feet
ACGIH	American Conference of Governmental Industrial Hygienists
ACL	Alternate Concentration Limit
AET	apparent effect threshold
AEU	Aquatic Exposure Unit
AI	adequate intake
AL	action level
ALARA	As Low as Reasonable Achievable
ALF	RFCA Attachment 5, RFETS Action Levels and Standards Framework for Surface Water, Ground Water and Soils
Am	americium
AME	Actinide Migration Evaluation

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AOC	Area of Concern
AOI	Analytes of Interest
APEN	Air Pollutant Emission Notice
AR	Administrative Record
ARAR	applicable or relevant and appropriate requirement
ASD	Analytical Services Division
AST	Analytical Services Toolkit
AT	alternative toxicity
ATSDR	Agency for Toxic Substances and Disease Registry
AUF	area use factor
AWQC	Ambient Water Quality Criteria
BAF	bioaccumulation factor
BDL	below detection limit
Be	beryllium
BGCR	Background Geochemical Characterization Report
bgs	below ground surface
BRA	Baseline Risk Assessment
BSCP	Background Soils Characterization Program
BSF	biota to sediment factor
BW	body weight
BZ	Buffer Zone
BZSAP	Buffer Zone Sampling and Analysis Plan
C	Celsius
C	Chemical-specific ARAR

CAA	Clean Air Act
CAD	Corrective Action Decision
CAD/ROD	Corrective Action Decision/Record of Decision
Cal	California (Environmental Protection Agency)
CAQCC	Colorado Air Quality Control Commission
CAS	Chemical Abstract Service
CB-PEC	consensus-based probable effects concentration
CCC	criterion continuous concentration
CCME	Canadian Council of Ministers of the Environment
CCP	Comprehensive Conservation Plan
CCR	Code of Colorado Regulations
CD	compact disc
CD ROM	Compact Disc- Read Only Memory
CDD	polychlorinated dibenzodioxin
CDF	polychlorinated dibenzofuran
CDH	Colorado Department of Health
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESC	Citizen's Environmental Sampling Committee
CF	chloroform
cfm	cubic feet per minute
CFR	Code of Federal Regulations
cfs	cubic feet per second

CHWA	Colorado Hazardous Waste Act
CLP	Contract Laboratory Program
CM	chloromethane
cm	centimeter
cm/sec	centimeters per second
CMC	criterion maximum concentration
CMS	Corrective Measures Study
CNHP	Colorado Natural Heritage Program
CO	carbon monoxide
CO_2	carbon dioxide
CoC	chain of custody
COC	contaminant of concern
CRA	Comprehensive Risk Assessment
CRDL	contract required detection limit
CRMP	Cultural Resource Management Plan
CRS	Colorado Revised Statutes
CSF	cancer slope factor
CSU	Colorado State University
CT	carbon tetrachloride
CWA	Clean Water Act
CWQC	Colorado Water Quality Control
cy	cubic yard
D	difference
D&D	Decontamination and Decommissioning

DAF	dermal absorption factor
DAR	Data Adequacy Report
DCA	dichloroethane
DCE	dichloroethene
DCF	dose conversion factor
DER	duplicate error ratio
DHHS	Department of Health and Human Services
DO	dissolved oxygen
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DPM	disintegration per minute
DQA	Data Quality Assessment
DQO	data quality objective
DRC	data review checklist
DRCOG	Denver Regional Council of Governments
DRI	dietary reference intake
DU	depleted uranium
DU	dilution
ECOC	ecological chemical of concern
ECOI	ecological contaminant of interest
ECOPC	ecological contaminant of potential concern
EcoSSL	ecological soil screening level
EDD	electronic data deliverable
EDE	effective dose equivalent

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EE	Environmental Evaluation
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EqP	equilibrium partitioning
ER	Environmental Restoration
ERA	Ecological Risk Assessment
ERL	effect range low
ERM	effects range moderate
ERM	effect range median
ESA	Endangered Species Act
ESA	Endangered Species Act
ESCO	ESCO Associates Inc.
ESL	ecological screening level
ET	evapotranspiration
ETPTS	East Trenches Plume Treatment System
EU	Exposure Unit
F	Fahrenheit
FS	Feasibility Study
ft	foot or feet
FY	fiscal year
g	acceleration due to gravity
g/cm^3	grams per cubic centimeter
GC	gas chromatography

GIS	Geographic Information System
GMU	Game Management Unit
GRRASP	General Radiochemistry and Routine Analytical Services Protocol
HAER	Historic American Engineering Record
handbook	Wildlife Exposure Factors Handbook
HAP	hazardous air pollutant
HEPA	high efficiency particulate air
HHRA	Human Health Risk Assessment
HI	hazard index
HQ	hazard quotient
HRR	Historical Release Report
HSL	Hazardous Substance List
IA	Industrial Area
IABZSAP	Industrial Area and Buffer Zone Sampling and Analysis Plan
IAEU	Industrial Area Exposure Unit
IAG	Interagency Agreement
IASAP	Industrial Area Sampling and Analysis Plan
IBI	index of biotic integrity
ICA	Institutional Control Area
ICP	inductively couple plasma
IDEU	Inter-Drainage Exposure Unit
IDL	instrument detection limit
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measure/Interim Remedial Action

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IMP	Integrated Monitoring Plan
IRIS	Integrated Risk Information System
ISQG	interim sediment quality guideline
kg	kilogram
K-H	Kaiser-Hill Company, L.L.C.
L	Location-specific ARAR
L/day	liters per day
LCS	laboratory control sample
LEL	lowest effect level
LFG	landfill gas
LHSU	lower hydrostratigraphic unit
LLW	low-level radioactive waste
Ln	natural logarithmic
LOAEL	lowest observed adverse effect level
LOE	line of evidence
LOEC	lowest observed effect concentration
Log Kow	log octanol-water portioning coefficient
LRA	Lead Regulatory Agency
LWNEU	Lower Walnut Drainage Exposure Unit
LWOEU	Lower Women Drainage Exposure Unit
m	meter
m/s	meters per second
M+2SD	mean plus two standard deviations
MAC	maximum acceptable concentration

MaxDL	maximum daily unit
MaxDL	maximum detection limit
MC	methylene chloride
MCL	maximum contaminant level
MCLG	Maximum Contaminant Level Goal
MDA	minimum detectable activity
MDC	maximum detected concentration
MDL	method detection limit
MENVIQ/EC	Ministere de l'Environnement du Quebec et Environnement Canada
mg	milligram
mg/day	milligrams per day
mg/kg	milligrams per kilogram
mg/kg/BW/day	milligrams per kilogram receptor body weight per day
mg/kg/day	milligrams per kilogram per day
mg/L	milligrams per liter
Mg/yr	megagrams per year
MIDEQ	Michigan Department of Environmental Quality
MK AEU	McKay Ditch Aquatic Exposure Unit
mL	milliliter
mL/day	milliliters per day
mph	miles per hour
mrem	millirem
mrem/yr	millirems per year
MRL	Minimum Risk Level

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MS	matrix spike
MSA	method of standard additions
MSD	matrix spike duplicate
msl	mean sea level
MSPTS	Mound Site Plume Treatment System
MSv	millisievert
n	sample size
N/A	not available or not applicable
NAS	National Academy of Sciences
NATA	National-scale Air Toxics Assessment
NAWQC	National Ambient Water Quality Criteria
NC	not calculated
NCP	National Contingency Plan
ND	not detected
NEC	no-effect concentration
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFA	No Further Action
NFAA	No Further Accelerated Action
NHPA	National Historic Preservation Act
NIPHEP	National Institute of Public Health and Environmental Protection
NIST	National Institute of Standards Technology
NLR	no longer representative
NMOC	non-methane organic compound
NN AEU	No Name Gulch Aquatic Exposure Unit

NNEU	No Name Gulch Drainage Exposure Unit
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NREL	National Renewable Energy Laboratory
NW AEU	North Walnut Creek Aquatic Exposure Unit
NWTC	National Wind Technology Center
NYSDEC	New York State Department of Environmental Conservation
O&G	oil and grease
O&M	operation and maintenance
ODS	ozone-depleting substances
OLF	Original Landfill
OMB	Office of Management and Budget
OMOE	Ontario Ministry of the Environment
OPWL	Original Process Waste Lines
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
P.L.	Public Law
PAC	Potential Area of Concern
PAH	polynuclear aromatic hydrocarbon
PAH	polyaromatic hydrocarbon

PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
pCi	picocurie
pCi/g	picocuries per gram
pCi/kg	picocuries per kilogram
pCi/L	picocuries per liter
PCOC	potential contaminant of concern
PDSR	Pre-Demolition Survey Report
PEC	probable effect concentration
PEL	probable effect level; Permissible Exposure Level
PM/PM_{10}	particulate matter; fine particulate matter
PMJM	Preble's meadow jumping mouse
POC	Point of Compliance
POE	Point of Evaluation
ppb	part per billion
PPE	personal protective equipment
ppm	parts per million
PPRTV	Provisional Peer Reviewed Toxicity Value
PPT	pipette
PQL	practical quantitation limit
PRG	preliminary remediation goal
Pu	plutonium
PU&D	Property Utilization and Disposal

PVC	polyvinyl chloride
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QC	quality control
QLI	Quantalex Laboratories, Inc.
RAO	Remedial Action Objective
RBA	relative bioavailability
RBP	Rapid Bioassessment Protocol
RC AEU	Rock Creek Aquatic Exposure Unit
RCEU	Rock Creek Drainage Exposure Unit
RCRA	Resource Conservation and Recovery Act
RDA	recommended daily allowance
RDI	recommended daily intake
RDL	reporting detection limit
RDL	required detection limit
REL	Reference Exposure Level
RESRAD	Residual Radioactivity
RFA	Rocky Flats Alluvium
RfC	Reference Concentration
RFCA	Rocky Flats Cleanup Agreement
RFCAB	Rocky Flats Citizens Advisory Board
RFCOLG	Rocky Flats Counsel of Local Governments
RfD	reference dose
RFEDS	Rocky Flats Environmental Data System

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RFETS or Site	Rocky Flats Environmental Technology Site
RFI	RCRA Facility Investigation
RFI/CMS	RCRA Facility Investigation/Corrective Measures Study
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RFNWR	Rocky Flats National Wildlife Refuge
RFPO	Rocky Flats Project Office
RH	Radiation Health
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RL	reporting limit
RLCR	Reconnaissance-Level Characterization Report
RMRS	Rocky Mountain Remediation Services
ROC	receptor of concern
ROD	Record of Decision
RPD	relative percent difference
RRT	Risk Reporting Tool
RSAL	radionuclide soil action level
SAP	Sampling and Analysis Plan
SCM	site conceptual model
SCMTM	site conceptual model technical memorandum
SCS	Soil Conservation Service
SDP	standard data package
SE AEU	Southeast Aquatic Exposure Unit
SEC	sediment effect concentration

SEEU	Southeast Buffer Zone Area Exposure Unit
SEP	solar evaporation ponds
SEV	severity of ill effect
SHPO	State Historic Preservation Office
SID	South Interceptor Ditch
SMDP	scientific management decision point
SO_2	sulfur dioxide
SOW	Statement of Work
SPPTS	Solar Ponds Plume Treatment System
SQC	soil quality criteria
SQG	sediment quality guideline
SQL	sample quantitation limit
SQL	Structured Query Language
SR	Summary Report
StDev	standard deviation
STP	standard temperature and pressure
SVOC	semivolatile organic compound
SW AEU	South Walnut Creek Aquatic Exposure Unit
SWD	Soil Water Database
SWEU	Southwest Buffer Zone Area Exposure Unit
SWMU	Solid Waste Management Unit
SWWB	Site-Wide Water Balance
TAL	Target Analyte List
TBC	To-Be-Considered

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TCDD	tetrachlorodibenzodioxin
TCE	trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TDS	total dissolved solids
TEC	threshold effect concentration
TEDE	total effective dose equivalent
TEF	toxicity equivalency factor
TEL	toxic effects level
TEQ	toxic equivalency
tESL	threshold ecological screening level
TET	toxic effect threshold
TIC	tentatively identified compound
TLV	Threshold Limit Value
TMDL	total maximum daily load
TNRCC	Texas Natural Resource Conservation Commission
TOC	total organic carbon
TRV	toxicity reference value
TSS	total suspended solids
TTHM	trihalomethanes
U	nondetected; uranium
U.S.	United States
U.S.C.	U.S. Code
UBC	Under Building Contamination

UCL	upper confidence limit
UDFCD	Urban Drainage and Flood Control District
UHSU	upper hydrostratigraphic unit
UL	upper limit daily intake
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UT	uncertain toxicity
UTL	upper tolerance limits
UWNEU	Upper Walnut Drainage Exposure Unit
UWOEU	Upper Woman Drainage Exposure Unit
V&V	verification and validation
VC	vinyl chloride
VFA	Valley Fill Alluvium
VOC	volatile organic compound
WAEU	West Area Exposure Unit
WBEU	Wind Blown Area Exposure Unit
WC AEU	Woman Creek Aquatic Exposure Unit
WHO	World Health Organization
WQCC	Water Quality Control Commission
WRS	Wilcoxon Rank Sum

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WRV	wildlife refuge visitor
WRW	wildlife refuge worker
WSF	West Spray Field
yr/pCi/g	years per picocurie per gram

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RCRA Facility Investigation – Remedial Investigation/ Corrective Measures Study – Feasibility Study Report for the Rocky Flats Environmental Technology Site

Executive Summary

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1.0 INTRODUCTION

The Rocky Flats Environmental Technology Site (RFETS or site) is a 6,240-acre U.S. Department of Energy (DOE) facility owned by the United States. RFETS is located in the Denver metropolitan area approximately 16 miles northwest of Denver, Colorado and approximately 10 miles south of Boulder, Colorado (Figure ES.1). This Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) Report for RFETS was prepared in accordance with the Final Work Plan for the Development of the Remedial Investigation and Feasibility Study Report (RI/FS Work Plan) and EPA's Guidance for conducting RIs and FSs under CERCLA.

Because remedial activities at RFETS are also being conducted under the Resource Conservation and Recovery Act (RCRA) and the Colorado Hazardous Waste Act (CHWA), this RI/FS Report also meets RCRA/CHWA requirements for a RCRA Facility Investigation/Corrective Measures Study (RFI/CMS) Report. References to CERCLA requirements are also intended to encompass RCRA/CHWA requirements. For simplicity, the report is hereinafter referred to as the RI/FS Report.

CERCLA response actions and RCRA/CHWA corrective and closure actions are conducted by DOE at RFETS subject to the July 19, 1996, Rocky Flats Cleanup Agreement (RFCA). The U.S. Environmental Protection Agency, Region VIII (EPA) and the Colorado Department of Public Health and Environment (CDPHE) exercise their respective statutory and regulatory authorities to oversee and approve DOE's investigation and cleanup actions in accordance with RFCA. Other CERCLA and RCRA/CHWA agreements and orders between DOE, EPA and CDPHE preceded RFCA, guiding DOE's investigation and cleanup actions since 1986.

To expedite remedial work and maximize early risk reduction, RFCA adopted an accelerated action approach to cleanup. Accelerated actions removed contaminated soils, decontaminated and demolished contaminated buildings, closed the Present and Original Landfills, and installed four systems to intercept and treat contaminated groundwater. These actions were implemented to contribute to the efficient performance of the final remedial action anticipated for the site. RFCA also divided the entire RFETS property into two geographic areas, known as the Industrial Area (IA) Operable Unit (OU) and the Buffer Zone (BZ) OU, which surrounds the IA OU (Figure ES.2).

When approved by CDPHE and EPA, the RI/FS Report will be the basis for development of a Proposed Plan that describes the preferred remedy for the IA and BZ OUs at RFETS. The Proposed Plan is the basis for the final Corrective Action Decision/Record of Decision (CAD/ROD).

1.1 Organization of the RI/FS Report

The RI/FS Report is organized as follows:

- Section 1.0 provides introductory information, including the site description, history, future land use, previous investigations, and the RFCA regulatory approach for cleanup.
- Section 2.0 provides a summary of the physical characteristics of the site, including surface features, meteorology, surface water hydrology, geology, soil, hydrogeology, demography and land use, and ecology.
- Sections 3.0 through 6.0 present the nature and extent of soil, groundwater, surface water and sediment, and air contamination.
- Section 7.0 presents contaminant fate and transport and describes potential routes of migration based on the RFETS conceptual model, physical characteristics of the site, contaminant mobility, and environmental persistence.
- Section 8.0 summarizes the RI, including the Comprehensive Risk Assessment (CRA) results. The CRA consists of a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA).
- Section 9.0 presents the Remedial Action Objectives (RAOs) for groundwater, surface water, and soil and the applicable or relevant and appropriate requirements (ARARs) used as the final remedy goals in the RI/FS.
- Section 10.0 presents a detailed analysis of final remedial alternatives.
- Appendix A contains the CRA Report (Volumes 1 through 15).

2.0 BACKGROUND

The site background and cleanup progress toward final closure of RFETS is summarized below.

2.1 History

RFETS was established in 1951 primarily to manufacture plutonium pits and other components for nuclear weapons triggers from uranium and other metals including stainless steel and beryllium. This was accomplished in an approximately 300 acre industrialized area at the center of the RFETS property. The industrialized area was surrounded by a security buffer zone that contained some supporting activities, such as waste disposal, but was left mostly undisturbed.

Manufacturing activities, accidental fires and spills, and support activities, including waste management, resulted in the release of CERCLA hazardous substances and RCRA/CHWA hazardous wastes and hazardous waste constituents (also defined as CERCLA hazardous substances) to air, soil, sediment, groundwater, and surface water at RFETS. Some buildings and infrastructure systems also became contaminated.

Released hazardous substances at RFETS include radionuclides, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), inorganic compounds, and metals. RFETS was added to the CERCLA National Priority List (NPL) on September 21, 1989 (54 Federal Register 41015, October 4, 1989). The NPL description included RFETS and land adjacent, or offsite, from RFETS.

Known or suspected release locations (primarily soil) were delineated by 183 Individual Hazardous Substance Sites (IHSSs) in 16 OUs, 146 Potential Areas of Concern (PACs), 31 Under Building Contamination (UBC) sites, and 61 Potential Incidents of Concern (PICs) (totaling 421 areas). The IHSSs, PACs, UBC sites and PICs have been thoroughly investigated and characterized as appropriate and RFCA accelerated actions triggered by contamination levels have been confirmed completed.

In the mid-1990s the RFETS mission changed from production to cleanup and closure. At that time there were serious safety concerns about inventories of special nuclear materials (SNM) (plutonium and enriched uranium) and hazardous substances and legacy wastes contained in aging RFETS facilities, and stored in temporary structures. The following major accomplishments to complete this mission have been achieved under RFCA:

Approximate amount of SNM shipped to other DOE facilities: • 21 tons plutonium • 100 tons plutonium residues • 30,000 liters SNM solutions	Over 800 structures cleaned up/removed, including >1 million square feet associated with: • 5 major plutonium facilities • 2 major uranium facilities
1,475 gloveboxes deactivated, decontaminated, removed and size-reduced, as required, and disposed offsite.	690 tanks deactivated, decontaminated, removed, and size-reduced, as required, and disposed off site.
Covers installed at the Present Landfill and Original Landfill to meet applicable or relevant and appropriate landfill regulatory closure performance criteria.	421 IHSSs, PACs, UBC sites and PICs investigated and dispositioned. All RFCA accelerated cleanup actions have been completed or a no accelerated action decision made.
3 contaminated groundwater plume barriers and a seep collection system, and accompanying passive treatment systems installed serving to protect surface water quality. • Over 11 million gallons of contaminated groundwater and 5 million gallons of contaminated seep water treated to date.	Cleanup and closure waste shipped off site: • Over 15,000 cubic meters (m3) transuranic waste (including mixed waste) • Over 500,000 m3 low-level radioactive waste (including mixed waste) • Over 800,000 m3 sanitary waste • Over 4,300 m3 hazardous waste

2.2 Rocky Flats National Wildlife Refuge Future Use

After completion of cleanup and closure, RFETS will become a National Wildlife Refuge in accordance with the Rocky Flats National Wildlife Refuge Act of 2001, Public Law 107-107 (Refuge Act). The U.S. Fish and Wildlife Service (USFWS), an agency of the U.S. Department of Interior (DOI), will assume jurisdiction and control of most of the

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property for refuge purposes and DOE will retain jurisdiction of real property and facilities to be used in carrying out any final response action. A Final Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) related to the establishment of the Refuge has been prepared by USFWS, in consultation with the public and the local communities. The area of DOE and USFWS jurisdiction and control will be delineated in the final CAD/ROD and the transfer will occur in accordance with a DOE and DOI Memorandum of Understanding.

2.3 Environmental Permits

After the NPL listing, CHWA/RCRA, National Pollutant Discharge Elimination System (NPDES), and Clean Air Act (CAA) permits covering RFETS operations were issued to DOE and its contractor. The CHWA/RCRA permit and RFCA requirement for corrective action were specifically coordinated under the RFCA regulatory approach. Permitted operational activities continued at RFETS during the cleanup under RFCA. Permits have been or will be terminated in accordance with the regulatory requirements for termination after permitted activities end, or upon CHWA-permitted facility closure in accordance with the CHWA permit closure plan. A CHWA post-closure permit or an order or agreement in lieu of a post-closure permit may be required.

3.0 PHYSICAL CHARACTERISTICS

The physical characteristics information helps support the analysis of the fate and transport of contamination in the environment and the design of potential response actions.

3.1 Demographics and Surrounding Land Use

As of 2004, approximately 2.6 million people were living in the Denver metropolitan area counties. Between 1990 and 2000, the population of the Denver metropolitan area increased by approximately 556,000 people (29.9 percent). The projected metropolitan area population will increase by more than 1,000,000 people by 2035.

Northeast of the site is an extensive area of commercial, residential and office space. The Jefferson County Airport, located approximately 3 miles east of RFETS, is surrounded by recent business park and light industrial developments.

State-owned lands southwest and west of the site are used for grazing, mining, and storage and conveyance of municipal water supplies. Along Highway 93, an area of land approximately 1,200 feet wide adjacent to the site's western boundary is available for eventual development, open space, or highway right-of-way. The 259-acre DOE National Wind Technology Center is located adjacent to the northwestern corner of the BZ OU. Preserved open space is the primary existing and proposed use of the lands immediately north (Boulder County and City of Boulder) and east (Cities of Broomfield and Westminster) of the site.

Areas within the BZ OU and adjacent privately owned lands west of the site have been permitted by the State and County for mineral extraction (primarily clay, sand, and gravel mining). Some irrigated and non-irrigated croplands, producing primarily wheat and barley, are located north and northeast of RFETS. Much of the rest of the land immediately adjacent to RFETS is used for cattle grazing.

To the south, several horse operations and small hay fields exist at present. By 2020, it is projected that the entire area south of the site will be developed, as well as areas to the southeast that are either not already developed or protected as open space.

3.2 Surface Features

RFETS is located approximately 2 miles east of the foothills of the Front Range. The western portion of RFETS is located on a broad, relatively flat pediment, which is capped by unconsolidated surficial deposits. On the eastern portion of RFETS, stream valleys trend generally from west to east dissecting the pediment surface. These valleys cut into the underlying bedrock in some locations, although in most places bedrock is located beneath colluvium that has collected along the valley slopes. Elevations at RFETS range from west to east approximately 6,190 feet above mean sea level (MSL) to approximately 5,600 feet above MSL.

The primary topographic features at RFETS are the Rock Creek, Walnut Creek, and Woman Creek drainages that traverse the site and flow generally from west to east. Drainage ditches also cross the site, including the South Interceptor Ditch (SID), Woman Creek Bypass, McKay Ditch, Upper Church Ditch, and Smart Ditch. Man-made ponds include nine ponds on North and South Walnut Creeks, two ponds in the Woman Creek drainage, one pond east of the Present Landfill, two ponds in the Rock Creek drainage, and two ponds on Smart Ditch.

Accelerated actions resulted in removal of buildings and surface pavement. Surface recontouring and revegetation of the former industrialized area provide a stable land surface consistent with the wildlife refuge future use. The Original Landfill has a soil cover layer with a minimum thickness of 2 feet. The Present Landfill composite cover has a soil cover layer with a minimum thickness of 3 feet. The soil layer surface vegetation will be established on the covers using appropriate native seed mixes.

Five functional channels were configured to also minimize soil disturbance and were generally placed in areas of major surface water drainage features existing during site operations. Erosion was controlled in the functional channels by armoring the entire length of the channel with riprap or erosion matting and revegetation. Each of the five functional channels was designed to convey the 100-year storm event. This work was completed as part of a series of best management practices.

Several public utility easement corridors at RFETS are expected to remain indefinitely. The Refuge Act prohibits any through roads, but provides that up to a 300-foot strip on the eastern RFETS boundary may be made available for transportation improvements along Indiana Street. All other land transfers are prohibited by the Refuge Act.

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3.3 Subsurface Features and Geology

Between the ground surface and 3 feet below grade, essentially all structures have been removed, with the exception of utility lines less than two inches in diameter, some fence posts or utility poles cut off at ground level, and the groundwater collection and treatment systems.

Some subsurface structures remain in place at depths greater than three feet below grade. These include slabs, building foundations, tunnels, sewer lines, water lines, foundation drains, storm drains, manholes/manways, valve vaults and process waste lines.

The local geology and hydrogeology is well documented based on several comprehensive site-specific studies, which also includes characterization of background concentrations of a number of metals, inorganics and radionuclides. The background concentration information is considered in evaluating whether measured contamination concentrations are consistent with variations in background or are related to RFETS historical activities.

3.4 Hydrogeology and Geomorphology

The hydrogeology of RFETS has been thoroughly studied, and focused groundwater modeling activities support evaluation and implementation of accelerated actions and the final remedy. Unconfined groundwater flow occurs in unconsolidated geologic materials and in subcropping weathered bedrock claystones and sandstones comprising the upper hydrostratigraphic unit (UHSU). Sandstone beds of the lower Laramie Formation and the underlying Fox Hills Sandstone are grouped together as the regionally important Laramie/Fox Hills aquifer. This aquifer is separated from the UHSU by the approximately 800 to 900 foot-thick lower hydrostratigraphic unit (LHSU). The LHSU acts as a confining layer to separate the UHSU from the Laramie/Fox Hills Aquifer, which constitutes a regional water supply resource. Consequently, the UHSU is not hydraulically connected to any groundwater drinking water supply and the LHSU has not been impacted by DOE activities. Alluvial groundwater that has been impacted by activities at RFETS discharges to surface water prior to leaving the site.

Although the groundwater at RFETS discharges to surface water, it is currently not the major contributor or source of surface water volumes or flows on site. The vast majority of current RFETS surface water volume and flow is due to imported water and runoff (from pavement) from precipitation. When importation of water ceases, and the areas of impermeable surfaces are eliminated, it is anticipated that groundwater could become a larger proportionate contributor to surface water volumes and flows, not because of a significantly increased volume of groundwater, but because of the significant reduction from those other contributors.

3.5 Ecology

Many areas of the site have remained relatively undisturbed for the past 30 to 50 years, allowing them to retain diverse habitat and associated wildlife. The regional network of protected open space that surrounds the site on three sides also buffers wildlife habitat from the surrounding urban development. Of particular interest, the site contains Preble's meadow jumping mouse (PMJM) habitat. Listed as a threatened species in 1998, the PMJM occurs in habitat adjacent to streams and waterways along the Front Range of Colorado and southeastern Wyoming. The PMJM occurs in every RFETS major creek drainage, and distribution, movement patterns, and habitat preferences on RFETS are well understood. A PMJM Protection Plan was created by DOE and areas mapped under this plan have been adopted by USFWS. Figure ES.3 shows PMJM habitat at RFETS.

RFETS contains a unique diverse mixture of mountain and prairie plant species resulting from the topography of the area and its proximity to the mountain front. The relatively undeveloped site provides numerous plant communities that are used by wildlife to satisfy habitat needs. Many of these plant communities are increasingly rare along the Front Range as urbanization continues to replace and fragment the remaining parcels of these plant communities. The USFWS CCP/EIS provides a description of the vegetation, wildlife, and threatened and endangered species present at RFETS.

Each of the primary drainages at the site contains pond and stream habitats, varying with the amounts of habitat modification, and seasonal water flows available. Streams at RFETS are flow limited; however, in general, the upper reaches of the creek drainages flow perennially while the downstream reaches have intermittent flows. The low and irregular flows in the Rock, Walnut and Woman Creeks limit the amount of quality habitat for aquatic fauna and therefore limit the number and variety of aquatic species at RFETS.

4.0 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination evaluations considered the following environmental media: soil, groundwater, surface water, sediment, and air. These evaluations were conducted to show the types of analytes of interest (AOIs) remaining in the environmental media and their extent at RFETS following the RFCA accelerated actions. The purpose of identifying AOIs was to focus the nature and extent evaluation on constituents that were detected at concentrations that may contribute to the risk to future receptor and to show the overall spatial and temporal trends of those constituents on a sitewide basis. This information is used in considering where and what type of media-specific remedial actions may be needed to adequately protect human health and the environment. Table ES.1 presents a summary of the RI. The first column presents the results of the nature and extent of contamination evaluations.

4.1 Soil

Fourteen surface soil AOIs and 14 subsurface soil AOIs were identified in Section 3.0, Nature and Extent of Soil Contamination. The surface soil AOIs are: aluminum, arsenic, chromium (total), vanadium, aroclor-1254, aroclor-1260, 2,3,7,8-TCDD TEQ, benzo(a)pyrene, dibenz(a,h)anthracene, americium-241, plutonium-239/240, uranium-233/234, uranium-235, and uranium-238. The subsurface soil AOIs are: chromium (total), lead, aroclor-1260, benzo(a)pyrene, 1,1,2,2-tetrachloroethane, carbon tetrachloride, chloroform, methylene chloride, tetrachloroethene, trichloroethene, americium-241, plutonium-239/240, uranium-235, and uranium-238. Soil AOIs are those analytes with concentrations greater than the WRW PRGs. The WRW PRGs were used for this medium because no standards exist for soil and the exposure assumptions used for the risk-based levels were consistent with the future land use. Details on the nature and extent of contamination screening methodology, PRGs used in the screen, and results are found in Section 3.0.

4.2 Groundwater

Eighteen analytes of interest (AOIs) were identified in Section 4.0, Nature and Extent of Groundwater Contamination, as analytes detected in wells that represent contiguous, mappable areas of contaminated groundwater or "plumes" above surface water standards or MCLs. The AOIs are uranium isotopes, chloromethane, benzene, 1,2-dichloroethane, vinyl chloride, cis-1,2-dichloroethene, methylene chloride, 1,1-dichloroethene, chloroform, carbon tetrachloride, tetrachloroethene, trichloroethene, dissolved and total nickel, dissolved arsenic, total chromium, nitrate/nitrite (as N), and fluoride. Groundwater AOIs are those analytes with concentrations greater than surface water standards. Surface water standards are promulgated in the Colorado Water Quality Control Commission regulations. Comparison to surface water standards is consistent with RFCA objectives of protecting surface water quality. Details on the nature and extent of contamination screening methodology, standards used in the screen, and results are found in Sections 4.0.

4.3 Surface Water

Nineteen surface water AOIs were identified in Section 5.0, Nature and Extent of Surface Water and Sediment Contamination. The AOIs are carbon tetrachloride, chloroform, cis-1,2-dichloroethene, methylene chloride, tetrachloroethene, trichloroethene, vinyl chloride, dissolved aluminum and total beryllium, chromium, lead, nickel, zinc, americium-241, gross alpha, gross beta, plutonium-239/240, uranium isotopes, and nitrate/nitrite (as N). Surface water AOIs are those analytes with concentrations greater than surface water standards. Surface water standards are promulgated in the Colorado Water Quality Control Commission regulations. Comparison to surface water standards is consistent with RFCA objectives of protecting surface water quality. Details on the nature and extent of contamination screening methodology, standards used in the screen, and results are found in Sections 5.0

4.4 Sediment

Ten sediment AOIs were identified in Section 5.0, Nature and Extent of Surface Water and Sediment Contamination. The sediment AOIs are benzo(a)pyrene, dibenz(a,h)anthracene, antimony, arsenic, chromium, silver, thallium, americium-241, plutonium-239/240, and uranium-238. Sediment AOIs are those analytes with concentrations greater than the WRW PRGs. The WRW PRGs were used for this medium because no standards exist for soil or sediment, and the exposure assumptions used for the risk-based levels were consistent with the future land use. Details on the nature and extent of contamination screening methodology, standards used in the screen, and results are found in Sections 5.0

4.5 Air

With the completion of accelerated actions under RFCA, sources of ongoing emissions to air include the following:

- Resuspension of residual radioactive contaminants attached to surface soil particles; and
- Volatilization/release of volatile organic compounds (VOCs) from residual subsurface contamination and the closed landfills.

However, sources of radionuclide and VOC contamination were removed during accelerated actions conducted pursuant to RFCA. VOC emissions are rapidly decreasing and present no health or environmental concerns at present and future levels in ambient air.

5.0 CONTAMINANT FATE AND TRANSPORT

Contaminant Fate and Transport evaluated the environmental pathways and physical and chemical processes by which the AOIs are transported and distributed in the RFETS environment and whether the analytes may impact surface water quality. The following is a summary of the key findings of the contaminant fate and transport analysis. The second column in Table ES.1 presents the results of the evaluation of fate and transport.

5.1 Soil and Sediment

Although surface soil is the medium where many of the residual contaminants are detected in the RFETS environment, surface soil does not, in itself, represent a transport pathway. The transport of contaminants from surface soil to other environmental media is dependent on physical processes, such as erosion of surface soil. The physical processes are affected by the chemical properties of the AOI, in conjunction with other chemical and biological mechanisms, that dictate how each AOI is transported in the environment.

In general, sediment transport in the post-accelerated action configuration will be reduced compared with the historic developed condition because the elimination of buildings and pavement will result in diminished runoff and reduced peak flow rates during storm events, when the majority of sediment transport occurs. In addition, vegetative cover over previously exposed soil areas will also promote reduced deposition and migration of sediments.

5.2 Groundwater

Alluvial groundwater that has been impacted by RFETS activities discharges to surface water prior to leaving RFETS. Per the Fiscal Year 2005 (FY05) Integrated Monitoring

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Plan (IMP) (K-H 2005), potential impacts from groundwater to surface water quality is measured at sentinel and Area of Concern (AOC) wells (Figure ES.4). AOC wells are wells that are within a drainage and downgradient of a contaminant plume or group of contaminant plumes. These wells are monitored to determine whether the plume(s) are discharging to surface water. In Section 7.0, groundwater AOI data were compared to surface water standards at AOC wells. All groundwater AOIs were below surface water standards at AOC wells.

Groundwater AOIs were also evaluated at sentinel wells. Sentinel wells are wells that are typically located near downgradient contaminant plume edges, in drainages, and downgradient of existing groundwater treatment systems. These wells are monitored to determine whether concentrations of contaminants are increasing. Five groundwater plume areas with the potential to impact surface water quality were identified because some groundwater AOIs are above surface water standards at some sentinel wells. These areas are:

- Carbon tetrachloride plume at former Building 771 (historical IHSS 118.1) – vinyl chloride and methylene chloride may exceed the surface water standards.
- East Trenches plume (downgradient portion between South Walnut Creek and the existing East Trenches Plume Treatment System [ETPTS]) – tetrachloroethene, trichloroethene, carbon tetrachloride, chloroform, and cis-1,2-dichloroethene may exceed the surface water standards.
- Oil Burn Pit #2 and Mound Site plume (downgradient portion between South Walnut Creek and the Mound Site Plume Treatment System [MSPTS]) – chloroform, tetrachloride, trichloroethene, cis-1,2-dichloroethene, 1,1-dichloroethene, and methylene chloride may exceed the surface water standards between South Walnut Creek and the MSPTS, and carbon tetrachloride, chloroform, methylene chloride, and tetrachloroethene may exceed the surface water standards between Oil Burn Pit #2 and the MSPTS. (Contaminated groundwater from Oil Burn Pit #2 is treated at the MSPTS.)
- 903 Pad and Ryan's Pit plumes – tetrachloroethene, trichloroethene, carbon tetrachloride, chloroform, and cis-1,2-dichloroethene may exceed the surface water standards at the 903 Pad, while carbon tetrachloride, chloroform, and trichloroethene may exceed the surface water standards at Ryan's Pit.
- Solar Evaporation Ponds (SEP) plume and 700 Area Northeast plume (downgradient portion of plumes between Solar Ponds Plume Treatment System [SPPTS] and North Walnut Creek) – nitrate and uranium at the SEP and nitrate from the 700 Area Northeast plume may exceed the surface water standards.

Based on data and modeling results, it is likely that residual VOC sources and associated downgradient groundwater concentrations will persist in the environment for decades to hundreds of years even with the source removals that were implemented as accelerated actions (EPA, 2003). As part of the Groundwater Interim Measure/Interim Remedial

Action (IM/IRA) (K-H 2005), an alternatives analysis was conducted to evaluate other accelerated action strategies that were feasible and practicable based on the type of residual contamination in these five plume areas and environmental conditions (for example, distance between the existing treatment systems and adjacent stream channels). The selected alternatives were conducted as enhancements to previously implemented remedial actions. The selected enhancements are detailed in the Groundwater IM/IRA and were completed in 2005. All the enhancements are intended to reduce the inventories of potential groundwater contaminants and/or reduce the migration of contaminated groundwater that could impact surface water quality. They are not expected to eliminate groundwater contamination in the short term, but to have a positive long-term impact on groundwater and surface water quality. At this time, no other alternatives for these areas are feasible or practicable.

The following actions have been implemented in accordance with approved RFCA decision documents to treat contaminated groundwater that could potentially impact surface water quality. The actions are:

- Post-closure care and monitoring of the Present Landfill and continued operation and maintenance (O&M) of the Present Landfill seep treatment system;
- Post-closure care and monitoring of the Original Landfill; and
- O&M of three groundwater passive treatment systems and performance monitoring (ETPTS, MPTS, and SPPTS).

The Present Landfill was closed under RCRA/CHWA; the Original Landfill was closed under CERCLA using RCRA closure ARARs. Each of the landfills has a Closure Plan approved by CDPHE and EPA. A system to treat the Present Landfill seep was installed. A system to monitor groundwater upgradient and downgradient of both landfills is in place.

Continued operation of these three groundwater actions serves to protect surface water quality over short- and intermediate-term periods by removing contaminant loading to surface water. This protection also serves to meet long-term goals for returning groundwater to its beneficial use of surface water protection.

- Groundwater contamination above maximum contaminant levels (MCLs) exists in some areas of RFETS; however, groundwater outside the former IA is acceptable for all uses.

5.3 Surface Water

In the Contaminant Fate and Transport section, surface water AOI data were compared to surface water standards at surface water POCs. All surface water AOI concentrations were below surface water standards at the surface water POCs and/or at the terminal ponds upgradient of the surface water POCs. Surface water leaving RFETS is acceptable for all uses.

5.4 Air

Plutonium, americium, and uranium isotopes (uranium-233/234, uranium-235, and uranium-238) were modeled as Air Pollutants of Concern because the residual soil source is resuspended by air erosion processes. Historic concentrations of airborne radionuclides are low relative to the air emission standard (40 Code of Federal Regulations [CFR], Part 61, Subpart H). The total off-site annual effective dose equivalent (EDE) of combined radionuclides (americium-241, plutonium-239/2340, uranium-233/234, uranium -235, and uranium -238) has been less than 3 percent of the allowable 10 millirem (mrem) standard, based on samples collected since 1999. Remediation of radionuclides in surface soil through accelerated actions should, in the long term, further reduce airborne radionuclide concentrations.

6.0 COMPREHENSIVE RISK ASSESSMENT

The CRA consists of two parts: a HHRA and an ERA and presents the risks remaining at RFETS following completion of the RFCA accelerated actions. EPA considers environmental concentrations corresponding to a 10^{-6} to 10^{-4} cancer risk range and a total noncancer hazard index (HI) less than or equal to 1 to be adequately protective of human health. CDPHE defines acceptable human health risk as a lifetime excess cancer risk less than 1×10^{-6} from exposure to carcinogenic compounds and/or a hazard quotient less than 1.0 for noncarcinogenic compounds. The purpose of the HHRA is to identify whether site concentrations meet EPA's and CDPHE's goals for the protection of human health.

The overall risk management goal identified for use in the ERA is the following:

> *Site conditions due to residual contamination should not represent significant risk of adverse ecological effects to receptors from exposure to site-related residual contamination.*

The ERA was designed and implemented to determine whether site conditions meet the defined goal. Columns 3 through 5 in Table ES.1 present the results of the CRA.

Contaminants of concern (COCs) and ecological contaminants of potential concern (ECOPCs) were identified for the CRA on an EU (Figure ES.5) or AEU (Figure ES.6) basis using the processes outlined in the CRA Methodology. Quantitative risk characterization was then performed for the EUs and AEUs that had COCs and/or ECOPCs identified. COCs were quantitatively evaluated in the HHRA for the WRW and wildlife refuge visitor (WRV) consistent with the anticipated future land use of RFETS as a wildlife refuge. A variety of ecological receptors of concern for the ERA were identified in the CRA Methodology including the PMJM, a federally listed threatened species present at RFETS.

6.1 Soil and Sediment

A HHRA was conducted separately for each of the 12 EUs identified for RFETS. COCs were identified for surface soil/surface sediment. No COCs were identified for subsurface soil/subsurface sediment. Five of the 12 EUs have COCs in surface soil/surface sediment, as listed below:

- Upper Woman Drainage EU (benzo[a]pyrene and dioxins);
- Industrial Area (IA) EU (arsenic and benzo[a]pyrene);
- Upper Walnut Drainage EU (benzo[a]pyrene);
- Wind Blown Area EU (arsenic and plutonium 239/240); and
- No Name Gulch Drainage EU (vanadium).

The COCs were quantitatively evaluated for the WRW and WRV receptor. Cancer risks, noncancer health effects, and radiation doses were calculated and are summarized in Table ES.1. The cancer risk estimates for all EUs were at the low end of EPA's 1×10^{-6} to 1×10^{-4} risk range.

The cancer risk estimates for the WRW in the Upper Woman Drainage EU was estimated for exposure to benzo(a)pyrene (7×10^{-6}) and to dioxins (2×10^{-6}). It is important to note that the benzo(a)pyrene samples that were used in the risk estimate for the Upper Woman Drainage Area EU are located in an area that is now several feet underneath a landfill cover. As part of the uncertainty analysis for the HHRA, the exposure point concentration for benzo(a)pyrene was re-calculated using only samples from the Upper Woman Drainage EU that are located outside the landfill cover. This exposure point concentration is less than the PRG so benzo(a)pyrene would not be identified as a COC for the portion of the Upper Woman Drainage EU that is outside the landfill cover. Accordingly, risks associated with exposure to benzo(a)pyrene in the areas of the EU outside the landfill cover are less than 1×10^{-6}.

In addition, the soil containing the dioxin in the Upper Woman Drainage EU is located approximately 20 feet below the ground surface where exposure is not anticipated. Since the dioxin samples in this EU were confirmation samples collected after an accelerated action, the samples were classified as surface soil and included in the risk assessment.

Even without taking into account the depth of contamination in the Upper Woman Drainage EU, the site is still considered protective of human health because the risk falls within the acceptable range of 1×10^{-6} to 1×10^{-4} cancer risks and a hazard index of 1 for noncarcinogenic effects for benzo(a)pyrene and dioxins.

The cancer risk estimates for the Industrial Area EU are from exposure to arsenic (2×10^{-6}) and to benzo(a)pyrene (1×10^{-6}). Arsenic concentrations in this EU is similar to background concentrations. The cancer risk estimates for the Upper Walnut Drainage EU are from exposure to benzo(a)pyrene (1×10^{-6}). Although identified as a COC in the

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Industrial Area EU and the Upper Walnut Drainage EU, benzo(a)pyrene has not been directly associated with any historical source areas at the site, but could be associated with traffic, pavement degradation, or pavement operations.

The cancer risk estimates for the Wind Blown Area EU are estimated for exposure to plutonium (2 x 10^{-6}) and arsenic (2 x 10^{-6}). Arsenic concentrations in this EU are also similar to background concentrations. The dose estimate for plutonium for the WRW is 0.3 millirems per year (mrems/yr) and for the WRV child is 0.2 mrem/yr. These dose estimates are well below the acceptable annual radiation dose of 25 mrem.

Noncancer health effects were estimated for arsenic in the Industrial and Wind Blown Area EUs and vanadium in the No Name Gulch Drainage EU. The noncancer health effects estimates (HIs) were all below 1, indicating that noncancer health effects are unlikely for WRW and WRV receptors at RFETS.

For EUs that did not have COCs, risks are expected to be similar to risks associated with background conditions. Background cancer risks from naturally occurring metals at RFETs are approximately 2 x 10^{-6} for the WRW and WRV, and HIs are 0.3 for the WRW and 0.1 for the WRV.

6.2 Groundwater

Ingestion of groundwater is an incomplete exposure pathway for the WRW and WRV and therefore, was not evaluated in the HHRA.

6.3 Surface Water

Potential exposure to surface water by WRW or WRV receptors was evaluated in the CRA on a sitewide basis (see Appendix A, Volume 2). For this sitewide evaluation, surface water concentrations were compared to WRW PRGs. Exceedances of surface water PRGs occurred within three EUs: the Industrial Area EU, Upper Walnut Drainage EU, and Upper Woman Drainage EU. Several organics, inorganics, and radionuclides in surface water exceeded their PRGs. Further analyses for each analyte indicated that 1) the exceedances were generally slight and infrequent, and 2) the exceedances were in data from 1998 or older, whereas no exceedances occurred in the more recent data. The more recent data are more representative of current conditions at the site than the older data. For these reasons, significant exposure from the surface water pathway for the WRW or WRV is not expected.

In some areas of the site, groundwater surfaces in seeps. Contact with groundwater in these seeps is theoretically possible for the WRW and WRV. However, because the chemical concentrations in the seeps are low and any contact with water in the seeps is expected to be infrequent and of short duration, the groundwater-to-surface water migration pathway is not considered significant.

Surface water and sediment were evaluated in the ERA portion of the CRA on an AEU basis.

6.4 Air

The indoor air pathway was evaluated on a sitewide basis in the CRA. Volatile chemicals have been detected in the subsurface in some areas of the site. If a building is erected in these areas in the future, the volatile chemicals may migrate through the building foundation indoors and be subsequently inhaled by people. In the CRA, the evaluation for the indoor air inhalation pathway was performed by comparing the maximum detected concentration of VOCs in subsurface soil, subsurface sediment, and groundwater to PRGs for indoor air. In areas where there are no exceedances of the volatilization PRGs, the indoor air inhalation pathway is assumed to be insignificant. Areas where there are exceedances of the volatilization PRGs require further evaluation in the FS due to the potential for an exposure resulting in unacceptable risk to the WRW.

6.5 Ecological Receptors

Of the 12 EUs that were evaluated for potential risk to terrestrial ecological receptors, 8 EUs had ECOPCs identified for surface soil for risk characterization for non-PMJM receptors. PMJM receptors were evaluated in eight EUs because of the location of the PMJM habitat patches and of these EUs, four had surface soil ECOPCs for the PMJM receptor. The four EUs that did not have any ECOPCs identified for either non-PMJM or PMJM receptors (West Area EU, Rock Creek Drainage EU, Southeast Buffer Zone [BZ] EU, and Southwest Buffer Zone EU) are part of the BZ area of RFETS. No ECOPCs were identified for subsurface soil for any of the EUs.

The ECOPC/receptor pairs were evaluated in the risk characterization using a range of exposure scenarios and toxicity values to give a range of risk estimates. The HQs indicate that the potential for risks to PMJM and non-PMJM receptors range from low to moderate in the EUs where ECOPCs were identified. Results of the uncertainty analysis and background risk calculations were also considered to characterize the full range of potential risk and define the uncertainties and conservatism inherent in the HQ models. No significant risks were identified for any receptor in any EU.

In the ERA portion of the CRA, sediment and surface water were evaluated on an AEU basis. Of the seven AEUs that were evaluated for potential risk to aquatic ecological receptors, five AEUs had ECOPCs identified for surface water and sediment. The two AEUs that did not have ECOPCs identified are the Rock Creek AEU and Southeast AEU, both located in the buffer zone area of RFETS. The ECOPCs were evaluated in the risk characterization using multiple lines of evidence including a hazard quotient (HQ) assessment using chemical data and review of drainage-specific conclusions from previous studies. As discussed for each AEU, the previous studies included tissue analyses, aquatic population studies, toxicity bioassays, waterfowl and wading bird exposure studies, and contaminant loading analyses.

The AEU assessments indicate that there are no continuing, significant risks to aquatic life from residual ECOPCs due to RFETS-related operations. Overall, the aquatic communities in the AEUs are limited by natural environmental conditions (for example, low flows and poor habitat) characteristic of this area along the Colorado Front Range.

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No additional risks above what would be expected to be encountered in the natural environment in the vicinity of the AEUs are predicted for the aquatic life receptors evaluated in the ERA.

The ERA also considered the results of ecological monitoring studies that have been conducted since 1991 as part of the characterization of risk. The high species diversity and continued use of the site by numerous vertebrate species verify that habitat quality for these species remains acceptable and the ecosystem functions are being maintained. As discussed for each EU or AEU in the ERA, data collected on wildlife abundance and diversity indicate that wildlife populations are stable and species richness remains high at RFETS. Overall, low risk to survival, growth, and reproduction is predicted for the ecological receptors evaluated at RFETS. This supports the chemical risk conclusions that no significant risks appear to be affecting receptor populations at RFETS.

The overall conclusions from the ERA indicate there is no significant risk of adverse ecological effects to receptors from exposure to site-related residual contamination.

7.0 CONCLUSIONS OF THE RI

Based on the results of the RI, the specific media to be evaluated in the FS are:

- Areas where groundwater contamination exceeds MCLs;
- Areas where subsurface soil and groundwater contamination are above the indoor air volatization PRGs; and
- Surface soil in the WBEU where results of the CRA indicate risk to a WRW is 2 x 10-6 for plutonium-239/240.

Column 6 of Table ES.1 presents the overall results of the RI and Column 7 of Table ES.1 identifies the specific media to be evaluated in the FS.

8.0 RAOS AND ARARS

RAOs are contaminant-specific goals for the final comprehensive response action and are used in developing and evaluating remedial alternatives. ARAR are the promulgated media- and contaminant-specific standards that must be met and that are associated with the actions, locations, and contaminant levels associated with any remedial alternative. In some cases the RAOs specifically include the ARAR standard. The results of the RI are compared to the RAOs to determine whether remedial action is needed to meet the RAOs. Remedial action alternatives are evaluated in the FS and only alternatives that comply with ARARs may be considered for the final remedy. Final remediation goals, including final ARARs, are incorporated into the CAD/ROD for the selected remedy.

8.1 RAOs

Based on the results of the RI, RAOs were developed for groundwater, surface water, soil, and environmental protection. The RAO for environmental protection is incorporated into the RAOs for the specific medium.

8.1.1 Groundwater RAOs

Groundwater RAO 1:

Meet groundwater quality standards, which are the Colorado Water Quality Control Commission (WQCC) surface water standards, at groundwater area of concern (AOC) wells.

Status: Groundwater RAO 1 is met.

Groundwater RAO 2:

Restore contaminated groundwater that discharges directly to surface water as baseflow, and that is a significant source of surface water, to its beneficial use of surface water protection wherever practicable in a reasonable timeframe. This is measured at groundwater sentinel wells. Prevent significant risk of adverse ecological effects.

Status: While this RAO is not met at all sentinel wells, at this time no other alternatives for these areas are feasible or practicable. The ERA concluded that there is no significant risk of adverse ecological effects.

Groundwater RAO 3:

Prevent drinking water and irrigation use of groundwater contaminated at levels above MCLs.

Status: Groundwater quality in the outer BZ and offsite will support all uses. There are some areas on site where groundwater contamination exceeds MCLs; specific measures to prevent use of groundwater in these areas will be evaluated in the FS.

8.1.2 Surface Water RAO

Surface Water RAO:

Meet surface water quality standards, which are the WQCC surface water standards, at surface water POCs.

Status: This RAO is met. There are some areas on site upstream of the surface water POCs where surface water contamination exceeds surface water standards; specific measures to prevent use of surface water in these areas will be evaluated in the FS.

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8.1.3 Soil RAOs

Soil RAO 1:

Prevent migration of contaminants to groundwater that would result in exceedances of groundwater RAOs.

Status: This RAO is met.

Soil RAO 2:

Prevent migration of contaminants that would result in exceedances of surface water RAOs.

Status: This RAO is met.

Soil RAO 3:

Prevent exposures that result in unacceptable risk to the WRW. The 10^{-6} risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at the site or multiple pathways of exposure [40 CFR 300.430(e)(2)(i)(A)(2)]. Prevent significant risk of adverse ecological effects.

Status: While the calculated risks for all surface soil/surface sediment COCs were at the low end of the acceptable risk range, all COCs except plutonium-239/240 in the Wind Blown Area EU were either comparable to background risks for the COC or of limited spatial extent or location.

The 10 CFR 20 Subpart E dose rate criteria for restricted and unrestricted use are met because residual levels of RFETS-related radiological contamination do not result in the exceedance of the annual radiation dose limits for the WRW under the RFETS land use as a wildlife refuge. If this land became unrestricted in the future, annual dose limits for the unrestricted user would also be met.

The qualitative assessment of the indoor air volatilization pathway concluded that the insignificant pathway assumptions could not be met if buildings were constructed and occupied in some areas of the site.

While this RAO is met based on the low risk presented by residual plutonium-239/240 remaining in surface soil, the FS will evaluate removing plutonium-239/240 contamination to below 9.8 pCi/g, which is the 1×10^{-6} WRW risk target concentration. The FS will also evaluate alternatives that prevent buildings from being constructed over areas of the reconfigured IA OU where indoor air volatilization PRGs are exceeded.

8.2 ARARs

The sources of identified ARARs and a summary of how the ARAR is met is provided below. The FS evaluation includes analysis of any chemical-, location- or action-specific aspects of ARARs compliance related to each alternative. A detailed listing of the specific substantive regulatory requirements identified as ARARs is included in the RI, section 9.0.

1. Colorado Basic Standards and Methodologies and Site Specific Standards for Surface Water - This ARAR is met because surface water at the POCs meet surface water quality standards.
2. Colorado Basic and Site Specific Standards for Groundwater - This ARAR is met because the groundwater at the groundwater AOC boundary wells and most sentinel wells meets the groundwater quality standards. At sentinel wells where groundwater data are above the groundwater quality standards, results of the RI conclude that, based on the environmental conditions and type of residual contamination, no further action can be taken. Monitoring will continue. In addition, contaminated groundwater has been addressed on a site wide basis for three plume areas where groundwater treatment systems are installed and operating properly and successfully to improve groundwater quality that could adversely impact surface water quality. These systems will continue to be operated and monitored in accordance with their individual system monitoring and maintenance plans.
3. NPDES - This ARAR is met because the existing NPDES permit, which covered stormwater discharges and sanitary sewage treatment plant discharges. has been properly terminated. Point source and stormwater sources covered by the permit have been removed as part of site closure. In addition, the discharge from the seep treatment system at the Present Landfill to surface water upstream of No Name Gulch meets NPDES substantive requirements for such discharges. As part of the accelerated action decision, the system discharge meets the CERCLA permit waiver provisions. The discharge will be monitored for VOCs and metals with effluent limitations that are the surface water quality standards for Walnut Creek, Big Dry Creek Segment 4a.
4. Federal and Colorado Noxious Weed Act - This ARAR is met because the alternatives will not result in or exacerbate the growth of undesirable plant species nor create difficult measures to control noxious weeds.
5. National Wildlife Refuge System Administration Act - This ARAR is met because the alternatives considered are consistent with the future RFETS land use in accordance with the Rocky Flats National Wildlife Refuge Act and will not interfere with Refuge purposes.
6. Atomic Energy Act, Radiation Protection Standards for Decommissioning Licensed Facilities; Colorado Regulations Pertaining to Radiation Control - This ARAR is met because residual levels of RFETS-related radiological contamination do not result in the exceedance of the annual radiation dose limits for the WRW under the future RFETS land use as a wildlife refuge. If this land became unrestricted in the future, annual dose limits for the unrestricted user would also be met.

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7. Subtitle C: Hazardous Waste Management; Solid Waste Disposal Act; Colorado Hazardous Waste Act - Groundwater Protection and Monitoring - This ARAR is met because groundwater at the Present Landfill (including the landfill seep) and the Original Landfill will be monitored as required under the approved accelerated action decision documents.
8. Subtitle C: Hazardous Waste Management; Solid Waste Disposal Act; Colorado Hazardous Waste Act - Closure and Post Closure - This ARAR is met because the Present and Original Landfills were adequately stabilized and covers were properly installed in accordance with regulatory agency approved designs and will be maintained and monitored in accordance with their individual landfill monitoring and maintenance plan under a post-closure care enforceable document to be determined by the RFCA Parties.
9. Environmental Covenants - The ARAR is met under the assumption that DOE will execute a covenant in accordance with CHWA requirements.

Therefore, the identified ARARs are met.

9.0 RECONFIGURATION OF THE OUS

In 2004, the RFCA Parties modified the 1996 OU Consolidation Plan in RFCA Attachment 1 to reduce the number of OUs that may need individual CAD/RODs. Thus, two OUs: the IA OU and BZ OU, were evaluated in this RI/FS Report.

In 2003, the RFCA Parties modified RFCA Attachment 5. Included in the modification was a refinement of future land use assumptions, as depicted on RFCA Attachment 5, Figure 1, Conceptual RFETS Land Uses. Figure 1 depicted an anticipated boundary of areas that will be subject to institutional controls. The Parties stated that the area that will be subject to institutional controls is subject to modification based upon characterization, future response actions, the results of the CRA, and the final remedial/corrective action decision in the final CAD/ROD.

Results of the RI, RAO and ARARs analysis have concluded that areas impacted by DOE activities are within this boundary (Figure ES.7, Figure ES.8, and Figure ES.9). For purposes of this RI/FS Report, the IA OU boundary will be reconfigured to match the anticipated boundary (RFCA Attachment 5, Figure 1) to consolidate all areas of the site that may require final remedial actions into the final reconfigured IA OU. The remaining portions of the site meet all RAOs and ARARs and have been consolidated into the final reconfigured BZ OU. The reconfigured IA OU boundary is intended for discussion purposes and may be refined throughout the CAD/ROD process. This reconfiguration and nomenclature are used in the remainder of this RI/FS Report.

Since RAOs and ARARs are met without any further action in the reconfigured BZ OU a detailed analysis of alternatives is not required for the reconfigured BZ OU. Two RAOs are not met in the reconfigured IA OU; however, ARARs are met in the reconfigured IA OU. Three alternatives were developed and evaluated in detail for the reconfigured IA OU.

10.0 DETAILED ANALYSIS OF ALTERNATIVES

With the experience and knowledge gained conducting RFCA accelerated actions, and from evaluation of alternatives in the preparation of accelerated action decision documents, the number of available options and alternatives to address residual contamination at RFETS are limited and well understood. Consequently, no formal screening of alternatives prior to the selection of alternatives that are evaluated in detail in the FS is deemed necessary.

Three alternatives for the IA OU were developed and evaluated in detail in accordance with the nine CERCLA evaluation criteria. The alternatives were analyzed individually against each evaluation criterion. The three alternatives were then compared to each other in regard to each criterion.

The following approved completed accelerated actions that include post-closure continued maintenance and monitoring requirements are not reevaluated in the alternatives analysis, but the costs for these activities are included because they will continue to operate in each alternative:

- Post-closure care and monitoring of the Present Landfill and continued operation and maintenance of the Present Landfill seep treatment system;
- Post-closure care and monitoring of the Original Landfill; and
- Operation and maintenance and performance monitoring of the East Trenches Plume, Mound Site Plume, and Solar Ponds Plume Treatment Systems, which are operating properly and successfully.

The passive treatment system for the Present Landfill seep is operating properly and successfully and a system to monitor groundwater upgradient and downgradient of both landfills is in place.

The other actions involve groundwater remediation. Results of the RI indicate that continued operation of these three groundwater actions serves to protect surface water quality over short- and intermediate-term periods by removing contaminant loading to surface water. This protection also serves to meet long-term goals for returning groundwater to its beneficial use of surface water protection.

10.1 Alternative 1: No Further Action With Monitoring

This alternative maintains and monitors the completed actions conducted at the Present and Original Landfills and the 3 groundwater plume treatment systems. Specific monitoring and operations and maintenance requirements for these five actions will continue. Alternative 1 also includes the additional environmental monitoring as described in the Fiscal Year 2005 Integrated Monitoring Plan (IMP) and RFETS access control of the entire site through fencing and signage of the surrounding BZ OU.

This alternative assumes that the National Wildlife Refuge Act specifies the land use and that no institutional control is needed to maintain the land as a national wildlife refuge. It also assumes the State environmental covenant ARAR will be met because DOE will execute the required covenant.

10.2 Alternative 2: Institutional and Physical Controls

This alternative adds institutional and physical controls to Alternative 1. This alternative more specifically addresses the problems posed by exceedances of the volatilization PRGs and MCLs and ensures that the conditions remain protective for the WRW and WRV. Institutional controls include legally enforceable and administrative land use restrictions and physical controls including signage or other physical features to control access and activity within the reconfigured IA OU. Physical controls are items such as signage monuments along the perimeter of the reconfigured IA OU to notify the WRW and WRV that they are at the boundary of the Refuge maintained by USFWS. DOE will retain jurisdiction over the engineered structures and monitoring systems associated with the completed actions. Institutional controls will include the following:

- Prohibition of construction and use of buildings in contaminated areas;
- Prohibition on drilling wells into contaminated groundwater for water use (specifically, drinking water or irrigation use);
- Prohibition on the use of contaminated surface water, groundwater and/or pumping groundwater where the remedy may be impacted;
- Restrictions on excavation in areas above subsurface contamination or intrusion into subsurface contamination;
- Prohibition of excavation at the Present and Original Landfills; and.
- Restrictions on activities that cause soil disturbance in areas with residual surface soil contamination.

In the future, surface water or groundwater monitoring may indicate that institutional controls may no longer be necessary if residual groundwater contamination is below MCLs or the indoor air volatilization PRGs can be met. This will be evaluated as part of future CERCLA periodic reviews.

Institutional and physical controls will be inspected every 3 months. If evidence of activities that violate the restrictions or damage of the physical controls is found, a plan will be developed to correct the condition and the correction will be implemented. Inspections and corrective actions will be documented in an annual report to the regulatory agencies.

10.3 Alternative 3: Targeted Surface Soil Removal

This alternative will remove the top 6-inches of soil in areas of residual surface soil contamination that are above the plutonium-239/240 WRW PRG of 9.8 picocuries per gram (pCi/g), an area of approximately 368 acres. The removed soil would be placed in shipping containers and then shipped for disposal at a permitted low-level radioactive waste disposal facility.

Note that this alternative is not anticipated to completely remove all plutonium contamination because it is not technically feasible to remove all contamination. Previous excavation actions of a similar nature resulted in successful removal of the bulk of contamination, as verified through post-accelerated action confirmation sampling based on a 90-percent confidence level.

This alternative also includes the implementation of Alternative 2.

10.4 Results for Each Alternative

The results of the evaluation for each of the CERCLA criteria, except for the State and community acceptance criteria, which will be addressed in the CAD/ROD after comments on the Proposed Plan have been received, are shown in Table ES.2.

10.5 Comparison of Alternatives

Each alternative complies with ARARs, but Alternative 1 does not meet soil RAO 3 (prevent exposure resulting in an unacceptable risk) and groundwater RAO 3 (prevent drinking water and irrigation use of groundwater contaminated at levels above MCLs).

Alternative 1 is the most implementable alternative because no further removal actions need to be implemented. Alternatives 2 and 3 meet all RAOs, but at additional cost and for Alternative 3, with additional short-term risks to the workers and environment that would need to be controlled during implementation. Alternative 2 can be easily implemented by initiating deed restrictions and limited construction work to install the physical controls (signage). These activities are not expected to entail direct exposure to residual contamination. Alternative 3 is the most difficult to implement, and would take up to 3 years to complete. Alternative 3 uses standard earthmoving and transportation equipment to remove the areas of residual surface soil contamination. However, the implementation of the surface soil removal is much more difficult due to the large extent and large volume of soil to be managed. Wind and precipitation will also increase the potential for soil erosion and sediment loads to the RFETS drainages during the removal process. Major construction to support the long duration of the work (for example, new temporary roadways) would be required to implement Alternative 3.

Alternative 3 permanently reduces the volume of plutonium-contaminated soil on site, and thus has a positive impact on the mobility and toxicity of residual contamination. However, the calculated risk from this contamination is already at the low end of the acceptable risk range. The reduction in absolute risk at this end of the risk spectrum is quite small. The present worth costs are approximately $41.4 million, $43.2 million, and

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$265.5 million for Alternatives 1, 2, and 3, respectively. Thus, Alternative 3 is not cost effective based on the high incremental costs above Alternatives 1 and 2 (approximately $220 million or 500 percent more), to address a risk that is already quite low. The incremental cost increase for Alternative 2 over Alternative 1 is small (approximately $2 million or 5 percent more).

Table ES.1
Summary of the RCRA Facility Investigation-Remedial Investigation (RFI-RI)

Nature And Extent Analytes of Interest	Results of Contaminant Fate and Transport	CRA COCs (human receptors WRW/WRV)	CRA ECOPCs (representative ecological receptors)	Results of CRA	Results of RFI-RI	Areas to be Evaluated in CMS-FS
Purpose: Characterize the nature of and threat posed by hazardous substances and hazardous material and gather data necessary to assess the extent to which the release poses a threat to human health or the environment or to support the analysis and design of potential response actions.		Purpose: Conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to groundwater or surface water, releasing to air, leaching through soil, remaining in the soil, and bioaccumulating in the food chain.				
AIR – Screened Against Air Emission Standards						
No AOIs were identified; however, Air Pollutants of Potential Concern were identified. RADS Americium-241 Plutonium-239/240 Uranium-233/234 Uranium-235 Uranium-238 Screening methodology, standard screened against and results are discussed in Section 6.0.	Results of Contaminant Fate and Transport are discussed in Section 7.0. The total off-site annual EDE of combined radionuclides has been less than 3 percent of the allowable 10 mrem/yr standard, based on samples collected since 1999.	A groundwater/subsurface soil-to-air pathway analysis was completed. A WRW is potentially exposed to contaminants in groundwater that volatize and are transported through soil and released to the atmosphere where they can be inhaled by a WRW. Results of this analysis are in Appendix A, Volume 2.	No ECOPCs were identified in air.	Some areas of the site contain a complete groundwater/subsurface soil-to-air pathway for a WRW. See Figures 8.3 and 8.4 for possible indoor air volatilization exposure areas.	The groundwater/subsurface soil-to-air exposure pathway is identified, for some areas of the site, as a complete exposure pathway (Figures 8.3 and 8.4).	For specific areas of the site that contain a complete groundwater/subsurface soil-to-air exposure pathway, identify mechanisms to prevent unacceptable indoor air exposures.
GROUNDWATER – Screened Against Surface Water Standards						
UHSU RADs Uranium Isotopes (T) VOCs cis-1,2-Dichloroethene (T) 1,2-Dichloroethane (T)* 1,1-Dichloroethene (T) Benzene (T)* Carbon tetrachloride (T) Chloroform (T) Chloromethane (T)* Methylene chloride (T) Tetrachloroethene (T) Trichloroethene (T) total Trihalomethanes (T) Vinyl chloride (T) Metals Arsenic (D) Chromium (T) Nickel (D) Nickel (T) WQP Fluoride (T) Nitrate/Nitrite, as N (T) **LHSU** None Screening methodology, surface water standards screened against and results are discussed in Section 4.0. Included in the methodology is a screen to MCLs, if the MCL is higher than the surface water standard.	Results of Contaminant Fate and Transport are discussed in Section 7.0. GW AOC and sentinel wells were identified as locations to evaluate contaminated groundwater migration and potential to impact surface water. Consequently, included in the Contaminant Fate and Transport section is an evaluation of all groundwater AOIs at GW AOC and sentinel wells against SW standards. All GW AOIs are below surface water standards at all AOC wells. Five groundwater plume areas with the potential to impact surface water quality were identified because some GW AOIs are above surface water standards at some sentinel wells: • Carbon Tetrachloride Plume; • East Trenches Plume (downgradient portion of plume); • Solar Evaporations Ponds and 700 Area Northeast Plumes	Ingestion of groundwater is an incomplete exposure pathway for the WRW and WRV and therefore, was not evaluated in the CRA.	No ECOPCs were identified in groundwater.	No groundwater risk characterization required for ecological receptors since no ECOPCs were identified.	GW AOIs are below SW standards at the GW AOC wells. Five groundwater plume areas with the potential to impact surface water quality were identified because some groundwater AOIs are above surface water standards at some sentinel wells. As part of the Groundwater IM/IRA, an alternatives analysis was conducted to evaluate accelerated action strategies that were feasible and practicable based on the type of residual contamination in these five plume areas and environmental conditions. The selected alternatives were conducted as enhancements to previously implemented remedial actions. Each enhancement was intended to reduce inventories of potential groundwater contaminants and/or reduce the migration of contaminated groundwater that could impact surface water quality. At this time, no other alternatives for these areas are feasible or practicable. Three groundwater treatment systems were installed as accelerated actions under individual decision documents. Continued operation of the three groundwater actions serves to protect surface water quality over short- and intermediate-term periods by removing contaminant loading to surface water. This protection also serves to meet long-term goals for returning groundwater to its beneficial use of surface water protection. Each action is under ongoing performance monitoring consistent with groundwater and	Three groundwater treatment systems will not be re-evaluated in the FS. These actions will be carried forward as actions in a No Further Action Alternative (East Trenches Plume Treatment System; Solar Evaporations Ponds Plume Treatment System; and Mound Site Plume Treatment System). For specific areas of groundwater contaminated above MCLs, identify mechanisms to prevent drinking water or irrigation use.

Table ES.1
Summary of the RCRA Facility Investigation-Remedial Investigation (RFI-RI)

Nature And Extent Analytes of Interest	Results of Contaminant Fate and Transport	CRA COCs (human receptors WRW/WRV)	CRA ECOPCs (representative ecological receptors)	Results of CRA	Results of RFI-RI	Areas to be Evaluated in CMS-FS
Purpose: Characterize the nature of and threat posed by hazardous substances and hazardous material and gather data necessary to assess the extent to which the release poses a threat to human health or the environment or to support the analysis and design of potential response actions.		Purpose: Conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to groundwater or surface water, releasing to air, leaching through soil, remaining in the soil, and bioaccumulating in the food chain.				
	(downgradient portion of plume); • Mound Site and Oil Burn Pit #2 Plumes (downgradient portion of plumes); and • 903 Pad and Ryan's Pit Plumes. An accelerated action and/or enhancement was completed for each of these five areas under the Groundwater IM/IRA in 2005. At this time, no other alternatives for these areas are feasible or practicable. Three groundwater treatment systems were installed as accelerated actions under individual decision documents (East Trenches Plume Treatment System; Solar Evaporations Ponds Plume Treatment System; and Mound Site Plume Treatment System). Continued operation of these three groundwater actions serves to protect surface water quality over short- and intermediate-term periods by removing contaminant loading to surface water.				surface water monitoring required by the FY2005 IMP. GW contamination above MCLs exists in some areas of RFETS (Figure 8.5). A FS is not required for the protection of the environment due to groundwater contamination.	
SURFACE WATER – Screened Against Surface Water Standards						
RADs: Americium-241 (T), Plutonium-239/240 (T), Uranium (T), Gross α (T), Gross β (T) VOCs: cis-1,2-dichloroethene (T), Carbon Tetrachloride (T), Chloroform (T), Methylene Chloride (T), Tetrachloroethene (T), Trichloroethene (T), Vinyl Chloride (T) Metals: Aluminum (D), Beryllium (T), Chromium (T), Lead (T), Nickel (T), Zinc (T) WQP: Nitrate/Nitrite, as N (T) Screening methodology, surface water standards screened against and results are discussed in Section 5.0	Results of Contaminant Fate and Transport are discussed in Section 7.0 RFCA established SW POCs for Segment 5 at the outfalls of the terminal ponds A-4, B-5, and C-2 (stations GS11, GS08 and GS31) and for Segment 4a/4b at the two locations where Walnut Creek and Woman Creek cross Indiana Street (stations GS03 and GS01). Consequently, included in the Contaminant Fate and	No COCs were identified in surface water.	See Appendix A, Volumes 15B1 and 15B2 for ECOPCs.	There is no significant risk of adverse ecological effects to receptors from exposure to site-related residual contamination.	SW AOIs are below SW standards at the SW POCs. There are some areas on site upstream of the surface water POCs where surface water contamination exceeds surface water standards. A FS is not required for the protection of the environment due to surface water contamination.	There are some areas on site upstream of the surface water POCs where surface water contamination exceeds surface water standards; identify measures to prevent use of surface water in these areas.

Table ES.1
Summary of the RCRA Facility Investigation-Remedial Investigation (RFI-RI)

Nature And Extent Analytes of Interest					Results of Contaminant Fate and Transport	CRA COCs (human receptors WRW/WRV)	CRA ECOPCs (representative ecological receptors)	Results of CRA	Results of RFI-RI	Areas to be Evaluated in CMS-FS
Purpose: Characterize the nature of and threat posed by hazardous substances and hazardous material and gather data necessary to assess the extent to which the release poses a threat to human health or the environment or to support the analysis and design of potential response actions.						Purpose: Conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to groundwater or surface water, releasing to air, leaching through soil, remaining in the soil, and bioaccumulating in the food chain.				
					Transport section is an evaluation of all surface water AOIs at SW POCs against SW standards. If data is not available at the SW POC, other data upstream of the SW POC may be used in the analysis.					
SEDIMENT – Screened Against WRW PRGs										
<u>RADs</u> Americium-241 Plutonium-239/240 Uranium- 238	<u>Metals</u> Antimony Arsenic Chromium Silver Thallium	<u>SVOC</u> Benzo(a)pyrene Dibenz(a,h)anthracene			Results of Contaminant Fate and Transport are discussed in Section 7.0.	For human receptors, sediment was combined with surface soil (see soil analysis below)	See Appendix A, Volumes 15B1 and 15B2 for ECOPCs.	There is no significant risk of adverse ecological effects to receptors from exposure to site-related residual contamination.	For human health, see soil analysis below. A FS is not required for the protection of the environment due to sediment contamination.	For human health, see soil analysis below.
Screening methodology, standards screened against and results are discussed in Section 5.0.										
SOIL – Screened Against WRW PRGs (Screening methodology, standards screened against and results are discussed in Section 3.0)										
Surface soil <u>RADs</u> Americium-241 Plutonium-239/240 Uranium-233/234* Uranium-235* Uranium-238* <u>Metals</u> Aluminum Arsenic Chromium Vanadium* <u>VOCs</u>	**Subsurface soil (0.5-3')** <u>RADs</u> <u>Metals</u> Lead* <u>VOCs</u>	**Subsurface soil (3-8')** <u>RADs</u> Americium-241* Plutonium-239/240 Uranium-235* Uranium-238* <u>Metals</u> Chromium* Lead* <u>VOCs</u> Tetrachloroethene*	**Subsurface soil (8-12')** <u>RADs</u> Plutonium-239/240* Uranium-235* Uranium-238* <u>Metals</u> Chromium* <u>VOCs</u> Tetrachloroethene*	**Subsurface soil (12-30')** <u>RADs</u> <u>Metals</u> <u>VOCs</u> Tetrachloroethene* Trichloroethene* 1,1,2,2-Tetrachloroethane* Carbon tetrachloride* Chloroform* Methylene chloride*	Results of Contaminant Fate and Transport are discussed in Section 7.0. Two landfill covers were installed as accelerated actions under individual RFCA decision documents. In the Upper Woman Drainage EU, 2,3,7,8-TCDD TEQ is located at a former incinerator and sample is actually approximately 20 feet below the surface. Benzo(a)pyrene is located at the Original Landfill and is under the Original Landfill cover.	**Surface soil** <u>RADs</u> Pu-239/240[a] <u>Metals</u> Arsenic[a,b] Vanadium[c] <u>VOCs</u> None	**Surface soil** See Appendix A, Volumes 3 – 14 for ECOPCs. **Subsurface soil for any EUs** None	There is no significant risk of adverse ecological effects to receptors from exposure to site-related residual contamination. Background cancer risk from arsenic = 2×10^{-6} WRW **<u>Industrial Area EU</u>** Arsenic (2×10^{-6} WRW) Benzo(a)pyrene (1×10^{-6} WRW) Given background cancer risk for arsenic, RI results are acceptable. **<u>Upper Woman Drainage EU</u>** 2,3,7,8-TCDD (2×10^{-6} WRW) Benzo(a)pyrene (7×10^{-6} WRW) Even without taking into account the depth of contamination, the EU is still considered protective of human health because the risk falls within the acceptable range 1×10^{-6} to 1×10^{-4} cancer risks and a hazard index of 1 for noncarcinogenic effects. **<u>No Name Gulch Drainage EU</u>** Vanadium HI = 0.1 **<u>Wind Blown Area EU</u>** Arsenic (2×10^{-6} WRW)	The calculated risks for all surface soil/surface sediment COCs were at the low end of the acceptable risk range. All COCs, except plutonium-239/240 in the Wind Blown Area EU, were either comparable to background risks or were of limited spatial extent or location. A FS is not required for the protection of the environment due to soil contamination.	Actions at the Present Landfill and Original Landfill will not be re-evaluated in the FS. An alternative analysis was included in the respective landfill IM/IRAs. These actions will be carried forward as actions in a No Further Action Alternative. The calculated risks for all surface soil/surface sediment COCs were at the low end of the acceptable risk range. All COCs, except plutonium-239/240 in the Wind Blown Area EU, were either comparable to background risks or were of limited spatial extent or location. While RFETS is protective of human health based on the low risk presented by the COCs, the CMS-FS will evaluate removal of surface soil within an EU to reduce the residual plutonium-239/240 contamination to below 9.8 pCi/g, which is the 1×10^{-6} WRW risk target concentration.

Table ES.1
Summary of the RCRA Facility Investigation-Remedial Investigation (RFI-RI)

Nature And Extent Analytes of Interest					Results of Contaminant Fate and Transport	CRA COCs (human receptors WRW/WRV)	CRA ECOPCs (representative ecological receptors)	Results of CRA	Results of RFI-RI	Areas to be Evaluated in CMS-FS
Purpose: Characterize the nature of and threat posed by hazardous substances and hazardous material and gather data necessary to assess the extent to which the release poses a threat to human health or the environment or to support the analysis and design of potential response actions.						Purpose: Conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to groundwater or surface water, releasing to air, leaching through soil, remaining in the soil, and bioaccumulating in the food chain.				
<u>SVOCs</u> Benzo(a)pyrene Dibenz(a,h)anthracene	<u>SVOCs</u> Benzo(a)pyrene	<u>SVOCs</u> Benzo(a)pyrene*	<u>SVOCs</u> Benzo(a)pyrene	<u>SVOCs</u>		<u>SVOCs</u> Benzo(a)pyrene[b,d,e]		Given background cancer risk for arsenic, RI results are acceptable. Plutonium- 239/240 (2 x 10^{-6} WRW) <u>**Upper Walnut Drainage EU**</u> Benzo(a)pyrene (1 x 10^{-6} WRW)		
<u>PCBs</u> PCB-1254 PCB-1260 <u>Dioxins</u> 2,3,7,8-TCDD TEQ	<u>PCBs</u>	<u>PCBs</u>	<u>PCBs</u>	<u>PCBs</u> PCB-1260		<u>Dioxins</u> 2,3,7,8-TCDD TEQ[d] **Subsurface soil for any EUs** None				

[a] Wind Blown Area EU (see Appendix A, Volume 9)
[b] Industrial Area EU (see Appendix A, Volume 14)
[c] No Name Gulch Drainage EU (see Appendix A, Volume 6)
[d] Upper Woman Drainage EU (see Appendix A, Volume 10)
[e] Upper Walnut Drainage EU (see Appendix A, Volume 7)

RADs = radionuclides
VOCs = volatile organic compounds
SVOCs = semi-volatile organic compounds
PCBs = polychlorinated biphenyls
T = Total metal
D = Dissolved metal
* = Indicate those AOIs that have a frequency of detection of less than 1% above the designated standard.

Table ES.2
Analysis of Alternatives for the Proposed Reconfigured IA OU

	No Further Action With Monitoring (Alternative 1)	Institutional and Physical Controls (Alternative 2)	Targeted Surface Soil Removal (Alternative 3)
Alternative Description	Maintains and monitors the completed actions conducted at the Present and Original Landfills and the groundwater treatment systems. Alternative 1 also includes the additional environmental monitoring as described in the Final Draft FY2005 IMP, dated September 8, 2005. Note: This alternative assumes that the National Wildlife Refuge Act specifies the land use and that no institutional control is needed to maintain the land as a national wildlife refuge.	Includes Alternative 1 plus institutional and physical controls. Institutional controls include legally enforceable and administrative land use restrictions. Physical controls include signage.	Includes Alternative 2 plus targeted removal of surface soil within an EU to reduce the residual plutonium-239/240 contamination to below 9.8 pCi/g, which is the 1×10^{-6} WRW risk target concentration.
Evaluation Criteria			

Protection of Human Health and the Environment	This alternative is protective of human health and the environment because:
	• With all RFCA actions complete, the CRA shows that the incremental risk to the WRW is at or below 1×10^{-6} or an HI of 1 for soil and sediment with residual contamination above background, except in the Wind Blown Area EU where the calculated risk to a WRW is 2×10^{-6} for plutonium-239/240. Under CERCLA, the Wind Blown Area EU is still considered protective of human health because the risk falls within the acceptable range of 1×10^{-6} to 1×10^{-4} cancer risks and a HI of 1 for noncarcinogenic effects.
	• With all RFCA actions complete, the CRA indicates that there is no significant ecological risk from residual contamination within all environmental media across RFETS.
	• Actions at the Present and Original Landfills provide protection of human health and the environment.
	• Groundwater actions are operating as designed to remove contamination captured to meet appropriate surface water quality standards at surface water POCs.
	• The IMP monitoring of groundwater and surface water provides data to verify that RFETS continues to be protective of human health and the environment. The IMP also includes the environmental monitoring of the Present and Original Landfills, the Present Landfill seep treatment system, and the groundwater treatment systems.
		This alternative is protective of human health and the environment because:
		• See Alternative 1.
		• Alternative 2 increases the protectiveness of Alternative 1 because institutional controls will provide the following:
		  • Prohibition on construction and use of buildings in contaminated areas.
		  • Prohibition on drilling wells into contaminated groundwater for water use (specifically drinking water or irrigation use).
		  • Prohibition on the use of contaminated surface water, groundwater and/or pumping groundwater where the remedy may be impacted.
		  • Restrictions on excavation in areas above subsurface contamination or intrusion into subsurface contamination.
		  • Prohibition on excavation at the Present and Original Landfills.
		  • Restrictions on activities that cause soil disturbance in areas with residual surface soil contamination.
		• In addition, Alternative 2 will prohibit construction of buildings for human occupancy, thereby eliminating the indoor air volatilization pathway.
		• Signage monuments will be installed as a physical control along the perimeter of the IA OU to notify the WRW and WRV that they are at the boundary of the Refuge maintained by USFWS.
			This alternative is protective of human health and the environment because:
			• See Alternatives 1 and 2.
			• Alternative 3 increases the protectiveness of Alternatives 1 and 2 because targeted surface soil removal will reduce plutonium-239/240 contamination to below 9.8 pCi/g.
			• Surface soil removal will result in short-term adverse impacts to ecological resources, including potential impacts to PMJM habitat.
			• Removal of surface soil increases the potential to mobilize residual contamination, particularly if a large area of soil is removed, or if the removal is on a steep slope or in close proximity to a stream segment. It also increases the potential for wind erosion.

Compliance With ARARs and RAOs	• This alternative complies with all ARARs. • This alternative meets all RAOs except soil RAO 3 (prevent exposure resulting in unacceptable risk to WRW) because of the risk related to indoor air volatilization, and groundwater RAO 3 (prevent drinking water and irrigation use of groundwater contaminated at levels above MCLs). • The Present Landfill RFCA decision document requires institutional controls to be put in place at the time the post-closure period begins. However, institutional controls for the Original Landfill will not be required until the CAD/ROD. Alternative 1 assumes that these controls will be in place but that no other institutional controls will be implemented.	• This alternative complies with all ARARs. • This alternative meets all RAOs.	• This alternative complies with all ARARs. • This alternative meets all RAOs.
Long-term Effectiveness and Permanence	• Accelerated actions have removed contaminated wastes, materials, debris, and soil providing a high degree of long-term effectiveness and permanence. • Landfills have been closed in accordance with regulatory agency-approved closure plans as long-term solutions. • Remaining building structures either meet free release standards or have fixed contamination that is 6 feet or more below ground surface. • Groundwater treatment systems are permanent passive systems requiring limited operational attention. • Monitoring through the IMP provides additional assurance of permanence.	See Alternative 1 plus: • Institutional controls are designed to provide the mechanisms that permanently maintain the completed actions conducted at RFETS and the monitoring consistent with the requirements in all accelerated action decision documents. • In the very long term, institutional controls may fail. • An environmental covenant will increase the long-term permanence of institutional controls.	See Alternative 2 plus: • Removal of surface soil will permanently and effectively reduce plutonium-239/240 contamination to below 9.8 pCi/g. • Surface soil removal reduces remaining residual surface contamination that could be mobilized in the future if disturbed.

Table ES.2
Analysis of Alternatives for the Proposed Reconfigured IA OU

	No Further Action With Monitoring (Alternative 1)	Institutional and Physical Controls (Alternative 2)	Targeted Surface Soil Removal (Alternative 3)
Reduction of Toxicity, Mobility or Volume through Treatment	• Groundwater treatment systems remove contaminants thereby reducing contaminant loading to surface water. • The Present Landfill seep treatment system provides treatment to remove the VOC contamination from the landfill seep. • Experience and knowledge gained during accelerated actions have shown that it is not technically feasible to reduce toxicity, mobility, or volume of residual plutonium in surface soil through treatment. • All of the RFCA accelerated actions (except the landfills) included removal of contaminated structures and environmental media. Removal provides the highest level of reduction of toxicity, mobility, and volume. • Where subsurface removal was not conducted, the contaminated material or media is fixed and/or not considered mobile in the environment.	• See Alternative 1.	See Alternative 1 plus: • Removal of surface soil and thus reducing plutonium-239/240 contamination to below 9.8 pCi/g will reduce toxicity, mobility, and volume. • Surface soil removal reduces remaining residual surface contamination that could be mobilized in the future if disturbed.
Short-term Effectiveness	• Workers and the public are not at risk because no additional action is required in this alternative.	See Alternative 1 plus: • Institutional controls are effective immediately after the controls have been established.	See Alternative 2 plus: • Removal of surface soil will result in an incremental risk to the workers and the public through the removal and transportation operations. • Surface soil removal will result in short-term adverse impacts to ecological resources, including potential impacts to PMJM habitat. • Removal of surface soil increases the potential to mobilize residual contamination, particularly if a large area of soil is removed, or if the removal is on a steep slope or in close proximity to a stream segment. It also increases the potential for wind erosion.
Implementability	• No further action is easily implemented because all accelerated actions are complete. • Post-accelerated action monitoring of the Present and Original Landfills is easily implemented because the monitoring systems are established. • Monitoring through the IMP is easily implemented because the monitoring network is established.	See Alternative 1 plus: • Institutional controls are easily implemented. • Physical controls, such as signage, are easily implemented.	See Alternative 2 plus: • Removal of surface soil is implementable with standard earthmoving and transportation equipment.
Cost[a]	Capital Cost: $0 Annual O&M Cost: $2,530,000 Present Worth Cost: $41,350,000 Groundwater treatment system media replacement costs are estimated at $728,000 every 5 years. The estimated costs for preparing materials for the CERCLA periodic reviews is $153,000 every 5 years.	Capital Cost: $1,120,000 Annual O&M Cost: $45,000 (Alternative 2 only) Total Annual O&M Cost: $2,575,000 (includes Alternatives 1 and 2), less the periodic media replacement costs and CERCLA review costs Present Worth Cost: $43,170,000 (includes Alternatives 1 and 2)	Surface Soil Removal Capital Cost: $222,340,000 (assumes up to approximately 368 acres for surface soil removal and disposal as low-level radionuclide-contaminated soil) Total Capital Cost: $223,460,000 (includes Alternatives 1, 2 and 3) Annual O&M Cost: Varies from $206,000 to $70,000 (Alternative 3 only) Total Annual O&M Cost: $2,781,000 to 2,645,000 (includes Alternatives 1, 2, and 3), less the periodic media replacement costs and CERCLA review costs Present Worth Cost: $265,510,000 (includes Alternatives 1, 2 and 3)
State Acceptance	Discussion of this criterion will be provided in the CAD/ROD.	Discussion of this criterion will be provided in the CAD/ROD.	Discussion of this criterion will be provided in the CAD/ROD.
Community Acceptance	Discussion of this criterion will be provided in the CAD/ROD.	Discussion of this criterion will be provided in the CAD/ROD.	Discussion of this criterion will be provided in the CAD/ROD.

[a] Capital costs are in 2005 dollars and O&M costs are calculated for 30 years at a discount rate of 5 percent.

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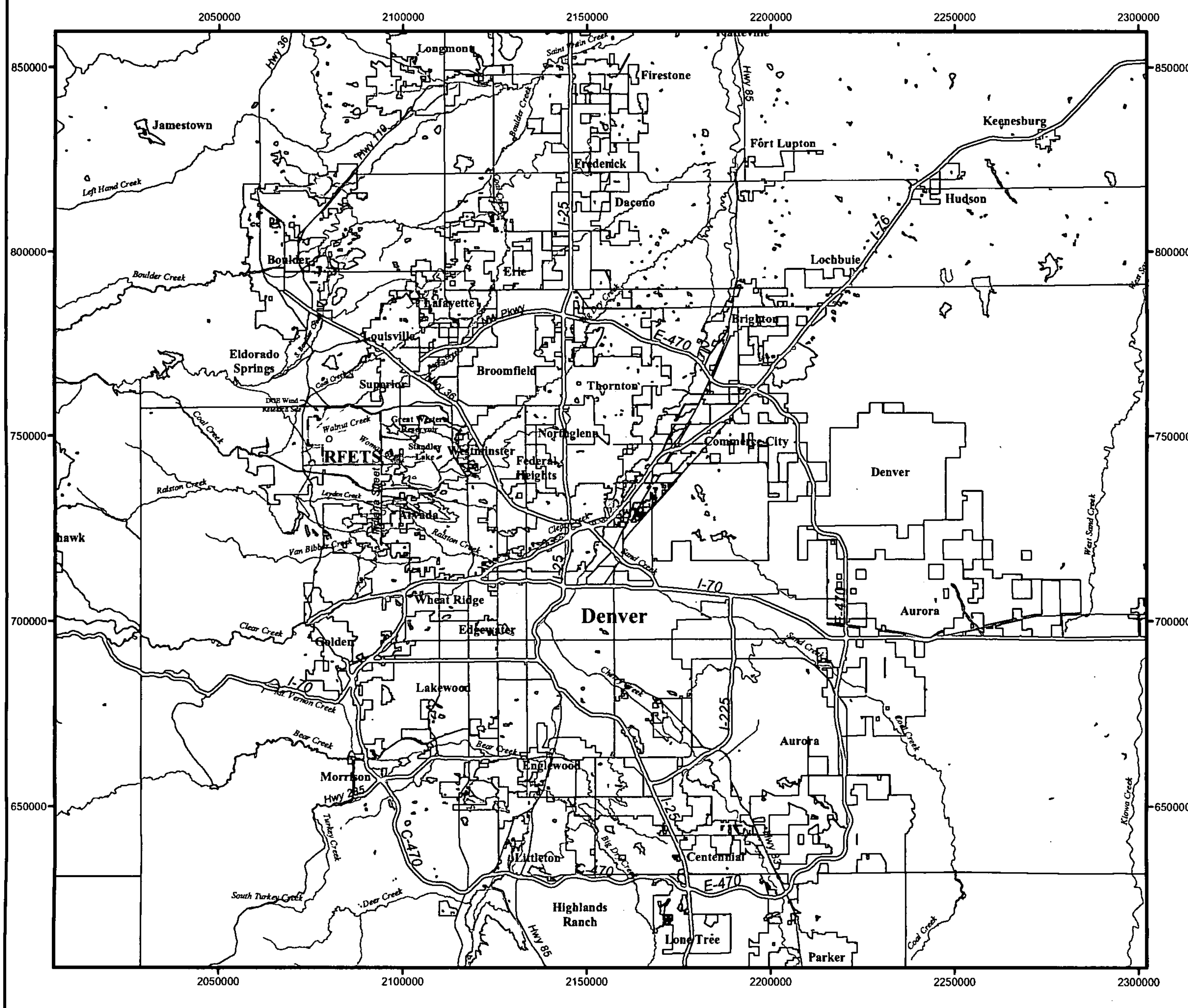
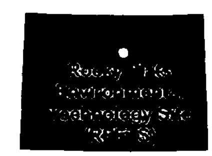
Figure ES.1
Location of
Rocky Flats Environmental
Technology Site (RFETS)



Key

Highway	
Interstate	
Streams	
Lakes and Ponds	
Site Boundary	
City Boundary	
County Boundary	



Colorado

N
W E
S

0 3 6 Miles

Scale 1:480,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

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Fig_ES_01_Denver_area_map_RIFS.mxd

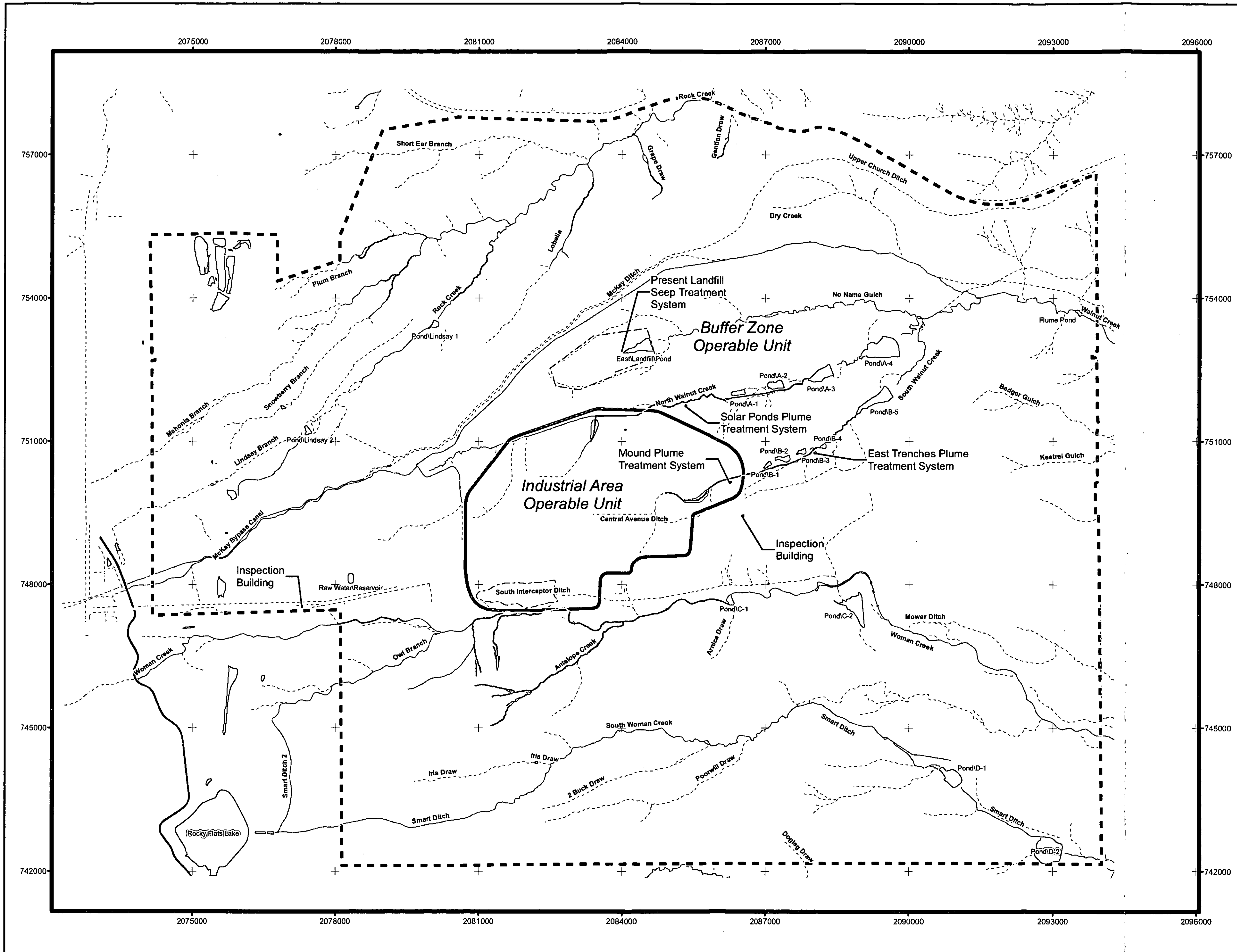

Figure ES.2
Buffer Zone and Industrial Area Operable Units Boundaries and Groundwater Treatment Systems and Landfill Locations

Key

- Original landfill
- Present landfill

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 1,000 2,000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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36

37

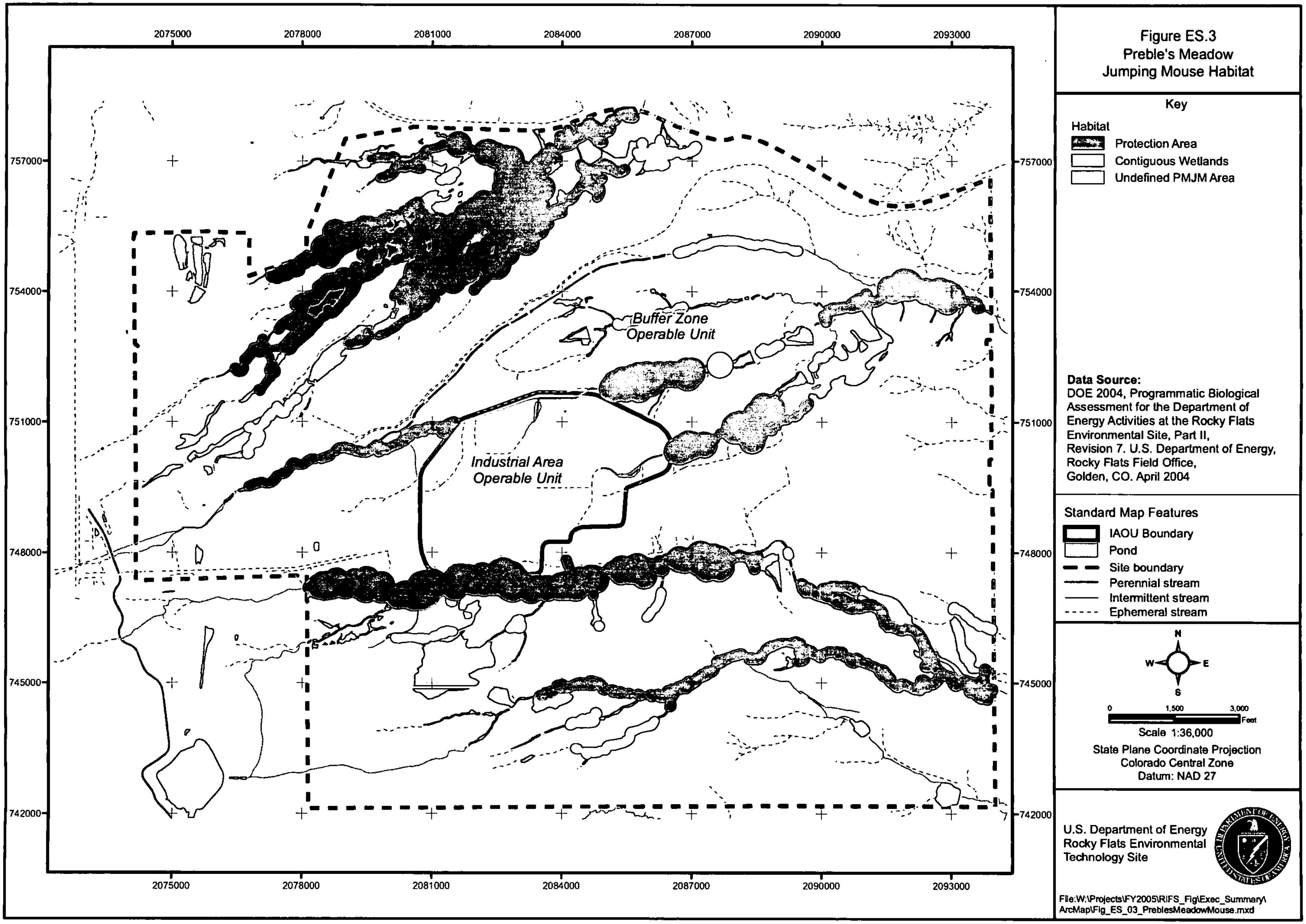

Figure ES.3
Preble's Meadow Jumping Mouse Habitat

38

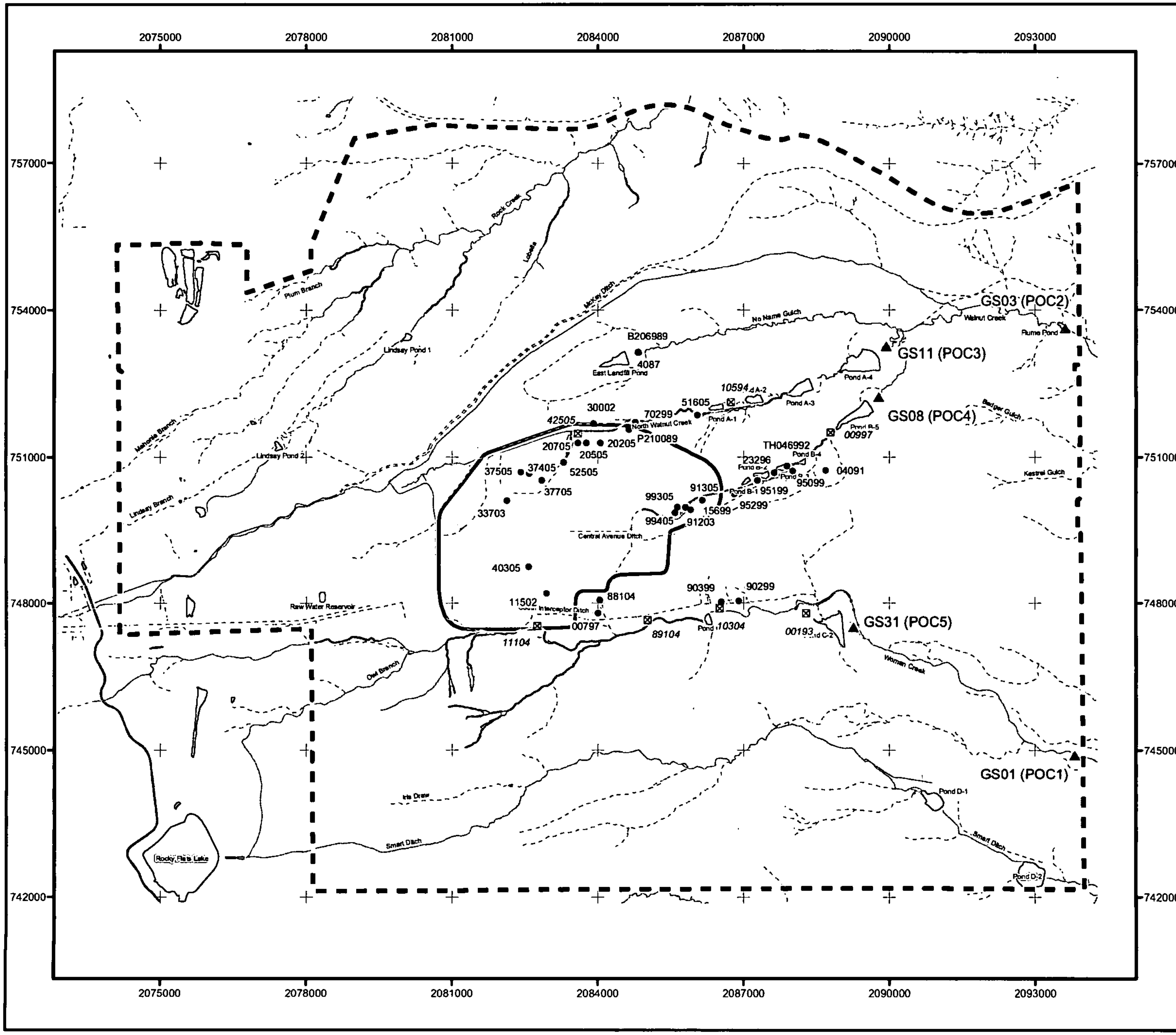

Figure ES.4
Groundwater and Surface Water Evaluation Locations

KEY

- Area of Concern Well
- Sentinel Well
- Surface Water Point of Compliance

Notes:
1) Groundwater monitoring in the Present Landfill and Original Landfill areas is defined in corresponding RFCA Decision Documents. This is defined and shown in the FY05 IMP.
2) Some of the wells shown on this figure and listed in the IMP will be replaced (with wells that have different identification numbers) and the IMP will be updated accordingly.

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 1,500 3,000 Feet

Scale 1:36,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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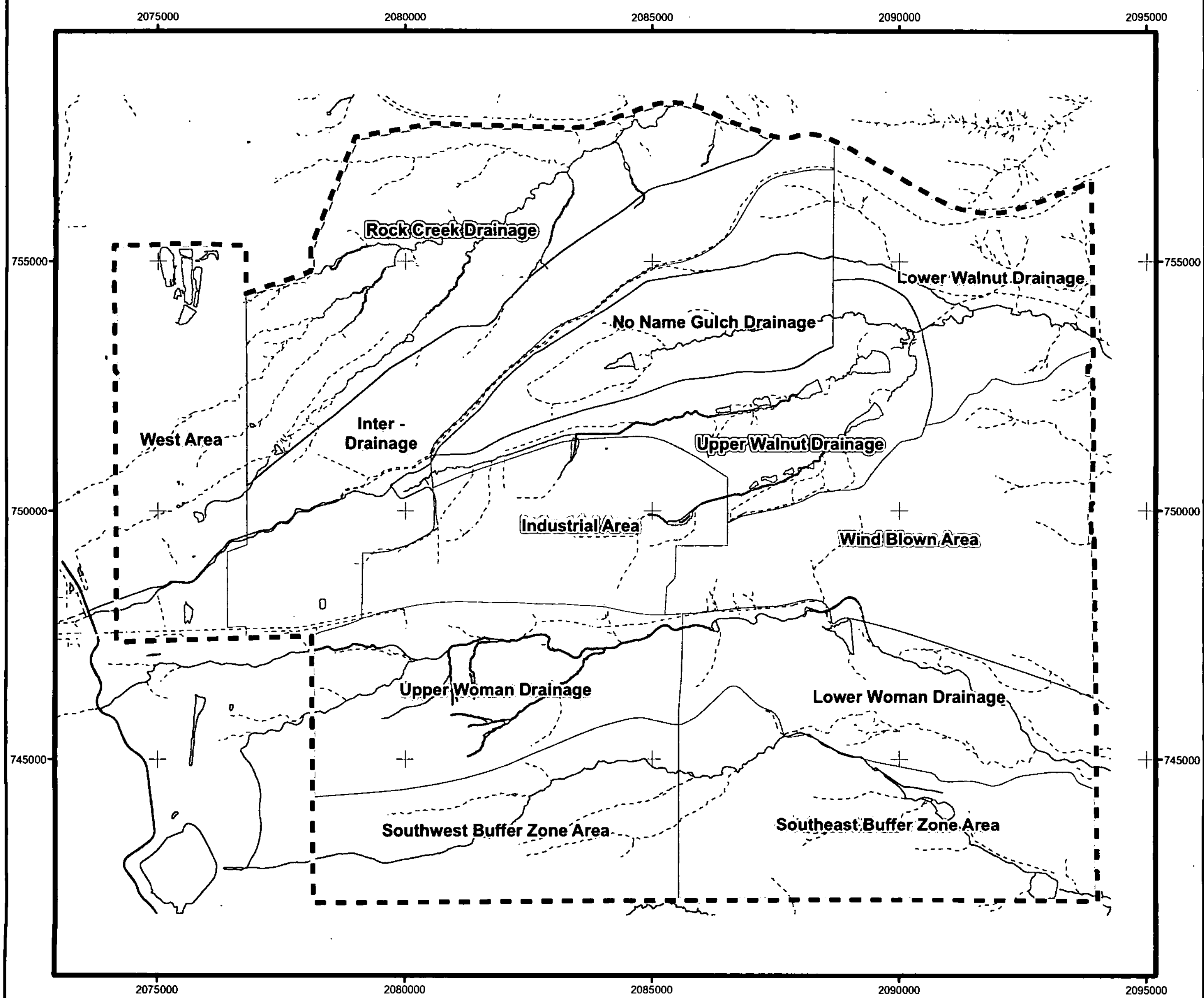

Figure ES.5
Rocky Flats Environmental Technology Site
Exposure Units

KEY

- Exposure unit boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W
E
S

0 1,500 3,000 Feet

Scale 1:36,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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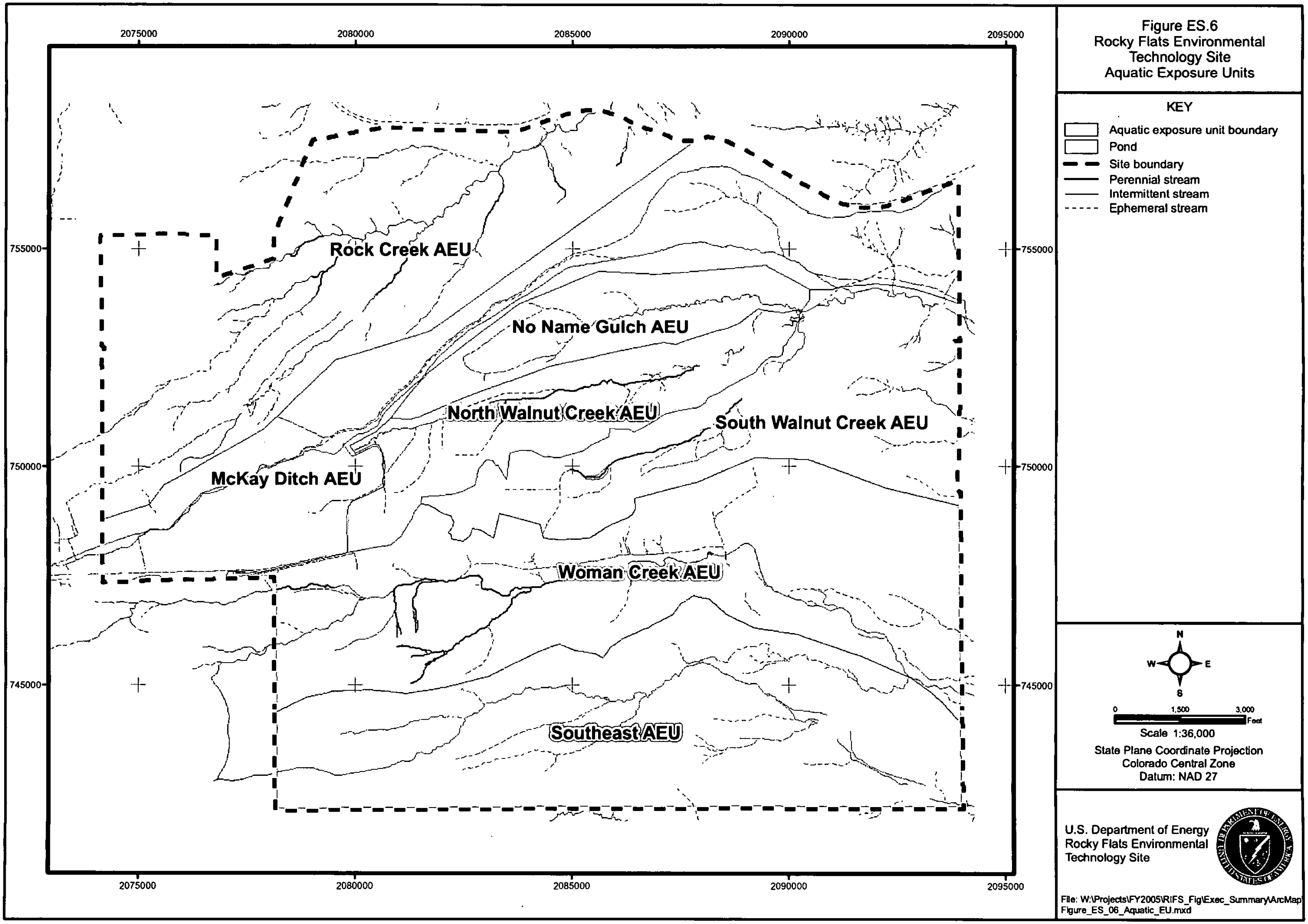
Figure ES.6
Rocky Flats Environmental Technology Site
Aquatic Exposure Units
KEY
Aquatic exposure unit boundary
Pond
Site boundary
Perennial stream
Intermittent stream
Ephemeral stream
Rock Creek AEU
No Name Gulch AEU
North Walnut Creek AEU
South Walnut Creek AEU
McKay Ditch AEU
Woman Creek AEU
Southeast AEU
2075000
2080000
2085000
2090000
2095000
755000
750000
745000
N
W
E
S
0
1,500
3,000
Feet
Scale 1:36,000
State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27
U.S. Department of Energy
Rocky Flats Environmental Technology Site
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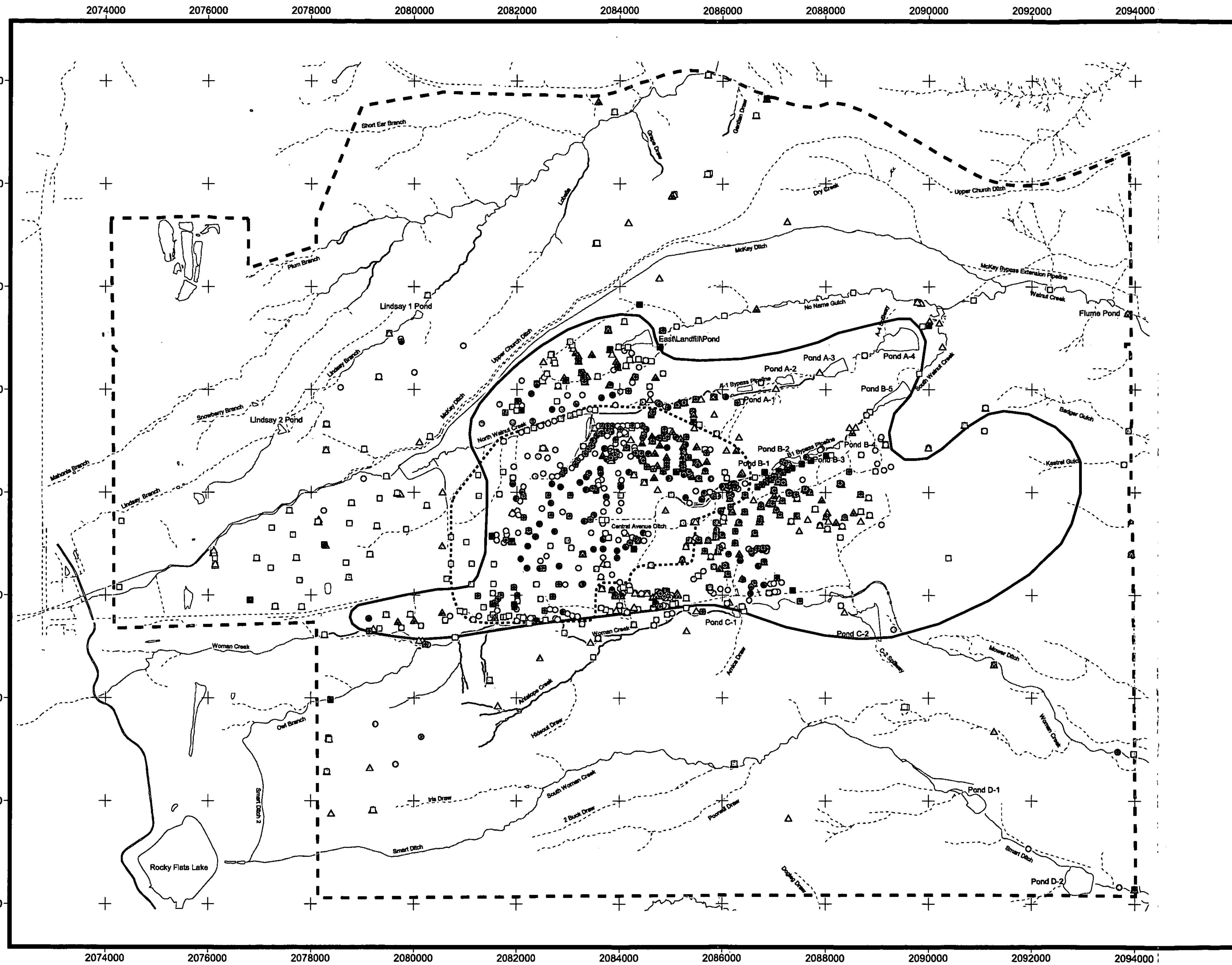

Figure ES.7

UHSU Groundwater Sampling Locations Where Composite MCLs Were Exceeded

KEY

- ○ Sample collected since January 1, 2000
- □ Sample collected between January 1, 1995 and December 31, 1999
- △ Sample collected between June 28, 1991 and December 31, 1994
- ● Concentrations > MCL
- ○ Concentrations <= MCL

Standard Map Features

- Proposed reconfigured IA OU boundary
- IA OU boundary
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N / S / E / W

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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41

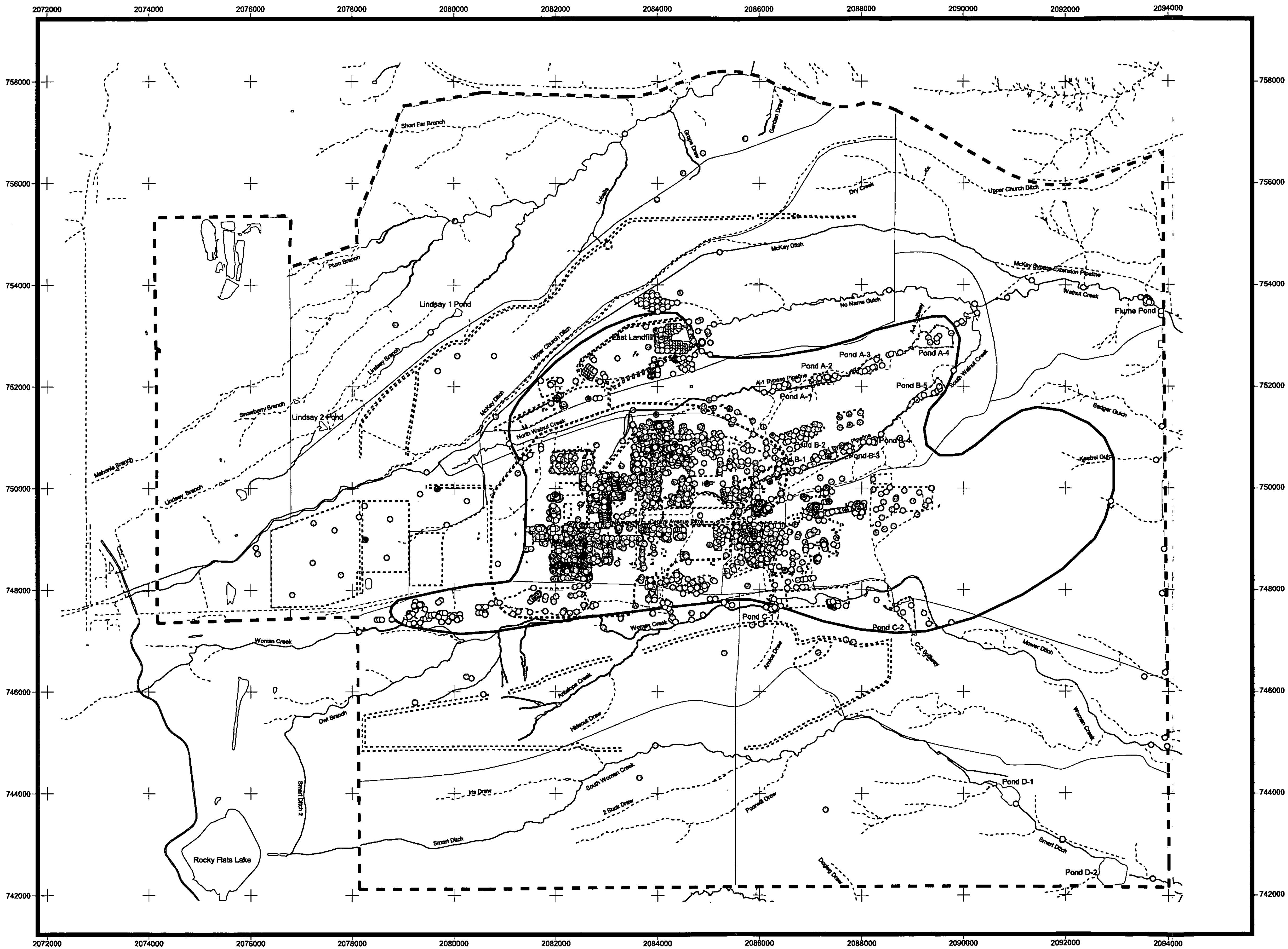

Figure ES.8

Subsurface Soil Sampling Locations Where Volatilization PRGs Were Exceeded

KEY

- Exceeded volatilization PRGs
- Did not exceed volatilization PRGs

A location is classified as a PRG exceedance if any analyte was detected at a concentration exceeding it's PRG since June 28, 1991.

Standard Map Features

- Proposed reconfigured IA OU boundary
- IA OU boundary
- Historical IHSS/PAC
- Site boundary
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream

Exposure Units

- Industrial Area
- Inter-Drainage
- Lower Walnut Drainage
- Lower Woman Drainage
- No Name Gulch Drainage
- Rock Creek Drainage
- Southeast Buffer Zone Area
- Southwest Buffer Zone Area
- Upper Walnut Drainage
- Upper Woman Drainage
- West Area
- Wind Blown Area

N W E S

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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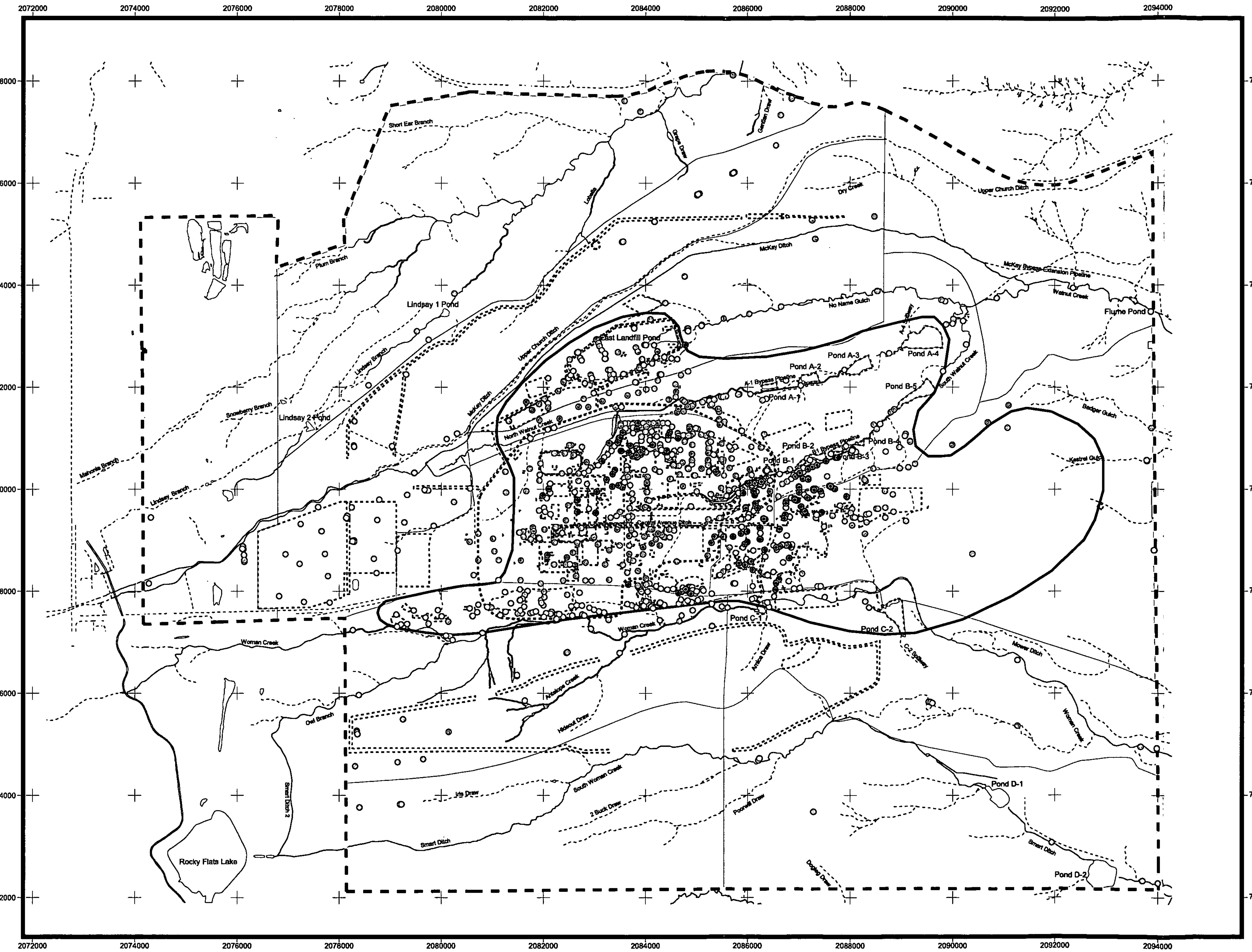

Figure ES.9

Groundwater Sampling Locations Where Volatilization PRGs Were Exceeded

KEY

- ● Exceeded volatilization PRGs
- ○ Did not exceed volatilization PRGs

A location is classified as a PRG exceedance if any analyte was detected at a concentration exceeding it's PRG since June 28, 1991.

Standard Map Features

- Proposed reconfigured IA OU boundary
- IA OU boundary
- Historical IHSS/PAC
- Site boundary
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream

Exposure Units

- Industrial Area
- Inter-Drainage
- Lower Walnut Drainage
- Lower Woman Drainage
- No Name Gulch Drainage
- Rock Creek Drainage
- Southeast Buffer Zone Area
- Southwest Buffer Zone Area
- Upper Walnut Drainage
- Upper Woman Drainage
- West Area
- Wind Blown Area

N W E S

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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DRAFT

RCRA Facility Investigation – Remedial Investigation/ Corrective Measures Study – Feasibility Study Report for the Rocky Flats Environmental Technology Site

Section 1.0
Introduction

This Draft was prepared by Kaiser-Hill Company, L.L.C.
for the U.S. Department of Energy

October 2005

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1.0 INTRODUCTION

This Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) Report for the Rocky Flats Environmental Technology Site (RFETS or site) was prepared in accordance with the Final Work Plan for the Development of the Remedial Investigation and Feasibility Study Report (RI/FS Work Plan) (DOE 2002a). Because remedial activities at RFETS are also being conducted under the Resource Conservation and Recovery Act (RCRA) and the Colorado Hazardous Waste Act (CHWA), this RI/FS Report also meets RCRA/CHWA requirements for a RCRA Facility Investigation/Corrective Measures Study (RFI/CMS) report. For simplicity, the report is hereinafter referred to as the RI/FS Report. The RI/FS Report compiles the completed Technical Memoranda, Summary Reports, and Comprehensive Risk Assessment (CRA) tasks identified in the RI/FS Work Plan as Tasks 1 through 14. This completed Report is the final task, Task 15, of the RI/FS Work Plan.

RFETS is a 6,240-acre U.S. Department of Energy (DOE) facility owned by the United States. RFETS is located approximately 16 miles northwest of Denver, Colorado, and approximately 10 miles south of Boulder, Colorado (Figure 1.1).

DOE conducts CERCLA response actions pursuant to its CERCLA Lead Agency authority under Executive Order 12580. DOE activities in this regard are subject to the U.S. Environmental Protection Agency's (EPA's) and the State of Colorado's statutory authorities to approve and monitor both the conduct and completion of the cleanup. The EPA Region VIII and the Colorado Department of Public Health and Environment (CDPHE) exercise these respective authorities at RFETS and they are referred to as the Lead Regulatory Agencies (LRA). CERCLA response actions and RCRA/CHWA corrective and closure actions are currently subject to the July 19, 1996, Rocky Flats Cleanup Agreement (RFCA) and approved modifications. RFCA is a CERCLA Federal Facility Agreement and RCRA/CHWA Consent Order (CERCLA VIII-96-21; RCRA (3008[h]) VIII-96-01; State of Colorado Docket #96-07-19-01) between DOE, EPA, and CDPHE. Other CERCLA and RCRA/CHWA agreements and orders preceded RFCA (see Section 1.4.1).

Operations began at RFETS in the early 1950s. Components for nuclear weapons were fabricated in a large industrial complex at RFETS from plutonium, uranium and metals such as beryllium and stainless steel. Other activities at RFETS included chemical recovery and purification of plutonium and research and development related to component fabrication (DOE 1998a).

As further summarized in this section, these industrial activities resulted in releases of CERCLA hazardous substances including RCRA/CHWA hazardous wastes and constituents to the environment. Some releases were the result of accidents, such as fires or spills from pipelines and tanks. Others were the result of waste management practices that did not properly isolate wastes from the environment, such as allowing drums of contaminated used solvents stored outdoors to corrode and leak and placing contaminated aqueous wastes in surface impoundments with leaking liners.

Since the 1980s investigation and cleanup of hazardous substances releases at RFETS have been ongoing under CERCLA and RCRA/CHWA. Contaminants released to the environment include, but are not limited to plutonium-239/240, americium-241, enriched and depleted uranium, carbon tetrachloride, tetrachloroethene, trichloroethene, nitrates and chromium.

As part of this process these known or suspected release locations were delineated by 183 Individual Hazardous Substance Sites (IHSSs), 146 Potential Areas of Concern (PACs), 31 Under Building Contamination (UBC) sites and 61 Potential Incidents of Concern (PICs) (totaling 421 areas). The IHSSs, PACs, UBC sites and PICs have been thoroughly investigated and characterized as appropriate. Any required accelerated actions triggered by contamination levels found during investigation and characterization have been completed by DOE and approved by the LRA. The disposition process for these historical IHSSs, PACs, UBC sites and PICs is further described and discussed in this section.

These 183 historical IHSSs were contained within 15 designated Operable Units (OUs) within the RFETS property boundary and one OU, designated OU 3, for the area outside the RFETS boundary. Table 1.1 and Table 1.2 list the 16 OUs and associated historical IHSSs, under RFCA and the preceding CERCLA and RCRA/CHWA agreement/order, known as the 1991 Interagency Agreement (IAG). RFCA also established the Buffer Zone and Industrial Area OUs, which encompassed all of the RFETS property. Table 1.3 shows the final RFCA consolidated OUs. Figure 1.2 and Figure 1.3 show the locations of the historical IHSSs, PACs and UBC sites within the RFETS boundary.[1] Figure 1.4 shows the approximate historical PIC locations.

By the beginning of the 1990s serious safety concerns were being raised about inventories of special nuclear materials (plutonium and enriched uranium) and hazardous substances and legacy wastes contained in aging RFETS facilities, and about hazardous substances and legacy wastes stored in temporary structures. The disposition of these materials was uncertain since approved treatment technologies and disposal facilities were not yet operable or did not exist. While DOE and RFETS personnel were working to resolve many of these concerns, in the mid-1990s the RFETS mission changed from production to cleanup and closure. This entailed safe final disposition of all of these materials and wastes and disposition of contaminated buildings in addition to disposition of the wastes from required environmental cleanup already underway.

To complete this mission the following major accomplishments have been achieved:

- All special nuclear materials were packaged and shipped to other DOE facilities, including:
  - Approximately 21 tons of weapons-grade material; and

[1] This totals 421 IHSS, PAC, UBC site and PIC areas. Four IHSSs are located within OU 3 Offsite Areas. The disposition of OU 3 through a Final Corrective Action Decision/Record of Decision is discussed in section 1.4.2.2. Volume 2 of the Comprehensive Risk Assessment, Appendix A of this RI/FS Report contains a data summary review for OU 3.

- Approximately 100 tons of plutonium residues and 30,000 liters of plutonium and enriched uranium solutions, which were processed prior to shipment to meet strict transportation and receiving site requirements.

- Over 800 structures were cleaned up as necessary and removed. This included the safe decommissioning, decontamination, and demolition of five major plutonium processing and fabrication facilities and two major uranium fabrication facilities totaling over 1,000,000 square feet (ft^2).
- A total of 1,457 gloveboxes, many of which were highly internally contaminated, underwent deactivation, decontamination, removal and size reduction as required and disposal off site. Glovebox sizes ranged up to the size of an 18-wheel tractor-trailer vehicle.
- A total of 690 tanks, many of which were highly internally contaminated, underwent deactivation, decontamination, removal and size reduction as required and disposal off site. Tank sizes ranged up to three stories high and 30,000 gallons capacity.
- Four hundred twenty-one historical IHSSs, PACs, UBC sites and PICs have been thoroughly investigated and dispositioned through appropriate accelerated remedial actions or by determining that no accelerated action is required.
- Covers have been installed on the two RFETS historic landfills, the Present Landfill and the Original Landfill, historical IHSSs 114 and 115, to meet final closure performance criteria.
- Three contaminated groundwater plume barriers and passive treatment systems and a seep collection and passive aeration treatment system were installed and continue to operate (an OU 1 groundwater treatment system was also installed and subsequently removed). Over 11 million gallons of groundwater and over 5 million gallons of seep water have been successfully treated. See Figure 1.2 for the location of these systems. These systems and contaminants removed are:
  - Solar Ponds Plume Treatment System, which collects and passively treats groundwater to remove nitrates and uranium;
  - East Trenches Plume Treatment System, which collects and passively treats groundwater to remove volatile organic compounds, primarily carbon tetrachloride, tetrachloroethene and trichloroethene and their degradation products;
  - The Mound Site Plume Treatment System, which collects and passively treats groundwater to remove volatile organic compounds, primarily carbon tetrachloride, tetrachloroethene and trichloroethene and their degradation products; and
  - The Present Landfill Seep Treatment System, which passively treats groundwater collected primarily from the perimeter of the Present Landfill to remove volatile organic compounds, primarily benzene.

- All wastes from these cleanup and closure activities, including legacy wastes and contaminated excavated soils, have been treated and processed as required by the receiving facilities, packaged to meet strict transport requirements, and shipped off site. This includes:
  - Over 15,000 cubic meters (m^3) of transuranic radioactive waste (TRU), including wastes classified as transuranic mixed waste (TRM) (radioactive wastes mixed with hazardous wastes), have been shipped to DOE's Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico.
  - Over 500,000 m^3 of low-level radioactive waste (LLW), including low-level mixed wastes (LLMW) have been shipped to DOE and commercial permitted facilities.
  - Over 820,000 m^3 of sanitary wastes, which includes building demolition debris and other wastes including soils from cleanup that are not regulated as radioactive or hazardous wastes, have been shipped to commercial permitted facilities.
  - Over 4,300 m^3 of hazardous wastes, which includes building demolition debris and other wastes including soils from cleanup classified as hazardous wastes, have been shipped to commercial permitted facilities.

As described in more detail in this Section, these major accomplishments were achieved by or in coordination with the conduct of accelerated CERCLA and CHWA/RCRA remedial actions. To fully complete the cleanup and closure mission, a final CERCLA and CHWA/RCRA remedial decision based on levels of hazardous substances remaining is now required.

1.1 Scope and Purpose of Report

The purpose of the RI/FS Report is to present the findings of the field investigation, including the nature and extent of contamination, contaminant fate and transport, and CRA results, as well as the development, screening, and detailed analysis of alternatives.

When approved by CDPHE and EPA, the RI/FS Report will be the basis for development of a Proposed Plan that describes the preferred remedy for RFETS. The Proposed Plan is the basis for the final Corrective Action Decision/Record of Decision (CAD/ROD).

The RI/FS Report follows EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1988).

1.2 Report Organization

This report is organized as follows:

- Section 1.0 provides introductory information, including the site description, history, future land use and the regulatory approach for cleanup. Previous investigations and OU configuration and disposition and the disposition of IHSSs, PACs, UBC sites and PICs and of buildings through the RFCA accelerated action process are also discussed, and a summary of the 2002 CERCLA 5-year review presented.

- Section 2.0 presents a summary of the physical characteristics of the site, including surface features, meteorology, surface water hydrology, geology, soil, hydrogeology, demography and land use, and ecology.
- Section 3.0 presents the nature and extent of soil contamination.
- Section 4.0 presents the nature and extent of groundwater contamination.
- Section 5.0 presents the nature and extent of surface water and sediment contamination.
- Section 6.0 presents the nature and extent of air contamination.
- Section 7.0 presents contaminant fate and transport and describes potential routes of migration based on the RFETS conceptual model, contaminant mobility, and persistence.
- Section 8.0 summarizes the RI, including the Comprehensive Risk Assessment (CRA), results. The CRA consists of a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA).
- Section 9.0 presents the remedial action objectives (RAOs) for groundwater, surface water, and soil and the Applicable or Relevant and Appropriate Requirements (ARARs) used as the goals for the final remedy for this RI/FS Report.
- Section 10.0 presents a discussion of the development and screening of alternatives and the detailed analysis of final remedy alternatives.
- Appendix A presents the CRA Report (Volumes 1 through 15).

1.3 Site Background

The site has been in existence since 1951. A brief description of the site, the historical RFETS mission, inclusion on the CERCLA National Priorities List (NPL) and RCRA/CHWA permit history and the site future use is presented below.

1.3.1 Site History

The United States, through the Atomic Energy Commission, acquired the land for RFETS in several phases. RFETS occupies approximately 10 square miles of sections 1 through 4 and 8 through 15 of Township 2 South, Range 70 West of the 6th Principal Meridian. RFETS is generally bounded by State Highway 128 to the north; Jefferson County Highway 17, also known as Indiana Street, to the east; and State Highway 93, which is approximately 0.25 miles from the site's western boundary. To the south agricultural and industrial properties lie between RFETS and State Highway 72 (EPA 1997).

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Approximately 2,519 acres were acquired in 1951 and approximately 4,027 acres were added in 1974 and 1975. This additional acreage provided an additional security buffer area around the approximately 300-acre Industrial Area (IA) near the center of the site, resulting in the 6,546-acre property (USFWS 2004).[2]

Land use within 10 miles of RFETS includes residential, agricultural, industrial, parks and open space, vacant, and institutional classifications. Most residential use is located northeast, east, and southeast of RFETS. Much of the vacant land around RFETS is rangeland. Local government-owned open space lies directly north, west, and east of RFETS (EPA 1997).

Main fabrication and processing facilities were located near the center of RFETS in the approximately 300-acre IA. The remainder of the site contained limited support facilities and served as a Buffer Zone (BZ) to the main production areas. When the United States acquired the RFETS land, it also acquired the surface rights from the landowners, but not the subsurface mineral rights. Approximately 800 acres in the western portion of the BZ are currently permitted for surface gravel mining, which is ongoing. Mined property must be reclaimed in accordance with permit requirements. Other property rights, such as utility easements and water conveyances, also exist at RFETS.

Additional information regarding physical characteristics, demography, third-party property rights, and surrounding land use is provided in Section 2.0.

1.3.2 Site Mission

RFETS was part of the United States' nationwide nuclear weapons complex and its mission was to fabricate plutonium pits and other key components making up the triggers for nuclear weapons. A description of the industrial processes and key manufacturing buildings of this facility, known originally as the Rocky Flats Plant, is contained in the Historic American Engineering Record, HAER CO-83 (HAER 1998).[3]

The Atomic Energy Commission and its successor agency, the Energy Research and Development Administration, had jurisdiction and control of RFETS from 1951 to the end of 1974 and from 1975 to 1977, respectively. Since 1977 RFETS has been under the jurisdiction and control of DOE, pursuant to the authority of the Atomic Energy Act of 1954, 42 United States Code (USC) §§ 2011, et seq. as amended (DOE 1994a).

---

[2] In 1995, control and jurisdiction of 234 acres (located in the northwestern corner of RFETS) were transferred to the DOE Golden Field Office to be used as a scientific wind turbine testing facility for development of alternative energies (DOE 1998a). This area is the National Wind Technology Center. Pursuant to the 2002 National Defense Authorization Act, an additional 25 acres were transferred from RFETS to the National Wind Technology Center (EPA 2003).

[3] The National Park Service, the Library of Congress and the American Society of Civil Engineers formed the HAER program in 1969 to document nationally and regionally significant engineering and industrial sites. HAER documentation in the forms of measured and interpretive drawings, large format photographs and written histories, is archivally preserved in the Prints and Photographs Division of the Library of Congress, where it is readily available to the public. The HEAR CO-83 is available through the Library of Congress website, http://memory.loc.gov. See also, DOE 1998a.

Since 1951 four companies have managed and operated RFETS under contracts with DOE or its predecessor agencies. Dow Chemical Company was the contractor prior to July 1975. Rockwell International Company (Rockwell) was the contractor from July 1, 1975, until December 31, 1989. EG&G Rocky Flats, Inc. was the contractor from January 1, 1990, until June 30, 1995. Kaiser-Hill Company, L. L. C. has been the contractor since July 1, 1995 (DOE 1998a). As of the end of Fiscal Year 2005, it is anticipated that Kaiser-Hill Company, L.L.C.'s contract scope of work will be completed in Fiscal Year 2006.

Because the United States restricted information regarding the production of nuclear weapons components, and because access to RFETS was strictly controlled, the specific processes and materials used at RFETS were not publicly known for many years. Fires in plutonium processing buildings in 1957 and 1969 and public activism in opposition of the Nation's nuclear weapons production programs in the 1970s and 1980s resulted in more public and federal and state environmental regulatory agency scrutiny of RFETS.

As new environmental laws were enacted during this period, information about hazardous substances and hazardous wastes at RFETS led to remedial investigations beginning in the 1980s of possible releases of these substances to the environment. The conduct of CERCLA response actions and RCRA/CHWA corrective and closure actions has thus been a part of DOE's mission at RFETS since the 1980s.

In February 1991, DOE introduced a plan to realign the Nation's nuclear weapons production program. The Secretary of Energy announced in a February 1992 Report to Congress that as part of the realignment RFETS would no longer have a nuclear production mission. DOE's mission at RFETS is currently the safe deactivation of nuclear production facilities; decontamination, decommissioning, and demolition of buildings and infrastructure; cleanup; and closure (DOE 1998a).

1.3.3 The Rocky Flats National Wildlife Refuge Act

As a result of most of the RFETS land remaining relatively undisturbed since 1951, preservation and diversity of plants and animals at RFETS is unique in this area of the Front Range. RFETS provides habitat for many wildlife species, including the Preble's meadow jumping mouse (PMJM), which is federally protected as a threatened species, and several rare plant communities.

The Rocky Flats National Wildlife Refuge Act of 2001 (Public Law 107-107, Subtitle F, 16 U.S.C. 668dd) (Refuge Act)[4] provides that future ownership and management of RFETS shall be retained by the United States. Under the Refuge Act, upon completion of cleanup and closure of RFETS, the Secretary of Energy shall transfer administrative jurisdiction over certain RFETS lands to the Secretary of the Interior for the purposes of establishing the Rocky Flats National Wildlife Refuge (Refuge). The U.S. Fish and Wildlife Service (USFWS), is the Department of Interior agency responsible for Wildlife

[4] See the Refuge Act for its specific requirements. This discussion is intended only as a brief overview of the Refuge Act requirements in relation to the future use of RFETS as a Refuge.

Refuge management. Under the Refuge Act, the Secretary of Energy will retain administrative jurisdiction over those RFETS engineered structures used for carrying out a response action and any lands or facilities related to a response action or other actions to be carried out by the Secretary of Energy at RFETS. The specific lands for which jurisdiction and management will be transferred to the Secretary of the Interior and those to be retained by the Secretary of Energy are to be described in a Memorandum of Understanding (MOU) between the agencies, as required by the Refuge Act. The final delineation of lands to be transferred to the Secretary of the Interior will be identified in the CAD/ROD.

A Final Comprehensive Conservation Plan and Environmental Impact Statement (CCP/EIS) related to the establishment of the Refuge has been prepared by USFWS, in consultation with the public and the local communities as required by the Refuge Act. The Refuge Act also requires the Secretary of the Interior to provide a report to Congress on the impact of any existing property rights, including any mineral rights, on management of the Refuge, and identify strategies for resolving and mitigating the impacts.[5] The CCP/EIS contains extensive information regarding the attributes and the plant and animal resources of the approximately 6,240-acre RFETS property[6] in relation to its designation as a National Wildlife Refuge.

1.3.4 National Priority List and Hazardous Waste Activities

Results of early remedial investigations indicated operations at RFETS resulted in the release or threatened release of materials defined as hazardous substances, contaminants, and pollutants by CERCLA, 42 USC §§ 9601, et seq. as amended. Investigations indicated elevated levels of hazardous substances, including uranium, plutonium, other metals of concern, hazardous wastes and hazardous waste constituents (hereinafter referred to as "hazardous substances") were released to the environment.

RFETS was proposed for inclusion on the CERCLA NPL on October 15, 1984 (49 Federal Register [FR] 40320, October 15, 1984), and the listing became final on September 21, 1989 (54 FR 41015, October 4, 1989). The area composing the NPL listing included RFETS and land adjacent, or off site, from RFETS. Thus, the NPL Site was not identified as coincident with the RFETS property boundaries, and investigations were needed to determine the extent of hazardous substance releases that required CERCLA response actions. Historically the terms "RFETS" and "Site" have been used

[5] The MOU is under development. The CCP/EIS also briefly discusses existing property rights. In accordance with the CCP/EIS preferred alternative, the Refuge will include approximately 16 miles of trails, a seasonally staffed visitor contact station, trailheads with parking, and developed overlooks (USFWS 2004). This RI/FS Report will not be revised to update the progress toward or results of the MOU development or the comprehensive planning process. Rather, the periodic reports on progress and results will be made publicly available by or on behalf of DOE and are hereby incorporated by reference. Also see the web site at http://rockyflats.fws.gov for information related to the CCP/EIS.

[6] The RFETS acreage has been listed in a variety of past documents as ranging from approximately 6,200 to approximately 6,500 acres, which generally conveys its size. The 6,240-acre figure is from the CCP/EIS for the purposes of Refuge planning, based upon review of acquisition and transfer records and previous land surveys for portions of the property. This figure may change slightly based on future land surveys or other information gathered to implement the Refuge Act.

to denote both the RFETS property and the geographical extent of the NPL Site. In this RI/FS Report, "Site" refers to the NPL Site and "RFETS" or "site" refers to the property owned by the United States. In March 2003, EPA determined that the 259-acre National Wind Technology Center was not part of the NPL Site (EPA 2003).

RFETS operations also resulted in the generation, disposal, and/or release of materials regulated as hazardous wastes and hazardous waste constituents (which are also CERCLA hazardous substances) pursuant to RCRA, 42 USC §§ 6901, et seq. as amended and CHWA, Colorado Revised Statutes (CRS), §§ 25-15-301, et seq. after the dates that RCRA and CHWA requirements, including regulations promulgated there under, became applicable to RFETS.

Consistent with Section 3010 of RCRA, 42 USC § 6930, DOE and Rockwell notified EPA of hazardous waste activity at the Rocky Flats Plant on or about August 18, 1980. In a RCRA Part A Permit application submittal in November 1980, DOE and Rockwell identified themselves as a generator of hazardous waste at the Rocky Flats Plant, and the Rocky Flats Plant as a treatment, storage, and/or disposal facility. DOE and Rockwell also identified themselves as handling several hazardous wastes at the Rocky Flats Plant (Rockwell 1980).

On November 1, 1985, DOE and Rockwell filed RCRA and CHWA Part A and B Hazardous Waste Permit applications with both EPA and the Colorado Department of Health[7], identifying certain generated hazardous waste streams and waste management processes (K-H 2004).

In 1989, the Federal Bureau of Investigation and EPA agents executed a search warrant to confirm alleged violations of federal environmental laws and regulations at RFETS. Following the search, the U.S. Department of Justice indicted Rockwell, the management and operating contractor at the time of the search, for commission of environmental crimes at RFETS. In 1992, Rockwell's plea of guilty for environmental crimes was accepted in District Court, and Rockwell consequently agreed to pay a fine of $18.5 million (DOE 1998a).

After several revisions to the RCRA/CHWA permit application, CDPHE issued the CHWA Permit on September 30, 1991, for a number of hazardous waste management units at RFETS. Since then, the permit has been modified to add or remove units; and it has also been periodically renewed as required by CHWA regulations (K-H 2004).

1.4 Site Investigations and Cleanup History

Three successive environmental compliance agreements/orders have provided a regulatory framework for the cleanup of RFETS since the 1980s. The first was in 1986,

[7] The Colorado Department of Public Health and Environment was created on July 1, 1994, and assumed the statutory authority of the Colorado Department of Health to regulate hazardous waste pursuant to the CHWA (CRS § 25-1-101.5.) The Colorado Department of Health was eliminated as a state executive agency. For simplicity, the Colorado Department of Health and the Colorado Department of Public Health and Environment are hereinafter referred to as "CDPHE."

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prior to the NPL listing in 1989, the second was in 1991 and the third was in 1996. These agreements/orders resulted in reordering and restructuring the investigation and cleanup priorities. A summary of the various investigations and cleanup history of RFETS is provided below.

1.4.1 Regulatory Framework

This section provides a summary of the three environmental compliance agreements/orders regarding cleanup of RFETS, as well as a brief description of the three environmental permits issued to DOE and its contractor.

Compliance Agreement (1986)

On July 31, 1986, DOE, CDPHE, and EPA entered into a Compliance Agreement (1986 Compliance Agreement, CERCLA VIII-86-08 and RCRA VIII 86-06) which defined roles and established milestones for major environmental operations and response action investigations for the Site. The 1986 Compliance Agreement established requirements for compliance with CERCLA. Through this action, the 1986 Compliance Agreement established a specific strategy, which allowed for management of high-priority past disposal areas and low-priority areas at the Site.

The 1986 Compliance Agreement also established roles and requirements for compliance with RCRA and CHWA through compliance with interim status requirements and submittal of required permit applications and closure plans. Through the 27 specific tasks identified in the five schedules included in the 1986 Compliance Agreement, DOE and Rockwell identified over 2,000 waste generation points and 178 solid waste management units (SWMUs) and RCRA/CHWA-regulated closure sites. The SWMU terminology is a RCRA designation consisting of inactive waste disposal sites, accidentally contaminated sites, and sites found to pose potential environmental concern due to past or current waste management practices. SWMUs were initially identified in 1985 in the Draft Comprehensive Environmental Assessment and Response Program (CEARP) Phase I: Installation Assessment (DOE 1986). The study consisted of record searches, open literature survey, inspections and interviews with RFETS employees.

IAG (1991)

The 1986 Compliance Agreement did not reflect the requirements of the 1986 Superfund Amendments and Reauthorization Act, in particular the requirements governing federal facility NPL Sites pursuant to Section 120 of CERCLA. EPA's and CDPHE's priorities for investigation of the Site were also clarified based on increased knowledge of the Site gained from the ongoing investigation. The new priorities placed greater emphasis on OUs that, based on information available, were known to pose the greatest risk to humans and the environment through actual or potential contact with wastes or contaminated soil, air, or water. EPA and CDPHE established criteria reflecting priorities for addressing both human health and environmental issues. These factors necessitated revision of the 1986 Compliance Agreement in 1991.

On January 22, 1991, DOE, EPA, and CDPHE signed Federal Facility Agreement and Consent Order CERCLA VIII-91-03, RCRA (3008[h]) VIII-91-07), and State of Colorado Docket #91-01-22-01, referred to as the Rocky Flats Interagency Agreement (IAG). The IAG regulated and provided for enforcement of DOE's investigation, planning, and conduct of response and corrective actions at the Site. It also established a comprehensive plan for integrating CERCLA and RCRA/CHWA requirements for these actions. The IAG divided the remedial activities into 16 OUs (Table 1.1). In the IAG the SWMUs were renamed IHSSs. IHSSs are specific locations within OUs where solid wastes, hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents may have been disposed or released into the environment within the Site at any time, irrespective of whether the location was intended for the management of these materials.

The 16 OUs were groupings of IHSSs into single management areas based on similarities of contaminants, geographical location and possible interrelation of the IHSSs. Table 1.1 provides a summary description of each OU. EPA or CDPHE, or in some cases EPA and CDPHE jointly, were identified as the Lead Regulatory Agency (LRA) for each designated OU. The IAG also established a schedule including 221 milestones to guide and enforce activities related to these 16 OUs. The identified LRA had approval authority over DOE's remediation activities and compliance with the schedule and milestones for each OU.

During 1992 and into 1993, it became apparent that unrealistic schedule and cost assumptions would make it impossible for DOE to fully comply with the IAG schedules. DOE began missing milestones in March 1993, and the agency projected that a series of future milestones were likely to be missed. In early 1994, DOE proposed an agreement to toll the stipulated penalties associated with these milestones for a certain period. According to the terms of the Tolling Agreement, signed by the IAG Parties on July 7, 1994, DOE paid cash penalties to EPA and the State, and conducted Supplemental Environmental Projects, for a total value of $2.8 million. The agreement tolled stipulated penalties until January 31, 1995.

Because of these events and issues surrounding the scope of work for response actions at the Site given that the RFETS nuclear weapon component production mission had ended, beginning in mid-1994, DOE, CDPHE, and EPA began negotiations to substantially modify or replace the IAG. Subsequently, in light of negotiations toward a new agreement EPA and CDPHE agreed not to assess further stipulated penalties for violations of the IAG milestones occurring after January 31, 1995.

DOE continued appropriate investigation and remediation work in the IAG OUs subject to LRA approval during this period.

RFCA (1996)

On July 19, 1996, DOE, EPA, and CDPHE signed Federal Facility Agreement and Consent Order CERCLA VIII-96-21, RCRA (3008[h]) VIII-96-01, and State of Colorado Docket #96-07-19-01, referred to as RFCA. RFCA terminated and replaced the IAG and has since served as the regulatory agreement to accomplish the required cleanup of radioactive and other hazardous substance contamination at and from RFETS.

RFCA expanded the cleanup scope to include disposition of all buildings, which were not covered in the IAG OUs, and changed the regulatory approach in several significant respects. It incorporated an unenforceable Preamble recitation of the objectives for eight topics that influenced cleanup decision making that were developed in consultation with the community and local governments, resulting in a Vision for the Site. The Vision was intended to provide a holistic view of key RFETS activities in relation to the required cleanup of the Site.

In addition, each objective included a description of the anticipated near-term and intermediate site conditions for the covered topic. Per the RFCA Preamble, Section B paragraph 9g, the Intermediate Site Condition is:

> the period of time during which all weapons useable fissile material, and transuranic wastes will be removed from RFETS. By the end of this period, none of these materials, nor the buildings that contained them, will remain. Also by the end of this period, all low-level, low-level mixed, hazardous, and solid wastes will have been shipped off-site, disposed, or stored in a retrievable and monitored manner to protect public health and the environment. Any remaining cleanup will be completed. Activities occurring in this period are anticipated to be completed about 12 to 20-25 years from now.

The following descriptions of the summary objectives and intermediate site conditions are taken from Section B of the RFCA Preamble. The status of each topic in relation to its anticipated intermediate site condition is also described.

1. Disposition of Weapons Useable Fissile Materials and Transuranic Wastes

   Summary: DOE will stabilize, consolidate, and temporarily store weapons useable fissile materials and transuranic wastes on-site for removal; ultimate removal of weapons useable fissile material is targeted for no later than 2015.

   Intermediate Site Condition: Weapons useable fissile materials are targeted for removal from RFETS by 2015. By the end of the Intermediate Site Condition, all transuranic waste will have been removed from RFETS.

Status: All weapons useable fissile material was removed by 2003 and transuranic waste removal for disposal at WIPP was completed in 2005.

2. On-Site and Off-Site Waste Management

Summary: Waste management activities for low-level, low-level mixed, hazardous, and solid wastes will include a combination of on-site treatment, storage in a retrievable and monitored manner, disposal, and off-site removal. Low-level and low-level mixed wastes generated during cleanup will be stored in a safe, monitored and retrievable manner for near-term shipment off-site, long-term storage with subsequent shipment off-site and/or long-term storage with subsequent disposal on-site of the remaining wastes.

Intermediate Site Condition: Waste materials that are to be removed will have been shipped off-site. Any necessary follow-up cleanup related to the former storage sites will have been completed. By the end of this period, decisions will have been made regarding stored material for its continued storage, treatment or disposal.

Status: No monitored retrievable storage is planned. It is expected that all waste materials will be shipped off site for disposition. Cleanup for closure of former storage sites will also be completed by the end of 2005. Whether any follow up cleanup of environmental media is required is evaluated in the RI/FS and any required actions taken pursuant to the final remedial decision after that decision is made.

3. Water Quality

Summary: At the completion of cleanup activities, all surface water on-site and all surface and ground water leaving RFETS will be of acceptable quality for all uses.

Intermediate Site Condition: By the time cleanup activities are completed, all on-site surface water and all surface water and ground water leaving RFETS will be of acceptable quality for all uses including domestic water supply. Ground water quality in the Outer Buffer Zone and off-site will support all uses. On-site ground water will not be used for any purpose unrelated to RFETS cleanup activities. Reliable monitoring and controls to protect water quality during storage of plutonium and other special nuclear material and wastes, and during storm events, will continue. To assure the above described water quality, long-term operation and maintenance of waste management and cleanup facilities will continue.

Status: All surface water and groundwater leaving RFETS boundaries currently meet this objective based on the results of routine, continuous surface water monitoring for radionuclides and historical, non-routine monitoring of surface water and groundwater for a limited number of other analytes of interest. Surface water downstream of the Woman Creek and Walnut Creek terminal ponds currently meets this objective based on the results of routine, continuous surface water monitoring for radionuclides and predischarge monitoring of the terminal ponds for radionuclides and a limited number of other analytes of interest. These monitoring results indicate

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surface water and groundwater meet Colorado water quality standards. Completed accelerated actions have removed significant surface soil sources of surface water contamination and significant subsurface soil and non-aqueous phase liquid sources of groundwater contamination that contribute to surface water contamination. The Solar Ponds, East Trenches and Mound Plume barriers and passive treatment systems and Present Landfill seep collection and passive aeration treatment system were installed and continue to operate to reduce surface water contaminant loading form residual subsurface soil and groundwater contamination.

4. Cleanup Guidelines

Summary: Cleanup activities will be conducted in a manner that will:

** reduce risk;

** be cost-effective;

** protect public health;

** protect reasonably foreseeable land and water uses;

** prevent adverse impacts to ecological resources, surface water and ground water; and

** be consistent with a streamlined regulatory approach.

Intermediate Site Condition: After off-site disposition of plutonium, other special nuclear material and transuranic wastes, the cleanup of the buildings that contained these materials, and of any residual waste from their shipment or storage, will be completed. Appropriate monitoring, operation and maintenance of any remaining treatment, storage, or disposal facilities will continue.

Status: Building cleanup and waste disposition is complete. No waste treatment, storage, or disposal facilities remain at the completion of this work. The "streamlined regulatory approach" is discussed further, below.

5. Land Use

Summary: Cleanup decisions and activities are based on open space and limited industrial uses; the particular land use recommendations of the Future Site Use Working Group (FSUWG) are not precluded; specific future land uses and post-cleanup designations will be developed in consultation with local elected officials, local government managers, Rocky Flats Local Impacts Initiative (RFLII), CAB, other groups and citizens. The Parties recognize the legal authority of local government to regulate future land use at and near RFETS.

Intermediate Site Condition: At the beginning of this period, access to the Buffer Zone will continue to be controlled consistent with the safety and security needs of plutonium, other special nuclear material and transuranic wastes. After weapons useable fissile material and transuranic wastes are removed, DOE will work with local elected officials, local government managers, RFLII, CAB, other groups and citizens to determine the optimal use of the Buffer Zone. Any access controls and/or institutional controls that are necessary or appropriate for public health, environmental protection, ongoing monitoring and operation and maintenance activities, will continue.

Status: The future land use for RFETS is a National Wildlife Refuge (see Section 1.3.3).

6. Environmental Monitoring

Summary: Environmental monitoring will be maintained for as long as necessary.

Intermediate Site Condition: After plutonium, other special nuclear material and transuranic wastes are gone, the monitoring system will continue to address remaining waste management facilities and water quality needs. This monitoring system will remain in place for as long as necessary for the protection of public health, environment, and safety.

Status: Environmental monitoring is conducted pursuant to the Integrated Monitoring Plan (IMP) established in accordance with RFCA. The IMP was first approved in 1997 and is reviewed annually and updated as needed (through Fiscal Year 2003 reviews and any needed updates were performed quarterly). Reviews and updates are conducted in consultation with CDPHE, EPA and local cities staff and other stakeholders. Consultative meetings were routinely held and quarterly monitoring information exchanges conducted. These consultations considered monitoring results, the evolving nature of site conditions and changes to monitoring needs as cleanup progressed towards closure. City and other stakeholder participants included, but were not limited to, representatives of the City and County of Broomfield, the Cities of Arvada, Westminster, Northglenn and Thornton and the Rocky Flats Coalition of Local Governments and the Rocky Flats Citizens Advisory Board.

The IMP will be refined and implemented concurrently with the final remedial decision.

7. Building Disposition

Summary: All contaminated buildings will be decontaminated as required for future use or demolition; unneeded buildings will be demolished.

Intermediate Site Condition: By the end of this period, the remaining buildings that were used for plutonium, other special nuclear material, and transuranic waste storage will have been demolished. Also by the end of

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this period, decisions will have been made regarding material that has been stored in a retrievable and monitored manner for its continued treatment, storage or disposal.

Status: All RFETS buildings have been decommissioned, decontaminated as necessary, and demolished except for the east and west vehicle inspection sheds that DOE retains for future use. See the status description for On-Site and Off-Site Waste Management presented earlier.

8. Mortgage Reduction

Summary: Weapons useable fissile material and transuranic wastes will be safely consolidated into the smallest number of buildings to reduce operating costs and shrink the security perimeter; contaminated and non-contaminated buildings will be decommissioned and either demolished or turned over for other non-DOE uses.

Intermediate Site Condition: During this period, the secured area will be further reduced and eventually removed. Operating costs will be minimized. By the end of this period, weapons useable fissile material and transuranic wastes will have been removed from RFETS and the related buildings will have been decontaminated and either demolished or converted to non-DOE uses. Closure or conversion to non-DOE use of non-contaminated buildings will be completed by the end of this period. Also by the end of this period, in consultation with local officials, the Community Reuse Organization, and interested members of the public, existing RFETS infrastructure will be essentially eliminated, except for monitoring, and operation and maintenance of any remaining waste storage or disposal facilities, or to support RFETS reuse activities, to the extent that it is paid for by the users.

Status: See the status descriptions for On-Site and Off-Site Waste Management, Land Use, and Building Disposition presented earlier.

The streamlined regulatory approach summarized in Objective 4, Cleanup Guidelines, was implemented in several ways. Two new OUs were established: the IA OU with CDPHE as the LRA, and the BZ OU with EPA as the LRA. The 16 IAG OUs (Table 1.1) were realigned and consolidated to fit within these OUs, as was LRA planning, investigation, and decision document review and approval authorities (Table 1.2 and Table 1.3). RFCA also coordinated all of DOE's cleanup obligations under CERCLA, RCRA, and CHWA in a single agreement to streamline compliance with these three statutes.

A consultative, accelerated action approach for the IHSSs was also delineated in RFCA. RFCA paragraph 79 provides, in part, the following:

To expedite remedial work and maximize early risk reduction at the Site, the Parties intend to make extensive use of accelerated actions to remove,

> stabilize, and/or contain IHSSs. Focusing on IHSSs rather than OUs will allow most remedial work to be reviewed and conducted through one of the accelerated review and approval processes described in Part 9, rather than the RI/FS process. . . .

In addition, to aid in evaluation of accelerated action determinations for IHSSs, action levels (ALs) were established and used as described in RFCA paragraph 75:

> The Action Levels and Standards Framework, Attachment 5, establishes action levels for ground water and soil as well as action levels and cleanup standards for surface water. Attachment 5 also establishes a deadline for setting additional action levels for soil and interim cleanup levels for soil. Action levels and standards are requirements of this Agreement, but exceedance of an Action Level is not subject to penalties. The Framework action levels describe numeric levels of contamination in ground water, surface water, and soils which, when exceeded, trigger an evaluation, remedial action and/or management action. The Framework surface water standards are in-stream contaminant levels that, contingent on action by the Colorado Water Quality Control Commission to align stream classifications and standards with the Action Levels and Standards Framework, the regulators will require DOE to meet for activities undertaken prior to the final CAD/ROD, and which constitute the Parties' current joint recommendation for the CAD/ROD. . . . .

RFCA Attachment 5, RFETS Action Levels and Standards Framework for Surface Water, Ground Water and Soils (ALF), has been modified several times. [8]

The RFCA approach resulted in development of a credible planning and funding baseline from which enforceable RFCA regulatory milestones were established and almost always met.[9] Implementation of RFCA resulted in reducing the projected time and funding needed to achieve required cleanup, and eventually line item, relatively level annual "closure project" congressional appropriations for RFETS were approved. The realignment and consolidation of OUs, disposition of IHSSs, and decommissioning of facilities pursuant to RFCA are discussed in more detail in Section 1.4.3.

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[8] For a more in-depth discussion of ALs and the accelerated action approach, see the Soil Action Levels Technical Memorandum, developed under Task 2 of the Final Work Plan for the Development of the Remedial Investigation and Feasibility Study Report (DOE 2002a). ALs for soil are based on risk to the WRW human receptors and ALs for groundwater are based on drinking water standards for groundwater: thus, an accelerated action evaluation for these media is based on impacts to human health. ALs for surface water are based on Colorado Water Quality Standards, which are protective of human health and ecological resources. Once an evaluation is triggered by the exceedance of soil or groundwater ALs, the threat to ecological receptors is considered in determining whether to take an accelerated action. An ERA, for purposes of the final remedy decision, will be part of the CRA.

[9] See the RFCA Quarterly Reports for details on the annual milestone setting process and the "score cards" related to milestone achievement.

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Environmental Permits

After the NPL listing, CHWA/RCRA, National Pollutant Discharge Elimination System (NPDES), and Clean Air Act (CAA) permits covering RFETS operations were issued to DOE and its contractor.

RFCA paragraph 16 provides in part:

> The Parties recognize that under section 121(e)(1) of CERCLA, portions of the response actions required by this Agreement and conducted entirely on the Site are exempted from the procedural requirement to obtain federal, state, or local permits, when such response action is selected and carried out in compliance with section 121 of CERCLA. It is the understanding of the Parties that the statutory language is intended to avoid delay of on-Site response actions, due to procedural requirements of the permit process. The Parties agree that the following activities are being approved, at least in part, pursuant to CERCLA authorities:
>
> a) removal or remedial actions in the Buffer Zone ... ;
>
> b) decommissioning activities;
>
> c) activities required under any concurrence CAD/ROD; and
>
> d) remedial actions in the Industrial Area for hazardous substances that are not also hazardous wastes or hazardous constituents (e.g., radionuclides that are not mixed wastes and PCBs).

Pursuant to RFCA paragraph 15, when RFCA replaced the IAG, the following language was incorporated as the corrective action requirement of the CHWA permit:

> There have been releases of hazardous wastes and constituents from solid waste management units into the environment at Rocky Flats. Accelerated corrective and remedial actions to address these releases are being regulated by the Department [CDPHE] and EPA under ... [RFCA] .... Following implementation of these accelerated corrective and remedial actions, the Department [CDPHE] will be making a final corrective action decision for each OU. The final corrective action decisions will be incorporated as modifications to this permit. If the RFCA is terminated before all corrective action has been taken, this permit shall be modified to incorporate requirements of the RFCA that are requirements of CHWA.

RFCA paragraph 65 also provided the following related to the operating permits:

> Activities that are not subject to regulation under this Agreement shall continue to be subject to any existing permits, orders, etc., including, but not limited to, the following:
>
> a) CHWA permit No. CO7890010526[10]
>
> b) Air Quality Operating permit (when issued)[11]
>
> c) NPDES permit No. CO-0001333

Therefore, except as provided by the CHWA permit for corrective actions, environmentally permitted operational activities continued at RFETS during the cleanup under RFCA. These permits will be renewed as regulatory required until they are terminated in accordance with the regulatory requirements for termination after permitted activities end, or upon CHWA-permitted facility closure in accordance with the CHWA permit closure plan. A CHWA post-closure permit or an order or agreement in lieu of a post-closure permit may be required.

1.4.2 Previous Site Investigations and Configuration

Many detailed studies of the RFETS environment have been performed. These studies include characterizations of geology, hydrology, biology, meteorology, and demography, as well as prior efforts to identify and characterize potential hazardous substance sites. Efforts to document the extent of contamination became a major focus starting in the 1980s in accordance with RCRA/CHWA and CERCLA. These studies provide most of the information upon which the current IHSS and OU structure is based.

IHSSs

In accordance with the IAG, a Historical Release Report (HRR) was developed. The original intent of the HRR was to capture existing information on historical incidents and Plant practices involving hazardous substances at RFETS. Additionally, the IAG prescribed that the HRR reporting process continue quarterly for reporting of new or newly identified releases of hazardous substances to the environment (now identified as PACs). RFCA incorporated the earlier IAG requirements for updating the HRR; however, it was agreed that reporting would be required annually instead of quarterly.[12]

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[10] RFCA paragraph 65 refers to the facility identification number. The current CHWA permit number is CO-04-06-18-01.

[11] The application for the air quality permit was filed with and accepted by CDPHE on February 13, 1996. According to the relevant rules, this provided a "permit shield" for air emission operations for which the permit was applied for, until final disposition of the application. Permit No. 96OPJE1249 was issued on July 1, 2002.

[12] The first HRR was released in June 1992 (DOE 1992a) and updated quarterly between 1992 and 1995 (DOE 1992a, 1992b, 1993a, 1993b, 1993c, 1993d, 1994b, 1994c, 1994d, 1994e, 1994f, 1995a, 1995b). Beginning in September 1996, the HRR was updated annually (DOE 1996a, 1997a, 1998b, 1999a, 2000a, 2001a, 2002b, 2003, 2004a, 2005a).

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For purposes of the HRR process and mapping clarity, original IHSS locations were designated a unique "PAC area" prefix based upon geographic location. For example, IHSS 123.1 is designated as PAC 700-123.1. An area where there has been a recent release or finding of a hazardous substance in the environment (post-1992) is also assigned a PAC area prefix number, followed by the next numerically highest PAC reference number for that area. These areas are referred to as PACs and are equivalent to IHSSs in that they are CERCLA sites requiring disposition through the HRR and RFCA process. PAC prefixes are selected according to geographic subdivisions, as illustrated on Figure 1.2 and Figure 1.3. Large PAC areas (that is, PACs that cross geographic PAC boundaries), such as the Original Process Waste Lines (OPWL) (PAC 000-121) and the Central Avenue Ditch (PAC 000-172), have been assigned a 000 prefix due to the boundary extent. There are a total of 329 PACs.

In addition, 31 UBC sites and 61 PICs were designated. The identification of UBC sites was necessary because of the potential contamination of soil under specific buildings from broken process waste lines or other potential sources related to building histories. UBC sites are identified using the UBC acronym followed by the building number (for example, UBC 123) (DOE 1996a). In addition, CDPHE has conducted further investigations to verify that all potential contamination is included in the designated PACs, UBC sites, or IHSSs (hereinafter referred to as "IHSSs") (CDPHE 1999, 2003).

Over time, IHSSs, PACs, UBC sites, and PICs have totaled 421 areas at the Site requiring investigation and/or remediation. Regardless of the designation, each area was evaluated and investigated as needed. Table 1.4 lists each IHSS, PAC, UBC site and PIC.

OUs

OUs were created at RFETS based on the source of contamination, contamination type, and distribution of contaminants. Over time, the number of OUs was consolidated for purposes of remediation and closure of the Site. This history is discussed in more detail below.

<u>IAG (1991)</u>

The IAG grouped IHSSs by similar contaminant or geographic location into 16 OUs (Table 1.1).

CAD/RODs were completed for OUs 11, 15, and 16 under the IAG as follows:

OU 11, West Spray Field

OU 11 was composed of one IHSS: the West Spray Field (IHSS168). The preferred alternative for OU 11 consisted of no action (DOE 1995c). The no action decision for OU 11 was based upon the National Contingency Plan (NCP), which provides for the selection of a no action alternative when a site or OU is in a protective state (that is, poses no current or potential threat to human health or the environment). The risk evaluation performed in the RFI/RI Report (DOE 1995d) determined that OU 11 was in a protective state. A RCRA closure certification for IHSS 168, signed by an independent registered professional engineer, was approved by CDPHE. A certificate of clean closure was submitted to CDPHE in 1995 and the final CAD/ROD (Administrative Record [AR] Reference Number OU 11-A-000184) was completed on September 29, 1995.

OU 15, Inside Building Closures

OU 15, Inside Building Closures, was composed of eight IHSSs; however, IHSSs 215 and 212 were subsequently administratively incorporated into OU 9 and OU 10, respectively. The preferred alternative for the remaining six OU 15 IHSSs consisted of the following actions (DOE 1995e): clean closure under RCRA for all six IHSSs; a no action CERCLA decision for IHSSs 178, 211, and 217; and a deferral of any CERCLA actions at IHSSs 179, 180, and 204 until final disposition of their respective buildings. (These historical IHSSs have been addressed as required. See section 1.5.3 regarding the Building Disposition process.) RCRA closure certification for the six IHSSs, signed by an independent registered professional engineer, was approved by CDPHE. The no action CERCLA decision for IHSSs 178, 211, and 217 is based upon the NCP, which provides for the selection of a no action alternative when a site or OU is already in a protective state. The CAD/ROD (AR Reference Number OU15-A-000272) was completed on September 13, 1995.

OU 16, Low Priority Sites

OU 16, Low Priority Sites, was originally composed of seven IHSSs. The decision for a no action remedy for five of the IHSSs (185, 192, 193, 194, and 195) was based upon the NCP, which provides for the selection of a no action alternative when a site or OU is already in a protective state (DOE 1994g). The risk evaluation performed in the Final No Further Action Justification document (DOE 1992c) determined that these IHSSs were in a protective state and presented no unacceptable risk to human health and the environment. Further investigation had been recommended for IHSSs 196 and 197, which were administratively transferred to OU 5 and OU 13, respectively. The CAD/ROD (AR Reference Number OU16-A -000164) was completed on September 29, 1994.

<u>RFCA (1996)</u>

The 16 OUs designated in the IAG were consolidated into 10 OUs during RFCA negotiations to reduce field and administrative requirements. The OU consolidation is contained in RFCA Attachment 1. The consolidation of the IAG OUs is presented in Table 1.2. At that time, CAD/RODs for OUs 11, 15, and 16 were already completed and CAD/RODs for OUs 1, 3, 5, 6, and 7 were in process or expected to be completed. For this reason these OUs retained their IAG designations. CAD/RODs were completed for OU 1 and OU 3 under RFCA as follows:

OU 1, 881 Hillside

OU 1 was composed of 11 IHSSs. The OU 1 CAD/ROD was signed in 1997 (DOE 1997b) (AR Reference Number OU01-A-001366), and a major modification to the

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CAD/ROD was signed in 2001 (DOE 2001b) (AR Reference Number OU01-A-001416). The selected remedy presented in the original CAD/ROD includes three primary components:

1. Excavating subsurface soil contamination at IHSS 119.1, thereby removing the current source of groundwater contamination and thus the principal threat posed by OU 1. The major components of the selected remedial action at IHSS 119.1 included:
   - Excavation of approximately 1,000 to 2,000 cubic yards (cy) of contaminated subsurface soil at IHSS 119.1;
   - Ultraviolet/hydrogen peroxide and ion-exchange treatment of contaminated groundwater from the excavation and of groundwater collected from a french drain installed in 1992; and
   - Off-site disposal of excavated soil.
2. Maintaining institutional controls throughout the OU 1 area in a manner consistent with RFCA, the Rocky Flats Vision, and the Action Levels and Standards Framework (ALF) (Attachment 5 to RFCA). The specific mechanisms (for example, deed restrictions on future land use and prevention of domestic use of groundwater) to ensure the implementation and continuity of the necessary institutional controls were not included in the CAD/ROD. These mechanisms are envisioned to be placed in the final CAD/ROD for RFETS or in the OU 1 CAD/ROD during one of the 5-year reviews of this document.
3. No remedial action at the remaining 10 IHSSs in OU 1. Because of the groundwater and land use controls, low amounts of contamination in OU 1 outside of IHSS 119.1, and low levels of risk associated with the contamination, no remedial action was taken at the other OU 1 IHSSs.

Any surface soil contamination at OU 1 was administratively transferred and addressed jointly with other surface soil contamination originating from the 903 Pad Drum Storage Site (IHSS 112). A Major Modification to the CAD/ROD was approved by the LRA after soil sampling and analysis showed that there was no significant soil source of contamination and that it was not necessary to excavate historical IHSS 119.1 (DOE 2001b). The elements of the modified remedy for IHSS 119.1 included:

- Downgradient investigation: DOE performed confirmatory soil sampling downgradient of IHSS 119.1 to verify that a significant contamination source did not exist there. Therefore, subsurface soil was not excavated from IHSS 119.1, and groundwater from the excavation was not collected and treated.
- Cessation of groundwater extraction and treatment: The french drain was disrupted so that it no longer collected groundwater. Groundwater continued to be extracted from the upgradient collection well and transferred to the existing Building 891 treatment system for final treatment and discharge for a period of 1-year after signing the Major Modification to the CAD/ROD.

- Groundwater monitoring: In accordance with the Major Modification to the OU 1 CAD/ROD (DOE 2001b), pumping and treating of groundwater from the collection well was discontinued in 2002 after four quarters of monitoring showed that the average concentration of trichloroethene in the well continued to be below the Tier I groundwater AL. The collection well was then designated as a plume definition well and monitored quarterly consistent with the IMP. Data for this well have continued to indicate concentrations below ALF Tier I groundwater ALs.

OU 3, Off-Site Areas

OU 3 was composed of four IHSSs. The selected remedy for OU 3 was no action (DOE 1997c) based upon the Baseline Risk Assessment and the Environmental Risk Assessment contained in the RFI/RI Report (DOE 1996b). The RFI/RI Report concluded that all IHSSs within OU 3 are already in a state protective of human health and the environment. The NCP provides for the selection of a no action remedy when an OU is in such a protective state. Therefore, no remedial action regarding OU 3 or any of its constituent IHSSs was warranted. On June 30, 1997, EPA and CDPHE approved the final CAD/ROD document for OU 3 (AR Reference Number OU03-A-000551).

The continuing protectiveness of the OU 1 and OU 3 remedies was confirmed in the CERCLA 5-Year Review, discussed in Section1.5.3.

<u>RFCA Modifications (2004)</u>

On April 13, 2004 the RFCA Parties modified the 1996 OU Consolidation Plan in RFCA Attachment 1 to reflect the current status. The changes were based on the following:

- OUs 1 and 3 were dispositioned in accordance with the final CAD/RODs for these OUs; and
- The RFCA Parties agreed that the IHSSs contained in OUs 5, 6, and 7 (as modified in July 1996) could be efficiently consolidated into the BZ OU to reduce the number of OUs that may need individual CAD/RODs.

As a result, the 10 remaining OUs were consolidated into 7 OUs as outlined in Table 1.3. CAD/RODs were completed for 5 OUs and the BZ and IA OUs are being evaluated in this RI/FS Report.

Groundwater

Under the IAG and RFCA, contaminated groundwater was not identified as a separate OU. IAG OU investigations included groundwater contamination yielding extensive knowledge regarding the various contaminant plumes that existed at the site and the OUs associated with each plume.

Under RFCA, the IMP (DOE et al. 1997) specifies groundwater sampling and analysis requirements. RFCA requires RFCA Parties jointly evaluate the IMP for adequacy on an annual basis, based on previous monitoring results, changed conditions, planned

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activities, and public input. The RFCA Parties have reviewed the groundwater monitoring aspects of the IMP on a more frequent basis and updated the monitoring requirements as necessary. These reviews included consultation with local municipality representatives and other interested stakeholders.

1.4.3 Remedial Activities (RFCA Accelerated Actions)

The majority of accelerated action remedial work has been completed after RFCA replaced the IAG in 1996. Since that time, all historical IHSSs, buildings and identified contaminated groundwater plumes were dispositioned. These activities are described below.

IHSSs

In order to prioritize work at the site, IHSSs were listed in RFCA Attachment 3 and ranked in RFCA Attachment 4, Environmental Restoration Ranking, in order of descending risk using a methodology developed by the RFCA Parties. Accelerated actions were planned and conducted to address the highest risk-ranked IHSSs as early in the cleanup process as practicable, while the detailed consolidated plans for all RFCA cleanup activities (the Site baseline and schedule) were being developed. This allowed streamlined decision making and focused available resources on meaningful risk reduction. The RFCA Parties updated the ranking on an annual basis through fall of 2001. They subsequently agreed that there was no need for future updates, because the Site baseline and schedule were sufficiently developed to address proper sequencing of building decontamination and decommissioning and historical IHSS cleanup through planned project completion in 2006. Also, many of the high risk-ranked historical IHSSs had been or were in the process of being cleaned up by that time.

All historical IHSSs listed in RFCA Attachment 3 have been dispositioned in accordance with RFCA requirements. An IHSS disposition flow chart is shown on Figure 1.5, and the general disposition process is described below.

HRR information, process knowledge, and results of previous sampling and analysis efforts were used in planning for disposition of each historical IHSS. To facilitate the RFCA decision-making process, the majority of IHSSs were further consolidated into 58 IHSS Groups in the IA OU and 8 IHSS Groups in the BZ OU as part of the 1999 IA Characterization and Remediation Strategy (IA Strategy) (DOE 1999b). The group designations for those historical IHSSs that were grouped are indicated in Table 1.4.

Characterization results were compared to RFCA soil ALs specified in ALF to evaluate whether the levels and extent of contamination triggered an accelerated action. Because of concerns by some in the community over the exposure parameters used to establish the radionuclide soil action levels (RSALs) in 1996, these levels were considered interim. The RFCA Parties conducted a review to determine whether the interim RSALs should be modified. During the period of review the future land use as a National Wildlife Refuge became law. Thus, the RSAL review expanded to reconsider soil ALs for all analytes, using the Wildlife Refuge Worker (WRW) exposure scenario. As a result of the review, soil ALs and the evaluation and implementing criteria for RFCA accelerated actions required under ALF were modified in 2003 based upon levels that were calculated to result in a lifetime excess cancer risk of $1x10^{-5}$ to the WRW. However, while this risk level equated with a surface soil concentration of 116 picocuries per gram (pCi/g) for plutonium-239/240, the RSAL for plutonium was established at a lower level of 50 pCi/g, which equates to about $3x10^{-6}$ risk. This lower RSAL was designed to help ensure the total risk from all radionuclides would be below $1x10^{-5}$ and to reduce plutonium concentrations that could migrate through the soil erosion pathway. The lower plutonium RSAL also met acceptable risk and annual radiation dose Applicable or Relevant and Appropriate Requirements (ARARs) for an unrestricted user scenario.[13]

In addition, the modified ALF implementing criteria required soils within 3 feet of the surface contaminated above the plutonium RSAL to be removed to below the RSAL. This also addressed the soil erosion pathway concerns. Thus, in the disposition of all IHSSs where plutonium 239/240 was the soil contaminant, 50 pCi/g in surface soil was the accelerated action trigger for soil removal. This RSAL is not a trigger for actions being evaluated in the FS for final remedy purposes, and is not used in the evaluation of nature and extent of soil contamination or the CRA for risk calculations. Rather, risk for plutonium, like all other contaminants, is calculated based on existing contamination levels after completion of accelerated actions.

Prior to 2000, characterization was completed in accordance with CDPHE and EPA approved Sampling and Analysis Plans (SAPs) for a specific IHSS or group of IHSSs within relatively close geographic proximity. To streamline the regulatory review process, existing IA and BZ characterization data were summarized (DOE 2000b, 2001c), and two SAPs were developed and approved by EPA and CDPHE to direct the soil characterization activities: the IA SAP (DOE 2000c) and the BZ SAP (DOE 2002c). These SAPs emphasized performing real-time analyses using an on-site laboratory and field-portable instruments to streamline the sampling and data analysis processes and shorten the time to render remedial decisions. The specific sampling and analytical requirements for each IHSS Group were contained in SAP Addenda, which were prepared and submitted to the LRA for the particular IHSS Group for review and agreement. The Addenda provided "starting points" from which the soil cleanup activities proceeded. The strategies and decision rules defined in the SAPs guided in-process and final "endpoint" confirmation sampling and analysis. In 2004, the IA and BZ SAPs were combined into one site wide SAP titled the IABZSAP (DOE 2004b), which was approved by EPA and CDPHE. Ecological threats were considered and evaluated in accordance with ALF and the IABZSAP. (An ERA is also part of the CRA.)

If no accelerated action was required, the data were summarized in a Data Summary Report and the IHSS or IHSS Group was recommended for No Further Accelerated Action (NFAA). The Data Summary Report summarized, in tabular and graphical format,

[13] The Soil Action Levels Technical Memorandum, developed under Task 2 of the RI/FS Work Plan, discusses this review and subsequent revision of ALs, including interim RSALs. See also Section 9.0 of the RI/FS Report, which contains ARARs for annual radiation dose criteria for restricted and unrestricted use.

the data that justify the NFAA for the IHSS Group. Information provided in the Data Summary Report was used in the update to the HRR pertaining to the IHSS to further document the basis for NFAAs. If an accelerated action was taken, the confirmation sampling results were used to demonstrate that NFAA requirements were met for the IHSS.

Except in a few instances, groundwater contamination was not identified at specific IHSSs. However, IHSS specific contaminated soil remedial activities generally reduced sources of soil contamination that could continue to impact groundwater and/or surface water quality. Accelerated actions for groundwater contamination are discussed below.

If an accelerated action was determined to be required, it was proposed in a draft decision document for LRA approval. Three types of RFCA accelerated actions have been conducted in accordance with the following RFCA decision documents:

- Proposed Action Memorandums (PAMs) implemented when remedy selection was straightforward, and remedial activities were estimated to take less than 6 months from commencement of the physical work to completion;
- Interim Measure/Interim Remedial Actions (IM/IRAs) implemented when a formal evaluation of remedial options was necessary or remedial activities were estimated to take more than 6 months from commencement of physical work to completion; and
- RFCA Standard Operating Protocols (RSOPs) implemented for routine accelerated actions that are substantially similar in nature, for which standardized procedures were developed (DOE 2002d).

RFCA also provides that a RCRA/CHWA-permitted or interim status unit may be closed under a separate closure plan, or under an accelerated action decision document.

At the completion of the accelerated action, regardless of the type of decision document implemented, a Closeout Report was prepared and submitted to the LRA for approval. The purpose of the Closeout Report was to document accelerated action activities for an IHSS Group. The Closeout Report summarized characterization data, the action taken, demarcation of excavation, confirmation sampling results, remediation waste volume and disposition, any changes in remediation approach and the rationale behind the change, stewardship recommendations, and the demarcation of residual contamination left in place. Information provided in the Closeout Report was used in the update to the HRR to further document the basis for NFAAs.

Table 1.4 lists each IHSS and IHSS Group and their respective IAG OU and RFCA OU designations. Table 1.4 also lists the applicable Data Summary Report or Closeout Report to show the disposition of each IHSS.

Groundwater

The RFCA consolidation of OUs emphasized prioritizing the individual IHSSs and conducting accelerated actions on contaminated soil that may have been contributing to contaminated groundwater plumes. Groundwater contamination was not identified as a separate OU, but IHSSs known to be a source of groundwater contamination were addressed through accelerated actions.

One accelerated action goal is the removal or adequate containment of contaminated soil and wastes to reduce impacts to surface water quality from known or suspected surface and groundwater contamination sources. Current soil ALs are calculated based on soil ingestion and inhalation exposure pathways; the ALs do not include the soil-to-surface water or soil-to-groundwater pathways or any subsequent groundwater-to-surface water pathways. Therefore, it was necessary to also evaluate contaminated groundwater plumes and contaminated soil sources for potential impacts to surface water.

In accordance with RFCA, levels of contamination in groundwater and soil are compared with groundwater and soil ALs specified in RFCA Attachment 5, ALF. For groundwater and soil concentrations that exceeded specified ALs, an evaluation, including impacts of cross media contamination, was conducted in accordance with ALF to determine the appropriate response action.

Accelerated groundwater actions currently in operation are the collection barriers and passive treatment cells installed for the East Trenches Plume (DOE 1999c), Mound Site Plume (DOE 1997d), and Solar Ponds Plume (DOE 1999d). These accelerated actions were conducted to reduce contaminant loading to surface water. A system was also installed to collect and passively aerate a groundwater seep at the Present Landfill area to remove low levels of benzene contamination prior to discharge to surface water (DOE 2004c). Additional evaluation for contaminated groundwater accelerated action decisions was deferred to a site wide evaluation, which is contained in the Interim Measure/Interim Remedial Action (IM/IRA) for Groundwater (Groundwater IM/IRA) (DOE 2005b).

The Groundwater IM/IRA concluded that the following actions would have a positive long-term impact on groundwater and/or surface water quality:

- The already completed accelerated actions for soil source removals and enhancement through *in situ* biodegradation using a one time placement of hydrogen releasing compound in the soil; and
- Addition of *in situ* biodegradation and phytoremediation technologies to enhance the improvement of groundwater quality being achieved by the East Trenches, Solar Ponds and Mound Site Treatment systems.

Other soil source removals have eliminated potential sources of groundwater contamination. Those actions include decontamination and decommissioning of buildings and infrastructure, removing liquids in tanks and piping, plugging process lines and sewers left in place, and disrupting utility corridors.

Buildings

In accordance with RFCA, decommissioning activities were conducted as CERCLA removal actions. By the end of 2005, all buildings have been removed except for the east and west vehicle inspection sheds retained for DOE uses. As required by RFCA, a

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Decommissioning Program Plan (DPP) (K-H 1999) established the framework for the disposition of all facilities at RFETS. Decommissioning of contaminated facilities was conducted under a RFCA accelerated action decision document approved by the LRA. A building disposition flow chart is presented on Figure 1.6, and the general disposition process is described below.

Each RFETS facility was preliminarily screened as either a Type 1, Type 2, or Type 3 facility based on the levels of contamination, if any (radioactive and nonradioactive), known or believed to exist within the facility. The EPA and CDPHE approved Decontamination and Decommissioning (D&D) Characterization Protocol (D&D Protocol) and the Reconnaissance Level Characterization Plan, Appendix D of the D&D Protocol, guided the identification of hazards necessary for proper building typing (DOE 2001d; CDPHE et al. 2001). Generally, a building-specific Reconnaissance Level Characterization Report (RLCR) was prepared that provided the basis for the building type for LRA concurrence. Prior to demolition of contaminated buildings, a Pre-Demolition Survey was completed and a Pre-Demolition Survey Report (PDSR) was prepared for LRA review and approval. In some instances, PDSRs or previous characterization information, such as knowledge of building use, was used in lieu of the RLCR for facility typing (primarily used for proposed Type 1 buildings). The buildings were identified as Type 1, 2, or 3 as follows:

- Type 1 - Buildings Free of Contamination. "Free of contamination" means that the following conditions were met:
  - Hazardous wastes, if any, had been previously removed and any RCRA units were closed;
  - Routine surveys for radiological contamination showed the building was not contaminated;
  - Surveys, if required, for hazardous substance contamination showed the building was not contaminated; and
  - If any hazardous substances including polychlorinated biphenyls (PCBs) in light ballasts, or friable asbestos were present, they were an integral part of the building's structural lighting, heating, electrical, insulation, or decorative material. As such, they were not considered contaminated. Friable asbestos and PCBs were removed for proper disposal before building demolition.
- Type 2 - Buildings without Significant Contamination or Hazards, but in Need of Decontamination. Type 2 buildings contained some radiological contamination or hazardous substance contamination. The extent of the contamination was such that routine methods of decontamination sufficed and only a moderate potential existed for environmental releases during decommissioning. Most buildings where industrial operations occurred that used hazardous substances and/or radioactive materials fell into this category.
- Type 3 - Buildings with Significant Contamination and/or Hazards. Type 3 buildings contained extensive radiological contamination, usually as a result of plutonium processing operations or accidents. Contamination existed in gloveboxes, ventilation systems, and/or the building structure. Those buildings

that were used for plutonium component production along with the major support buildings for such production included Buildings 371/374, 771/774, 707, 776/777, and 779.

For Type 2 and Type 3 buildings, four types of RFCA decision documents, which were approved by the LRA, were used for decommissioning activities:

- PAMs, written when activities took less than 6 months to complete;
- IM/IRAs, written when activities took more than 6 months to complete;
- Decommissioning Operations Plans (DOPs), used for Type 3 buildings; and
- RSOPs, used for repetitive decommissioning activities regardless of the facility type.

Decommissioning of Type 2 buildings was typically conducted under the RSOP for Facility Disposition (DOE 2000d) and the RSOP for Facility Component Removal, Size Reduction, and Decontamination Activities (DOE 2001e), although several buildings were decommissioned under an IM/IRA or PAM. Type 3 buildings were decommissioned pursuant to DOPs.

Closeout Reports document the completed building decommissioning activity. The Closeout Reports for Type 2 and 3 buildings were submitted for LRA approval. Closeout Reports for Type 1 buildings were provided to the LRA for information.

Table 1.5 lists each building decommissioned under RFCA, the building type, and the associated Closeout Report.[14]

1.4.4 CERCLA 5-Year Review

Section 121(c) of CERCLA requires that remedial actions resulting in any hazardous substances remaining at a site shall be periodically reviewed no less than every 5 years (thus, referred to as the CERCLA 5-Year Review) to ensure adequate protection of human health and the environment. Comprehensive Five-Year Review Guidance issued by EPA in June 2001 (EPA 2001) provided such reviews are to be conducted on a sitewide basis for response actions that did not result in levels of contamination that allow unrestricted and unlimited use. The CAD/ROD for OU 3, signed in June 1997, although a no action decision based on unrestricted use, stipulated that a Section 121(c) review would be required for that OU because completion of the then ongoing review of interim soil ALs for radionuclides had not been completed.[15] This date was taken as the trigger for the first periodic Site review. The scope included OU 1 and OU 3, for which final

[14] Note that this list represents the portion of the over 800 structures that have been removed in cleanup and closure of RFETS that were required to follow the RFCA building disposition process described herein.

[15] The Soil Action Levels Technical Memorandum, developed under Task 2 of the Final Work Plan for the Development of the Remedial Investigation and Feasibility Study Report (DOE 2002a), discusses this review and subsequent modification of interim RSALs.

CAD/RODs were issued, and the following completed accelerated actions with residual levels of contamination above unrestricted use levels:

- Trenches T-1 through T-4, historical IHSSs 108, 109, 110 and 111.1;
- Mound Site, historical IHSS 113;
- East Trenches, Mound Site, and Solar Pond Plumes reactive barriers and treatment systems (Figure 1.2);
- Solar Ponds Sludge Removal, historical IHSS 101;
- Former OU 7 (historical IHSSs 114, 167.2, 167.3 and 203) Seep treatment system[16]; and
- Underground Storage Tanks accelerated action for six tanks, T-2, T-3, T-10, T-14, T-16 and T-40, related to the OPWL, historical IHSS 121.

DOE conducted the review from October 2001 through May 2002, with participation of EPA and CDPHE staff. EPA concurred with the Final Report (DOE 2002e) (AR Reference Number SW-A-004535), which includes a Protectiveness Statement as required by EPA guidance, on September 26, 2002.

Pursuant to the Protectiveness Statement, DOE's ongoing custody and control of RFETS, ongoing monitoring programs, and restriction of public access serve to adequately control risks posed by contamination at RFETS. The no action decision for OU 3, which lies east of the RFETS property boundary and outside DOE custody and control, was determined to be adequately protective. In addition, the Protectiveness Statement recognized that DOE was continuing cleanup within the RFETS boundary under RFCA and proceeding toward a final remedy that is expected to be adequately protective when implemented.

It was also concluded that the final remedy for OU 1 is protective and that the accelerated actions addressed the immediate hazards presented prior to the actions that, for the most part, are functioning as intended. The potential bypassing of the Solar Ponds Plume reactive barrier by contaminated groundwater was identified as an area where the system may not be properly functioning; however, this did not result in contaminated groundwater impacting surface water that left the Site above water quality standards.

1.5 Site Conditions for Evaluation in the RI/FS, Proposed Plan, and Final Remedy

RFCA paragraph 83 provides:

> Following implementation of all planned accelerated actions, CDPHE and EPA shall evaluate the Site conditions and render final remedial/corrective action decisions for each OU. Notwithstanding the emphasis on accelerated actions and IHSS-based approach, the Parties recognize

[16] This system has been removed and replaced as part of the accelerated action to install a cover on the Present Landfill, historical IHSS 114, to meet final closure performance criteria. See Section 2.0 for information about the landfill cover and current seep treatment system.

that the final remedial/corrective action decisions may require some additional work as specified in the CAD/ROD to ensure an adequate remedy.

Based on the RFCA consolidation of OUs within the RFETS boundary the geographic areas of all OUs except OU 3 are contained within BZ or IA OU. Thus, the RI/FS reevaluates all OUs within the IA and BZ OUs. The RI characterization information and CRA results provide the basis for evaluating remedial alternatives and rendering a final decision for the BZ and IA OUs.

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Table 1.1
IAG OUs (January 1991)

OU Number	Description	Included IHSSs	LRA
1	881 Hillside Area	102, 103, 104, 105.1, 105.2, 106, 107, 119.1, 119.2, 130, and 145	EPA and CDPHE
2	903 Pad, Mound, and East Trenches Area	108, 109, 110, 111.1-111.8, 112, 113, 140, 153, 154, 155, 183, 216.2, and 216.3	EPA and CDPHE
3	Off-site Areas	199, 200, 201, and 202	EPA
4	Solar Evaporation Ponds	101	CDPHE
5	Woman Creek	115, 133.1-133.6, 142.10, 142.11, and 209	EPA
6	Walnut Creek	141, 142.1-142.9, 142.12, 143, 165, 166.1-166.3, 167.1-167.3, and 216.1	EPA
7	Present Landfill	114 and 203	CDPHE
8	700 Area	118.1, 118.2, 123.1, 123.2, 125, 126.1, 126.2, 127, 132, 135, 137, 138, 139.1, 139.2, 144, 146.1-146.6, 149, 150.1-150.8, 151, 159, 163.1, 163.2, 172, 173, 184, and 188	EPA and CDPHE
9	Original Process Waste Lines	121	CDPHE
10	Other Outside Closures	124, 124.1-124.3, 129, 170, 174, 175, 176, 177, 181, 182, 205, 206, 207, 208, 210, 213, and 214	CDPHE
11	West Spray Field	168	CDPHE
12	400/800 Area	116.1, 116.2, 120.1, 120.2, 136.1-136.3, 147.1, 147.2, 157.2, 187, and 189	CDPHE
13	100 Area	117.1-117.3, 122, 128, 134, 148, 152, 157.1, 158, 169, 171, 186, 190, and 191	CDPHE
14	Radioactive Sites	131, 156, 156.1, 156.2, 156, 160, 161, 162, 164, 164.1, 164.2, 1and 64.3	EPA
15	Inside Building Closures	178, 179, 180, 204, 211, 212, 215, and 217	CDPHE
16	Low-Priority Sites	185, 192, 193, 194, 195, 196, and 197	CDPHE

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Table 1.2
RFCA OU Consolidation Plan (July 1996)

IAG OU	RFCA OU	Description	Consisting of	LRA
1	1	881 Hillside Area	Current OU1 IHSSs	EPA
2	BZ	903 Pad, Mound, and East Trenches Area	All IHSSs from OU2	EPA
3	3	Off-site Areas	Current OU3 IHSSs	EPA
4	IA	Solar Evaporation Ponds	All IHSSs from OU4	CDPHE
5	5	Woman Creek	Current OU5 IHSSs except IHSSs 115 and 196 (Original Landfill), which are part of the IA OU	EPA
6	6	Walnut Creek	Current OU6 IHSSs except IHSSs 143 (Old Outfall) and 165 (Triangle Area), which are part of the IA OU	EPA CDPHE for IHSSs part of IA
7	7	Present Landfill	Current OU7 IHSSs	EPA
8	IA	700 Area	All IHSSs from OU8	CDPHE
9	IA	Original Process Waste Lines	All IHSSs from OU9	CDPHE
10	IA	Other Outside Closures	Current OU10 IHSSs except IHSSs 170, 174a and 174b (PU&D Yard), which are part of the BZ OU	CDPHE EPA for IHSS part of BZ
11	11	West Spray Field	CAD/ROD completed	CDPHE
12	IA	400/800 Area	Current OU12 IHSSs	CDPHE
13	IA	100 Area	Current OU13 IHSSs	CDPHE
14	IA	Radioactive Sites	Current OU14 IHSSs	CDPHE
15	15	Inside Building Closures	CAD/ROD completed	CDPHE
16	16	Low Priority Sites	CAD/ROD completed	CDPHE

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Table 1.3
Final RFCA OUs (April 2004)

Former RFCA OU	Final RFCA OU	Description	Consisting of	LRA
1	1	881 Hillside Area	Current OU1 IHSSs; CAD/ROD completed	EPA
3	3	Off-site Areas	Current OU3 IHSSs; CAD/ROD completed	EPA
11	11	West Spray Field	Current OU11 IHSSs; CAD/ROD completed	CDPHE
15	15	Inside Building Closures	Current OU15 IHSSs; CAD/ROD completed	CDPHE
16	16	Low Priority Sites	Current OU16 IHSSs; CAD/ROD completed	CDPHE
IA	IA	IHSSs located within the IA.	All current IHSSs associated with OUs 4, 8, 9, 12, 13, and 14; IHSSs 115 and 196 from OU5; IHSSs 143 and 165 from OU6; plus all OU10 IHSSs except IHSSs 170, 174a and 174b	CDPHE
BZ and OUs 5, 6, and 7	BZ	IHSSs located within the BZ.	All current IHSSs associated with OUs 2 and 5 except IHSSs 115 and 196; OU6 except IHSSs 143 and 165; OU7; and IHSSs 170, 174a, and 174b from OU10	EPA

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1 7/19/96	RFCA OU RFCA Att. 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
101	000-1	000-101	4	IA	IA	207 Solar Evaporation Ponds			06/01/03 (07/25/03)	I101-A-000310 (I101-A-000319)
102		800-102	1	1	1	Oil Sludge Pit	Feb-97 OU1 CAD/ROD	OU01-A-001366		
103		800-103	1	1	1	Chemical Burial	Feb-97 OU1 CAD/ROD	OU01-A-001366		
104		800-104	1	1	1	Liquid Dumping	Feb-97 OU1 CAD/ROD	OU01-A-001366		
105.1		800-105.1	1	1	1	Bldg. 881 Westernmost Out of Service Fuel Tanks	Feb-97 OU1 CAD/ROD	OU01-A-001366		
105.2		800-105.2	1	1	1	Bldg. 881 Easternmost Out of Service Fuel Tanks	Feb-97 OU1 CAD/ROD	OU01-A-001366		
106		800-106	1	1	1	Bldg. 881, Outfall	Feb-97 OU1 CAD/ROD	OU01-A-001366		
107		800-107	1	1	1	Bldg. 881, Hillside Oil Leak	Feb-97 OU1 CAD/ROD	OU01-A-001366		
108		900-108	2	BZ	BZ	Trench T-1	2000 HRR (02/14/02)	SW-A-004154 (SW-A-004766)		
109	NE-2	900-109	2	BZ	BZ	Trench T-2 - Ryan's Pit	1997 HRR (09/26/02)	SW-A-002435 (BZ-A-000557)		
110		NE-110	2	BZ	BZ	Trench T-3	05/21/03 (06/12/03) 03/08/05 (03/07/05)	BZ-A-000594 (OU05-A-000718) BZ-A-000823 Note 2		
111.1		NE-111.1	2	BZ	BZ	Trench T-4	05/21/03 (06/12/03) 03/08/05 (03/07/05)	BZ-A-000594 (OU05-A-000718) BZ-A-000823 Note 2		
111.2	900-12	NE-111.2	2	BZ	BZ	Trench T-5			02/23/05 (2/23/2005)	BZ-A-000813 Note 2
111.3	900-12	NE-111.3	2	BZ	BZ	Trench T-6			02/23/05 (2/23/2005)	BZ-A-000813 Note 2
111.4	NE-2	NE-111.4	2	BZ	BZ	Trench T-7	05/21/03 (06/12/03) 03/02/05 (02/23/05)	BZ-A-000593 (OU05-A-000718) BZ-A-000817 Note 2		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att 1 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
111.5	900-12	NE-111.5	2	BZ	BZ	Trench T-8			02/01/05 (2/23/2005)	BZ-A-000813 Note 2
111.6	900-12	NE-111.6	2	BZ	BZ	Trench T-9			02/01/05 (2/23/2005)	BZ-A-000813 Note 2
111.7	900-12	NE-111.7	2	BZ	BZ	Trench T-10			02/01/05 (2/23/2005)	BZ-A-000813 Note 2
111.8	900-12	NE-111.8	2	BZ	BZ	Trench T-11			02/01/05 (2/23/2005)	BZ-A-000813 Note 2
112	900-11	900-112	2	BZ	BZ	903 Pad (IAG Name: 903 Drum Storage Area)			01/01/05 (01/13/05)	BZ-A-000807 Note 2
113		900-113	2	BZ	BZ	Mound Area	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
114	000-5	NW-114	7	7	BZ	Present Landfill			06/23/05	BZ-A-000722
115	SW-2	SW-115	5	IA	IA	Original Landfill			09/26/05	IA-A-002617
116.1	400-3	400-116.1	12	IA	IA	West Loading Dock, Building 447 (IAG Name: West Loading Dock Area)	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		
116.2	400-3	400-116.2	12	IA	IA	South Loading Dock, Building 444 (IAG Name: South Loading Dock Area)	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		
117.1	500-1	500-117.1	13	IA	IA	North Site Chemical Storage	09/01/04 (09/29/04)	IA-A-002354 (IA-A-002387)		
117.2	500-4	500-117.2	13	IA	IA	Middle Site Chemical Storage	07/29/04 (06/18/04)	IA-A-002236 (IA-A-002495)		
117.3		600-117.3	13	IA	IA	Chemical Storage – South Site	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
118.1	700-3	700-118.1	8	IA	IA	Multiple Solvent Spills West of Building 730			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)

Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att.1 7/19/96	RFCA OU RFCA Att.1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
118.2	700-3	700-118.2	8	IA	A	Multiple Solvent Spills South End of Building 776			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)
119.1		900-119.1	1	1	1	West Scrap Metal Storage Area and Solvent Spill	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
119.2		900-119.2	1	1	1	East Scrap Metal Storage Area and Solvent Spill	Feb-97 OU1 CAD/ROD	OU01-A-001366		
120.1	600-3	600-120.1	12	IA	IA	Fiberglassing Area North of Building 664	05/01/04 (05/12/04)	IA-A-002139 (IA-A-002140)		
120.2	400-10	600-120.2	12	IA	IA	Fiberglassing Area West of Building 664	06/01/03 (07/15/03)	IA-A-001477 (IA-A-001533)		
121	000-2	000-121	9	IA	IA	Original Process Waste Lines (includes Tanks T-2, T-3, T-10, T-14, T-16, T-40) See:				
						(a) IHSS Group 100-1 Tank T-1	12/01/04 (12/13/04)	IA-A-002466 (IA-A-002472)		
						(b) IHSS Group 100-4			03/01/03 05/12/03 (04/22/03)	IA-A-001309 IA-A-001412 (IA-A-001389)
						(c) IHSS Group 400-3 inc Tanks 4, 5, 6	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		
						(d) IHSS Group 400-8 inc Tanks T-2, T-3			03/01/04 (03/19/04)	IA-A-002027 (IA-A-002021)
						(e) IHSS Group 500-3 inc Tanks 7, 33, 34, 35			06/04/05 (06/24/05)	IA-A-002725 (IA-A-002687)
						(f) IHSS Group 700-2 inc Tanks 11 and 30			03/15/05 (3/14/05)	IA-A-002587 Note 2
						(g) IHSS Group 700-3 inc Tanks 9, 10			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)
						(h) IHSS Group 700-4 inc Tanks 8, 12, 13, 14, 15, 16, 17, 36, 37			12/18/03	IA-A-001876

Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att 1 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
									02/11/04 (02/06/04)	IA-A-001972 (B771-A-000219)
						(i) IHSS Group 700-7			09/30/04 (10/01/04)	IA-A-002395 (IA-A-002357)
						(j) IHSS Group 800-1			03/01/04 (03/19/04)	IA-A-002031 (IA-A-002022)
						(k) IHSS Group 800-2 inc Tank 39	06/01/03 (07/16/03)	IA-A-001442 (IA-A-001523)		
						(l) IHSS Group 800-3 inc Tanks 25, 26			06/13/05 (06/07/05)	IA-A-002705 (IA-A-002684)
						(m) IHSS Group 800-4			05/01/03 (05/15/03)	IA-A-001436 (IA-A--001423)
						(n) IHSS Group 800-6 inc T-40, Tanks 28, 40			03/01/03 (03/25/03)	IA-A-001329 (IA-A-001351)
122	400-8	400-122	9	IA	IA	Underground Concrete Tank			03/01/04 (03/19/04)	IA-A-002027 (IA-A-002021)
123.1		700-123.1	8	IA	IA	Valve Vault 7	2000 HRR (02/14/02)	SW-A-004154 (SW-A-004766)		
123.2	000-2	700-123.2	9	IA	IA	Valve Vault West of Building 707			07/28/05	
124.1	700-4	700-124.1	9	IA	IA	30,000 Gallon Tank (Tank #68)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
124.2	700-4	700-124.2	9	IA	IA	14,000 Gallon Tank (Tank #66)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
124.3	700-4	700-124.3	9	IA	IA	14,000 Gallon Tank (Tank #67)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)

Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
125	700-4	700-125	9	IA	IA	Holding Tank (Tank #66) (This is the same tank identified in IHSS 124.2)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
126.1	700-4	700-126.1	9	IA	IA	Westernmost Out-of-Service Waste Tank			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
126.2	700-4	700-126.2	9	IA	IA	Easternmost Out-of-Service Waste Tank			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
127	000-2	700-127	9	IA	IA	Low-Level Radioactive Waste Leak			07/28/05	Note 2
128	300-1	300-128	13	IA	IA	Oil Burn Pit No. 1	06/01/03 (06/20/03)	IA-A-001456 (IA-A-001481)	06/01/03 (06/20/03)	IA-A-001456 (IA-A-001481)
129	400-7	400-129	10	IA	IA	Building 443 Oil Leak			12/01/04 (01/10/05)	IA-A-002524 (IA-A-002521)
130		900-130	1	1	1	Contaminated Soil Disposal Area East of Bldg. 881	Feb-97 OU1 CAD/ROD	OU01-A-001366		
131	700-3	700-131	14	IA	IA	Radioactive Site - 700 Area Site #1			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)
132	700-3	700-132	9	IA	IA	Radioactive Site - 700 Area Site #4			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)
133.1	SW-1	SW-133.1	5	5	BZ	Ash Pit 1	05/20/03 (06/12/03)	OU05-A-000714 (OU05-A-000718)		
133.2	SW-1	SW-133.2	5	5	BZ	Ash Pit 2	05/20/03 (06/12/03)	OU05-A-000714 (OU05-A-000718)		
133.3	SW-1	SW-133.3	5	5	BZ	Ash Pit 3	2001 HRR (02/14/02)	SW-A-004400 (SW-A-004766)		
133.4	SW-1	SW-133.4	5	5	BZ	Ash Pit 4	05/20/03 (06/12/03)	OU05-A-000714 (OU05-A-000718)		

Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
133.5	SW-1	SW-133.5	5	5	BZ	Incinerator Facility			12/18/03 (12/18/03)	BZ-A-000650 (BZ-A-000781)
133.6	SW-1	SW-133.6	5	5	BZ	Concrete Wash Pad			12/18/03 (12/18/03)	BZ-A-000650 (BZ-A-000781)
134N	300-1	300-134N	13	IA	IA	Lithium Metal Destruction Site	06/01/03 (06/20/03)	IA-A-001456 (IA-A-001481)	06/01/03 (06/20/03)	IA-A-001456 (IA-A-001481)
134S	300-2	300-134S	13	IA	IA	Lithium Metal Destruction Site	12/01/04 (12/17/04)	IA-A-002460 (IA-A-002491)		
135		300-135	8	IA	IA	Cooling Tower Blowdown	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
136.1	400-3	400-136.1	12	IA	IA	Cooling Tower Pond West of Building 444 (IAG Name: Cooling Tower Pond Northeast Corner of Building 460)	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		
136.2	400-3	400-136.2	12	IA	IA	Cooling Tower Pond East of Building 444 (IAG Name: Cooling Tower Pond West of Building 460)	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		
137	700-6	700-137	8	IA	IA	Cooling Tower Blowdown Buildings 712 and 713 (IAG Name: Cooling Tower Blowdown Building 774)			10/01/04 (09/29/04)	IA-A-002397 (IA-A-002384)
138	700-7	700-138	8	IA	IA	Cooling Tower Blowdown Building 779			09/30/04 (10/01/04)	IA-A-002395 (IA-A-002357)
139.1N(a)	700-11	700-139.1N(a)	8	IA	IA	Caustic/Acid Spills Hydroxide Tank Area			02/22/05 (02/04/05)	IA-A-002548 (IA-A-002536)
139.1N(b)	700-4	700-139.1N(b)	8	IA	IA	Caustic/Acid Spills Hydroxide Tank Area			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
139.1S	700-6	700-139.1S	8	IA	IA	Caustic/Acid Spills Hydroxide Tank Area			10/01/04 (09/29/04)	IA-A-002397 (IA-A-002384)

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
139.2	700-4	700-139.2	8	IA	IA	Caustic/Acid Spills Hydrofluoric Acid Tanks			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
140	900-11	900-140	2	BZ	BZ	Hazardous Disposal Area (IAG Name: Reactive Metal Destruction Site)			01/01/05 (01/13/05)	BZ-A-000809
141		900-141	6	6	BZ	Sludge Disposal	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
142.1	NE-1	NE-142.1	6	6	BZ	Pond A-1	06/08/05	OU06-A-000601		
142.2	NE-1	NE-142.2	6	6	BZ	Pond A-2	06/08/05	OU06-A-000601		
142.3	NE-1	NE-142.3	6	6	BZ	Pond A-3	06/08/05	OU06-A-000601		
142.4	NE-1	NE-142.4	6	6	BZ	Pond A-4	06/08/05	OU06-A-000601		
142.5	NE-1	NE-142.5	6	6	BZ	Pond B-1			05/01/05 06/14/05 (05/12/05)	BZ-A-000843 BZ-A-000856 Note 2
142.6	NE-1	NE-142.6	6	6	BZ	Pond B-2 (PAC NE-1404 overlaps with IHSS 142.6)			05/01/05 06/14/05 (05/12/05)	BZ-A-000843 BZ-A-000856 Note 2
142.7	NE-1	NE-142.7	6	6	BZ	Pond B-3			05/01/05 06/14/05 (05/12/05)	BZ-A-000843 BZ-A-000856 Note 2
142.8	NE-1	NE-142.8	6	6	BZ	Pond B-4	06/08/05	OU06-A-000601		
142.9	NE-1	NE-142.9	6	6	BZ	Pond B-5	06/08/05	OU06-A-000601		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
142.10	NE-1	SE-142.10	5	5	BZ	Pond C-1	2004 HRR (06/17/04)	SW-A-005018 (OU05-A-000733)		
142.11	NE-1	SE-142.11	5	5	BZ	Pond C-2	06/08/05	OU06-A-000601		
142.12	NE-1	NE-142.12	6	6	BZ	Flume Pond (IAG Name: Newly Identified Pond A-5)	06/08/05	OU06-A-000601		
143	000-3	700-143	6	IA	IA	Bldg. 771 Outfall	2004 HHR (09/07/04)	SW-A-005018 (IA-A-002305)		
144N	700-3	700-144(N)	8	IA	IA	Sewer Line Overflow (IAG Name: Sewer Line Break)			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)
144S	700-3	700-144(S)	8	IA	IA	Sewer Line Overflow (IAG Name: Sewer Line Break)			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)
145		800-145	1	1	1	Sanitary Waste Line Leak	Feb-97 OU1 CAD/ROD	OU01-A-001366		
146.1	700-4	700-146.1	9	IA	IA	Concrete Process Waste Tanks 7,500 Gallon Tank (31)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
146.2	700-4	700-146.2	9	IA	IA	Concrete Process Waste Tanks 7,500 Gallon Tank (32)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
146.3	700-4	700-146.3	9	IA	IA	Concrete Process Waste Tanks 7,500 Gallon Tank (34W)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)

Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
146.4	700-4	700-146.4	9	IA	IA	Concrete Process Waste Tanks 7,500 Gallon Tank (34E)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
146.5	700-4	700-146.5	9	IA	IA	Concrete Process Waste Tanks 3,750 Gallon Tank (30)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
146.6	700-4	700-146.6	9	IA	IA	Concrete Process Waste Tanks 3,750 Gallon Tank (33)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
147.1	000-2	700-147.1	9	IA	IA	Process Waste Line Leaks (IAG Name: Maas Area)				
147.2		800-147.2	12	IA	IA	Bldg. Conversion Activity Contamination Area	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
148	100-4	100-148	13	IA	IA	Waste Spills			03/01/03 05/12/03 (04/22/03)	IA-A-001309 IA-A-001412 (IA-A-001389)
149.1	000-2	700-149.1	9	IA	IA	Effluent Pipe			07/28/05	Note 2
149.2	700-7	700-149.2	9	IA	IA	Effluent Pipe			09/30/04 (10/01/04)	IA-A-002395 (IA-A-002357)
150.1	700-4	700-150.1	8	IA	IA	Radioactive Site North of Building 771 (IAG Name: Radioactive Leak North of Building 771)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
150.2(N)	700-4	700-150.2(N)	8	IA	IA	Radioactive Site West of Building 771 (IAG Name: Radioactive Leak West of Building 771)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
150.2(S)	700-3	700-150.2(S)	8	IA	IA	Radioactive Site West of Building 776 (IAG Name: Radioactive Leak West of Building 771)			05/01/05	IA-A-002638

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
									06/06/05 (04/19/05)	IA-A-002620 (IA-A-002601)
150.3	700-4	700-150.3	8	IA	IA	Radioactive Site Between Buildings 771 & 774 (IAG Name: Radioactive Leak Between Buildings 771 & 774)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
150.4	700-3	700-150.4	8	IA	IA	Radioactive Site Northwest of Building 750 (IAG Name: Radioactive Leak East of Building 750)			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)
150.5		700-150.5	8	IA	IA	Radioactive Site West of Building 707 (IAG Name: Radioactive Leak West of Building 707)	1998 HRR (07/09/99)	SW-A-002770 (SW-A-004156)		
150.6	700-7	700-150.6	8	IA	IA	Radioactive Site South of Building 779 (IAG Name: Radioactive Leak South of Building 779)			09/30/04 (10/01/04)	IA-A-002395 (IA-A-002357)
150.7	700-3	700-150.7	8	IA	IA	Radioactive Site South of Building 776 (IAG Name: Radioactive Leak South of Building 776)			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)
150.8	700-7	700-150.8	8	IA	IA	Radioactive Site Northeast of Building 779 (IAG Name: Radioactive Leak Northeast of Building 779)			09/30/04 (10/01/04)	IA-A-002395 (IA-A-002357)
151		300-151	8	IA	IA	Tank 262 Fuel Oil Spills	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
152		600-152	13	IA	IA	Fuel Oil Tank 221 Spills	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		

Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
153	900-2	900-153	2	BZ	BZ	Oil Burn Pit No. 2			06/01/05 (06/13/05)	BZ-A-000863 Note 2
154	900-2	900-154	2	BZ	BZ	Pallet Burn Site			06/01/05 (06/13/05)	BZ-A-000863 bote 2
155	900-11	900-155	2	BZ	BZ	903 Lip Area			01/01/05 (01/13/05)	BZ-A-000809 Note 2
156.1		300-156.1	14	IA	IA	Building 371 Parking Lot	2000 HRR (02/14/02)	SW-A-004154 (SW-A-004766)		
156.2		NE-156.2	6	6	BZ	Soil Dump Area Between the A and B Series Drainages	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
157.1	400-7	400-157.1	13	IA	IA	Radioactive Site North Area			12/01/04 (01/10/05)	IA-A-002524 (IA-A-002521)
157.2	400-6	400-157.2	12	IA	IA	Radioactive Site South Area	09/01/04 (09/29/04)	IA-A-002380 (IA-A-002388)		
158	500-2	500-158	13	IA	IA	Radioactive Site – Building 551			07/29/04 (06/18/04)	IA-A-002242 (IA-A-002183)
159	500-3	500-159	9	IA	IA	Radioactive Site – Building 559			06/01/05 (06/24/05)	IA-A-002725 draft (IA-A-002687)
160	600-4	600-160	14	IA	IA	Radioactive Site Building 444 Parking Lot			12/01/04 (12/23/04)	IA-A-002488 (IA-A-002469)
161	400-10	600-161	14	IA	IA	Radioactive Site - Building 664	06/01/03 (07/15/03)	IA-A-001477 (IA-A-001533)		
162	000-2	000-162	14	IA	IA	Radioactive Site - 700 Area Site # 2			07/28/05	Note 2
163.1	700-4	700-163.1	8	IA	IA	Radioactive Site 700 Area Site No.3 Wash Area			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
163.2	700-4	700-163.2	8	IA	IA	Radioactive Site 700 Area Site No.3 Buried Slab			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
164.1		600-164.1	14	IA	IA	Radioactive Slab from Bldg. 771	2000 HRR (02/14/02)	SW-A-004154 (SW-A-004766)		
164.2	800-4	800-164.2	14	IA	IA	Radioactive Site 800 Area Site #2, Building 886 Spills			05/01/03 (05/15/03)	IA-A-001436 (IA-A-001423)
164.3	800-6	800-164.3	14	IA	IA	Radioactive Site 800 Area Site #2, Building 889 Storage Pad			03/01/03 (03/25/03)	IA-A-001329 (IA-A-001351)
165	000-1	900-165	6	IA	IA	Triangle Area			06/01/03 (07/25/03)	I101-A-000310 (I101-A-000319)
166.1		NE-166.1	6	6	BZ	Trench A	1996 HRR (02/14/02)	SW-A-002448 (SW-A-004766)		
166.2		NE-166.2	6	6	BZ	Trench B	1996 HRR (02/14/02)	SW-A-002448 (SW-A-004766)		
166.3		NE-166.3	6	6	BZ	Trench C	1996 HRR (02/14/02)	SW-A-002448 (SW-A-004766)		
167.1		NE-167.1	6	6	BZ	Landfill North Area Spray Field	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
167.2		NE-167.2	6	6	BZ	Pond Area Spray Field (Center Area)	1996 HRR (02/14/02)	SW-A-002448 (SW-A-004766)		
167.3		NE-167.3	6	6	BZ	South Area Spray Field	1996 HRR (02/14/02)	SW-A-002448 (SW-A-004766)		
168		000-168	11	11	11	West Spray Field	Sep-95 OU11 CAD/ROD	OU11-A-000184		
169		500-169	13	IA	IA	Waste Drum Peroxide Burial	1998 HRR (02/20/04)	SW-A-002770 (IA-A-001990)		
170		NW-170	10	BZ	BZ	PU&D Storage Yard - Waste Spills	1999 HRR (09/26/02)	SW-A-003379 (BZ-A-000557)		
171	300-1	300-171	13	IA	IA	Solvent Burning Ground			06/01/03 (06/20/03)	IA-A-001456 (IA-A-001481)
172		000-172	8	IA	IA	Central Avenue Waste Spill	1998 HRR (07/09/99)	SW-A-002770 (SW-A-004156)		

Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
173	900-1	900-173	8	IA	IA	South Dock - Building 991 (IAG Name: Radioactive Site - 900 Area)			04/01/04 (03/31/04)	IA-A-002056 (IA-A-002044)
174A	NE/NW	NW-174A	10	BZ	BZ	PU&D Yard Container Storage Area	09/01/03 (10/07/03)	BZ-A-000631 (BZ-A-000634)		
174B		NW-174B	10	BZ	BZ	PU&D Container Storage Facilities	1998 HRR (07/09/99)	SW-A-002770 (SW-A-004156)		
175	900 Area	900-175	10	IA	IA	S&W Building 980 Container Storage Facility	07/01/03 08/06/03 (07/23/03)	IA-A-001512 IA-A-001570 (IA-A-001556)		
176	000-1	900-176	10	IA	IA	S&W Contractor Storage Yard			06/01/03 (07/25/03)	I101-A-000310 (I101-A-000319)
177	800-5	800-177	10	IA	IA	Building 885 Drum Storage and Paint Storage (IAG Name: Building 885 Drum Storage Area)	07/29/04 (06/21/04)	IA-A-002240 (IA-A-002182)		
178		800-178	15	15	15	Building 881 Drum Storage Area	Aug-95 OU15 CAD/ROD	OU15-A-000273 OU15-A-000274		
179		800-179	15	15	15	Building 865 Drum Storage; refer to OU 15 CAD/ROD)	2001 HRR (02/14/02)	SW-A-004400 (SW-A-004766)		
180		800-180	15	15	15	Building 883 Drum Storage; refer to OU 15 CAD/ROD)	2001 HRR (02/14/02)	SW-A-004400 (SW-A-004766)		
181		300-181	10	IA	IA	Building 334 Cargo Container Area	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
182	400-3	400-182	10	IA	IA	Building 444/453 Drum Storage Area	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		
183		900-183	2	BZ	BZ	Gas Detoxification Area	2000 HRR (02/14/02)	SW-A-004154 (SW-A-004766)		
184	900-1	900-184	8	IA	IA	Building 991 Steam Cleaning Area			04/01/04 (03/31/04)	IA-A-002056 (IA-A-002044)
185		700-185	16	16	16	Solvent Spill	Aug-94 OU16 CAD/ROD	OU16-A-000164		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
186	500-1	300-186	13	IA	IA	Valve Vault 12	09/01/04 (09/29/04)	IA-A-002354 (IA-A-002387)		
187	400-7	400-187	12	IA	IA	Sulfuric Acid Spill (IAG Name: Acid Leaks [2])			12/01/04 (01/10/05)	IA-A-002524 (IA-A-002521)
188		300-188	8	IA	IA	Acid Leak	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
189		600-189	12	IA	IA	Nitric Acid Tanks	2001 HRR (09/26/02)	SW-A-004400 (BZ-A-000557)		
190	000-3	000-190	13	IA	IA	Caustic Leak (also referred to as Central Avenue Ditch)	07/14/04 (07/09/04)	IA-A-002221 (IA-A-002207)		
191		400-191	13	IA	IA	Hydrogen Peroxide Spill	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
192		000-192	16	16	16	Antifreeze Discharge	Aug-94 OU16 CAD/ROD	OU16-A-000164		
193		400-193	16	16	16	Steam Condensate Leak	Aug-94 OU16 CAD/ROD	OU16-A-000164		
194		700-194	16	16	16	Steam Condensate Leak	Aug-94 OU16 CAD/ROD	OU16-A-000164		
195		NW-195	16	16	16	Nickel Carbonyl Disposal	Aug-94 OU16 CAD/ROD	OU16-A-000164		
196	SW-2	SW-196	5/16	IA	IA	Water Treatment Plant Backwash Pond			06/23/05	Note 2
197	500-1	500-197	16	16	16	Scrap Metal Sites	09/01/04 (09/29/04)	IA-A-002354 (IA-A-002387)		
199		Offsite Area 1	3	3	3	Off-Site Area 1	Apr-97 OU3 CAD/ROD	OU03-A-000551		
200		Offsite Area 2	3	3	3	Great Western Reservoir	Apr-97 OU3 CAD/ROD	OU03-A-000551		
201		Offsite Area 3	3	3	3	Standley Lake	Apr-97 OU3 CAD/ROD	OU03-A-000551		
202		Offsite Area 4	3	3	3	Mower Reservoir	Apr-97 OU3 CAD/ROD	OU03-A-000551		
203		NW-203	7	7	BZ	Inactive Hazardous Waste Storage Area	1998 HRR (07/09/99)	SW-A-002770 (SW-A-004156)		
204		400-204	15	15	15	Original Uranium Chip Roaster	1996 HRR (02/14/02)	SW-A-002448 (SW-A-004766)		
205	400-5	400-205	10	IA	IA	Building 460 Sump #3 Acid Side	12/01/04 (12/07/04)	IA-A-002514 (IA-A-002497)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
206	300-5	300-206	10	IA	IA	Inactive D-836 Hazardous Waste Tank	2001 HRR (09/26/02)	SW-A-004400 (BZ-A-000557)		
207	400-3	400-207	10	IA	IA	Inactive 444 Acid Dumpster	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		
208	400-3	400-208	10	IA	IA	Inactive 444/447 Waste Storage Area	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		
209		SE-209	5	5	BZ	Surface Disturbance Southeast of Bldg. 881	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
210		900-210	10	IA	IA	Building 980 Cargo Container, Unit 16	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
211		800-211	15	15	15	Building 881 Drum Storage, Unit 26	Aug-95 OU15 CAD/ROD	OU15-A-000273 OU15-A-000274		
212		300-212	15	15	15	Building 371 Drum Storage Area, Unit 63	1997 HRR (09/26/02)	SW-A-002435 (BZ-A-000557)		
213	900-3	900-213	10	IA	IA	Unit 15, 904 Pad Pondcrete Storage	12/18/03 (12/17/03)	IA-A-001905 (IA-A-001887)		
214	700-8	700-214	10	IA	IA	750 Pad Pondcrete & Saltcrete Storage, Unit 25	12/01/04 (12/17/04)	IA-A-002490 (IA-A-002496)		
215	700-4	700-215	9	IA	IA	Process Waste Tank T-40, Unit 55.13			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972 (B771-A-000219)
216.1		NE-216.1	6	6	BZ	East Spray Fields - North Area	1996 HRR (02/14/02)	SW-A-002448 (SW-A-004766)		
216.2	NE/NW	NE-216.2	2	BZ	BZ	East Spray Field	09/01/03 (10/07/03)	BZ-A-000631 (BZ-A-000634)		
216.3	NE/NW	NE-216.3	2	BZ	BZ	East Spray Field	09/01/03 (10/07/03)	BZ-A-000631 (BZ-A-000634)		
217		800-217	15	15	15	Building 881, CN- Bench Scale Treatment, Unit 32	Aug-95 OU15 CAD/ROD	OU15-A-000273 OU15-A-000274		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA OU RFCA Att 1 & 3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A	000-3	000-500	N/A	N/A	IA	Sanitary Sewer System	12/09/04 03/01/05 (3/21/2005)	IA-A-002498 IA-A-002567 (IA-A-002568)		
N/A		000-501	N/A	N/A	BZ	Roadway Spraying (originally identified as 000-501 in HRR Qtly Update 4; reassigned as 100-613 in the HRR Qtly Update 7)	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		000-503	N/A	N/A	IA	Solar Pond Water Spill Along Central Avenue (originally identified as 000-503 in HRR Qtly Update No. 4; reassigned as NE-1409 in HRR Qtly Update No. 7)	Q7 HRR (09/26/02)	SW-A-002622 (BZ-A-000557)		
N/A	000-4	000-504	N/A	N/A	IA	New Process Waste Lines --- See:				
						(a) IHSS Group 800-1			03/01/04 (03/19/04)	IA-A-002031 (IA-A-002022)
						(b) IHSS Group 000-4			08/09/05	Note 2
N/A	000-3	000-505	N/A	N/A	IA	Storm Drains	03/17/05 (03/21/05)	IA-A-002567 IA-A-002568		
N/A		100-600	N/A	N/A	IA	Mercury Spill-Valve Vault 124-B, Building 124	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		100-601	N/A	N/A	IA	Building 123 Phosphoric Acid Spill	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	000-2	100-602	N/A	N/A	IA	Building 123 Process Waste Line Break			07/28/05	Note 2
N/A	100-4	100-603	N/A	N/A	IA	Building 123 Bioassay Waste Spill	2001 HRR (02/14/02)	SW-A-004400 (SW-A-004766)		
N/A		100-604	N/A	N/A	BZ	T130 Complex Sewer Line Leaks	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		100-605	N/A	N/A	IA	Building 115 Hydraulic Oil Spill	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		100-606	N/A	N/A	IA	Building 125 TCE Spill	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	100-3	100-607	N/A	N/A	IA	Building 111 Transformer PCB Leak	2001 HRR	SW-A-004400		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
							(04/12/01)	(B111-A-000003)		
N/A		100-608	N/A	N/A	IA	Building 131 Transformer Leak	1998 HRR (07/09/99)	SW-A-002770 (SW-A-004156)		
N/A	100-5	100-609	N/A	N/A	IA	Building 121 Security Incinerator			03/01/03 05/12/03 (04/22/03)	IA-A-001309 IA-A-001412 (IA-A-001389)
N/A		100-610	N/A	N/A	IA	Asbestos Release – Building 123	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	100-4	100-611	N/A	N/A	IA	Building 123 Scrubber Solution Spill			03/01/03 05/12/03 (04/22/03)	IA-A-001309 IA-A-001412 (IA-A-001389)
N/A		100-612	N/A	N/A	IA	Battery Solution Spill - Building 119	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		100-613	N/A	N/A	BZ	Asphalt Surface in Lay-down Yard North of Building 130 (identified as 000-501 in HRR Quarterly Update No. 4; reassigned as 100-613 in HRR Quarterly Update No. 7).	Q7 HRR (09/26/02)	SW-A-002622 (BZ-A-000557)		
N/A		300-700	N/A	N/A	IA	Scrap Roofing Disposal	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		300-701	N/A	N/A	IA	Sulfuric Acid Spill – Building 371	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	300-6	300-702	N/A	N/A	IA	Pesticide Shed	07/01/03 (07/21/03)	IA-A-001509 (IA-A-001544)		
N/A		300-703	N/A	N/A	IA	Building 331 North Area	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		300-704	N/A	N/A	IA	Roof Fire, Building 381	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A		300-705	N/A	N/A	IA	Potassium Hydroxide Spill North of Building 374	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		300-706	N/A	N/A	IA	Evaporator Tanks North of Building 374	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		300-707	N/A	N/A	IA	Sanitizer Spill	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		300-708	N/A	N/A	IA	Transformers North of Building 371	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A		300-709	N/A	N/A	IA	Transformer Leak 334-1	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A		300-710	N/A	N/A	IA	Gasoline Spill North of Building 331	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		300-711	N/A	N/A	IA	Nickel-Cadmium Battery Acid Spill Outside of Building 373	Q7 HRR (09/26/02)	SW-A-002622 (BZ-A-000557)		
N/A		300-712	N/A	N/A	IA	0.5-Gallon Antifreeze Spilled by Street Sweeper Outside of Building 373	Q7 HRR (09/26/02)	SW-A-002622 (BZ-A-000557)		
N/A		300-713	N/A	N/A	IA	Caustic Spill North of Building 331	Q8 HRR (09/26/02)	SW-A-001193 (BZ-A-000557)		
N/A		300-714	N/A	N/A	IA	Laundry Waste Water Spill from Tank T-803, North of Building 374	Q10 HRR (09/26/02)	SW-A-001548 (BZ-A-000557)		
N/A		300-715	N/A	N/A	IA	Battery Acid Spill	1997 HRR (07/09/99)	SW-A-002435 (SW-A-004157)		
N/A		400-800	N/A	N/A	IA	Transformer 443-1	1998 HRR (07/09/99)	SW-A-002770 (SW-A-004156)		
N/A	400-3	400-801	N/A	N/A	IA	Transformer, Roof of Building 447	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		
N/A	600-2	400-802	N/A	N/A	IA	Storage Area, South of Building 334			06/01/03 (06/19/03)	IA-A-001458 (IA-A-001485)
N/A	400-4	400-803	N/A	N/A	IA	Miscellaneous Dumping, Building 460 Storm Drain	08/24/04 (08/23/04)	IA-A-002275 (IA-A-002267)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att 1 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A	400-4	400-804	N/A	N/A	IA	Road North of Building 460	08/24/04 (08/23/04)	IA-A-002275 (IA-A-002267)		
N/A		400-805	N/A	N/A	IA	Building 443 Tank #9 Leak	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		400-806	N/A	N/A	IA	Catalyst Spill, Building 440	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	400-10	400-807	N/A	N/A	IA	Sandblasting Area	06/01/03 (07/15/03)	IA-A-001477 (IA-A-001533)		
N/A		400-808	N/A	N/A	IA	Vacuum Pump Leak - Building 442	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		400-809	N/A	N/A	IA	Oil Leak - 446 Guard Post	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	400-3	400-810	N/A	N/A	IA	Beryllium Fire - Building 444	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		
N/A		400-811	N/A	N/A	IA	Transformer 443-2, Building 443	1998 HRR (07/09/99)	SW-A-002770 (SW-A-004156)		
N/A		400-812	N/A	N/A	IA	Tank T-2 Spill in Building 460	2001 HRR (02/14/02)	SW-A-004400 (SW-A-004766)		
N/A	400-5	400-813	N/A	N/A	IA	RCRA Tank Leak in Building 460	12/01/04 (12/07/04)	IA-A-002514 (IA-A-002497)		
N/A		400-814	N/A	N/A	IA	Air Conditioner Compressor Release, Bldg. 444 Roof	Q8 HRR (09/26/02)	SW-A-001193 (BZ-A-000557)		
N/A	400-5	400-815	N/A	N/A	IA	RCRA Tank Leak in Building 460	12/01/04 (12/07/04)	IA-A-002514 (IA-A-002497)		
N/A		500-900	N/A	N/A	IA	Transformer Leak – 515/516	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A		500-901	N/A	N/A	IA	Transformer Leak – 555	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA/OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A		500-902	N/A	N/A	IA	Transformer Leak – 559	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A		500-903	N/A	N/A	IA	RCRA Storage Unit #1	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	500-5	500-904	N/A	N/A	IA	Transformer Leak – 223-1/223-2	05/01/04 (05/17/04)	IA-A-002143 (IA-A-002127)		
N/A		500-905	N/A	N/A	IA	Transformer Leak – 558-1	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A	500-6	500-906	N/A	N/A	IA	Asphalt Surface Near Building 559	07/01/03 (07/16/03)	IA-A-001495 (IA-A-001532)		
N/A	500-7	500-907	N/A	N/A	IA	Tanker Truck Release of Hazardous Waste from Tank 231B	06/01/03 (06/09/03)	IA-A-001438 (IA-A-001470)		
N/A		500-908	N/A	N/A	IA	Oil Released from Air Compressor	Q12 HRR (09/26/02)	SW-A-002591 (BZ-A-000557)		
N/A		500-909	N/A	N/A	IA	Release of Spent Photographic Fixer Solution	1996 HRR (02/14/02)	SW-A-002448 (SW-A-004766)		
N/A		600-1000	N/A	N/A	IA	Transformer Storage Building 662	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A	600-1	600-1001	N/A	N/A	IA	Temporary Waste Storage Building 663			06/01/03 (06/24/03)	IA-A-001467 (IA-A-001484)
N/A		600-1001(a)	N/A	N/A	IA	Waste Oil Identified in PAC-1001	2000 HRR (02/14/02)	SW-A-004154 (SW-A-004766)		
N/A		600-1002	N/A	N/A	IA	Transformer Storage - West of Building 666	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A		600-1003	N/A	N/A	IA	Transformers North and South of 661-675 Substation	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A	600-5	600-1004	N/A	N/A	IA	Central Avenue Ditch Cleaning Incident (identified in HRR Quarterly Update No. 6 as 400-820; reassigned as 600-1004 in HRR Quarterly Update No. 7)	07/29/04 (06/18/04)	IA-A-002238 (IA-A-002181)		

Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A	600-6	600-1005	N/A	N/A	IA	Former Pesticide Storage Area	09/01/02 (05/15/03)	SW-A-004669 (SW-A-004801)		
N/A	700-3	700-1100	N/A	N/A	IA	French Drain North of Building 776/777			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)
N/A	700-10	700-1101	N/A	N/A	IA	Laundry Tank Overflow - Building 732	09/28/04 (09/21/04)	IA-A-002348 (IA-A-002339)		
N/A		700-1102	N/A	N/A	IA	Transformer Leak – 776-4	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A		700-1103	N/A	N/A	IA	Leaking Transformers - Building 707	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A		700-1104	N/A	N/A	IA	Leaking Transformers - Building 708	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A	700-7	700-1105	N/A	N/A	IA	Transformer Leak - 779-1/779-2			09/30/04 (10/01/04)	IA-A-002395 (IA-A-002357)
N/A	700-12	700-1106	N/A	N/A	IA	Process Waste Spill - Portal 1	09/01/02 (05/15/03)	SW-A-004669 (SW-A-004800)		
N/A		700-1107	N/A	N/A	IA	Compressor Waste Oil Spill - Building 776	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	700-11	700-1108	N/A	N/A	IA	771/774 Footing Drain Pond			02/22/05 (02/04/05)	IA-A-002548 (IA-A-002536)
N/A		700-1109	N/A	N/A	IA	Uranium Incident - Building 778	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		700-1110	N/A	N/A	IA	Nickel Carbonyl Burial West of Building 771	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		700-1111	N/A	N/A	IA	Leaking Transformer - Building 750	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A		700-1112	N/A	N/A	IA	Leaking Transformer - 776-5	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A		700-1113	N/A	N/A	IA	Water Released from 207C Solar Evaporation Pond	Q11 HRR (09/26/02)	SW-A-001560 (BZ-A-000557)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A		700-1114a	N/A	N/A	IA	Release During Liquid Transfer Operations from Bldg. 774	1997 HRR (09/26/02)	SW-A-002435 (BZ-A-000557)		
N/A		700-1114b	N/A	N/A	IA	Release During Liquid Transfer Operations from Bldg. 774	1997 HRR (09/26/02)	SW-A-002435 (BZ-A-000557)		
N/A	700-1	700-1115	N/A	N/A	IA	Identification of Diesel Fuel in Subsurface Soils	09/16/04 (09/14/04)	IA-A-002350 (IA-A-002325)		
N/A	700-3	700-1116	N/A	N/A	IA	Leaking Transformer South of Building 776			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)
N/A		700-1117	N/A	N/A	IA	Building 701 Water Line, Soil Put-back	1998 HRR (07/09/99)	SW-A-002770 (SW-A-004156)		
N/A	800-3	800-1200	N/A	N/A	IA	Valve Vault 2			06/13/05 (06/07/05)	IA-A-002705 (IA-A-002684)
N/A	800-3	800-1201	N/A	N/A	IA	Radioactive Site South of Building 883			06/13/05 (06/07/05)	IA-A-002705 (IA-A-002684)
N/A		800-1202	N/A	N/A	IA	Sulfuric Acid Spill, Building 883	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		800-1203	N/A	N/A	IA	Sanitary Sewer Line Break Between Buildings 865 and 886	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	800-1	800-1204	N/A	N/A	IA	Building 866 Spills			03/01/04 (03/19/04)	IA-A-002031 (IA-A-002022)
N/A	800-2	800-1205	N/A	N/A	IA	Building 881, East Dock	06/01/03 (07/16/03)	IA-A-001442 (IA-A-001523)		
N/A		800-1206	N/A	N/A	IA	Fire, Building 883	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		800-1207	N/A	N/A	IA	Transformer 883-4	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A		800-1208	N/A	N/A	IA	Transformer 881-4	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA OU RFCA Att. 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A		800-1209	N/A	N/A	IA	Leaking Transformers, 800 Area	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A	800-1	800-1210	N/A	N/A	IA	Transformers 865-1 and 865-2			03/01/04 (03/19/04)	IA-A-002031 (IA-A-002022)
N/A		800-1211	N/A	N/A	IA	Capacitor Leak, Building 883	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	800-1	800-1212	N/A	N/A	IA	Building 866 Sump Spill			03/01/04 (03/19/04)	IA-A-002031 (IA-A-002022)
N/A		900-1300	N/A	N/A	IA	RO Plant Sludge Drying Beds	1992 HRR (09/26/02)	SW-A-000378 /9 (BZ-A-000557)		
N/A	900-1	900-1301	N/A	N/A	IA	Building 991 Enclosed Area			04/01/04 (03/31/04)	IA-A-002056 (IA-A-002044)
N/A		900-1302	N/A	N/A	IA	Gasoline Spill	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		900-1303	N/A	N/A	IA	Natural Gas Leak	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		900-1304	N/A	N/A	IA	Chromic Acid Spill - Building 991	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		900-1305	N/A	N/A	IA	Building 991 Roof	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	900-1	900-1306	N/A	N/A	IA	Transformers 991-1 and 991-2	04/15/04 (05/06/04)	IA-A-002522 (IA-A-002114)		
N/A	900-1	900-1307	N/A	N/A	IA	Explosive Bonding Pit (originally identified as 900-1307 in the 1997 Annual Update to the HRR; reassigned as 900-1318 in the 1998 Annual HRR Update)			04/01/04 (03/31/04)	IA-A-002056 (IA-A-002044)
N/A	900 Area	900-1308	N/A	N/A	IA	Gasoline Spill Outside of Building 980	2001 HRR (02/14/02)	SW-A-004400 (SW-A-004766)		
N/A		900-1309	N/A	N/A	BZ	OU 2 Field Treatability Unit Spill	1999 HRR (06/23/00)	SW-A-003379 (SW-A-004155)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A	000-1	900-1310	N/A	N/A	IA	ITS Water Spill (identified as 000-502 in HRR Quarterly Update No. 2; reassigned 900-1310 in HRR Quarterly Update No. 7)			06/01/03 (07/25/03)	I101-A-000310 (I101-A-000319)
N/A		900-1311	N/A	N/A	IA	Septic Tank East of Building 991	2000 HRR (02/14/02)	SW-A-004154 (SW-A-004766)		
N/A		900-1312	N/A	N/A	IA	OU-2 Water Spill	1999 HRR (06/23/00)	SW-A-003379 (SW-A-004155)		
N/A		900-1313	N/A	N/A	IA	Seep Area Near OU-2 Influent	1999 HRR (06/23/00)	SW-A-003379 (SW-A-004155)		
N/A		900-1314	N/A	N/A	IA	Solar Evaporation Pond 207B Sludge Release	Q9 HRR (09/26/02)	SW-A-001544 (BZ-A-000557)		
N/A		900-1315	N/A	N/A	IA	Tanker Truck Release on East Patrol Road, North of Spruce Ave.	Q11 HRR (09/26/02)	SW-A-001560 (BZ-A-000557)		
N/A		900-1316	N/A	N/A	BZ	Elevated Chromium (total) Identified During Geotechnical Drilling	Q10 HRR (09/26/02)	SW-A-001548 (BZ-A-000557)		
N/A		900-1317	N/A	N/A	IA	Soil Released from Wooden Crate in 964 Laydown Yard	Q11 HRR (09/26/02)	SW-A-001560 (BZ-A-000557)		
N/A		900-1318	N/A	N/A	IA	Release of F001 Listed Waste Water to Soil (identified as 900-1307 in 1997 Annual Update to the HRR; reassigned 900-1318 in 1998 Annual Update to the HRR)	2000 HRR (02/14/02)	SW-A-004154 (SW-A-004766)		
N/A		NE-1400	N/A	N/A	BZ	Tear Gas Powder Release	1992 HRR (12/23/92) (02/14/02)	SW-A-000378 /9 (OU02-A-000672) (SW-A-004766)		
N/A		NE-1401	N/A	N/A	BZ	NE Buffer Zone Gas Line Break	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		NE-1402	N/A	N/A	BZ	East Inner Gate PCB Spill	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A		NE-1403	N/A	N/A	BZ	Gasoline Spill - Building 920 Guard Post	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A		NE-1404	N/A	N/A	BZ	Diesel Spill at Pond B-2 Spillway (PAC NE-1404 overlaps with IHSS 142.6. Originally identified as NE-1404 in HRR Quarterly Update No. 2; reassigned as NE-1405 in HRR Quarterly Update No. 7)	1998 HRR (09/26/02)	SW-A-002770 (BZ-A-000557)		
N/A		NE-1405	N/A	N/A	BZ	Diesel Fuel Spill at Field Treatability Unit (originally identified as NE-1404 in HRR Quarterly Update No. 2; reassigned NE-1405 in HRR Quarterly Update No. 7)	1998 HRR (07/09/99)	SW-A-002770 (SW-A-004156)		
N/A		NE-1406	N/A	N/A	BZ	771 Hillside Sludge Release	1998 HRR (07/09/99)	SW-A-002770 (SW-A-004156)		
N/A	NE/NW	NE-1407	N/A	N/A	BZ	OU 2 Treatment Facility	09/01/03 (10/07/03)	BZ-A-000631 (BZ-A-000634)		
N/A		NE-1408	N/A	N/A	BZ	OU 2 Test Well (formerly NE-1406)	1999 HRR (06/23/00)	SW-A-003379 (SW-A-004155)		
N/A		NE-1409	N/A	N/A	BZ	Modular Tanks and 910 Treatment System Spill (originally identifed as 000-503 in HRR Quarterly Update No. 4; reassigned as NE-1409 in HRR Quarterly Update No. 7)	2000 HRR (02/14/02)	SW-A-004154 (SW-A-004766)		
N/A		NE-1410	N/A	N/A	BZ	Diesel Fuel Spill at Field Treatability Unit	Q7 HRR (09/26/02)	SW-A-002622 (BZ-A-000557)		
N/A		NE-1411	N/A	N/A	BZ	Diesel Fuel Overflowed from Tanker at OU 2 Field Treatability Unit	Q7 HRR (09/26/02)	SW-A-002622 (BZ-A-000557)		
N/A	NE/NW	NE-1412	N/A	N/A	BZ	Trench T-12 Located in OU 2 East Trenches	09/01/03 (10/07/03)	BZ-A-000631 (BZ-A-000634)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A	NE/NW	NE-1413	N/A	N/A	BZ	Trench T-13 Located in OU 2 East Trenches	09/01/03 (10/07/03)	BZ-A-000631 (BZ-A-000634)		
N/A		NW-1500	N/A	N/A	BZ	Diesel Spill at PU&D Yard (originally identifed as NW-175 in HRR Quarterly Update No. 3; reassigned as NW-1500 in HRR Quarterly Update No. 7)	1998 HRR (07/09/99)	SW-A-002770 (SW-A-004156)		
N/A	NE/NW	NW-1501	N/A	N/A	BZ	Asbestos Release at PU&D Yard (originally identified as NW-176 in HRR Quarterly Update No. 3; reassigned as NW-1501 in HRR Quarterly Update No. 7)	1999 HRR (06/23/00)	SW-A-003379 (SW-A-004155)		
N/A		NW-1502	N/A	N/A	BZ	Improper Disposal of Diesel-Contaminated Material at Landfill (originally identifed as NW-177 in HRR Quarterly Update No. 2; reassigned as NW-1502 in HRR Quarterly Update No. 7)	Q7 HRR (02/14/02)	SW-A-002622 (SW-A-004766)		
N/A		NW-1503	N/A	N/A	BZ	Improper Disposal of Fuel-Contaminated Material at Landfill	Q7 HRR (02/14/02)	SW-A-002622 (SW-A-004766)		
N/A		NW-1504	NA	NA	BZ	Improper Disposal of Thorosilane-Contaminated Material at Landfill	Q7 HRR (09/26/02)	SW-A-002622 (BZ-A-000557)		
N/A	NE-1	NW-1505	N/A	N/A	BZ	North Firing Range			06/01/05 (06/13/05)	BZ-A-000861
N/A		SE-1600	N/A	N/A	BZ	Pond 7-Steam Condensate Releases	1992 HRR (09/26/02)	SW-A-000378 /9 (BZ-A-000557)		
N/A		SE-1601.1	N/A	N/A	BZ	Pond 8 - North [Original Pond 8] (Cooling Tower Discharge Releases)	1992 HRR Note 3 (09/26/02)	SW-A-000378 /9 (BZ-A-000557)		
N/A		SE-1601.2	N/A	N/A	BZ	Pond 8 - South (Cooling Tower Discharge Releases)	1992 HRR Note 3 (09/26/02)	SW-A-000378 /9 (BZ-A-000557)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1 7/19/96	RFCA OU RFCA Att. 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A	900-11	SE-1602	N/A	N/A	BZ	East Firing Range			03/15/05 (02/08/05)	BZ-A-000828 (BZ-A-000798)
N/A		SW-1700	N/A	N/A	BZ	Fuel Spill into Woman Creek Drainage	1992 HRR (02/14/02)	SW-A-000378 /9 (SW-A-004766)		
N/A	SW-1	SW-1701	N/A	N/A	BZ	Recently Identified Ash Pit (Also referred to as TDEM-1)	2001 HRR (02/14/02)	SW-A-004400 (SW-A-004766)		
N/A	SW-1	SW-1702	N/A	N/A	BZ	Recently Identified Ash Pit (Also referred to as TDEM-2)	05/20/03 (06/12/03)	OU05-A-000714 (OU05-A-000718)		
N/A	100-1	UBC-122	N/A	N/A	IA	Building 122 (UBC-122)	12/01/02 (12/13/04)	IA-A-002466 (IA-A-002472)		
N/A	100-4	UBC-123	N/A	N/A	IA	Building 123 (UBC-123)			03/01/03 05/12/03 (04/22/03)	IA-A-001309 IA-A-001412 (IA-A-001389)
N/A	100-2	UBC-125	N/A	N/A	IA	Building 125 (UBC-125)	2002 HRR (04/02/02)	SW-A-004672 (IA-A-001297)		
N/A	300-2	UBC-331	N/A	N/A	IA	Building 331 (UBC-331)	12/01/04 (12/17/04)	IA-A-002460 (IA-A-002491)		
N/A	300-3	UBC-371	N/A	N/A	IA	Building 371 (UBC-371)	08/01/03 (08/21/03)	IA-A-001572 (IA-A-001611)		
N/A	300-4	UBC-374	N/A	N/A	IA	Building 374 (UBC-374)	08/01/03 (08/21/03)	IA-A-001572 (IA-A-001611)		
N/A	400-1	UBC-439	N/A	N/A	IA	Building 439 (UBC-439)	08/24/04 (08/23/04)	IA-A-002272 (IA-A-002266)		
N/A	400-2	UBC-440	N/A	N/A	IA	Building 440 (UBC-440)	09/22/04 (09/27/04)	IA-A-002338 (IA-A-002351)		
N/A	400-8	UBC-441	N/A	N/A	IA	Building 441 UBC-441)			03/01/04 (03/19/04)	IA-A-002027 (IA-A-002021)
N/A	400-7	UBC-442	N/A	N/A	IA	Building 442 (UBC-442)			12/01/04 (01/10/05)	IA-A-002524 (IA-A-002521)
N/A	400-3	UBC-444	N/A	N/A	IA	Building 444 (UBC-444)	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A	400-3	UBC-447	N/A	N/A	IA	Building 447 (UBC-447)	12/18/03 (12/18/03)	IA-A-001907 (B444-A-000059)		
N/A	500-3	UBC-528	N/A	N/A	IA	Building 528 (UBC-528)			06/01/05 (06/24/05)	IA-A-002725 draft (IA-A-002687)
N/A	500-3	UBC-559	N/A	N/A	IA	Building 559 (UBC-559)			06/01/05 (06/24/05)	IA-A-002725 draft (IA-A-002687)
N/A	700-3	UBC-701	N/A	N/A	IA	Building 701 (UBC-701)			05/01/05 06/06/05 (04/19/05)	IA-A-002638 IA-A-002620 (IA-A-002601)
N/A	700-2	UBC-707	N/A	N/A	IA	Building 707 (UBC-707)			03/22/05 (03/15/05)	IA-A-002587 IA-A-002564)
N/A	700-2	UBC-731	N/A	N/A	IA	Building 731 (UBC-731)			03/22/05 (03/15/05)	IA-A-002587 IA-A-002564)
N/A	700-5	UBC-770	N/A	N/A	IA	Building 770 UBC-770)	09/29/04 (09/07/04)	IA-A-002344 (IA-A-002304)		
N/A	700-4	UBC-771	N/A	N/A	IA	Building 771(UBC-771)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972) (B771-A-000219)
N/A	700-4	UBC-774	N/A	N/A	IA	Building 774 (UBC-774)			12/18/03 02/11/04 (02/06/04)	IA-A-001876 IA-A-001972) (B771-A-000219)
N/A	700-3	UBC-776	N/A	N/A	IA	Building 776 (UBC-776)			08/16/05	Note 2
N/A	700-3	UBC-777	N/A	N/A	IA	Building 777 (UBC-777)			08/16/05	Note 2
N/A	700-3	UBC-778	N/A	N/A	IA	Building 778 (UBC-778)			08/16/05	Note 2
N/A	700-7	UBC-779	N/A	N/A	IA	Building 779 (UBC-779)			09/30/04 (10/01/04)	IA-A-002395 (IA-A-002357)

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att 1, 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)
N/A	800-1	UBC-865	N/A	N/A	IA	Building 865 (UBC-865)			03/01/04 (03/19/04)	IA-A-002031 (IA-A-002022)
N/A	800-2	UBC-881	N/A	N/A	IA	Building 881 (UBC-881)	06/01/03 (07/16/03)	IA-A-001442 (IA-A-001523)		
N/A	800-3	UBC-883	N/A	N/A	IA	Building 883 (UBC-883)			06/13/05 (06/07/05)	IA-A-002705 (IA-A-002684)
N/A	800-4	UBC-886	N/A	N/A	IA	Building 886 (UBC-886)			05/01/03 (05/15/03)	IA-A-001436 (IA-A-001423)
N/A	800-5	UBC-887	N/A	N/A	IA	Building 887 (UBC-887)	07/29/04 (06/21/04)	IA-A-002240 (IA-A-002182)		
N/A	800-6	UBC-889	N/A	N/A	IA	Building 889 (UBC-889)			03/01/03 (03/25/03)	IA-A-001329 (IA-A-001351)
N/A	900-1	UBC-991	N/A	N/A	IA	Building 991 (UBC-991)			04/01/04 (03/31/04)	IA-A-002056 (IA-A-002044)
N/A	N/A	N/A	N/A	N/A	N/A	PICs 1, 2, 3, 5, 7, 8, 10, 12, 13, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 43, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 56, 58, 59, 60, 61	1992 HRR (09/26/02)	SW-A-000378 /9 (BZ-A-000557)		
N/A	N/A	N/A	N/A	N/A	N/A	PICs 4, 6, 9, 11, 14, 15, 17, 18, 41, 42, 44, 47, 57	04/15/04 (04/30/04)	IA-A-002073 (IA-A-002112)		

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Table 1.4
IHSS, PAC, UBC and PIC Site Disposition

IHSS	IHSS Group	PAC/UBC	IAG OU 1/21/91	RFCA Att. 1 7/19/96	RFCA OU RFCA Att 1&3 4/13/04	Description	Data Summary Report (Approved) (see Note 1)	Admin Record # (Approved)	Closeout Report (Approved) (see Note 1)	Admin Record # (Approved)

Note 1 - Generally, the date format is xx/01/xx for reports bearing month/year designations only. Nevertheless, in some instances the approval date will precede the date of the referenced report because the dated report is the FINAL version which was modified to conform to the Lead Regulatory Agency requirements for approval. "HRR" refers to Historical Release Report update. In some instances an Addendum to the HRR was prepared and approved in place of a Closeout Report.

Note 2 - Reference not in Administrative Record (AR) File index as of 9/30/05. Information will be updated as documents submitted to AR File are catalogued and index is updated. Agency approval letters are also included in the HRR.

Note 3 - The 1992 HRR summary of SE-1601 included description of Ponds 7 and 8, operating at different times, as subcatories 1601.1 and 1601.2. All approvals Noted were given as to SE-1601 without the subcategory distinction.

Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
111	Administration	1	04/12/02	B111-A-000015	N/A	N/A
111B	Guard Post-closed, relocated east of 663 (awaiting PU&D)	1	5/21/02	IA-A-000984	N/A	N/A
112	External Dosimetry	1	4/9/03 2/26/04	IA-A-001362 IA-A-001996	N/A 04/26/05	N/A IA-A-002605
113	Office Medical (former Guard Post)	N/A	02/24/99	B123-A-000108	Note 1	N/A
114	Bus Stop/Car Pool Shelter	N/A	02/24/99	B123-A-000108	Note 1	N/A
115	Office and EOC Building	1	10/14/04	IA-A-002361	N/A, 11/17/04	N/A, IA-A-002478
116	Office Building	1	12/15/03	IA-A-001880	N/A, 01/06/04	N/A, IA-A-001915
119	WSLLC Fitness Center	1	05/05/04	IA-A-002119	N/A, 06/26/04	N/A, IA-A-002193
120	West Access Guard Post	1	08/02/05	Note 2	N/A	N/A
120A	SPO Shelter (west of 120B) (Was 773S)	1	08/02/05	Note 2	N/A	N/A
120B	Vehicle Search Facility-West **(CONTINUING MISSION)**	N/A	N/A	N/A	N/A	N/A
121	WSLLC Plant Protection	1	11/03/04	IA-A-002447	N/A, 12/6/04	N/A, IA-A-002461
122	Occupational Health - Medical	2	11/18/04	IA-A-002440	08/25/05	Note 2
122S	Emergency Power Switchgear/Shredder Plant	1	11/18/04	IA-A-002440	N/A	N/A
123	Health Physics/Analytic Labs	N/A	02/01/99	B123-A-000108	Note 1; Note 2	
123S	Hazardous Waste Storage	N/A	02/24/99	B123-A-000108	Note 1; Note 2	
124	Water Treatment Plant	1	05/10/05	IA-A-002630	N/A	N/A
125	Standards Lab (demolished)	1	10/17/02	IA-A-001132	N/A, 10/14/03	N/A, IA-A-001705
126	Source Calibration and Storage Building	1	10/21/03	IA-A-001842	N/A, 12/04/03	N/A, IA-A-001845
127	Emergency Generator Building (121)	1	11/03/04	IA-A-002447	N/A, 12/6/04	N/A, IA-A-002461
128	Vehicle Shelter (Plant Protection)	1	08/18/04	IA-A-002264	N/A, 8/31/04	N/A, IA-A-002289
129	Raw Water Strainer	1	05/10/05	IA-A-002630	N/A	N/A
130	Engineering Support Administration Building	1	06/22/04	IA-A-002187	N/A, 08/02/04	N/A, IA-A-002250
131	Training	1	06/22/04	IA-A-002189	N/A, 08/02/04	N/A, IA-A-002250
133	130 Guard Post	1	In progress		N/A	N/A
181	Meteorological Tower Support Building Woman Creek (abandoned pre-	1	04/29/02	BZ-A-000545	N/A	N/A
223	Nitrogen Supply Facility, Includes Storage Tanks 233, 234	1	10/13/04	IA-A-002370	N/A	N/A
223A	Environmental Restoration (ERM) Storage	1	01/14/04	IA-A-001929	N/A, 02/06/04	N/A, IA-A-001968
228A	Drying Bed by 910	2	see B 910			
228B	Drying Bed by 910	2	see B 910			
280	Landfill Support Facility	1	10/31/02	BZ-A-000582	N/A, 03/24/05	N/A, IA-A-002585
281	Sanitary Landfill Leachate Valve Building (Part of B280 Facility)	1	09/03/03	IA-A-001620	N/A	N/A
282	Sanitary Landfill Fire Protection Building and 120,000 Gallon Water	1	10/31/02	BZ-A-000582	N/A, 03/24/05	N/A, IA-A-002585

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Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, TYI	Admin Record #
284	Sanitary Landfill Leachate Collection	1	10/31/02	BZ-A-000582	N/A, 03/24/05	N/A, IA-A-002585
302	Shoot House	1	05/05/04	IA-A-002132	N/A	N/A
303	Rifle Range	1	12/08/04	IA-A-002482	N/A, 1/3/05	N/A, IA-A-002511
308	Compressor Building (Shooting Range)	1	12/08/04	see B 303	N/A	N/A
308B	Modular Storage Tank Pump House	1	09/22/03	IA-A-001674	N/A	N/A
308D	Central Sump Pump House (Quonset Hut-southeast of Modular Tanks)	1	09/22/03	IA-A-001674	N/A	N/A
308E	Treatment Cell (southeast of Modular Tanks)		01/18/05	Note 2		
331	Fire Station (EGEN Supplied) & Garage & Offices	1	09/07/05	Note 2	N/A	N/A
331G	Vehicle Maintenance Garage Portion	2	In progress			
331A	Fire Station Training (Behind 335)	1	12/11/02 01/28/03	IA-A-001209 IA-A-001247	N/A, 11/17/04	N/A, IA-A-002477
331S	Storage	1	07/06/05	IA-A-002745	N/A, 7/25/05	N/A, IA-A-002712
333	Paint Shop and Sand Blast Facility (demolished)	1	04/12/02	B111-A-000015	N/A	N/A
334	General Offices & Maintenance Shop	1	09/09/03 11/10/03	IA-A-001629 IA-A-001955	N/A	N/A
335	Fire Training Building	1	12/11/02 01/28/03	IA-A-001209 IA-A-001247	N/A, 11/17/04	N/A, IA-A-002477
367	Pesticide Storage (was ID 667, located SE corner of 690 yard)	1	01/30/03 12/10/03	IA-A-001261 IA-A-001922	N/A, 11/10/03 N/A, 12/30/03	N/A, IA-A-001804 N/A, IA-A-001903
371	Pu Recovery	3	09/22/05	Note 2		
372	Guard Post (Portal 2)	1	09/22/03	IA-A-001673	N/A	N/A
372A	Personnel Access Control 371 (PACS 2)	1	09/22/03	IA-A-001673	N/A	N/A
373	Cooling Tower - B374	1	09/22/05	Note 2	N/A	N/A
373C	Cooling Tower (replaces old 373 Cooling Tower)	3	09/22/05	Note 2		
374	Liquid Process Waste Treatment - Low Level Pu	3	09/22/05	Note 2		
374A	Carpenter Shop (south of 374)	1	09/22/05	Note 2	N/A	N/A
375	Guard TowerT-4	1	10/08/04	IA-A-002376	N/A	N/A
376	Warehouse (was Chem Recovery)			Note 2		
377	Air Compressor Building (Production)	1	09/22/05	Note 2	N/A	N/A
378	Waste Collection Pump House	1	09/22/05	Note 2	N/A	N/A
381	Fluorine Building	1	09/22/05	Note 2	N/A	N/A
427	Emergency Generator Building (444)	1	7/11/03	B444-A-00051	N/A	N/A
428	Waste Collection Pump House Low Level - Unit 40	1	6/26/03	IA-A-001586	N/A	N/A

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Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
439	Building 440 Operations	1	07/18/05	IA-A-002736	N/A	N/A
440	Waste Storage / Shipping east	2	08/04/05	IA-A-002751		
	Waste Storage / Shipping west	2	08/04/05	IA-A-002751		
441	Production Support Offices	2	5/27/04	IA-A-002152	06/08/04	IA-A-002167
442L	RAD Ops / Glovebox Center Training	1	10/17/02	IA-A-001131	N/A, 10/14/03	N/A, IA-A-001705
442W	HEPA Filter Warehouse	1	10/17/02	IA-A-001130	N/A, 10/14/03	N/A, IA-A-001705
443	Heating Plant (Steam Plant)	1	10/19/04	IA-A-002391	N/A	N/A
444	Manufacturing Building Depleted Uranium Ops	1	07/01/05	B444-A-000131	N/A	N/A
445	Carbon Storage and Carbon Dust Collector	2	07/01/05	B444-A-000131		
447	Depleted Uranium Manufacturing Building	1	07/01/05	B444-A-000131	N/A	N/A
448	Shipping and Uranium Material Storage	2	07/01/05	B444-A-000131		
449	Oil and Paint Storage	1	7/11/03	B444-A-000052	N/A	N/A
449A	Maintenance Annex (northeast of 439)	2	08/11/03	IA-A-001645	10/8/03	IA-A-001708
449C	Maintenance Carpenter Shop (northeast of 439)	1	7/11/03	B444-A-000053	N/A	N/A
450	Filter Plenum Building (south of 444) for B444 Zone 1	2	07/01/05	Note 2		
451	Filter Plenum Building (south of 447) for B447 Zone 2	2	07/01/05	Note 2		
452	Human Resources Office Building	1	10/17/02	IA-A-001112	N/A, 10/14/03	N/A, IA-A-001705
453	Maintenance Storage	2	08/19/03	IA-A-001646	10/8/03	IA-A-001708
454	Cooling Tower - B444 - 800 Tons	1	02/06/04	B444-A-000061	N/A, 04/26/05	N/A, B444-A-000126
455	Filter Plenum (444 Plating Lab) HEPA for 444 Zone 2	2	07/01/05	Note 2		
457	Cooling Tower - B447 - 400 Tons	1	02/06/04	B444-A-000062	N/A, 04/26/05	N/A, B444-A-000126
460	Admin / Waste Storage	1	07/18/05	IA-A-002614	N/A	N/A
462	Cooling Tower B460	1	07/18/05	IA-A-002614	N/A	N/A
515	Electrical Substation 515 - 5,000 KVA	1	04/10/01 06/13/02 pad	B575-A-000006 IA-A-001002	N/A	N/A
516	Electrical Substation 516 - 5,000 KVA	1	04/10/01 06/13/02 pad	B575-A-000006 IA-A-001002	N/A	N/A
517	Electrical Substation 517 - 10,000 KVA	1	08/11/05	Note 2	N/A	N/A
518	Electrical Substation 518 - 10,000 KVA	1	08/11/05	Note 2	N/A	N/A
519	Alarms System Storage (steel framed, composite siding/roof, NW of	1	05/27/05	IA-A-002697	N/A, 6/13/05	N/A, IA-A-002670
520	Switchgear Building for 517/518	1	08/11/05	Note 2	N/A	N/A
528	Process Waste Pit (B559) Low Level Liquid	2	06/07/05	B559-A-000052	see B 559	
549	Fitness Center	1	03/22/04	IA-A-002023	N/A, 03/29/04	N/A, IA-A-002045

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Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
550	Guard Tower T-3	1	05/02/02	IA-A-000949	N/A	N/A
551	General Warehouse and Empty Waste Containers	1	11/05/03	IA-A-001799	N/A, 12/17/03	N/A, IA-A-001886
552	Bottle Gas Storage Building	1	11/05/03	IA-A-001797	N/A, 12/17/03	N/A, IA-A-001886
553	Welding Shop & Offices	1	06/27/03	IA-A-001592	N/A	N/A
554	Warehouse Storage & Shipping Dock	1	06/27/03	IA-A-001593	N/A	N/A
556	Plasma Arc Training	1	11/05/03	IA-A-001799	N/A, 12/17/03	N/A, IA-A-001886
557	Guard Post	1	01/14/04	IA-A-001930	N/A, 02/06/04	N/A, IA-A-001968
559	Plutonium Analytical Lab	2	06/07/05	B559-A-000052	09/26/05	Note 2
559A	Accountability Board Shelter	1	Note 5		N/A	N/A
559-TUN	559-561 Tunnel	2	see B 559			
560	Cooling Tower	1	01/14/04 08/21/02	IA-A-001931 IA-A-001159	N/A, 02/06/04	N/A, IA-A-001968
561	Filter Plenum - B559	2	06/07/05	B559-A-000052		
562	Emergency Generator Building - B561	1	06/07/05	B559-A-000052	N/A	N/A
563	Cooling Tower - B559	1	01/14/04	IA-A-001931	N/A, 02/06/04	N/A, IA-A-001968
564	Production Support Office	1	01/03/05	B559-A-000033	N/A, 1/10/05	N/A, B559-A-000037
566	CSS Alarms	2	04/22/04 06/07/04	IA-A-002074 IA-A-002612	06/09/04	IA-A-002166
566B	Carpenter Shop Shed	1	02/23/04	IA-A-002068	N/A, 04/29/04	N/A, IA-A-002111
569	Crate Counter	1	02/03/04 03/10/04	IA-A-001961 IA-A-002015	N/A, 3/21/05	N/A, IA-A-002570
570	Filter Plenum - B569	1	02/03/04 03/10/04	IA-A-001961 IA-A-002015	N/A, 3/21/05	N/A, IA-A-002570
575	Switchgear Building for 515/516	1	04/10/01 06/13/02 pad	B575-A-000006 IA-A-001002	N/A	N/A
662	Storage (Plant Power)	1	10/17/02 6/1/2003 (slab)	IA-A-001114 IA-A-001467	N/A, 10/14/03	N/A, IA-A-001705

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Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval FYI	Admin Record #
663	Storage and Shipping	1	10/17/02 6/1/2003 (slab)	IA-A-001113 IA-A-001467	N/A, 10/14/03	N/A, IA-A-001705
664	Waste Storage and Shipping	1	01/08/05	IA-A-002518	N/A, 1/10/05	N/A, IA-A-002520
666	Storage Facility	1	10/24/02	IA-A-001146	N/A, 03/24/05	N/A, IA-A-002585
668	Drum Certification	2	04/01/04	IA-A-002134	05/10/04	IA-A-002141
679	Substation - Replaces 555/558	1	08/11/05	Note 2	N/A	N/A
680	Substation - Replaces 555/558	1	08/11/05	Note 2	N/A	N/A
681	Switchgear Building for 679/680	1	08/11/05	Note 2	N/A	N/A
701	Offices / Warehouse	2	07/21/05	B776-A-000291	see B 776	
702	Pump House - Tower 712	1	07/21/05	B776-A-000291	N/A	N/A
703	Pump House - Cooling Tower 713	1	07/21/05	B776-A-000291	N/A	N/A
705	Coatings Lab	2	02/21/05	B705-A-000014	04/19/05	B705-A-000015
706	Closure Project Support Office	1	10/28/04	IA-A-002402	N/A	N/A
707	Plutonium Ops Manufacturing	3	07/19/05	B707-A-000184		
707S	Storage Shed (aka T707S)	1	07/19/05	B707-A-000184	N/A	N/A
708	Compressor Building	2	07/19/05	B707-A-000184		
709	Cooling Tower - B707 - 4000 Tons	1	07/19/05 pad	B707-A-000184		
709A	Emergency Diesel Pump		Note 2			
710	Steam Valve House	1	07/21/05	B776-A-000291	N/A	N/A
711	Cooling Tower B707	1	07/19/05	B707-A-000184	N/A	N/A
711A	Emergency Diesel Pump - 711 Tower	1	07/19/05	B707-A-000184	N/A	N/A
712	Cooling Tower for B776/777/779A	1	07/21/05	B776-A-000291	N/A, 9/29/04	N/A, IA-A-002384
712A	Propane Mix Shed	1	07/21/05	B776-A-000291	N/A	N/A
713	Cooling Tower for B776/777/779A	1	07/21/05	B776-A-000291	N/A, 9/29/04	N/A, IA-A-002384
713A	Valve Pit (east of 713)	1	07/21/05	B776-A-000291	N/A	N/A
714	Hydrofloric (HF) Storage	2	06/09/05	B771-A-000318		
714A	Hydrofloric (HF) Storage	1	see B 771	Note 3	N/A	N/A
714B	Emergency Breathing Air B771	1	see B 771	Note 3	N/A	N/A
715	Emergency Generator #1 B771/774	1	see B 771	Note 3	N/A	N/A
716	Emergency Generator #2 B771/774	1	see B 771	Note 3	N/A	N/A
717	Magnehelic Gauge Building/Sampling Shed	1	see B 771	Note 3	N/A	N/A
718	Pump House - Cooling Tower 711	2	07/19/05	B707-A-000184		
727	Emergency Generator - B782	N/A	see B 779			
728	Process Waste Pit - B771	2	06/09/05	B771-A-000318		

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Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
729	Filter Plenum & Emergency Generator B779 (Zone 1)	N/A	see B 779			
730	Process Waste Pit - B 776	2	07/21/05	B776-A-000291		
731	Process Waste Pit B707 Plenum Deluge	2	07/19/05	B707-A-000184		
732	Laundry Waste Pit - B778	2	07/19/05	B707-A-000184		
750	Offices and Cafeteria	1	10/14/04	IA-A-002363	N/A, 11/17/04	N/A, IA-A-002478
761	Guard Tower	1	05/02/02	IA-A-000949	N/A	N/A
762	Guard Post Portal 1 (Central and 9th)	1	05/02/02	IA-A-000949	N/A	N/A
762A	Personnel Access Control 707 (PACS 1)	1	05/02/02 10/15/01	IA-A-000949 IA-A-000841	N/A	N/A
763	South Breezeway (Portal 1 to 750)	1	01/03/05	IA-A-002517	N/A, 1/4/05	N/A, IA-A-002515
764	PIDAS Support	1	08/09/05	Note 2	N/A	N/A
765	Secondary Alarm	1	08/09/05	Note 2	N/A	N/A
770	774 Maintenance/771 War Room ("Home Depot")	2	06/09/05	B771-A-000318		
771	Plutonium Recovery Facility (including stack)	3	06/09/05	B771-A-000318	09/09/05	Note 2
771A	Corridor F Office Area	1	see B 771	Note 3	N/A	N/A
771B	Carpenter Shop	1	see B 771	Note 3	N/A	N/A
771C	Nuclear waste packaging/Drum Counting	2	06/09/05	B771-A-000318	09/09/05	Note 2
772	HF Acid Storage	1	see B 771	Note 3	N/A	N/A
772A	Acid Storage (southeast of B771)	1	see B 771	Note 3	N/A	N/A
773	Guard Post (old name-Incident Command Center)	1	see B 771	Note 3	N/A	N/A
774	Liquid Waste Treatment Plant - 771 Plutonium Ops	2	06/09/05	B771-A-000318	09/09/05	Note 2
775	Sewage Lift Station	2	06/09/05	B771-A-000318	09/09/05	Note 2
776	Manufacturing and Utilities Low Level and TRU Solid	3	07/21/05	B776-A-000291		
777	Assembly Building Plutonium Manufacturing Ops	3	07/21/05	B776-A-000291		
778	Service/Contaminated Clothing Laundry	2	07/19/05	B707-A-000184		
779	Plutonium Process Development Building	3	12/04/00	B779-A-000132	1/26/01	B779-A-000216
779-TUN	779-782 Tunnel	N/A	see B 779			
780	Flammable Storage	N/A	see B 779			
780A	Metal Storage	N/A	see B 779			
780B	Electrical Maintenance Storage	N/A	see B 779			
781	Compressor Building - 777 Helium Pumps	1	07/21/05	B776-A-000291	N/A	N/A
782	Filter Plenum B779 (Zone 2) HEPA Filters	N/A	see B 779			
783	Pump House Tower Water - Building 779	N/A	see B 779			
784	Cooling Tower - Standby B779	N/A	see B 779			
785	Cooling Tower - Process Water	N/A	see B 779			

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Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
786	Cooling Tower - East Chiller B779	N/A	see B 779			
787	Cooling Tower - West Chiller B779	N/A	see B 779			
790	Radiation Calibration Labs	1	07/28/03 11/10/03	IA-A-001685 IA-A-001953	N/A	N/A
792	Guard Post Portal 3 (north of 771)	1	05/02/02 09/27/01	IA-A-000949 IA-A-000833	N/A	N/A
792A	Personnel Access Control 771 (PACS 3)	1	05/02/02 09/27/01	IA-A-000949 IA-A-000833	N/A	N/A
827	Generator	1	04/17/03 04/08/04	IA-A-001382 IA-A-000092	N/A, 01/12/04	N/A, IA-A-001921
828	Process Waste Pit B886 Low Level	N/A	12/01/02	B886-A-000067	Note 4	
830	Storage / Isolated Power Supply	1	11/01/04	B881-A-000064	N/A	N/A
850	Logistics/Office Space/Cafeteria	1	10/17/02	IA-A-001116	N/A, 10/14/03	N/A, IA-A-001705
863	Electrical Transformer - Switchgear	1	03/01/04 04/08/04	B865-A-000091 B865-A-000092	N/A	N/A
864	Guard Union Office (former Guard Post)	1	10/17/02 11/01/04	IA-A-001115 B881-A-000064	N/A, 10/14/03	N/A, IA-A-001705
865	Materials and Process Development Lab	2	03/01/04 04/08/04	B865-A-000091 B865-A-000092		
866	Process Waste Transfer B865	2	03/01/04 04/08/04	B865-A-000091 B865-A-000092		
867	Filter Plenum (west of B865) Zone 1	2	03/01/04 04/08/04	B865-A-000091 B865-A-000092		
868	Filter Plenum (east of B865) Zone 2	2	03/01/04 04/08/04	B865-A-000091 B865-A-000092		
869	Gas Meter House - PSCO Natural Gas Reducer	1	01/14/04	IA-A-001932	N/A, 02/06/04	N/A, IA-A-001968
875	Filter Plenum B886 Zone 1	N/A	12/01/02	B886-A-000067	Note 4	
879	Filter Plenum B883 Zone 1	2	08/18/05	Note 2		
880	Storage Shed	N/A	12/01/02	B886-A-000067	Note 4	
881	Manufacturing and General Support Building	2	11/01/04	B881-A-000064		
881C	Cooling Tower B881 - 900 Tons	1	08/12/03	IA-A-001644	N/A	N/A
881F	Filter Plenum (881 roof) Zone 1	2	11/01/04	B881-A-000064		
881G	Emergency Generator Facility-B881	1	11/01/04	B881-A-000064	N/A	N/A
881H	Electrical Equipment Building	1	11/01/04	B881-A-000064	N/A	N/A
881-S1	881-883 Stack (north of 881, west stack)	2	11/01/04	B881-A-000064		

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Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
881-S2	881-883 Stack (north of 881, east stack)	2	11/01/04	B881-A-000064		
881-S3	881-883 Stack (south of 881)	2	11/01/04	B881-A-000064		
881-TUN	881-883 Tunnel	N/A		included w/B 881		
883	Uranium Rolling and Forming Facility	2	08/18/05	Note 2		
883C	Cooling Tower B883 - 4,000 Tons	1	08/18/05	Note 2	N/A	N/A
885	Oil & Paint Storage	1	11/01/04	B881-A-000064	N/A	N/A
886	Nuclear Safety Criticality Lab	N/A	12/01/02	B886-A-000067	Note 4	
887	Sewage & Process Waste Lift Station	2	11/01/04	B881-A-000064		
888	Guard Post	1	12/01/02 04/23/03	B886-A-000067 B886-A-000069	N/A	N/A
888A	Electrical Transformer,1500kva,3ph	1	12/1/02	B886-A-000067	N/A	N/A
890	Cooling Tower Pump House - 881, 883	1	11/01/04	B881-A-000064	N/A	N/A
891	Ground Water Treatment Facility OU-1	1	09/01/05	Note 2		
901	Guard Tower	1	05/02/02	IA-A-000949	N/A	N/A
903A2	ER Decontamination Pad Storage (9 x 12) west of MDF	1	11/02/04	BZ-A-000772	N/A	N/A
903B	Decon Pad Sedimentation and Water Holding Tanks	2	11/02/04	BZ-A-000772		
906	Central Waste Storage	1	03/01/05	IA-A-002551	N/A, 3/21/05	N/A, IA-A-002572
910	Solar Pond Evaporator Building, Gas Generators 1, 2, 3	2	04/01/03 2/26/04	IA-A-001372 IA-A-001995	04/06/05	IA-A-002606
910-G1	Gas Generator 1 - Building 910 (north)	1	sold 8/27/02		N/A	N/A
910-G2	Gas Generator 2 - Building 910 (middle)	1	sold 8/27/02		N/A	N/A
910-G3	Gas Generator 3 - Building 910 (south)	1	sold 8/27/02		N/A	N/A
920	Guard Post East Access	1	08/20/05	Note 2	N/A	N/A
920A	SPO Shelter (north of ATM - was S701)	1	08/20/05	Note 2	N/A	N/A
920B	Vehicle Search Facility-East **(CONTINUING MISSION)**	N/A	N/A	N/A	N/A	N/A
928	Fire Water Pump House	1	06/19/05	IA-A-002664	N/A	N/A
952	Isolated Toxic Gas Storage	1	07/27/04	IA-A-002244	N/A, 08/02/04	N/A, IA-A-002247
964	Waste Drum Storage RCRA Unit 24 Low Level Hazardous	2	12/01/04	IA-A-002484	01/04/05	IA-A-002516
965	Carpentry Shop/Contractor Storage	N/A	see B 980			
968	Contractor Warehouse/Storage	N/A	see B 980			
974	Sewage Treatment Sludge Drying Beds 1, 2, 3, 4 (supports 995)	1	see B 995		N/A	N/A
977	Sewage Treatment Sludge Drying Beds 5, 6, 7 (supports 995)	1	see B 995		N/A	N/A
980	General Metal Shop	N/A	10/9/97 11/4/04 pad	B980-A-000006 B980-A-000023	Note 2; Note 6	
984	TRU-Waste Storage Facility	1	04/01/05	IA-A-002693	N/A	N/A

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Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
985	Filter Plenum B996/997/999	1	04/01/05	IA-A-002693	N/A	N/A
987	Storage Vault (WSI Plant Protection) Bunker	1	4/1/03	IA-A-001352	N/A	N/A
988	Tertiary Treatment Pump House	1	see B 995		N/A	N/A
988A	Ultraviolet Disinfecting Facility	1	see B 995		N/A	N/A
989	Emergency Generator B991	1	04/01/05	IA-A-002693	N/A	N/A
990	Pre-Aeration Building	1	06/14/05	Note 2	N/A	N/A
990A	Waste Water Treatment	1	06/14/05	Note 2	N/A	N/A
991	Product Warehouse	2	04/01/05	IA-A-002693	03/31/04	IA-A-002044
991TUN	Tunnels Between 991 Cluster Facilities	2	04/01/05	IA-A-002693	03/31/04	IA-A-002044
992	Guard Post	1	04/01/03	IA-A-001352	N/A	N/A
993	Security Storage Vault (WSI)	2	04/01/03 02/26/04 04/04/04 (slab)	IA-A-001373 IA-A-001995 IA-A-002056	03/31/94 04/06/05	IA-A-002044 IA-A-002606
995	Sewage Treatment Facility Low Level	1	06/14/05	BZ-A-000855	N/A	N/A
995-AB-1	Sewage Treatment Aeration Basin #1 (North)	1	see B 995		N/A	N/A
995-AB-2	Sewage Treatment Aeration Basin #2 (South)	1	see B 995		N/A	N/A
995-C-1	Sewage Treatment Clarifier (Primary Clarifier #1)	1	see B 995		N/A	N/A
995-C-2	Sewage Treatment Clarifier (Primary Clarifier #2)	1	see B 995		N/A	N/A
995-C-3	Sewage Treatment Clarifier (Secondary Clarifier #1)	1	see B 995		N/A	N/A
995-C-4	Sewage Treatment Clarifier (Secondary Clarifier #2)	1	see B 995		N/A	N/A
995-C-5	Sewage Treatment Clarifier (Tertiary Clarifier - behind B988)	1	see B 995		N/A	N/A
995-CCC-1	Sewage Treatment Chlorine Contact Chamber #1	1	see B 995		N/A	N/A
995-CCC-2	Sewage Treatment Chlorine Contact Chamber #2	1	see B 995		N/A	N/A
995-D1	Sewage Treatment Digester #1	1	see B 995		N/A	N/A
995-D2	Sewage Treatment Digester #2	1	see B 995		N/A	N/A
995-EC1	Sewage Treatment Effluent Cell 1 (Southern set- SE Cell)	1	see B 995		N/A	N/A
995-EC2	Sewage Treatment Effluent Cell 2 (Southern set- SW Cell)	1	see B 995		N/A	N/A
995-EC3	Sewage Treatment Effluent Cell 3 (Southern set- NW Cell)	1	see B 995		N/A	N/A
995-IC1	Sewage Treatment Influent Cell 1 (Northern set- SW Cell)	1	see B 995		N/A	N/A
995-IC2	Sewage Treatment Influent Cell 2 (Northern set- NW Cell)	1	see B 995		N/A	N/A
995-IC3	Sewage Treatment Influent Cell 3 (Northern set- NE Cell)	1	see B 995		N/A	N/A
996	Storage Vault - Building 991	1	see B 991		N/A, 3/31/04	N/A, IA-A-002044
997	Storage Vault - Building 991	1	see B 991		N/A, 3/31/04	N/A, IA-A-002044
998	Storage Vault - Building 991	2	see B 991		03/31/04	IA-A-002044
999	Storage Vault - Building 991	1	see B 991		N/A, 3/31/04	N/A, IA-A-002044

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Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
C130	Storage Yard Container (Cargo containers w/roof)	1	05/21/02	BZ-A-000581	N/A	N/A
C331	Storage (Cargo Containers w/roof) aka 331C	1	07/28/05	Note 2	N/A	N/A
C865	Cooling Tower (865)	1	04/17/03 03/01/04 04/08/04	IA-A-001383 B865-A-000091 B865-A-000092	N/A, 01/12/04	N/A, IA-A-001921
Cell 1	Sanitary Landfill Cell 1(Support of B280 Complex)	N/A	see B 280			
K750	Traffic Safety Office - east of 662.		Note 2			
K771	PACS 3 Kiosk	1	Note 2		N/A	N/A
S120	Bus Stop Car Pool Shelter (west of B120, was S119 located by Heliport)	1	08/11/05	Note 2	N/A	N/A
S125	Storage Shed (south of 125)	1	06/12/02	IA-A-001002	N/A	N/A
S281	Sanitary Landfill Bale Storage (Part of B280 Facility)	1	09/03/03	IA-A-001620	N/A	N/A
S372	Bus Stop Car Pool Shelter (south of 372A)	N/A	Note 5			
S374	Building 374 Storage (north of 750HAZ)	N/A	see B 374			
S443	443 Steam Shed (Eighth Street)	N/A	see B 443			
S444	Bus Stop Car Pool Shelter (relocated south of T119B)	N/A	Note 5			
S449	Maintenance Storage	1	7/11/03	B444-A-000054	N/A	N/A
S452	Storage (west of 452)	1	09/03/03	IA-A-001633	N/A	N/A
S460	Portable Shelter / Bus Stop	N/A	Note 5			
S750	Custodial Storage (east of T750B)		Note 2			
S770	Storage Facility (north of 771B)	1		Note 3	N/A	N/A
S886	Bus Stop/Car Pool Shelter (north of 886) personal property	1	04/15/02	B800-A-000018	N/A	N/A
S966-1	Tuff Shed, 966 Decon Pad, directly next to Decon Pad (approx 8'x12')	N/A	see B 966			
S966-2	Tuff Shed, 966 Decon Pad, north of Decon Pad (approx 6'x6')	N/A	see B 966			
T112A	Trailer - Offices/Administration	1	04/02/01	IA-A-000757	N/A	N/A
T112B	Trailer - Storage	1	04/02/01	IA-A-000758	N/A	N/A
T112C	Trailer - Offices/Administration	1	04/02/01	IA-A-000759	N/A	N/A
T115A	Trailer (Offices)	1	01/14/04	IA-A-001927	N/A, 02/06/04	N/A, IA-A-001968
T115B	Fire Dispatch Quarters Trailer	1	10/13/04	IA-A-002368	N/A, 11/17/04	N/A, IA-A-002478
T115C	Trailer (Offices)	1	01/14/04	IA-A-001928	N/A, 02/06/04	N/A, IA-A-001968
T117A	Trailer (Offices)	1	12/15/03	IA-A-001878	N/A, 01/06/04	N/A, IA-A-001915
T119B	Trailer (WSLLC Offices)	1	05/05/04	IA-A-002119	N/A, 6/26/04	N/A, IA-A-002193
T121A	Trailer (Offices - Technical Security)	1	01/22/03	IA-A-001261	N/A, 11/10/03	N/A, IA-A-001804
T122A	Mobile Decontamination System Trailer	N/A	Transferred to	Hanford		
T124A	Trailer (Offices)	1	08/17/04	IA-A-002262	N/A, 08/31/04	N/A, IA-A-002290

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Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
T124G	Pump Skid	N/A	Transferred to	Hanford		
T130A	Trailer (Offices)	1	09/01/05	Note 2		
T130B	Trailer (Offices)	1	03/01/05	IA-A-002595		
T130C	Trailer (Offices)	1	06/07/05	IA-A-002695	N/A	N/A
T130D	Trailer (Offices)	1	09/19/05	Note 2	N/A	N/A
T130E	Trailer (Offices)	1	03/29/05	IA-A-002584	N/A	N/A
T130F	Trailer (Offices)	1	09/19/05	Note 2	N/A	N/A
T130G	Trailer (Offices)	1	03/29/05	IA-A-002584	N/A	N/A
T130H	Trailer (Offices)	1	09/19/05	Note 2	N/A	N/A
T130I	Trailer (Offices)	1	03/01/05	IA-A-002552	N/A, 3/21/05	N/A, IA-A-002569
T130J	Trailer (Offices)	1	08/02/05	Note 2		
T131A	Trailer (Offices)	1	06/03/03 11/10/03	IA-A-001440 IA-A-001954	N/A	N/A
T303D	Trailer (originally T120A)	1	10/10/04	IA-A-002374	N/A, 11/17/04	N/A, IA-A-002478
T331	Women Firefighter Change Area	1	04/06/01	IA-A-000760	N/A	N/A
T331A	Trailer - Fire Protection Administration	1	02/12/02 09/18/01	IA-A-000945 IA-A-000831	N/A	N/A
T334B	Trailer (Offices)	1	01/22/03	IA-A-001261	N/A, 11/10/03	N/A, IA-A-001804
T334D	Trailer (Offices)	1	08/13/03	IA-A-001632	N/A	N/A
T371A	Trailer (Offices)	1	3/23/04	B371-A-000187	N/A	N/A
T371C	Trailer (Offices)	1	3/23/04	B371-A-000188	N/A	N/A
T371D	Trailer (Offices)	1	3/23/04	B371-A-000189	N/A	N/A
T371E	Rest Rooms	1	3/23/04	B371-A-000190	N/A	N/A
T371F	Trailer (Offices)	1	3/23/04	B371-A-000191	N/A	N/A
T371G	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T371H	Trailer (Offices)	1	see B 371			
T371J	Trailer (Offices)	1	see B 371			
T371K	Trailer (Offices)	1	see B 371			
T371S	Trailer - Mobile Breakroom (D&D Closure Projects), originally T788A, T910MB and T771MB.		Note 2			
T376A	Trailer (Offices)		Note 2			
T428B	Trailer	1	06/28/04	IA-A-002191	N/A, 08/02/04	N/A, IA-A-002248
T439A	Trailer (Offices)	1	04/10/01 01/09/01	IA-A-000755 IA-A-000938	N/A	N/A
T439D	Trailer	1	04/10/01	IA-A-000756	N/A	N/A

Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
			01/09/01	IA-A-000939		
T441A	Trailer (Offices)	1	2/3/02	IA-A-001262	N/A	N/A
T444A	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T452A	Trailer (Offices)	1	10/17/02	IA-A-001124	N/A, 10/14/03	N/A, IA-A-001705
T452B	Trailer (Offices)	1	10/17/02	IA-A-001125	N/A, 10/14/03	N/A, IA-A-001705
T452C	Trailer (Offices)	1	10/17/02	IA-A-001126	N/A, 10/14/03	N/A, IA-A-001705
T452D	Trailer (Offices)	1	10/17/02	IA-A-001127	N/A, 10/14/03	N/A, IA-A-001705
T452E	Rest Rooms	1	10/17/02	IA-A-001128	N/A, 10/14/03	N/A, IA-A-001705
T452F	Trailer (Offices)	1	08/21/02	IA-A-001061	N/A	N/A
T452G	Trailer (Offices)	1	10/17/02	IA-A-001129	N/A, 10/14/03	N/A, IA-A-001705
T551A	Trailer - Contractor Offices	1	2/12/02	IA-A-000946	N/A	N/A
T664A	Trailer (Offices)	1	01/08/05	IA-A-002518	N/A, 1/10/05	N/A, IA-A-002520
T664B	NDA Inspection Station		Note 2			
T664C	Mobile RTR, Office		Note 2			
T690A	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T690B	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T690C	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T690D	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T690E	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T690F	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T690G	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T690H	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T690K	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T690L	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T690M	Trailer	1	10/09/97	SW-A-002620	N/A	N/A
T690N	Trailer - Administration	N/A	sold		N/A	N/A
T706A	Trailer (Offices)	1	12/14/04	IA-A-002475	N/A, 12/21/04	N/A, IA-A-002508
T707B	Trailer (Offices)	1	06/15/05	B707-A-000178	N/A, 6/27/05	N/A, B707-A-000179
T707C	Trailer (Offices) (originally RISS T111A)	1	08/09/05	Note 2	N/A	N/A
T707D	Trailer (Offices) (originally RISS T334C)	1	08/09/05	Note 2	N/A	N/A
T707E	Trailer (Offices) (originally RISS T442A)	1	08/09/05	Note 2	N/A	N/A
T707F	Trailer (Offices) originally RISS T883C and then T771Q)	1	08/09/05	Note 2	N/A	N/A
T707G	TTS Training Trailer (originally RISS T119A then T771R)	1	08/09/05	Note 2	N/A	N/A
T750A	Trailer - Training	1	07/27/05	IA-A-002755	N/A	N/A
T750B	Trailer - Training	1	07/27/05	IA-A-002755	N/A	N/A

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Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
T750C	Trailer (Offices)	1	07/27/05	IA-A-002755	N/A	N/A
T750D	Trailer (Offices)	1	07/27/05	IA-A-002755	N/A	N/A
T750E	Old Restroom Trailer	1	04/04/01	IA-A-000761	N/A	N/A
T750F	Trailer - Locker Room/Shower	1	07/27/05	IA-A-002755	N/A	N/A
T750G	Trailer	1	07/27/05	IA-A-002755	N/A	N/A
T760A	Trailer - Lockers/Showers - Pondcrete	1	01/22/03 12/10/03	IA-A-001261 IA-A-001923	N/A, 11/10/03 N/A, 12/30/2003	N/A, IA-A-001804 N/A, IA-A-001903
T771A	Trailer (Offices) - Modular Building	1	see B 771	Note 3	N/A	N/A
T771B	Trailer (Offices)	1	see B 771	Note 3	N/A	N/A
T771C	Nuclear Waste Packaging - Drum Counting	1	see B 771	Note 3	N/A	N/A
T771D	Trailer (Offices)	1	04/06/01	B771-A-000142	N/A	N/A
T771-DT	Decon Trailer (south of 441)	1	see B 771	Note 3		
T771E	Trailer (Offices)	1	see B 771	Note 3	N/A	N/A
T771F	Trailer (Offices)	1	see B 771	Note 3	N/A	N/A
T771G	Trailer - Showers/Lockers	1	see B 771	Note 3	N/A	N/A
T771H	Trailer (Offices)	1	see B 771	Note 3	N/A	N/A
T771J	Trailer (Offices)	1	see B 771	Note 3	N/A	N/A
T771K	Trailer (Offices)	1	see B 771	Note 3	N/A	N/A
T771L	Trailer - Rest Rooms	1	see B 771	Note 3	N/A	N/A
T771T	Administration (originally RISS T881A)	1	see B 771	Note 3	N/A	N/A
T779A	Trailer Administration	1	11/01/04	IA-A-002437	N/A, 11/17/04	N/A, IA-A-002476
T881B	Trailer	1	04/15/02	B800-A-000019	N/A	N/A
T883A	Trailer	1	06/20/01 04/15/02	IA-A-000805 IA-A-000947	N/A	N/A
T883B	Trailer	1	04/13/02	IA-A-000948	N/A	N/A
T883D	Trailer - Rest Rooms	1	04/15/02	B800-A-000017	N/A	N/A
T886A	Trailer (Offices)	1	12/01/02	B886-A-000067	N/A	N/A
T886B	Trailer (Offices)	1	10/17/02	IA-A-001119	N/A, 10/14/03	N/A, IA-A-001705
T886C	Trailer (Offices)	1	10/17/02	IA-A-001120	N/A, 10/14/03	N/A, IA-A-001705
T889A	Trailer - Locker Room/Shower	1	05/21/02	IA-A-000981	N/A	N/A
T891B	Trailer (Offices)	1	03/01/05	IA-A-002559	N/A, 3/21/05	N/A, IA-A-002571
T891C	Trailer (Offices)	1	03/01/05	IA-A-002561	N/A	N/A
T891D	Trailer (Offices)	1	10/31/02	IA-A-001142	N/A, 03/24/05	N/A, IA-A-002585
T891E	Trailer (Offices)	1	10/17/02	IA-A-001123	N/A, 10/14/03	N/A, IA-A-001705

Table 1.5
Building Disposition

Property Identifier	Property Name	Type	Closeout Report	Admin Record #	Approval, FYI	Admin Record #
T891F	Trailer (Offices)	1	07/25/02	IA-A-001041	N/A	N/A
T891G	Trailer (Offices)	1	04/16/02	IA-A-000942	N/A	N/A
T891O	Trailer (Offices)	1	04/16/02	IA-A-001157	N/A	N/A
T891P	Trailer (Offices)	1	10/17/02	IA-A-001117	N/A, 10/14/03	N/A, IA-A-001705
T891Q	Trailer (Shower)	1	10/17/02	IA-A-001118	N/A, 10/14/03	N/A, IA-A-001705
T891R	Trailer (Offices)	1	04/16/02	IA-A-000940	N/A	N/A
T891V	Trailer (Offices) (originally T690J)	1	04/16/02	IA-A-000941	N/A	N/A
T893A	Trailer (Offices)	1	10/17/02	IA-A-001121	N/A, 10/14/03	N/A, IA-A-001705
T893B	Trailer (Offices)	1	10/17/02	IA-A-001122	N/A, 10/14/03	N/A, IA-A-001705
T900A	Trailer - OU-2 Trailer/Surface Water Treatment	1	09/01/05	Note 2	N/A	N/A
T900B	Trailer - OU-2 Trailer/Surface Water Treatment	1	09/01/05	Note 2	N/A	N/A
T900C	Trailer - OU-2 Office Trailer/Surface Water Treatment	1	10/31/02	IA-A-001143	N/A, 03/24/05	N/A, IA-A-002585
T900D	Trailer - OU-2 Office Trailer/Surface Water Treatment	1	05/21/02	IA-A-000982	N/A	N/A
T900E	Trailer - OU-2 Soil Vapor Extraction (SVE) Unit	1	10/31/02	IA-A-001144	N/A, 03/24/05	N/A, IA-A-002585
T903A	Old Shower Trailer ("Original" T903A)	1	04/04/01	IA-A-000762	N/A	N/A
T904A	KHC Mobile Break Room Trailer	1	06/23/04	IA-A-002185	N/A, 08/02/04	N/A, IA-A-002249
T974A	Sewage Treatment Trailer	1	see B 995		N/A	N/A

Note 1 - An RLCR was prepared for the B123 cluster, including these buildings, but protocol for Typing of facilities and concurrence was under development.

Note 2 - Reference is not in the Administrative Record (AR) File index as of 9/30/05. Information will be updated as documents submitted to AR File are catalogued and index is updated. If Building Type is shown, the AR File as of 9/30/05 contains reference to the RLCR or other information supporting the Typing.

Note 3 - See AR #B771-A-000148, 7/12/01, CDPHE concurrence for RLCR for Type 1 Buildings in 771 cluster. This stipulated use of cosultative process and additional characterization if necessary before demolition. The numerous contact records documenting the consultation and agreement on demolition as Type 1 buildings is included in the AR Attachment in the B771 Cluster Closeout Report.

Note 4 - D&D of the 886 Cluster began under an IM/IRA dated 7/30/98, AR # B886-A-00025, which was approved by CDPHE 8/3/98 (AR # B886-A-00026). The action was completed, however, pursuant to the newly implemented Facility Disposition Program Plan and DPP. An RLCR was prepared, but Typing not needed to complete the IM/IRA scope of work.

Note 5 - Some small buildings such a guard shack, portable shelters, bus stop enclosures, etc. not formally typed - considered Type 1 through consultative process.

Note 6 - An RLCR was prepared for the B980 cluster, including these buildings, but protocol for Typing of facilities and concurrence was under development.

N/A means not applicable. In some instances for Type 1 buildings where closeout approval requirement N/A, the AR # related to any "For Your Information" (FYI) concurrence correspondence is included if in the AR File index.

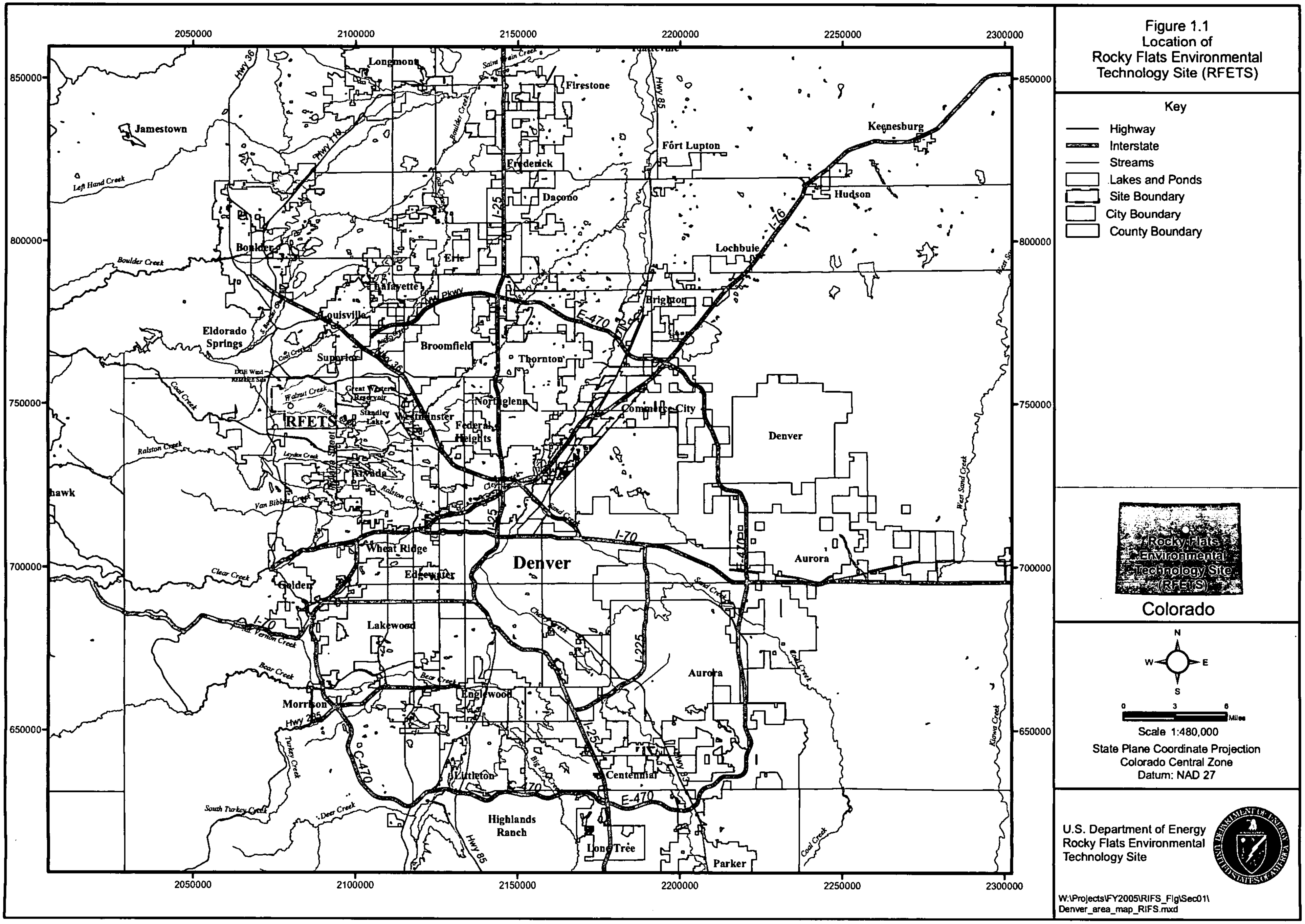

Figure 1.1
Location of
Rocky Flats Environmental
Technology Site (RFETS)

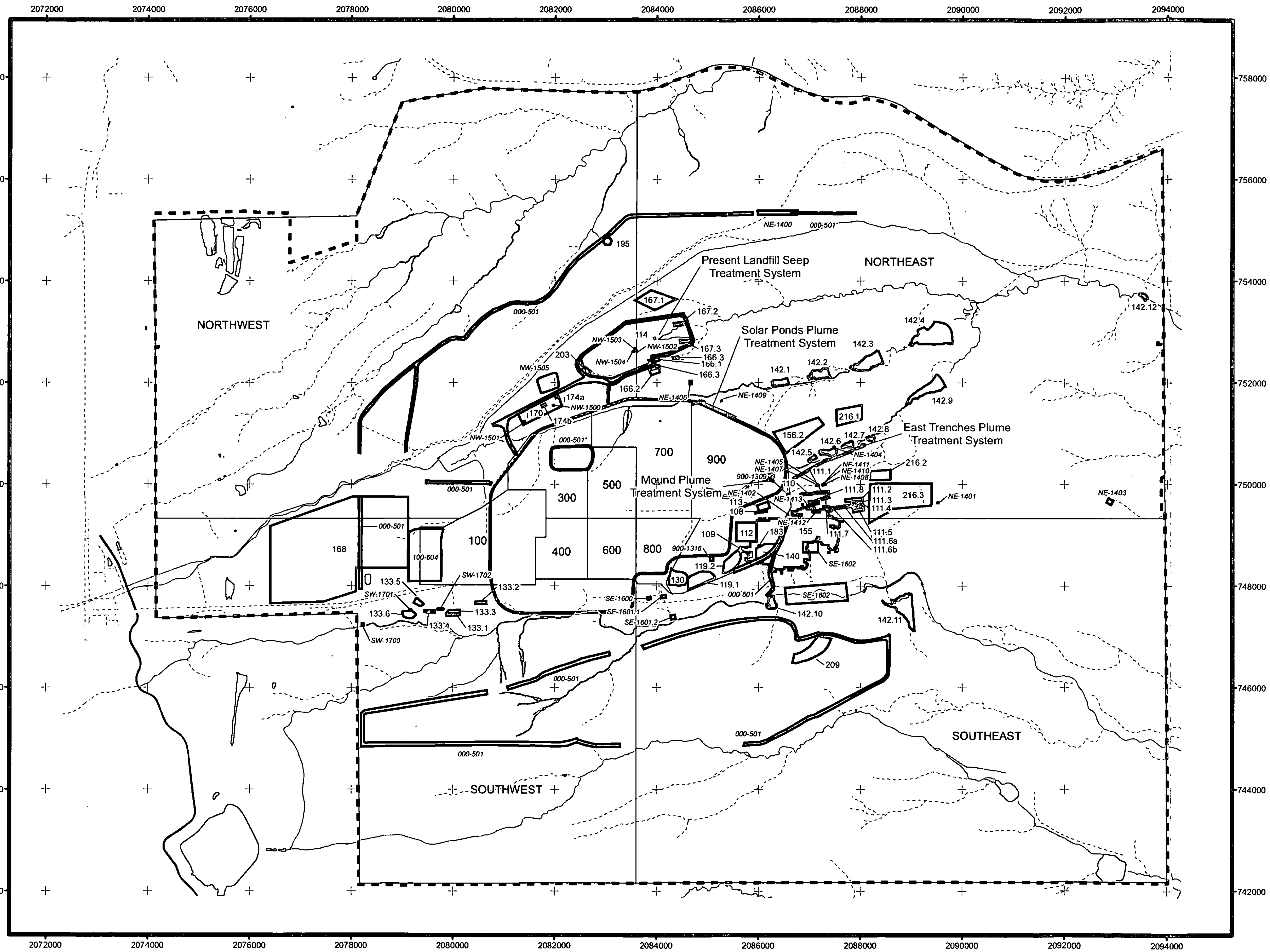

Figure 1.2

Buffer Zone IHSSs and PACs

Key

- HRR Area
- PAC Area
- IHSS Area
- Groundwater Treatment System

* Although geogrphically located within the IA, this portion of the PAC 000-501 is categorized as part of the buffer zone. NFAA has been granted.

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

0 1,000 2,000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec01\ArcMapFig1_02BufferZone_IHSS_PAC.mxd

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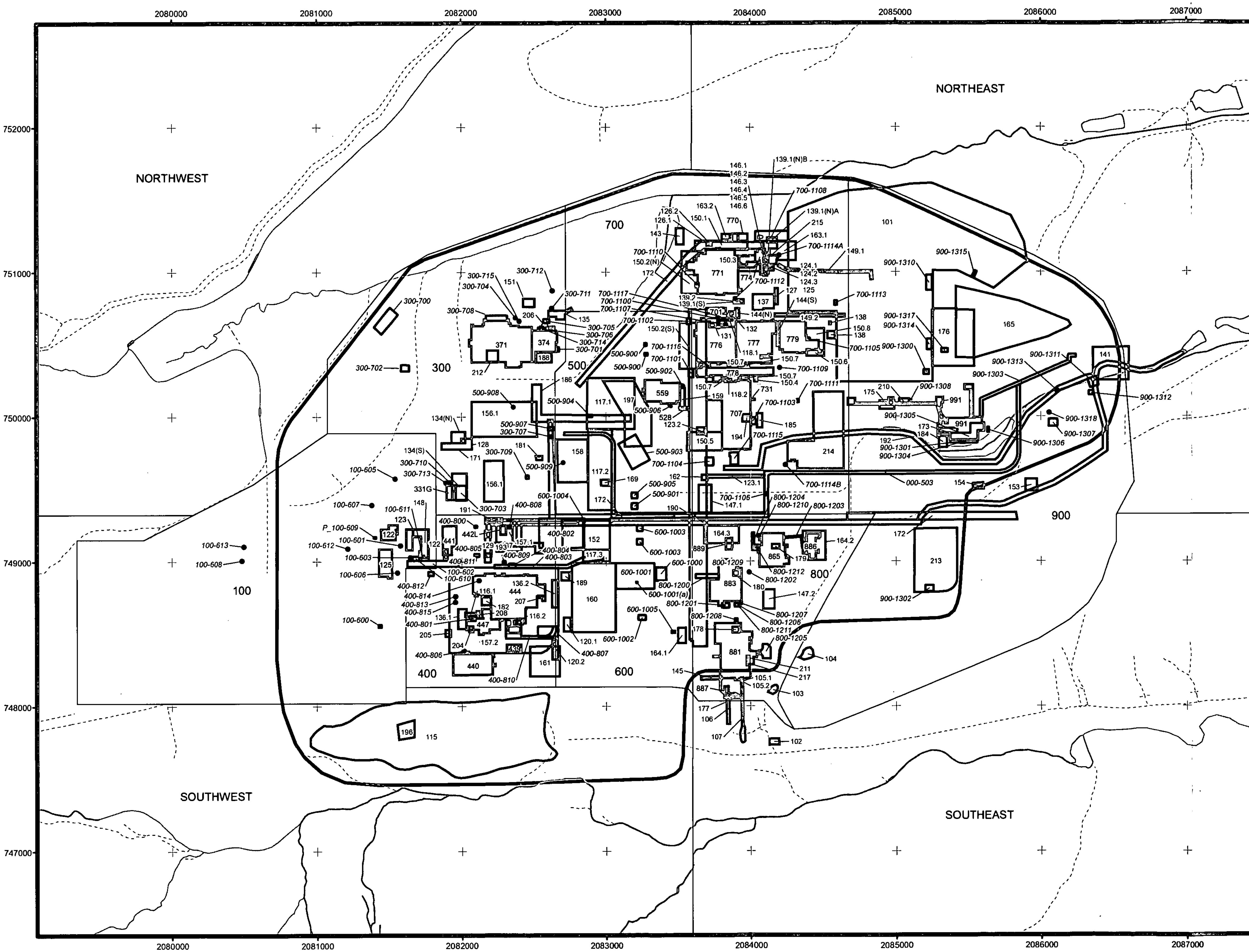
Figure 1.3

Industrial Areas IHSSs, PACs, and UBC Sites



Key

- PAC Area
- IHSS Area
- UBC Area
- HRR Area

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N W E S

0 350 700 Feet

Scale 1:8,400

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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Rocky Flats Environmental
Technology Site

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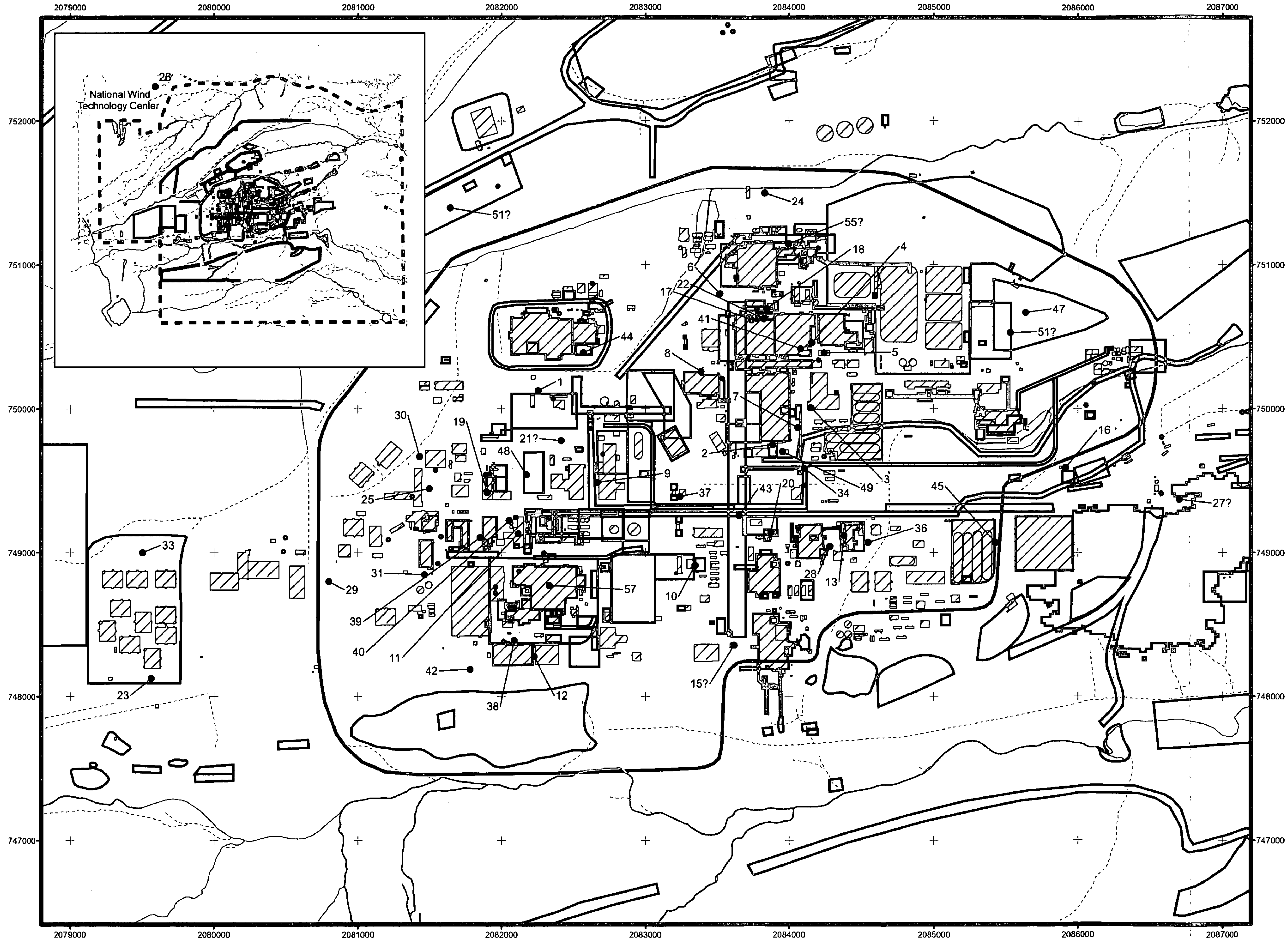

Figure 1.4
Approximate Locations of Potential Incidents of Concern (PICs)

Key

- PAC Area
- UBC Area
- IHSS Area
- Demolished Building/Removed Tanks
- ● Approximate PIC Location
- ? Assumed Location Using Available Information

Note:
Insufficient information exists to identify locations for following PICs:
14
32
35
46
50 (may coincide with NPWL/OPWL)
51 (may have been PU&D Yard (IHSS 170) or S&W Yard (IHSS 165))
52
53
54
56 (Rio Grande Motorways leak (occurred offsite))
58
59
60
61

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N W E S

0 350 700 Feet

Scale 1:8,400

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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Figure 1.5
IHSS Disposition Flow Chart

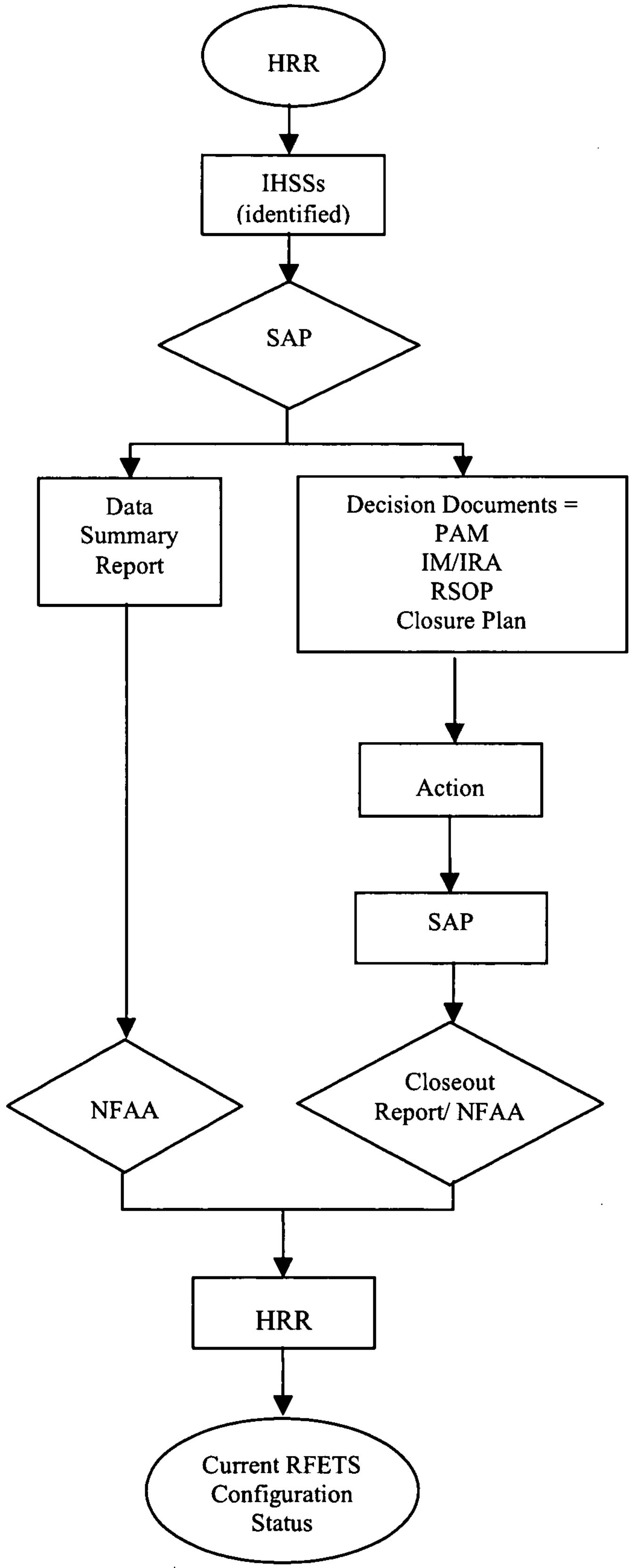

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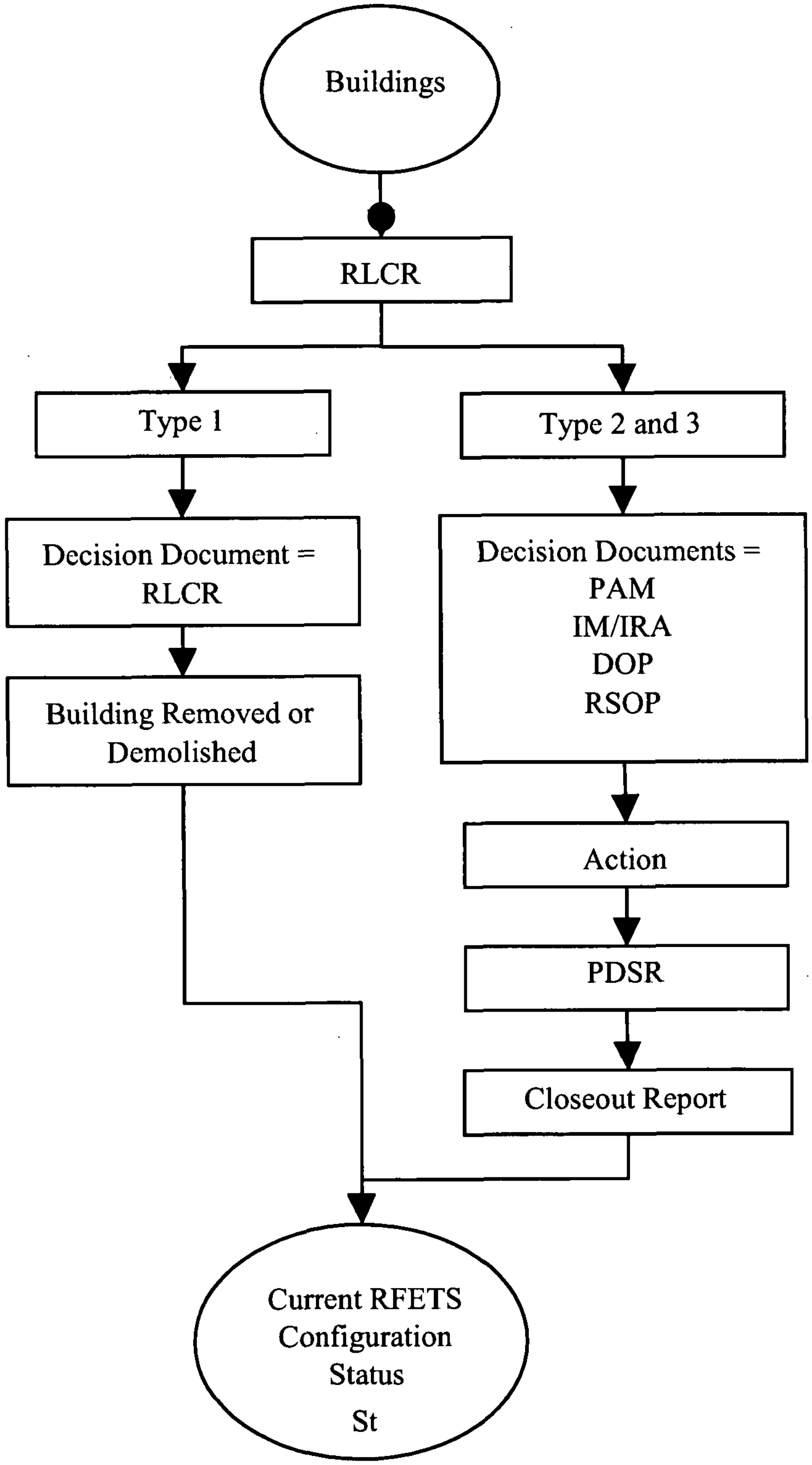
Figure 1.6
Building Disposition Flow Chart



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DRAFT

RCRA Facility Investigation – Remedial Investigation/ Corrective Measures Study – Feasibility Study Report for the Rocky Flats Environmental Technology Site

Section 2.0
Physical Characteristics of the Study Area

This Draft was prepared by Kaiser-Hill Company, L.L.C.
for the U.S. Department of Energy

October 2005

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2.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

2.1 Introduction

This section provides a summary of the physical characteristics of the Rocky Flats Environmental Technology Site (RFETS or site), including surface features, subsurface features, geology, soil, the vadose zone, surface water hydrology, hydrogeology, meteorology, demographics and land use, and ecology. The study area addressed in this section includes the Industrial Area (IA) and Buffer Zone (BZ) Operable Units (OUs) at RFETS. The study area also includes areas adjacent to RFETS, depending upon the specific characteristic being evaluated. Information presented in this section is provided to help characterize the physical features at RFETS to support the analysis and design of potential response actions evaluated in Section 10.0.

2.2 Surface Features

The site is located at the interface of the Great Plains and Rocky Mountains. Approximately 2 miles west of the RFETS western boundary, the foothills of the Front Range rise sharply above the lower elevations of the plains. The higher-elevation areas west of RFETS are characterized by rugged terrain and relatively sparse human population. In contrast, the plains east of RFETS are characterized by relatively gentle topography and higher population density associated with the greater Denver metropolitan area.

The western portion of RFETS is located on a broad, relatively flat pediment that slopes eastward from the foothills. The pediment is capped by unconsolidated surficial deposits. On the eastern portion of RFETS, the pediment surface is dissected by stream valleys that trend generally from west to east. The valleys cut into the underlying bedrock in some locations, although in most places bedrock is located beneath colluvium that has collected along the valley slopes. Elevations at RFETS range from approximately 6,190 feet above mean sea level (MSL) on the western portion of the pediment to approximately 5,600 feet above MSL in the southeastern corner of the site.

The primary topographic features at RFETS are the Rock Creek, Walnut Creek, and Woman Creek drainages that traverse the site and flow generally from west to east (Figure 2.1). Sixteen named retention ponds exist throughout RFETS. These include nine ponds on North and South Walnut Creeks, two ponds in the Woman Creek drainage, one pond downgradient from the site of the Present Landfill, two ponds in the Rock Creek drainage, and two ponds on Smart Ditch. In addition to the ponds, other manmade surface water features at RFETS include several drainage ditches that cross the site, including the South Interceptor Ditch (SID), Woman Creek Bypass, McKay Ditch, Upper Church Ditch, and Smart Ditch (see Section 2.5).

RFETS is vegetated with five general plant communities. These include the mixed mesic grassland and xeric tallgrass prairie, which are the dominant plant communities. Wetlands, riparian woodlands, and tall upland shrublands are less dominant plant

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communities. A detailed discussion of the various plant communities is provided in Section 2.9.1.

Site accelerated remedial actions resulted in removal of buildings, except for the former east and west vehicle inspection sheds. Surface pavement has been removed. For a discussion of remaining subsurface foundational elements, see Section 2.3. Other site activities resulted in some surface recontouring and revegetation of the former IA, after removal of parking lots and other surface infrastructure features, as necessary, to provide a stable land surface consistent with the end use of RFETS as a wildlife refuge.

The management of site stormwater in the former IA, at the completion of accelerated actions, including building demolitions, was to allow surface water to flow as non-channelized flow following the existing contours of the site. An overall goal was to disturb as little of the existing surface as possible while maintaining dispersed non-channelized flow. A design criterion for the site drainage was to maintain soil and slope stability by minimizing erosion. Revegetation and erosion mats and/or hydromulching were utilized to control erosion in areas of disturbed soil and sloping surfaces.

Five functional channels were configured to also minimize soil disturbance and were generally placed in areas of existing major surface water drainage features. Erosion was controlled in the functional channels by armoring the entire length of the channel with rip-rap or erosion matting and revegetation. Each of the five functional channels was designed to convey the 100-year storm event as follows:

- Functional Channel (FC)-1: FC-1 drains the northwestern corner of the former IA by a combination of an existing vegetated channel and a new channel through the soil borrow area directly west of the former Building 371 area. The upstream portion of FC-1 was an existing surface water feature. FC-1 is approximately 2,000 feet long and drains an area of 48 acres with a peak flow capacity of 76 cubic feet per second (cfs)[1].
- FC-2: FC-2 drains an area between and south of the former Buildings 371 and 771 areas by a combination of an existing vegetated channel and a new channel upstream of the existing channel. Much of FC-2 was an existing surface water drainage feature and located in the flowline of large-diameter culverts that were removed. A wetland area was constructed downstream of the existing channel before FC-2 flows into FC-3. FC-2 is approximately 1,800 feet long and drains an area of 51 acres with a peak flow capacity of 72 cfs.
- FC-3: FC-3 drains the northern side of the former IA and receives flow from FC-2. FC-3 is located at an existing surface water feature and in the flowline of large-diameter culverts that were removed. FC-3 is approximately 1,200 feet long and drains an area of 197 acres with a peak flow capacity of 264 cfs.
- FC-4: FC-4 drains the middle and southern portion of the former IA. FC-4 is

[1] The peak flow rates for the functional channels are based on a 100 year design storm.

located at an existing surface water feature and in the flowline of several large diameter culverts that were removed. A wetland was constructed in FC-4 in an existing flat area of the channel. FC-4 is approximately 3,300 feet long and drains an area of 242 acres with a peak flow capacity of 277 cfs.

- FC-5: FC-5 drains the southeastern corner of the former IA and conveys water into FC-4. FC-5 is the combination of an existing vegetated channel and a new channel. A portion of FC-5 is an existing surface water feature. The new portion of the functional channel generally follows the flowline of a large-diameter culvert that was removed. FC-5 is approximately 1,400 feet long and drains an area of 24 acres with a peak flow capacity of 37 cfs.

This work was completed as part of a series of best management practices (BMPs) and was generally guided by the Land Configuration drawings (K-H 2004a) and the Environmental Assessment, Pond and Land Configuration DOE/EA – 1492 (DOE 2004). RFETS surface features after accelerated actions are displayed on Figure 2.2. Overland flow directions and FC watershed delineations are displayed on Figure 2.3.

Other manmade features of the site include protective covers constructed under approved Interim Measure/Interim Remedial Action (IM/IRA) decision documents at two landfills, the Original Landfill and Present Landfill, which were used for historic site operations. The Original Landfill, located in the southwestern corner of the IA OU, has a soil cover layer with a minimum thickness of 2 feet. The soil cover is engineered to promote surface water runoff while minimizing erosion, reduce surface water ponding, increase overall slope stability, and provide for suitable vegetation (K-H 2004b). At the Present Landfill, located north of the IA OU, a cover was constructed to comply with closure requirements of the Resource Conservation and Recovery Act (RCRA) for minimizing infiltration and erosion. The Present Landfill cover consists of a soil cover, geosynthetic clay liner, flexible membrane liner, geocomposite drainage layer, cushion layer, cobble layer, and soil cover layer (K-H 2004c). Additionally, surface vegetation will be established on this soil layer to enhance resistance to surface erosion, prevent intrusion of noxious weeds and burrowing animals, and provide an aesthetic appearance to the cover, using appropriate native seed mixes.

Several public utility corridors have historically been located within the site boundaries, including low- and high-pressure natural gas pipelines, electric transmission lines, and telecommunication lines. These utilities are expected to remain as long as the utility easement or right-of-way is needed. Figure 2.4 presents a map of existing utility easements. The Refuge Act provides that land may be made available for transportation improvements along Indiana Street along the eastern RFETS boundary. All other land transfers are prohibited by the Refuge Act.

2.3 Subsurface Features

Between the ground surface and 3 feet below grade, essentially all structures have been removed, with the exception of utility lines less than 2 inches in diameter, three groundwater collection and treatment systems that serve an ongoing function, and the

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Present Landfill seep collection and treatment system. The groundwater and seep treatment systems are listed below and are shown on Figure 2.2:

- Solar Ponds Plume Treatment System;
- Mound Site Plume Treatment System;
- East Trenches Plume Treatment System; and
- Present Landfill Seep Treatment System.

At depths greater than 3 feet below grade, some subsurface structures remain in place. These include slabs, tunnels and building foundations (including in some areas, caissons or grade beams) (Figure 2.5), sewer lines and water lines (Figure 2.6), culverts, foundation drains, and storm drains (Figure 2.7), and valve vaults and process waste lines (Figure 2.8). Some subsurface features may contain contamination. For slabs and building foundations with contamination, see Figure 2.5 and building specific closeout reports, as referenced in Table 1.5, for details. For valve vaults and process waste lines with contamination, see closeout reports for IHSS 000-121 (OPWL) and IHSS 000-504 (NPWL), as referenced in Table 1.4, for details. (A majority of OPWL remaining in the subsurface is contaminated and only a portion of NPWL is contaminated.)

Fence posts and utility poles in place on September 19, 2003 forward, except those in Preble's meadow jumping mouse (PMJM) habitat areas, have been removed. In the PMJM areas, posts and poles were cut off to as close to ground level as possible. Posts and poles previously cut (prior to September 19, 2003) at ground level remain and are not shown on Figure 2.5. If a post or pole broke at or below ground surface while it was being pulled, the remaining section was left and will not be shown on Figure 2.5 through Figure 2.8.

This information is a reasonably representative depiction of known important structures and infrastructure components and is not intended as a definitive or all-inclusive mapping of everything that might be encountered in the subsurface. There are likely to be some items left in the subsurface over the more than 50-year history of RFETS that cannot be mapped because the locations are not known.

2.4 Geology

RFETS is situated approximately 2 miles east of the Front Range of Colorado on the western margin of the Colorado Piedmont section of the Great Plains Physiographic Province (Spencer 1961). The geologic history of the Colorado Rocky Mountain region, which includes the site area, has been summarized by Haun and Kent (1965). Several comprehensive site-specific studies have been undertaken to characterize the local geology and hydrogeology at RFETS (Hurr 1976; EG&G 1991, 1995a, 1995b). In addition, a large amount of lithologic and stratigraphic information has been obtained for RFETS from multiple sources. These include interpretation of aerial photographs, field geologic mapping, coal and aggregate mine development, petroleum exploration, and the completion of approximately 2,000 on-site boreholes and monitoring wells. A brief summary of results from historic investigations is presented in the following sections.

The effects of their geochemistry on the environmental fate and transport of an analyte is provided in Section 7.0.

2.4.1 Stratigraphy

The stratigraphic sequence that underlies the site extends in age from the crystalline Precambrian gneiss, schist, and granitoids at 3,000 feet below MSL to the unconsolidated Quaternary deposits at the surface approximately 6,000 feet above MSL. A generalized Stratigraphic column for the Rocky Flats area is shown on Figure 2.9 (Leroy and Weimer 1971).

The Pierre Shale and Fox Hills Sandstone underlie the site, with the latter exposed in quarries along the western edge of the site. The Laramie and Arapahoe Formations are exposed at the surface or underlie the site. Unconsolidated surficial deposits (for example, the Rocky Flats Alluvium [RFA] and the Verdos terrace alluvium) unconformably overlie bedrock. The unconsolidated surficial deposits, combined with the weathered portion of subcropping bedrock formations, form the upper hydrostratigraphic unit (UHSU).[2] Because of the wide extent of unconsolidated surficial materials beneath the IA and eastern BZ OUs, and relatively high hydraulic conductivity compared to that of the underlying weathered claystone, the unconsolidated portion of the UHSU is the primary influence on groundwater flow and contaminant transport at the site.

2.4.2 Unconsolidated Surficial Deposits

Based on local mapping (Hurr 1976; EG&G 1995a; USGS 1996), the unconsolidated surficial deposits that cover the pediment and adjacent watersheds proximal to the IA OU consist of the RFA, Valley Fill Alluvium (VFA), and colluvium that unconformably overlie bedrock. Various other younger unconsolidated alluvial deposits, such as the Piney Creek Alluvium (EG&G 1995a; USGS 1996), occur topographically below the RFA in the RFETS drainages. In addition, artificial fill material is found locally throughout the IA OU, and landslide and slump deposits are common on slopes in the BZ OU (EG&G 1995a) (Figure 2.10). The surface geology at RFETS is shown on Figure 2.11.

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[2] Pursuant to Colorado Water Quality Control Regulation 42.5(7), the UHSU is the uppermost layer of groundwater incorporating any aquifer or other zone of groundwater occurrence that is first encountered beneath the ground surface and includes all saturated geologic formations, unconsolidated alluvium and colluvium, and hydraulically connected zones in bedrock. Pursuant to Colorado Water Quality Control Regulation 42.7(1)(a), the UHSU includes the unconsolidated Quarternary and RFA, colluvium and VFA, and weathered claystone and hydraulically connected sandstone bedrock of the Arapahoe and Upper Laramie Formations.

2.4.2.1 Rocky Flats Alluvium

The youngest areally-extensive stratigraphic unit at RFETS is the early Pleistocene RFA. The RFA was deposited by intermittent braided streams and debris flows. Deposition took place on the pediment within a coalescing alluvial fan/braided stream system. Coarse gravel and cobbles were most likely deposited in channels by debris flows. Sand and fine gravel were deposited in channels and along banks, forming natural levees, while silt and clay would commonly be found on floodplains. The RFA occurs above the erosional bedrock surface and consists of generally poorly sorted, poorly stratified gravel, sand, cobbles, silt, and clay. The thickness of the RFA decreases from west to east, and ranges from slightly more than 100 feet to less than 10 feet. This is particularly important in the eastern IA and BZ OUs where the RFA is thinner or non-existent. In those areas, the UHSU groundwater flows through weathered bedrock, instead of the RFA, and therefore moves at a much slower velocity compared with RFA flow.

The coarse clastic materials (boulders and cobbles) were derived primarily from the Precambrian igneous and metamorphic rocks that crop out in Coal Creek Canyon, approximately 2 miles west of RFETS. Less common source rocks are the steeply eastward-dipping sedimentary formations exposed at the mouth of Coal Creek Canyon.

2.4.2.2 Colluvium

Colluvium occurs on the hillslopes descending into drainages at RFETS. This material is derived from the RFA and underlying weathered bedrock, and has a hydraulic conductivity intermediate to the hydraulic conductivities of those two formations. Colluvial material consists of unconsolidated clay with silty clay, sandy clay, and gravel layers. Occasional dark-yellowish-orange iron staining is present in colluvium consisting of reworked bedrock.

Landslide and Slump Deposits

Landslide and slump deposits have been identified in nearly all of the drainages at RFETS (EG&G 1995a; USGS 1996). These occur primarily in the upper bedrock claystones and involve downward and outward movement along rotational slip planes. At RFETS, landslides and slumps are recognized by a curved scarp at the top, a coherent mass of material downslope that has been rotated back toward the slip plane, and hummocky topography at the base. Older, weathered landslide and slump deposits are expressed in weakly consolidated, grass-covered slopes as bulges or low wavelike swells (EG&G 1995a; USGS 1996). Several distinct landslide and bedrock slump-blocks have been mapped above and along the banks of Walnut and Woman Creeks (EG&G 1995a; USGS 1996). These deposits can be up to 35 feet thick but are generally relatively shallow.

2.4.2.3 Valley Fill Alluvium

VFA occurs in all the major drainages at RFETS and consists of unconsolidated, poorly sorted sand, gravel, and pebbles in a silty clay matrix. Shroba and Carrara recognized two stages of VFA: Piney Creek and Post-Piney Creek Alluvium (USGS 1996). The Piney Creek Alluvium forms low terraces approximately 3 to 6 feet above modern stream level, and contains calcium carbonate veinlets and locally one or more buried soil horizons. The Post-Piney Creek Alluvium forms modern stream channels and floodplains, and does not contain secondary calcium carbonate.

2.4.2.4 Caliche

Local intervals of the unconsolidated surficial deposits may contain caliche, ranging from 25 to 80 percent. Caliche, which is generally calcium carbonate but may consist of magnesium carbonate, silica, or gypsum, forms by evaporation of vadose zone water. Early stages of caliche formation may produce either a powdery granular calcite or development of indurated nodules, termed "calcrete" (Blatt et al. 1980). Activities related to construction and site development have removed caliche deposits from some areas, particularly within the IA OU.

2.4.2.5 Artificial Fill

Artificial fill is a term that applies to material that has been deposited through human activities rather than geologic processes. Included as artificial fill are earthen dams and berms, railroad embankments, roads, landfills, and backfill related to RFETS development or closure, as well as the mine dumps associated with quarry operations on the west side of the site. Many deposits of artificial fill are merely composed of reworked RFA, weathered claystone, and/or other original materials, which have been displaced from their original position and redistributed. Other deposits are not of a geologic origin, such as sanitary wastes in landfills and concrete rubble in basements. Deposits of artificial fill at RFETS are most commonly less than 10 feet thick, although they may exceed 30 feet thick (for example, dams, and landfills) (EG&G 1995a).

2.4.3 Bedrock Deposits

An unconformity, representing a depositional hiatus of greater than 60 million years, separates the Arapahoe and Laramie Formations from the overlying unconsolidated surficial deposits. The unconformity comprises the irregular, undulating surface of the pediment, controlled in part by stream erosion/incision and subsequent deposition of the RFA. Incised channels in the bedrock surface represent important local preferential groundwater flow paths (EG&G 1995b).

2.4.3.1 Arapahoe Formation

The Arapahoe Formation is mainly composed of claystone and silty claystone, with lenticular sandstone bodies in the basal portion of the formation, and is generally less than 50 feet thick at RFETS (EG&G 1995a). The depth of the contact between the Arapahoe Formation and the underlying Laramie Formation is generally less than 100 feet below ground surface in the RFETS area. In many areas, the Arapahoe Formation is entirely absent, having been removed by erosion.

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Arapahoe Sandstones

The basal sandstones in the Arapahoe Formation (referred to as the No. 1 Sandstone) are poorly to moderately sorted, subangular to subrounded, clayey, silty, very fine-grained to medium-grained, and lenticular in geometry. Trough and planar cross-stratification are common sedimentary structures contained in these sandstones (EG&G 1991; 1995a). The depositional environment of the Arapahoe Formation has been interpreted as a subaerial fluvial system with associated channel, bar, and floodplain deposits (EG&G 1995a).

The sandstones are generally weathered to a depth of 30 to 40 feet below the base of the RFA. The weathered sandstone varies from pale orange to yellowish-gray and dark yellowish-orange in color. Unweathered sandstones are light to olive gray. Fractures have been noted in the weathered zone at depths of 5 to 14 feet. Arapahoe sandstones comprise an important element of the groundwater flow regime at RFETS, and represent a relatively higher-velocity groundwater pathway in the UHSU (EG&G 1995b).

Arapahoe Claystones/Silty Claystones

The Arapahoe Formation claystones and silty claystones are massive and blocky, and may contain thin laminae and stringers of sandstone, siltstone, and coal. The weathered claystones can extend to approximately 30 feet below the base of the RFA and, in some cases, farther. Weathered claystones range in color from pale yellowish-brown to light olive gray and are moderately stained with iron oxides. Unweathered claystones are typically dark gray to yellowish-gray.

Fractures have been encountered between 6 and 26 feet in depth in Arapahoe Formation claystones and are associated with ironstone concretions and calcareous deposits in the weathered zone. Small vertical, horizontal, and 45-degree fractures have been encountered in the unweathered zone at depths of 30 feet to over 100 feet. Many of the shallower fractures are stained with iron oxide or calcareous deposits, suggesting groundwater movement (Rockwell 1988). Additional information regarding fracturing within the Arapahoe Formation is provided in the White Paper entitled Analysis of Vertical Contaminant Migration Potential (RMRS 1996).

2.4.3.2 Laramie Formation

The upper contact of the Laramie Formation generally occurs at a depth of approximately 100 feet below the RFETS ground surface; however, in the IA OU and the east BZ OU, where the RFA is thinner and the Arapahoe Formation is thin or absent, the depth to the Laramie Formation is much less. The Laramie Formation is informally divided into two intervals: (1) an upper claystone unit, and (2) a lower unit composed of sandstone, siltstone, and claystone with coal layers (Weimer 1973). The upper unit is approximately 300 to 500 feet thick and consists primarily of olive-gray and yellowish-orange kaolinitic claystones, with lesser amounts of dark-gray to black carbonaceous claystones, discontinuous coal beds, and lenticular sandstone deposits (EG&G 1995a). These sandstone beds are less mature than those of the Arapahoe Formation, being finer-grained and including more silt, clay, and carbonaceous material. Because they are discontinuous and contained within relatively tight, low-permeability claystones, these sandstone lenses do not appear to represent a viable pathway for groundwater, and the upper Laramie Formation is considered a confining unit (EG&G 1995b). The lower unit of the Laramie Formation is approximately 300 feet thick and consists of kaolinitic claystones, sandstones, and coal beds (EG&G 1995a).

2.4.3.3 Fox Hills Sandstone

The Fox Hills Sandstone is 90 to 140 feet thick at RFETS and consists of well-sorted, quartz-rich sandstones (EG&G 1995a).

2.4.4 Structure

The site is located on the western flank of the Denver Basin, with the RFETS western boundary located approximately 2 miles east of steeply dipping strata on the eastern flank of the Front Range uplift. The Denver Basin is a north-south-trending, asymmetrical basin with a steep western flank and shallow eastern flank. The basin is more than 13,000 feet deep at its deepest point and contains bedrock of Paleozoic, Mesozoic, and Cenozoic age (Figure 2.12).

Earlier studies at RFETS (EG&G 1995b) suggested outcrops of the upturned beds on the western side of the site act as a primary source of recharge to the UHSU groundwater at the site. Modeling results and the Site Wide Water Balance study indicate direct recharge within the IA may be more important than previously estimated (K-H 2002a). Direct recharge from infiltration is more than an order of magnitude greater than the groundwater flux from the western part of the site. Groundwater from the western part of the site does not reach the IA OU due to strongly divergent flows to drainages (K-H 2002a, DOE 2005)

2.4.5 Seismic Conditions

The site is located about two miles east of the steeply dipping strata along the western flank of the Denver Basin. The Denver Basin, a north-south trending, asymmetrical basin containing Paleozoic, Mesozoic, and Cenozoic strata, occurs on the east flank of the Front Range uplift. Steeply dipping Pennsylvanian to Cretaceous bedrock formations underlying RFETS are exposed at the surface and by the Quaternary RFA and Verdos Alluviums, colluvium, and other unconsolidated sedimentary deposits of Recent age.

The local structure beneath RFETS has been assessed in numerous studies that are summarized in the Geologic Characterization Report (EG&G 1995a). Several faults have been identified in the vicinity of RFETS using seismic and stratigraphic techniques (Figure 2.13). These faults have been interpreted to be of Laramide and younger age and tectonic or syndepositional in origin. Based on seismic, drilling, and trenching data, these faults are thought to have been inactive for at least a million years. None of these faults appear to extend into or offset the overlying RFA or other recent deposits.

Evaluation of geologic and topographic features does not indicate recent movement has occurred along these faults. Consequently, based on current available information, the site is in a zone of relatively low seismic activity. A seismic hazard study was performed at the site in 1994 concluding there was a low probability of seismic activity to occur at the site (REI 1994). This is confirmed based on U.S. Geological Survey (USGS) general maps of peak horizontal bedrock acceleration, RFETS is located in an area with a 2-percent chance of exceeding, in 50 years, a peak bedrock acceleration equivalent to 0.12 the acceleration due to gravity (g) (USGS 2002). Current information also indicates that both the known and inferred faults are confined to the bedrock formations and do not influence groundwater flow or contaminant transport in the UHSU at the site (K-H 2002a).

2.4.6 Geomorphology

The dominant geomorphic processes at RFETS currently include side-slope erosion and the erosional activity of Walnut and Woman Creeks. The drainages erode and convey sediment, and are the primary forces that develop the slopes in the valleys. Slope erosion occurs as a result of precipitation while some movement of slope soils results from mass wasting, as occurs with landslides and slumps. Stream erosion occurs primarily by channel incision and headward erosion (active elongation of stream profiles by eroding the upstream end) as channels advance upstream.

North and South Walnut Creeks are at an immature stage of development. These drainages have fairly steep, V-shaped cross-sections, and narrow floodplains characteristic of relatively immature geomorphologic development. Streams at this stage of development move relatively large quantities of sediment, particularly during heavy precipitation events, by eroding their channels through stream downcutting. In addition to downcutting their channels, the stream channels exhibit headward erosion. Alternately, Woman Creek has a more U-shaped cross-section meanders and a broader floodplain compared to North and South Walnut Creeks, thereby suggesting a more mature stage of development. Less channel erosion likely occurs in the Woman Creek drainage.

Slumps and slides (including rotational failures) have developed on the hillslopes of Woman and Walnut Creeks in areas where shallow groundwater has saturated the unconsolidated material and weathered bedrock. The saturated condition can cause an increase in soil pore pressure and reduces the soil shear strength until the slope fails. Slumps also occur in locations where the stream flow has undercut the base or toe of the slope.

Geomorphic processes such as those that result from erosion of embankments and collection of sediments in the ponds are expected to be very slow. Areas of the site are being graded and revegetated as necessary to account for removal of manmade features, taking erosion processes into consideration. The effects of geomorphic processes are expected to be minimal between the periodic site evaluations that may be required in the future.

The Original Landfill cover is an engineered soil cover with surface drainage controls and a toe buttress that greatly enhances the stability of the Original Landfill. Due to these enhancements, the geomorphic processes described in this section will be minimized at the Original Landfill as compared to adjacent areas.

The Present Landfill cover is an engineering cover system with surface drainage controls and erosion protection. The design of the cover system addressed the stability of the cover slopes meeting engineering standards of practice. Due to the design of the cover system, the geomorphic processes described in this section will be minimized at the Present Landfill as compared to adjacent areas.

2.4.7 Soils

RFETS soils form a pattern related to geologic parent materials, geomorphic landforms, relief, natural vegetation, and climate processes. The U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS) developed map-unit models based on aerial photographs to reasonably predict the types of soils in an area. The boundaries of the map units were refined and the map-unit models were tested by digging test pits and recording the characteristics of the soil profiles studied (EG&G 1995c).

Soils are taxonomically classified based on specific soil properties (for example, number and size of clasts, particle-size distribution, acidity, distribution of plant roots, and structure of soil aggregates) and the arrangement of horizons within the soil profile. Figure 2.14 illustrates the SCS map units for RFETS defined at the soil-series level. There are four general SCS soil types at RFETS, associated with the geologic map units, as follows:

- Pediment (flat upland area, predominantly Flatirons soil series) soils are located on the broad, dissected, eastward-sloping pediment surface in the western portion of the site. These soils are associated with the RFA geologic map unit.
- Valley-slope soils (for example, Nederland and Denver-Kutch-Midway soils) are located in the stream-cut valleys of the intermittent Rock Creek, Walnut Creek, and Woman Creek drainages. These soils are associated with the Laramie Formation, Arapahoe Formation, and landslide geologic map units.
- Hilltop soils of the eastern third of RFETS (including the Flatirons soil series) are similar to valley-slope soils and are associated with the Laramie and Arapahoe Formations. Localized areas on hill summits are associated with Terrace Alluvium.
- Drainage-bottom soils (for example, Haverson soils) are forming in recent alluvium along drainage bottoms.

A comparison between the geologic map (Figure 2.11) and the soils map (Figure 2.14) illustrates the relationship between soils at the soil-series level and geologic map units. Specific geotechnical properties of the various soil types located within and around RFETS are described in Table 2.1.

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2.5 Surface Water Hydrology

Streams and seeps at RFETS are largely ephemeral or intermittent, with stream reaches gaining or losing flow, depending on the season and precipitation amounts. Surface water flow across RFETS is primarily from west to east, with four drainages traversing the site (Figure 2.15):

- Rock Creek – Major drainage in the northwestern part of RFETS (does not receive runoff from the IA OU);
- Walnut Creek – Major drainage in the north-central portion of RFETS, including the majority of the IA OU;
- Woman Creek – Major drainage on the southern side of RFETS, including the southern portion of the IA OU; and
- South Woman Creek– Minor drainage, including Smart Ditch, in the far southern section of RFETS (does not receive runoff from the IA OU).

Even the largest drainages at RFETS typically have defined channels that are relatively narrow, ranging in bottom widths from 2 to 10 feet. The channel bottoms intermittently vary between vegetation and exposed sediments and cobbles. Vegetation near the intermittent streams is dominated by riparian woodland/shrubland community types, with wet meadow and marsh species near seeps and ponds (see Section 2.9.1 for further discussion on vegetation).

A detailed discussion of each of the drainages is provided in Sections 2.5.1 through 2.5.4. Information is included on water routing, water volumes, peak flow rates, retention ponds, other structures, and a general description of the watershed. As part of water routing, under non-emergency conditions, the terminal ponds (Pond A-4, B-5 and C-2) are sampled prior to their discharge. As discussed above, four drainages exist at RFETS and are discussed in order from north to south.

2.5.1 Rock Creek

The Rock Creek drainage covers the northwestern portion of the BZ OU (Figure 2.15). The Rock Creek watershed does not receive runoff from the IA OU. The watershed area is approximately 1,499 acres (as measured by gaging station GS04 [Figure 2.1]), and includes an area west of the RFETS boundary. Rock Creek is classified as stream segment 8 in the Boulder Creek basin by the Colorado Water Quality Control Commission (WQCC).

The Rock Creek drainage basin consists of an alluvial terrace that slopes gently to the northeast and is dissected by Rock Creek and its tributaries, which flow generally from southwest to northeast. The principal surface features in the Rock Creek drainage include (from north to south) Short Ear Branch, Plum Branch, Mahonia Branch, Snowberry Branch, and Lobelia Branch (Figure 2.15). Two ponds are visible along the main stem of Rock Creek. The westernmost of the two ponds, located at the southern end of the Rock Creek drainage, is designated Lindsay 2. The other is Lindsay 1. The ponds predate federal ownership of the site. Flow in Rock Creek is ephemeral; however, portions of Rock Creek are perennial. The hydrology of the Rock Creek drainage is not expected to change as a result of accelerated remedial actions.

The mean annual discharge volume in Rock Creek, measured at gaging station GS04, is approximately 235 acre-feet (ac-ft) per year (based on flow records from October 1, 1996, through July 31, 2005). The peak flow rate measured at GS04 during the same period is 35.4 cfs. These flow data are summarized, along with flow data for other RFETS locations, in Table 2.2.

2.5.2 Walnut Creek

The Walnut Creek drainage comprises the central third of RFETS, and receives runoff from the majority of the IA OU, as well as the northeast BZ. The area of the Walnut Creek watershed upstream from gaging station GS03 is approximately 1,878 acres. The Walnut Creek basin includes several current or former tributaries within the RFETS boundaries, including, from north to south, McKay Ditch (formerly a tributary of Walnut Creek), No Name Gulch, North Walnut Creek, and South Walnut Creek. Descriptions of these sub-basins, and the off-site flow of Walnut Creek, are provided in this section.

2.5.2.1 McKay Ditch

The McKay Ditch runs west to east across the northern BZ OU, and is hydrologically isolated from the IA OU. The ditch was formerly a tributary to Walnut Creek within the RFETS boundaries. However, in 1999, an underground pipeline was constructed in the northeast BZ OU to reroute McKay Ditch water and prevent it from commingling with water in Walnut Creek discharged from Pond A-4 or B-5. This configuration allows the City of Broomfield to divert water from Coal Creek or the South Boulder Diversion Canal (both west of RFETS). The diverted water flows into the open-channel McKay Ditch and McKay Bypass Canal, across the northern RFETS BZ OU, and into the underground pipeline that runs eastward for approximately 3,500 feet on site before being routed underneath Indiana Street. On the eastern side of Indiana Street, the pipeline daylights and the water flows directly to Great Western Reservoir, where the water is stored by the City of Broomfield for irrigation purposes. The McKay Ditch is classified as stream segment 4a in the Big Dry Creek basin by the Colorado WQCC (Figure 2.1).

The McKay Ditch and Bypass Canal have a combined length of approximately 3.5 miles on RFETS property. The channel lining alternates between grass and exposed cobbles, and has grade-control structures constructed from rock and spaced intermittently. Water is diverted out of the McKay Ditch by a concrete diversion wall into a catch basin, and then into the diversion pipeline. The pipeline is approximately 3,500 feet long, ranges in diameter from 42 to 48 inches (high-density polyethylene pipe), and has a capacity of 110 cfs. Flows in excess of 110 cfs run over the diversion wall and into the McKay Ditch drainage downstream. To support downstream wildlife habitat, a 1-inch-diameter opening exists in the diversion wall near its base. The small opening is designed to provide a stream of water, when water is flowing in the McKay Ditch, to supply the habitat in the McKay Ditch drainage downstream of the diversion structure.

The McKay Ditch is generally dry. Flows in the ditch historically occur in the spring, when the City of Broomfield water rights are exercised and water is diverted into the ditch, or when overland runoff is captured and transported by the ditch. Future flows in the McKay Ditch are expected to be similar to past flows given that site activities do not impact the configuration of the ditch, and operations are managed by the City of Broomfield.

The mean annual discharge volume in the McKay Ditch, measured at gaging station GS35 (downstream from the diversion to the pipeline), is approximately 69 ac-ft per year. The discharge volume for the ditch is based on flow records collected from October 1, 1997, through July 31, 2005. The peak flow rate measured during the same period is 23.6 cfs. These flow data are summarized, along with flow data for other RFETS locations, in Table 2.2.

2.5.2.2 No Name Gulch

No Name Gulch is located in the north BZ OU downstream from the East Landfill Pond. The East Landfill Pond receives runoff from the Present Landfill area and the watershed immediately surrounding the pond, and is hydrologically isolated from the IA OU. A summary of the East Landfill Pond dam and pond characteristics and the pond operating protocol is provided in Table 2.3.

No Name Gulch is ephemeral, with periodic runoff occurring most frequently in the spring. The closure of the former Present Landfill, with a RCRA-compliant cover constructed over the landfill area, is expected to generate additional runoff compared to the historic runoff pattern. Drainage ditches along the perimeter of the Present Landfill cover allow free drainage of the geosynthetic composite cover and drainage layer, and direct surface water away from the landfill and into No Name Gulch east of the East Landfill Pond Dam. The perimeter channels are vegetated earthen channels; steeper sloped sections are rip-rapped. The discharges of these perimeter channels are in the same location as the historical perimeter channels (east of the East Landfill Dam and north and south of the East Landfill Pond) (K-H 2004c). Small amounts of additional water will flow from the perimeter channels due to the impermeable cover of the landfill.

The mean annual discharge volume in No Name Gulch, measured at gaging station GS33, is approximately 17 ac-ft per year (based on flow records from October 1, 1997, to July 31, 2005). The peak flow rate measured during the same period is 6.8 cfs. These flow data are summarized, along with flow data for other RFETS locations, in Table 2.2. As discussed previously, No Name Gulch will receive increased runoff compared to that observed historically as a result of additional flow routed through the drainage ditches along the perimeter of the Present Landfill (K-H 2004c).

2.5.2.3 North Walnut Creek

Runoff from the northern portion of the IA OU flows into North Walnut Creek, which has four retention ponds (Ponds A-1, A-2, A-3, and A-4). A summary description of the dams, flow routing, and pond operating protocol in North Walnut Creek is provided in

Table 2.3. North Walnut Creek upstream from Pond A-4 is classified as stream segment 5 in the Big Dry Creek basin by the Colorado WQCC; downstream from Pond A-4, North Walnut Creek is classified as stream segment 4b. Pond A-4 water is sampled prior to discharge into North Walnut Creek.

In contrast to the majority of other site drainages, North Walnut Creek has continuous flow (as measured at gaging station SW093, located immediately northeast and downstream from the IA OU). The hydrology of the North Walnut Creek drainage following accelerated remedial actions is expected to differ from the hydrology when the IA existed. Removal of buildings and pavement from the IA significantly reduces the volumes and peak discharge rates of runoff.

When buildings and pavement existed in the IA, the mean annual discharge volume from North Walnut Creek, measured at gaging station SW093 (upstream from Pond A-1), was approximately 145 ac-ft per year (based on flow records from October 1, 1996, through July 31, 2005). The peak flow rate measured during the same period was approximately 135 cfs (Table 2.2).

To predict surface water discharge volumes for the site configuration after accelerated actions are complete, the MIKE SHE model was used, which simulates multiple integrated hydrologic processes, including surface water and groundwater interaction. A description of the MIKE SHE model, including model uncertainties, is provided in the Site-Wide Water Balance Modeling Report for RFETS (K-H 2002a). Although the SWWB model provides the best estimate of time-varying flows throughout the site, results are best utilized in assessing the relative changes in hydrologic response due to site modifications, or climate variations. As a result, emphasis was placed on the change in hydrologic responses such as surface flows (K-H 2005).

With accelerated actions complete, hydrologic model simulations show that flows in North Walnut Creek will significantly decrease compared with pre-closure hydrologic conditions where imported water, pavement and subsurface drains contributed to the overall water balance at the site. The annual discharge volume predicted at station SW093 after completion of accelerated actions, assuming a typical annual climate sequence (Water Year 2000), is approximately 39 ac-ft per year. A range of model-predicted annual discharge volumes for station SW093, for varying climatic conditions, is presented in Table 2.4.

2.5.2.4 South Walnut Creek

Runoff from the central portion of the IA OU flows into South Walnut Creek, which has five retention ponds (Ponds B-1, B-2, B-3, B-4, and B-5). A summary description of the dams, flow routing, and pond operating protocol in South Walnut Creek is provided in Table 2.3. South Walnut Creek upstream from Pond B-5 is classified as stream segment 5 in the Big Dry Creek basin by the Colorado WQCC; downstream from Pond B-5, South Walnut Creek is classified as stream segment 4b (Figure 2.15). Pond B-5 water is sampled prior to discharge into South Walnut Creek.

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Similar to North Walnut Creek, South Walnut Creek has continuous flow (as measured at gaging station GS10, located immediately downstream from the IA OU). The hydrology of the South Walnut Creek drainage following accelerated remedial actions is expected to differ from the hydrology when the IA existed. Removal of buildings, elimination of water historically imported for RFETS operations, elimination of the Sewage Treatment Plant discharge, and removal of pavement from the IA significantly reduce the volumes and peak discharge rates of runoff in this drainage (K-H 2002a).

When buildings and pavement existed in the IA, the mean annual discharge volume from South Walnut Creek, measured at gaging station GS10 (located above Pond B-1), was approximately 99 ac-ft per year (based on flow records from October 1, 1996, through July 31, 2005). The peak flow rate measured at GS10 during the same period was approximately 113 cfs (Table 2.2).

With accelerated actions complete, it is anticipated that flows in South Walnut Creek will be significantly diminished compared with the historic configuration of the site, when buildings and pavement generated additional runoff. The annual discharge volume predicted at station GS10 after accelerated actions are complete, based on model simulations for a typical climate year (Water Year 2000), is less than 0.5 ac-ft per year. A range of model-predicted annual discharge volumes for station GS10, for varying climatic conditions, is presented in Table 2.4.

2.5.2.5 Walnut Creek

Downstream from terminal Ponds A-4 and B-5, North and South Walnut Creeks merge to form Walnut Creek. This reach of Walnut Creek is classified as stream segment 4b in the Big Dry Creek basin by the Colorado WQCC (Figure 2.15).

When buildings and pavement existed in the IA, the mean annual discharge volume measured at gaging station GS03 (at Walnut Creek and Indiana Street) was approximately 434 ac-ft per year (based on flow records from October 1, 1996, through July 31, 2005). The peak flow rate measured during the same period was approximately 57 cfs (Table 2.2).

With accelerated actions complete, it is anticipated that flows in Walnut Creek will be significantly diminished compared with the historic configuration of the site, when buildings and pavement generated additional runoff. The annual discharge volume predicted at station GS03 after accelerated actions are complete, based on model simulations for a typical climate year (Water Year 2000), is approximately 64 ac-ft per year. A range of model-predicted annual discharge volumes for station GS03, for varying climatic conditions, is presented in Table 2.4.

In addition to the Walnut Creek tributaries discussed in earlier sections, several other small drainage swales exist on the western side of Indiana Street, within the RFETS boundary. These drainages are tributary to Walnut Creek, but merge with Walnut Creek downstream from the site boundary (Figure 2.1 and Figure 2.15). Therefore, the runoff from these small drainages is not measured by station GS03. These vegetated sub-basins were not altered by accelerated remedial actions. Although these catchments generate little runoff, they are noted here to complete the description of the Walnut Creek watershed.

2.5.2.6 Walnut Creek Flow Off Site

Downstream from the site, east of Indiana Street, Walnut Creek flows into a splitter box operated by the City of Broomfield. The splitter box is normally configured to divert Walnut Creek flows into the Broomfield Diversion Ditch and around the south side of Great Western Reservoir, thereby preventing RFETS runoff in Walnut Creek from entering the reservoir (Figure 2.1). East of the reservoir, the Broomfield Diversion Ditch angles northward and rejoins Walnut Creek.

Great Western Reservoir was formerly used to store the drinking water supply for the City of Broomfield. However, during the 1990s, the Great Western Reservoir Replacement Project was implemented as part of the "Option B" project, funded by DOE to protect downstream water supplies from potential RFETS contamination.[3] The Great Western Reservoir Replacement Project involved the purchase of water rights, construction of a pipeline from Carter Lake (located near Loveland, Colorado) to Broomfield, construction of a drinking water treatment plant, and development of associated infrastructure. Great Western Reservoir was then taken off-line as a drinking water supply reservoir, in accordance with terms of the grant that funded the project, although it is still used by the City of Broomfield as a storage facility for irrigation water.

East of Great Western Reservoir, Walnut Creek flows into Big Dry Creek. The 86-square-mile Big Dry Creek watershed is tributary to the South Platte River. The confluence of Big Dry Creek with the South Platte River is located north of Brighton, Colorado, approximately 30 miles northeast of RFETS.

2.5.3 Woman Creek

The Woman Creek drainage comprises the southern side of the site, and receives runoff from the southern portion of the IA OU as well as the majority of the southern BZ (Figure 2.1 and Figure 2.15). The area of the Woman Creek watershed upstream from gaging station GS01 is approximately 1,602 acres. (It is noted that a Smart Ditch splitter box can be overtopped in a large storm, essentially adding an additional 792 acres to the Smart Ditch watershed, located south of the Woman Creek watershed [see Section 2.5.3.3]). Several tributaries to Woman Creek exist within the RFETS boundaries, and include, from north to south, the SID, North Woman Creek, Owl Branch, and Antelope Springs Gulch. Descriptions of these tributaries, the main channel of Woman Creek, and the off-site flow of Woman Creek are provided in this section.

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[3] In the early 1990s, DOE, Westminster, Broomfield, and Congressman David Skaggs evaluated options for protecting downstream drinking water supplies from potential contamination from Rocky Flats. "Option B" was ultimately selected in 1991, and consisted of two major components: (1) the Great Western Reservoir Replacement Project, and (2) the Standley Lake Protection Project.

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2.5.3.1 South Interceptor Ditch

Runoff from the southern portion of the IA OU flows into the SID. The SID was constructed to intercept runoff from the southern portion of the IA so that it would flow into Pond C-2 instead of directly into Woman Creek. A summary of Pond C-2 dam and pond characteristics, and the operating protocol, is provided in Table 2.3. Pond C-2 water is sampled prior to discharge into Woman Creek. As a tributary to the main stem of Woman Creek, the SID is classified as stream segment 4a in the Big Dry Creek basin by the Colorado WQCC.

The SID is a grass-lined, trapezoidal channel that flows intermittently. Removal of impervious surfaces, such as buildings and pavement, from the IA OU reduces the discharge volumes and peak flow rates observed historically. In addition, the western 1,500 feet of the SID were eliminated when the cover was constructed for the Original Landfill.

When buildings and pavement existed in the IA, the mean annual discharge volume in the SID, as measured at gaging station SW027 (located at the downstream, or eastern end, of the SID), was approximately 22 ac-ft per year (based on flow records from October 1, 1996, through July 31, 2005). The peak flow rate measured during the same period was approximately 10 cfs (Table 2.2). However, as noted above, flows in the final configuration are anticipated to be significantly less than runoff from the historic configuration, when buildings and pavement generated additional runoff.

With accelerated actions complete, it is anticipated that flows in the SID will be significantly diminished compared with the historic configuration of the site, when buildings and pavement generated additional runoff. The annual discharge volume predicted at station SW027 after accelerated actions are complete, based on model simulations for a typical climate year (Water Year 2000), is approximately 2 ac-ft per year. A range of model-predicted annual discharge volumes for station SW027, for varying climatic conditions, is presented in Table 2.4.

2.5.3.2 North Woman Creek

North Woman Creek flows from west of the site on to the southwest quadrant of the RFETS property, and converges with the Owl Branch of Woman Creek at a point approximately 1,800 feet east of the site's western boundary. North Woman Creek is hydrologically isolated from the IA OU. As a tributary to the main stem of Woman Creek, North Woman Creek is classified as stream segment 4a in the Big Dry Creek basin by the Colorado WQCC (Figure 2.15). Downstream from the confluence between North Woman Creek and Owl Branch, the channel is known as Woman Creek.

Changes made to the site from accelerated actions are not expected to alter the watershed or hydrology in North Woman Creek. The mean annual discharge volume measured at gaging station GS05 (located on the RFETS western boundary where North Woman Creek enters the site) was approximately 108 ac-ft per year (based on flow records from

October 1, 1996 through July 31, 2005). The peak flow rate measured during the same period was approximately 25 cfs (Table 2.2).

Owl Branch

The Owl Branch of Woman Creek flows west on to the southwest quadrant of the RFETS property, and roughly parallels North Woman Creek before joining it at a point approximately 1,800 feet east of the site's western boundary. Owl Branch is hydrologically isolated from the IA OU. As a tributary to the main stem of Woman Creek, Owl Branch is classified as stream segment 4a in the Big Dry Creek basin by the Colorado WQCC (Figure 2.15).

Changes made to the site from accelerated actions are not expected to alter the watershed or hydrology in the Owl Branch of Woman Creek. The mean annual discharge volume measured in Owl Branch at gaging station GS06 (located on the RFETS western boundary where South Woman Creek enters the site) was approximately 21 ac-ft per year (based on flow records from October 1, 1996, through June 6, 2005). The peak flow rate measured during the same period was approximately 12 cfs (Table 2.2).

Antelope Springs Gulch

Antelope Springs Gulch conveys water from Antelope Springs, which normally flows throughout the year. Antelope Springs is located on the southern side of Woman Creek, in the southwest quadrant of the BZ OU. The seep is likely influenced by Rocky Flats Lake, located off site to the west. Antelope Springs Gulch flows northeast and joins Woman Creek approximately 2,500 feet upstream from Pond C-1. The Antelope Springs drainage is hydrologically isolated from the IA OU. As a tributary to the main stem of Woman Creek, Antelope Springs Gulch is classified as stream segment 4a in the Big Dry Creek basin by the Colorado WQCC.

Changes made to the site from accelerated actions are not expected to alter the watershed or hydrology in Antelope Springs Gulch. The mean annual discharge volume of Antelope Springs Gulch, measured at gaging station GS16, was approximately 93 ac-ft per year (based on flow records from October 1, 1996, through July 31, 2005). The peak flow rate measured during the same period was approximately 9 cfs (Table 2.2).

Woman Creek

The stream channel downstream of the confluence between North Woman Creek and Owl Branch is known as Woman Creek. Between the North Woman Creek/Owl Branch confluence and Pond C-2, Woman Creek is isolated from the IA OU, in terms of surface runoff, because the SID intercepts surface flow and diverts it into Pond C-2. However, groundwater from portions of the southern IA OU discharges into Woman Creek. Woman Creek is designated as stream segment 4a in the Big Dry Creek basin by the Colorado WQCC, similar to North Woman Creek and Owl Branch.

In the western reach of Woman Creek, the watershed was enlarged when the Original Landfill remediation eliminated the western 1,500 feet of the SID, thereby allowing runoff from the Original Landfill area to flow directly to Woman Creek. However, because the vegetated cover on the Original Landfill will not generate a substantial quantity of runoff, this change is expected to have a negligible effect on the total flow volume in Woman Creek.

Woman Creek flows through Pond C-1, which was reconfigured as a low-profile, flow-through structure in 2005. A summary of the Pond C-1 dam and pond characteristics, and the operating protocol, is provided in Table 2.3. Below Pond C-1 and upstream from Pond C-2, Woman Creek is diverted, via a concrete diversion wall and channel, around the northern side of Pond C-2. The channel diversion was constructed so that Pond C-2 would capture only runoff from the IA and be isolated from the flow in Woman Creek. Downstream from Pond C-2, the diversion channel rejoins the original Woman Creek channel prior to leaving the site.

Pond C-2 is discharged into Woman Creek. Historically, when buildings and pavement existed in the IA, a Pond C-2 discharge was typically necessary once per year. However, with the reduced runoff from the IA OU flowing into the SID, Pond C-2 discharges to Woman Creek are expected to be less frequent, based on normal climate conditions. Because Pond C-2 discharges were historically a small percentage of the volume measured in Woman Creek, less frequent Pond C-2 discharges should not have a major impact on the overall hydrology of Woman Creek.

For the Woman Creek drainage, the mean annual discharge volume measured at gaging station GS01 (located on Woman Creek at Indiana Street) was approximately 272 ac-ft per year (based on flow records from October 1, 1996, through July 31, 2005). The peak flow rate measured during the same period was approximately 80 cfs (Table 2.2).

With the exception of the SID basin, changes made to the site resulting from accelerated remedial actions are not expected to have a major impact on the Woman Creek watershed or its hydrology. Based on model simulations of the site after accelerated actions have been completed, the annual discharge volume predicted at station GS01, for the Water Year 2000 climate, is approximately 130 ac-ft per year. For varying climatic conditions, a range of model-predicted annual discharge volumes for station GS01 is presented in Table 2.4.

Woman Creek Flow Off Site

Woman Creek is part of the Big Dry Creek basin, similar to Walnut Creek. Downstream from the site, east of Indiana Street, Woman Creek flows into Woman Creek Reservoir. Woman Creek Reservoir was constructed in 1996 as a major component of the Option B water management project. The 400-ac-ft reservoir was constructed to capture Woman Creek surface water from RFETS before it flows into Standley Lake, which stores water for municipal drinking supplies and irrigation (CH2M Hill 1996).

The Woman Creek Reservoir is operated by the Woman Creek Reservoir Authority. Water stored in the reservoir is detained until analytical results indicate the water quality is acceptable for discharge. Water is normally pumped north, via an underground pipeline, to Walnut Creek at a point east of Great Western Reservoir. Occasionally, water from Woman Creek Reservoir is pumped to Mower Reservoir and used for irrigation. Mower Reservoir is located immediately north of Woman Creek Reservoir.

2.5.3.3 South Woman Creek

South Woman Creek, including two irrigation ditches, Smart Ditch and Smart Ditch 2, is designated as stream segment 6 in the Big Dry Creek basin by the Colorado WQCC and exists in the southern portion of the BZ OU (Figure 2.15). Both are owned and operated by the Church Estate, not DOE or its contractors. Neither of the ditches receive runoff from the IA OU.

Smart Ditch fills two ponds (D-1 and D-2), located in the southeastern corner of the BZ OU, which are used for irrigation. Water from Rocky Flats Lake, located west of the site, flows through Smart Ditch for approximately 2.5 miles before reaching a splitter box, which diverts water toward the southeast, into Ponds D-1 and D-2. Overland runoff is also intercepted and conveyed by Smart Ditch.

Smart Ditch 2 runs northeast of Rocky Flats Lake and is used to flood-irrigate a pasture west of RFETS. Both Smart Ditch and Smart Ditch 2 are typically dry, although each has an estimated flow capacity of 10 cfs. Because both ditches are hydrologically separated, as well as far removed, from the IA OU, limited flow or water quality data exist for these conveyances. Data for these ditches are not presented in this report.

2.6 Hydrogeology

This section describes the hydrogeology of the site, including the unconfined and confined groundwater systems present. Unconfined groundwater flow occurs in unconsolidated geologic materials and in subcropping weathered bedrock claystones and sandstones comprising the UHSU. The UHSU consists of RFA, VFA, colluvium, underlying weathered bedrock claystones and Arapahoe No. 1 Sandstone.

Near-stream hydrology at RFETS is dominated by losses to evapotranspiration (ET), as demonstrated by site surface water flow monitoring and confirmed by an integrated hydrologic model of RFETS. The relatively small portion of infiltrating precipitation that does become shallow groundwater ultimately discharges to surface water before reaching the eastern site boundary. Therefore, the UHSU groundwater that has been impacted by site activities, both in the IA and BZ OUs, discharge to surface water prior to leaving RFETS.

In addition to the UHSU, a lower hydrostratigraphic unit (LHSU) has been identified at the site. The UHSU and LHSU are separated by extremely low-permeability claystone that serves to isolate them hydraulically (RMRS 1996). The LHSU is composed of the unweathered Arapahoe, Laramie, and Fox Hills Formations. The upper Laramie

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Formation claystones of the LHSU, with low permeability, act as an effective aquitard that restricts downward vertical groundwater flow from the UHSU to the LHSU. Background geochemical characterization of the UHSU and LHSU, based on major ion and stable isotope chemistry, shows that these units have statistically different groundwater chemistry, which provides further evidence of their hydraulic isolation from each other (EG&G 1993, 1995d). In addition, areas of the UHSU contain contaminant concentrations above drinking water standards, while the LHSU does not. Because the LHSU is hydraulically isolated from the UHSU, and because the LHSU does not show evidence of contamination from the UHSU, the LHSU is not a concern as a contaminant transport pathway from RFETS. (See Appendix A to the GW IM/IRA for further discussion on the hydrogeologic relationship between the UHSU and LHSU, DOE 2005.)

The term "aquifer," as defined by 40 Code of Federal Regulations (CFR) Section 260.10, is a "geologic formation, group of formations, or a part of a formation that is capable of yielding a significant amount of water to a well or spring." An uppermost aquifer is also defined as "the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's boundary." The UHSU is considered equivalent to the uppermost aquifer at RFETS, although in many UHSU monitoring wells the amount of water available is insufficient to meet the definition of aquifer given above. While some UHSU monitoring wells are capable of producing enough groundwater for residential uses (K-H 2002b), groundwater at the site has never been used for drinking water, and this use is not anticipated in the future.

2.6.1 Regional Setting

The unconfined UHSU includes unconsolidated surficial materials, weathered portions of the Arapahoe and Laramie Formations, and all sandstones within the Arapahoe and Laramie Formations that are in hydraulic connection with overlying surficial deposits or the ground surface. Seeps are found along valley slopes at the contact of the surficial deposits and the underlying weathered bedrock. Water levels measured in UHSU versus bedrock wells at RFETS generally indicate a downward vertical hydraulic gradient. This suggests that water in the UHSU is perched on and bounded by claystone and silty claystone of the Arapahoe Formation (EG&G 1995b).

Beneath the surficial materials and consolidated deposits of the UHSU are the geologic units of the LHSU. The LHSU consists of the consolidated, unweathered bedrock of the Arapahoe and upper Laramie Formations that is not in hydraulic communication with the overlying UHSU. The Arapahoe and upper Laramie Formations comprising the geologic units of the LHSU consist of small quantities of sandstone and large quantities of claystones and siltstones. Because of the low permeability of the unweathered claystones, they restrict hydraulic communication with the UHSU (EG&G 1995b). LHSU wells that are screened in sandstones and bounded by relatively impermeable claystones and silty claystones exhibit confined conditions. In places where the uppermost LHSU sandstone is separated from UHSU materials by claystones and silty claystones, the sandstone may exist in a semiconfined condition (EG&G 1995b).

Sandstone beds of the lower Laramie Formation and the underlying Fox Hills Sandstone are grouped together as the regionally important Laramie/Fox Hills aquifer. This aquifer is separated from the UHSU by the approximately 800 to 900-feet-thick LHSU confining layer (EG&G 1995b; DOE 2005). The LHSU acts as a confining layer to separate the UHSU from the Laramie/Fox Hills Aquifer, which constitutes a regional water supply resource.

2.6.2 Hydraulic Conductivities

Hydraulic conductivities within the UHSU are important with regard to contaminant transport at the site. Hydraulic conductivity values commonly used for calculations have been obtained from the geometric mean values presented in Table G-2 of the Hydrogeologic Characterization Report (EG&G 1995b), with updated geometric mean values for the RFA and VFA, including data from approximately 40 additional aquifer tests performed in 1995. Computed geometric mean hydraulic conductivity values for the materials that comprise the UHSU are as follows:

- RFA — 4.18×10^{-4} centimeter per second (cm/sec) (430 feet/year [ft/yr]);
- VFA — 9.20×10^{-4} cm/sec (950 ft/yr);
- Colluvium — 9.33×10^{-5} cm/sec (100 ft/yr);
- Arapahoe No. 1 Sandstone — 7.88×10^{-4} cm/sec (820 ft/yr); and
- Weathered claystone — 8.82×10^{-7} cm/sec (1 ft/yr).
- Hydraulic conductivity values determined through calibration of the integrated flow model are similar but slightly different than these values (K-H 2002a). Modeling values generally are slightly higher (i.e., within several factors) for the unconsolidated materials (i.e., RFA, VFA and Colluvium) and slightly lower for the bedrock (i.e., Arapahoe Sandstone and Claystone). This is reasonable given the variability (i.e., orders of magnitude) of values within each soil type indicated.

Although geochemical and hydraulic data show the UHSU and LHSU are isolated from each other, in theory limited hydraulic connection exists between these two units because of the downward vertical gradient between them. Hydraulic conductivities for the geologic materials separating the UHSU from the LHSU range from approximately 2.5×10^{-7} to 2.8×10^{-10} cm/sec (approximately 3 inches/year to 0.003 inches/year) (RMRS 1996). This extremely low conductivity, coupled with the depth to the LHSU, limits the vertical migration of contaminants from the UHSU to the LHSU to the extent that this is not a viable contaminant transport pathway (Hurr1976; RMRS 1996).

2.6.3 Groundwater Occurrence and Distribution

RFETS is located in near a regional groundwater recharge area (EG&G 1991), but is separated vertically from regional Denver basin aquifers by nearly 600 feet of lower permeability material. UHSU groundwater recharge in the IA OU occurs from the infiltration of incident precipitation with a minor contribution as base flow from the

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upgradient area of the drainage basin that extends west to Coal Creek. Groundwater recharge in the BZ OU occurs from stream, ditch, and pond seepage. Groundwater recharge to the confined aquifers of the LHSU and the lower Laramie Formation and Fox Hills Sandstone occurs as precipitation infiltrates the steeply dipping western edge of the Denver Basin, west of RFETS.

In the western part of RFETS, where the thickness of the RFA may exceed 100 feet, the depth to UHSU groundwater is 50 to 70 feet below ground. The depth to water generally becomes shallower, and the saturated thickness thinner, from west to east as the alluvial material thins and the underlying claystones are closer to the ground surface.

2.6.3.1 Groundwater Flow

At RFETS, unconfined groundwater flows vertically and horizontally within the UHSU materials and horizontally along the contact of the UHSU with the unweathered bedrock. The general flow direction is from west to east, with the tendency to flow away from the mesa tops into the drainages. UHSU groundwater flow is largely controlled by the topography of the bedrock surface and the hillslopes. UHSU groundwater that has been impacted by site activities discharges to surface water prior to leaving RFETS.

The potentiometric surface of groundwater in the UHSU has been mapped for the second and fourth quarters of 2003[4], and is shown on Figure 2.16 and Figure 2.17, respectively[5]. The periods illustrated, spring and fall, represent the times of year when static water levels are expected to be highest and lowest, respectively. The potentiometric surface maps confirm the propensity of the UHSU groundwater to flow toward the drainages and discharge to surface water.

Groundwater discharges from the UHSU to streams as base flow, or in non-stream areas as seeps, or springs. Within the site area, only the Antelope Springs area south of Woman Creek discharges groundwater continuously (i.e., springflow by definition) to surface water (i.e., GS16 gage). Baseflow contributions to streamflow were modeled using the integrated SWWB model (K-H 2002a). Results of equilibrated closure configuration conditions indicate that ephemeral baseflow will occur along several of the Functional Channels (i.e., FC-1, FC-2 and FC-4). The model results also suggest that the central IA just south of the former B707/Central Avenue will likely produce seepflow that will flow into the South Walnut Creek drainage for wetter periods (K-H 2005).

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[4] The second and fourth quarter 2003 data were selected to represent the potentiometric surface because it was the final IMP year, with the full groundwater level coverage (approximately 300 wells). Subsequent years had reduced coverage resulting in a less potentiometric surface. Integrated hydrologic modeling after surface recontouring and revegetation within the IA OU indicate that the general groundwater flow directions do not change because of the dominance of the hillslope topography on flow directions (K-H 2005).

[5] The seep areas identified on these figures are from the 1995 Hydrogeologic Characterization Report (EG&G 1995b). In addition, for Figures 2.16 and 2.17, some data points may lack result values printed on these figures due to the close proximity of the locations and software limitations.

Other groundwater discharges to the ground surface at RFETS occur as seeps (defined by limited and ephemeral discharge). Seep flow is typically generated at the head of stream drainages and along upper valley sides, where lower permeability bedrock emerges at the groundwater surface and forces groundwater to discharge to the surface. Notable seep areas are easily identified by the presence of phreatophytes (plant species with roots that extend to the water table). Seeps are common on north-facing slopes where evapotranspiration (ET) impacts on groundwater discharges are less than other slopes. The seeps generally provide insufficient water to become sources of overland flow; flow rates have been estimated. Most seep locations denoted in the 1995 Hydrogeologic Characterization Report (EG&G 1995b), based on prior mapping, aerial photography, and field reconnaissance (displayed on Figure 2.18) remain inactive during typical climate years, and only become active during wetter climate periods.

The bedrock surface has been modified in some areas of the IA OU due to incised utility corridors and excavations for building basements and other structures. These modifications locally affect the occurrence, distribution, and flowpath of groundwater. The potentiometric surfaces shown on Figure 2.16 and Figure 2.17, and published in previous reports, reflect these modifications. The removal of impermeable surfaces (parking lots, roads, and so forth) has resulted in an increase in the infiltration in many areas. Accelerated actions or land configuration activities have also added backfill where buildings were previously located, disrupted subsurface flowpaths, and removed the water supply system. This was previously was a source of groundwater recharge due to leakage from the water supply system's subsurface distribution piping. The cumulative impact of these changes on groundwater occurrence and distribution will be evaluated through the integrated monitoring program that will be implemented after the accelerated actions are complete. It is unlikely that the cumulative impacts will be realized prior to the implementation of the final remedy pursuant to the Corrective Action Decision/Record of Decision (CAD/ROD). It may take many years before changes result in a new "steady-state" groundwater level and flow condition. The evaluation of groundwater occurrence and distribution data will be included in future periodic reviews, as appropriate.

2.7 Meteorology

RFETS has a semiarid climate typical of much of the central Rocky Mountain region, characterized by dry, cool winters and warm summers. The topography of the area greatly influences the climate, with higher elevation areas of the Front Range immediately to the west and gently rolling plains to the east.

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2.7.1 Precipitation

Average annual precipitation at the site is approximately 14.3 inches (36.3 centimeters [cm]), based on 43 years of precipitation records.[6] Rainfall is highest from April through June, with approximately 41 percent of the average annual precipitation, as either rain or snow, occurring during those months. Fall and winter are typically drier seasons. Monthly precipitation data are summarized in Table 2.5.

Analysis of precipitation data collected at RFETS from 1993 through 2004 indicates that approximately 25 percent of the days had precipitation measured above 0.01 inch (0.025 cm). Only slightly more than 1 percent of the days had precipitation measured at a depth greater than 0.5 inch (1.3 cm).

Intense rainstorms along the Front Range are frequently of relatively short duration. Analysis of a 73-year record of rainfall at the Denver rain gage revealed that of the 73 most intense storms analyzed, 68 had the most intense period begin and end within the first hour of the storm. Furthermore, 52 of the storms had the most intense period begin and end within the first half-hour of the storm (UDFCD 2001). This pattern of highest intensity early in a rainstorm is common for storm events observed at RFETS.

2.7.2 Temperature

Temperatures at RFETS are relatively moderate; extremely warm and cold weather is usually of short duration. Average daily temperatures in July range from 58° Fahrenheit (F) to 85°F (14° Celsius [C] to 29°C), while average daily temperatures in January range from 20°F to 47°F (-9°C to 8°C) (AeroVironment 1995). The growing season, from the last spring freeze to the first autumn freeze, is approximately 148 days per year (RMRS/DOE, 1995). Monthly temperature data, collected between 1964 and 2004, are summarized in Table 2.6.

2.7.3 Winds

Winds at RFETS, although variable, are predominately from the northwest quadrant. Wind speeds at 10 meters (m) above ground level average between 9 and 10 miles per hour (mph) (4 to 4.5 meters per second [m/s]). Strong winds occur predominantly out of the west-northwest, and during the winter and spring months. RFETS occasionally experiences gusts in excess of 100 mph (45 m/s). Strong winds are generally associated either with frontal passages or "Chinook" episodes, caused by the acceleration of westerly winds due to pressure differences over the Front Range, resulting in warm, dry, gusty conditions. Monthly wind speed data, collected between 1964 and 2004, are summarized in Table 2.7.

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[6] Forty-three years of precipitation record include data from 1964 through 1977 (AeroVironment 1995), 1984 through 1993 (AeroVironment 1995), and 1994 through 2004 (K-H precipitation data).

During periods when RFETS is not under the influence of strong storm systems or other synoptic patterns, the topographic differences between the western and eastern portions of the site produce a daily cycle of thermally driven upslope/downslope flow. Light winds flow upslope during the day as the warming land surface heats the adjacent air, with downslope winds occurring as the land surface cools after sunset. The distribution of wind speed and direction, based on 2004 data, is shown on Figure 2.19.

Stability reflects the tendency for vertical motion in the atmosphere and can be an important factor in determining air pollutant concentrations, as more stable conditions inhibit vertical dilution of pollutants emitted near ground level. Unstable conditions occur at RFETS approximately 11 percent of the time (RMRS/DOE 1995). Stable conditions occur approximately 43 percent of the time, while neutral conditions occur with the highest frequency, 46 percent of the time (RMRS/DOE 1995).

A temperature inversion, where warmer air overlies cooler air at the surface, often acts as a "lid" to hold pollution near the ground. Temperature inversions are common at RFETS and develop on most cloudless nights, even in the summer. During winter, such inversions can persist all day. Inversions can also occur when there are high winds aloft.

2.8 Human Populations and Land Use

As discussed in Section 2.2, RFETS is located at the interface of the Great Plains and Rocky Mountains. Higher-elevation areas west of RFETS are characterized by rugged terrain and relatively sparse human population. In contrast, the plains east of RFETS are characterized by relatively gentle topography and higher population density associated with the greater Denver metropolitan area. RFETS is located in an area of growing population with residential and commercial development of lands historically used for farming and grazing, primarily to the north, east, and south. This development is somewhat countered by local government acquisition and preservation of open space, including land adjacent to RFETS, primarily directly to the west and north.

2.8.1.1 Population and Housing

As of 2004, approximately 2.6 million people were living in the Denver metropolitan area counties. Between 1990 and 2000, the population of the Denver metropolitan area increased by approximately 556,000 people (29.9 percent), according to the Denver Regional Council of Governments (DRCOG) (DRCOG 2004).

Table 2.8 presents the population and number of households in Denver-area counties in 2000, along with the estimated population and household numbers for 2004. The distribution of households and population within a radius of 20 kilometers (12.4 miles) of the site in 2004 is shown on Figure 2.20. Continued growth is expected for these areas. DRCOG projects the population in the Denver metropolitan area will increase by more than 1 million additional people from 2000 to 2025, or approximately 42 percent (DRCOG 2004).

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In addition to the trend of increasing population in adjacent counties, residential population has moved closer to the site since 1990. The communities of Superior (north of RFETS), Broomfield (northeast of RFETS), and Westminster and Arvada (east and southeast of RFETS) have experienced rapid growth in recent years. As a result, residential housing, as well as increased commercial and industrial uses, has developed primarily to the north, northeast, east, and southeast of RFETS, in areas that were vacant land when the 1990 census was conducted. Some of these developments are described in more detail in Section 2.8.2.

2.8.2 Surrounding Land Use

Until recently, land around the site consisted primarily of rangeland, preserved open space, mining areas, and low-density residential areas. However, this rural pattern is beginning to change due to the spread of development from the surrounding communities. The towns of Superior and Broomfield have already experienced extensive development north and northeast of the site. Superior has seen substantial residential growth, and a commercial center has been developed at the intersection of McCaslin Boulevard and U.S. Highway 36 (Figure 2.1).

Northeast of the site, an extensive area of commercial, residential, and office space (Interlocken and the Flatirons Crossing area) has developed over the past 5 to 7 years between State Highway 128 and U.S. Highway 36. During this same period, several office complexes, a county jail, and multifamily residential housing unit have been constructed south of State Highway 128 and east of Indiana Street. In addition, the Jefferson County Airport, located approximately 3 miles east of RFETS, is surrounded by recent business park and light industrial developments.

State-owned lands southwest and west of the site are used for grazing, mining, and storage and conveyance of municipal water supplies. Along Highway 93, an area of land approximately 1,200 feet wide adjacent to the site's western boundary is available for eventual development, open space, or highway right-of-way. The 259-acre DOE National Wind Technology Center is located adjacent to the northwestern corner of the BZ OU on lands transferred from the DOE Rocky Flats Project Office (RFPO). Preserved open space is the primary existing and proposed use of the lands immediately north (Boulder County and City of Boulder) and east (Cities of Broomfield and Westminster) of the site.

Areas within the BZ OU and adjacent privately owned lands west of the site have been permitted by the State and County for mineral extraction (primarily clay, sand, and gravel mining). Some irrigated and nonirrigated croplands, producing primarily wheat and barley, are located northeast of RFETS near the Cities of Broomfield, Lafayette, and Louisville; north of RFETS near Louisville and Boulder; and in scattered parcels adjacent to the eastern boundary of the site. Much of the rest of the land immediately adjacent to RFETS is used for cattle grazing.

To the south, several horse operations and small hay fields exist at present. However, a mixed-use residential and commercial development known as Vauxmont, within the City of Arvada, is proposed for an area immediately adjacent to the southern boundary of the site (USFWS 2004a). By 2020, DRCOG projects that the entire area south of the site will be developed, as well as areas to the southeast that are either not already developed or protected as open space (City of Westminster) around Standley Lake.

Planning is ongoing for possible upgrades to transportation systems in the area around RFETS. The Northwest Corridor Environmental Impact Statement process, which began in 2003 and is expected to be complete in late 2006, is looking at whether transportation improvements are needed in the Northwest Corridor and, if so, what options are the most effective and desirable. The study area extends from the freeway systems in the vicinity of U.S. 36 in the City and County of Broomfield to the freeway systems in the vicinity of State Highway 58, I-70, and C-470 to the south in Jefferson County. As of mid-2005, the original 70 alternatives had been narrowed to eight, plus the "No Action" alternative, including alternatives focused on construction of a new highway alignment and alternatives focused instead on improving existing highway and arterial networks. The existing highways involved include those immediately adjacent to RFETS to the east and south. If a new highway alignment if chosen, it would run near Indiana Street to the east of RFETS, with different options diverging near State Highway 72 to the southeast of the site.

2.8.3 Natural Heritage Resources

The Refuge Act identifies the following significant RFETS qualities:[7]

- The majority of the site has generally remained undisturbed since its acquisition by the government.
- The site preserves valuable open space and striking vistas of the Front Range mountain backdrop.
- The site provides habitat for many wildlife species, including a number of threatened and endangered species, and is marked by the presence of rare xeric tallgrass prairie plant communities.

The Colorado Natural Heritage Program (CNHP),[8] a research entity of the Nature Conservancy housed at Colorado State University's College of Natural Resources, assessed the BZ OU for its ecological value (CNHP 1994, 1995). CNHP concluded the site contains highly significant natural elements important for the protection of

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[7] Chapter 3 of the Rocky Flats National Wildlife Refuge Final Comprehensive Conservation Plan (CCP) and Environmental Impact Statement (EIS) also contains detailed descriptions of the habitat communities (USFWS 2004a).

[8] The CNHP is an independent, multidisciplinary group of ecologists that gather information on rare species and habitats and maintain the Biological and Conservation Databases (designed by the Nature Conservancy). Using databases that provide site-specific information for given species and habitats, they are able to rank and prioritize areas representing the nation's natural biodiversity. Priorities can then be established for the protection of the most sensitive areas to help in determining land use options.

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Colorado's natural diversity and encouraged DOE to take actions to protect and appropriately manage the site.

CNHP classifies the xeric tallgrass prairie plant community as very rare. The RFETS macrosite was identified by CNHP as the largest known remnant of xeric tallgrass prairie in Colorado, and probably the largest remaining parcel in all of North America (CNHP 1994, 1995). Most of the remaining xeric tallgrass prairie in Colorado is found in Boulder and Jefferson Counties in small, dispersed parcels. Less than 20 occurrences of the xeric tallgrass prairie are known worldwide. Approximately 1,800 acres of this xeric tallgrass prairie unit occurs within site boundaries.

The Great Plains riparian community, identified by CNHP as Great Plains riparian woodlands and riparian shrublands, is classified as rare and declining. Examples of this community are found in the Rock Creek, Walnut Creek, Woman Creek, and Smart Ditch drainages (CNHP 1994; CNHP 1995). Approximately 54 acres of this type (includes riparian woodland, willow riparian shrubland, and lead plant riparian shrubland) occurs within the site boundary.

The tall upland shrubland community is found on north-facing slopes primarily in the Rock Creek drainage and was identified by CNHP as a potentially unique shrubland community, possibly not occurring anywhere else. This community commonly occurs just above wetlands and seeps (CNHP 1994). Although the tall upland shrubland represents less than 1 percent of the total area of Rocky Flats, it contains 55 percent of the plant species on the site.

2.8.4 Cultural Resources

Two archeological surveys were conducted at RFETS, in 1989 and 1991. These surveys identified local points of interest in the BZ OU, such as Lindsay Ranch and an apple orchard. However, at that time, no sites or artifacts were found to be eligible for listing on the National Register of Historic Places (DOE 2000).

A survey of the IA OU was prepared in 1995 (AeroVironment 1995). The survey report concluded several facilities in the IA are of historic importance because of the role they played in the site's contribution to the Cold War. The State Historic Preservation Office (SHPO) agreed with these conclusions. Subsequent discussions with the SHPO determined how the historic information at the site would be recorded.

On January 16, 1998, 64 buildings and facilities at RFETS were included in a district that was formally added to the National Register of Historic Places. An Historic American Engineering Record (HAER) for the RFETS district was created using various reports, photographs, and drawings to document the history and significant contributions from 1953 to 1992 for the Rocky Flats Plant (DOE 1998). The HAER program was established in accordance with the 1935 Historic Sites Act (P.L. 74-292) and the 1966 National Historic Preservation Act (NHPA) (P.L. 89-665), as amended in 1980 (P.L. 96-515). The HAER program sets out to capture vanishing industrial and engineering treasures nationwide, in written historical reports. The RFETS district HAER was reviewed and accepted by the U.S. Department of Interior, National Park Service on January 22, 1999, and the HAER was transmitted to the Library of Congress. As a result of the National Park Service accepting the HAER, decontamination, decommissioning, and demolition of buildings within the historic district complied with the NHPA requirements.

A Cultural Resource Management Plan (CRMP) (SAIC 1996) was prepared that incorporated information from both the archeological and IA OU surveys and established guidelines regarding how to manage site cultural resources.

2.8.5 Property Rights

2.8.5.1 Subsurface Rights

The majority of RFETS is subject to subsurface property rights held by private owners. Extraction of subsurface minerals has occurred on or adjacent to the western area of the site for at least the last 60 years, and historically has included mining of coal, clay, and sand and gravel. Active permits currently exist for surface mining of sand and gravel and clay in the northwest area of the BZ OU. Lafarge West, Inc. holds a permit to mine sand, gravel, and clay in Section 4, called the Bluestone Pit. Church Ranch holds a permit to mine sand, gravel, and clay in the NE ¼ of the SE ¼ of Section 9, the Rocky Flats Pit. Lakewood Brick & Tile Company holds a permit to mine clay in the NW ¼ of the SE ¼ of Section 9, called the Church Pit. No other mining permits are currently in place within the site boundaries. Ownership of mineral rights for the site is presented on Figure 2.21.

2.8.5.2 Rock Creek Reserve

Rock Creek Reserve was created in May 1999 through a designation by the U.S. Secretary of Energy and execution of a cooperative agreement between DOE and the U.S. Fish and Wildlife Service (USFWS) for management of Rock Creek Reserve's ecologically important resources. Approximately 850 acres of the northern BZ was designated as Rock Creek Reserve for purposes of protecting and preserving the important wildlife, cultural, and open space resources in this area. DOE retains jurisdiction of the area and is responsible for access controls. Under the cooperative agreement, USFWS manages the ecological resources. Most of the Rock Creek Reserve was part of several livestock ranches (most notably, the Lindsay Ranch) before DOE purchased the property.

In May 2001, DOE and USFWS published the Integrated Natural Resources Management Plan and Environmental Assessment (DOE/USFWS 2001). This plan outlines steps proposed for the next five years to provide for the stewardship of the natural resources of the Rock Creek Reserve (also known as the Rock Creek Fish and Wildlife Cooperative Management Area). In this plan, the Rock Creek Reserve was expanded to 1,793 acres to include the entire northern boundary of the BZ (Figure 2.2).

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Within the Rock Creek Reserve are areas that have been permitted for mining. Thus, certain mineral rights, as discussed in Section 2.8.5, are being exercised. As noted above, a mining permit, called the Bluestone permit, was granted by the Colorado Division of Mining and Geology, and a zoning variance was passed by the Jefferson County Commissioners in 1995. The permit and variance included part of the area that became designated the Rock Creek Reserve. The portion of the Bluestone permit area lying within Rock Creek Reserve is located in the northwest, and includes approximately 250 acres, of which approximately 20 acres are permitted for mining. The remaining 230 acres of the permitted area are designated as a nonmining buffer area. Mining operations have not yet begun in this area.

2.8.5.3 Easements

The RFETS property is subject to easements and licenses granted by the U.S. government to third parties, primarily public utilities. A list of the existing easements and licenses is provided in Table 2.9, and the locations of these easements and licensed areas are illustrated on Figure 2.4. (The reference numbers in Table 2.9 correspond to the numbers on Figure 2.4.) The easements and licenses generally contain provisions for rights of access for the purposes of maintenance and operation.

2.8.6 Future RFETS Land Use

The Refuge Act designated Rocky Flats as Colorado's seventh National Wildlife Refuge. The designation will be effective upon achieving closure as defined in the Refuge Act, at which time jurisdiction of the areas of RFETS that become a wildlife Refuge will be transferred to the U.S. Department of the Interior for Refuge purposes.

The purposes of the Refuge are as follows:

- Restoring and preserving native ecosystems;
- Providing habitat for and population management of native plants and migratory and resident wildlife;
- Conserving threatened and endangered species; and
- Providing opportunities for compatible scientific research.

The following land management actions or implications are expected:[9]

- Land ownership will remain with the United States; however, jurisdiction for certain portions of RFETS will be transferred from DOE to the U.S. Department of the Interior.
- The U.S. Department of the Interior, specifically the USFWS, will administer the

[9] See the Refuge Act for its specific requirements. This discussion is intended only as a brief overview of the Refuge Act requirements in relation to the anticipated future use of RFETS as a Refuge. Also, the website http://rockyflats.fws.gov provides routinely updated information on the Refuge.

Refuge.

- The lands retained by DOE are expected to be managed consistent with the Refuge.
- Once designated as a National Wildlife Refuge, the transferred property will not be subject to annexation by any unit of general local government.
- The Refuge Act prohibits the United States from transferring any rights, title, or interest in land within the boundaries of Rocky Flats, except for the purpose of transportation improvements on the eastern edge of RFETS that is bordered by Indiana Street.
- It is anticipated that use of the land for residential, commercial, or industrial purposes will not occur, and that surface water and groundwater will not be used for potable water supplies. The land is not anticipated to be used as cropland, although the CCP allows for limited livestock grazing for the purpose of vegetation management.

2.9 Ecology

At an elevation of approximately 6,000 feet above MSL, the site contains a unique ecotonal mixture of mountain and prairie plant species resulting from the topography of the area and its proximity to the mountain front. The relatively undeveloped site provides numerous plant communities that are used by wildlife to satisfy habitat needs. Many of these plant communities are increasingly rare along the Front Range as urbanization continues to replace and fragment the remaining parcels of these plant communities. This section, which is largely a direct excerpt from the *Affected Environment* text in the CCP, provides a description of the vegetation, wildlife, and threatened and endangered species present at RFETS (USFWS 2004a).[10]

2.9.1 Vegetation

A diverse range of vegetation communities is found at RFETS (Table 2.10). Two of these vegetation communities, the xeric tallgrass grassland and the tall upland shrubland, are considered rare in the region. Other significant vegetation communities at RFETS include the riparian woodland, riparian shrubland, wetlands, mesic mixed grassland, xeric needle and thread grassland, reclaimed mixed grassland, and ponderosa pine woodland (Figure 2.22) (K-H 1997a, 1997b). Vegetation communities at RFETS have been grouped into Resource Management Zones. These zones generalize RFETS into three categories with similar wildlife habitat attributes and management requirements.

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[10] The majority of text in this Ecology section is taken directly from the CCP (USFWS 2004a). However, the text was modified in several cases to be consistent with findings from vegetation surveys documented in the 2001 Annual Vegetation Report for RFETS (K-H 2002c) and wildlife surveys documented in the 2000 Annual Wildlife Survey for RFETS (K-H 2001). In addition, latin names were added for plant and animal species referenced.

The three management zones are xeric tallgrass grassland, wetlands and riparian corridors, and mixed prairie grassland.

2.9.1.1 Xeric Tallgrass Grassland Management Zone

Xeric Tallgrass Grassland

This rare plant community is found on the rocky plains in the western portions of the site, extending eastward along several fingerlike ridgelines (Figure 2.22). The xeric tallgrass grassland covers 1,568 acres and contains several different plant associations that include combinations of big bluestem *(Andropogon gerardii),* little bluestem *(Andropogon scoparius),* mountain muhly *(Muhlenbergia montana),* sun sedge *(Carex. heliophila),* Fendler's sandwort *(Arenaria fendleri),* and Porter's aster *(Aster porteri).* Other tallgrass prairie species include Indian-grass *(Sorghastrum nutans),* prairie dropseed *(Sporobolus heterolepis)*, switchgrass *(Panicum virgatum),* and needle-and-thread grass *(Stipa comata).* Species richness is high; 295 species have been recorded within the xeric tallgrass community at the site, of which approximately 80 percent are native (K-H 2002c).

The xeric tallgrass grassland is believed to be a relict once connected to the tallgrass prairie hundreds of miles to the east (Essington et al. 1996; Nelson 2003). CNHP has found that much of the xeric tallgrass grasslands along the Colorado Front Range has been disturbed by urban development and agricultural conversion over the last century. In addition, aggressive weed species, such as cheatgrass *(Bromus* ssp.*),* Japanese brome *(Bromus japonicus),* and diffuse knapweed *(Centaurea diffusa),* have degraded many areas of this community throughout the region (Essington et al. 1996), as well as at RFETS. CNHP believes that the xeric tallgrass grassland community exists in fewer than 20 places globally and that RFETS has the largest example of this community remaining in Colorado and perhaps North America. CNHP ranks this community as imperiled within the state (Essington et al. 1996).

The xeric tallgrass grassland community is composed of several subcommunities (Nelson 2003). One of these subcommunities was identified by ESCO Associates Inc. (ESCO) during a 5-year evaluation of bluestem-dominated grasslands in the RFETS area. This study found that the major distinguishing feature of what ESCO calls the rare "Rocky Flats Bluestem Grassland" community is the abundance of big bluestem with little bluestem, mountain muhly, and Porter's aster (Figure 2.22). While big and little bluestem are characteristic of Midwestern tallgrass prairies, mountain muhly and Porter's aster are characteristic of mountain environments. This unusual combination of mountain and plains grassland species in a consistent and recurring pattern across the Rocky Flats alluvial surface, along with evidence of exceptional stability, makes this vegetation community a rare, if not unique, resource (ESCO 2002).

In 2001, high winds deposited several inches of sand on xeric tallgrass grassland areas adjacent to existing gravel mines in the northwestern corner of the site (Figure 2.23). This sand buried most of the native vegetation and was soon colonized by sunflower

(Helianthus pumilus), a native annual weedy species, as well as noxious weeds such as diffuse knapweed, Russian thistle *(Salsola iberica)*, and kochia *(Kochia scoparia)*.

2.9.1.2 Wetlands and Riparian Corridors Management Zone

Riparian Woodland

The riparian woodland community is characterized by a diverse mixture of plains cottonwood *(Populus deltoides)*, peachleaf willow *(Salix amygdaloides)*, and Siberian elm *(Ulmus pumila)*, with an understory of various shrubs such as coyote willow *(Salix exigua)*, false indigo (*Amorpha fruticosa*), and snowberry *(Symphoricarpos occidentalis)*. Covering 28 acres, it is found primarily along the RFETS drainage bottoms, with the most significant stand occurring in the Rock Creek drainage (Figure 2.22) (CNHP 1994; Essington et al. 1996; K-H 1997a, 1997b; PTI 1997b).

The most significant threat to the riparian woodland community is from exotic species such as Siberian elm, Canada thistle *(Cirsium arvense)*, musk thistle *(Carduus nutans)*, smooth brome *(Bromus inermis)*, and Kentucky bluegrass *(Poa pratensis)*. Preservation of this woodland community depends on the preservation of associated streamflow (Essington et al. 1996; PTI 1997b).

Riparian Shrubland

Riparian shrubland forms extensive, dense thickets of shrubs along the stream bottoms. This community covers 41 acres throughout RFETS (Figure 2.22). It is dominated by coyote willow and false indigo and generally has an understory consisting of Canada thistle (a noxious weed), meadow fescue *(Festuca pratensis)*, Canada bluegrass *(Poa compressa)*, Baltic rush *(Juncus balticus)*, and various sedges (Kettler et al. 1994; USACE 1994; K-H 1997b).

Tall Upland Shrubland

Tall upland shrubland occurs on 34 acres of north-facing slopes above seeps and along streams, primarily within the Rock Creek drainage (Figure 2.22). The tall upland shrubland consists of a rare association of hawthorn *(Crataequs erythropoda)*, chokecherry *(Prunus virginiana)*, and occasionally wild plum *(Prunus americana)*. This shrubland is associated with groundwater seeps that form at the contact of the RFA and the underlying, relatively impermeable Arapahoe Formation. The herbaceous understory contains a number of species that are restricted to the cool, shaded microhabitat provided by the canopy. Understory species include Fendler waterleaf *(Hydrophyllum fendleri)*, spreading sweetroot *(Osmorhiza chilensis)*, anise root *(Osmorhiza longistylis)*, carrionflower greenbriar *(Smilax herbacea)*, fragile fern *(Cystopteris fragilis)*, Colorado violet *(Viola scopulorum)*, Rydberg's violet *(Viola rydbergii)* and northern bedstraw *(Galium septentrionale)*. Although the tall upland shrubland represents less than 1 percent of the total area of RFETS, it contains 55 percent of the plant species on the site (DOE/USFWS 2001). This shrubland community is believed to be rare and may not occur anywhere else (Essington et al. 1996; DOE/USFWS 2001).

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Other Shrubland

Other shrubland communities include short upland shrubland and savannah shrubland, covering 70 acres primarily in the Rock Creek drainage (Figure 2.22). Short upland shrubland is characterized by stands of snowberry and occasional Wood's rose *(Rosa woodsii)* and is often found in association with wet meadows and other wetland or riparian communities. Savanna shrubland occurs in drier areas where scattered shrubs are interspersed with grasslands. Three-leaf sumac *(Ruhus trilobata)* is the predominant shrub in this community (K-H 1997a).

2.9.1.3 Wetland Communities

Wetland communities cover 406 acres of the site and play an important role in sustaining the diverse vegetation and habitat types found on the site. The most significant wetland complexes at RFETS are the seep-fed wetlands along the hillsides of the Rock Creek drainage and the Antelope Springs complex in the Woman Creek drainage. These wetlands are significant because they have the largest contiguous areas and the most complex plant associations (PTI 1997a).

Three wetland types, tall marsh, short marsh and wet meadow, are found at the site. These occur in streamside areas along the valley floors and near the seeps and springs that occur along many of the hillsides. Each wetland type is described below.

Tall Marsh Wetland

Tall marsh wetlands generally occur along ponds and ditches and in persistently saturated seeps (Figure 2.22). Covering 31 acres of the site, these wetlands are dominated by cattails *(Typha ssp.)*, bulrushes (*Scirpus ssp*), and associated forbs such as watercress *(Nasturtium officinale)*, showy milkweed *(Ascelepias speciosa)*, swamp milkweed *(Ascelepias incarnata)*, and Canada thistle. Antelope Springs in the Woman Creek drainage is the best example of a saturated slope wetland and tall marsh community at RFETS.

Short Marsh Wetland

The short marsh wetlands cover 121 acres at RFETS, and are commonly associated with seasonally inundated or saturated areas, such as hillside seeps (Figure 2.22). Prevalent species include Nebraska sedge (*Carex nebrascensis*), Baltic rush, and spike rush (*Eleocharis ssp.*), as well as forbs such as watercress and speedwell (*Veronica ssp.*).

Wet Meadow Wetland

These seasonally saturated wetlands occupy 254 acres on the perimeter of saturated wetlands and contain elements of both the short marsh wetland and upland mixed grassland communities (Figure 2.22). Prevalent species include redtop *(Agrostis stolonifera)*, prairie cordgrass *(Spartina pectinata)*, and solid stands of Canada bluegrass and western wheatgrass *(Agropyron smithii)*. Other species commonly found in this community include common milkweed *(Asclepias speciosa),* wild iris *(Iris missouriensis),* Canada thistle, dock (*Rumex ssp.*), and occasionally arnica *(Arnica fulgens)* (Nelson 2003).

2.9.1.4 Mixed Prairie Grasslands Management Zone

Mesic Mixed Grassland

The mesic mixed grassland community is the largest vegetation community at RFETS, covering 2,199 acres across the broad ridges, hillsides, and valley floors throughout the site and the rolling plains in the eastern portions of the site (Figure 2.22). This community is characterized by western wheatgrass, blue grama *(Bouteloua gracilis),* side-oats grama *(Bouteloua curtipendula),* prairie junegrass *(Koeleria pyramidata),* Canada bluegrass, Kentucky bluegrass, green needlegrass *(Stipa virigula),* and little bluestem. This grassland occurs on clay loam soils having relatively higher soil moisture content than other upland areas. The higher moisture results from subirrigation from the coarse alluvial soils, snow accumulation, and protection from wind (DOE 1997).

The mesic mixed grassland is very important to wildlife species including grassland birds, small mammals, and larger mammals such as mule deer. The quality of mesic mixed grassland varies considerably across the site. In the western parts of the site, this community has been degraded by diffuse knapweed, while some areas in the eastern portion of the site have been degraded by weed species such as Japanese brome, alyssum *(Alyssum minus),* and musk thistle *(Carduus nutans)* (PTI 1997b).

Xeric Needle and Thread Grassland

Several patches of xeric grassland dominated by needle-and-thread grass occur in the eastern half of RFETS. These patches cover 187 acres (Figure 2.22). Other dominant grass species include New Mexico feathergrass *(Stipa neomexicana),* Canada bluegrass, Kentucky bluegrass, and Japanese brome (Nelson 2003). This grassland occurs primarily on the eastern extensions of the Rocky Flats pediment that is characterized by very cobbly, sandy loam soils. Although not as cobbly, these soils are very similar to the soils that support the xeric tallgrass grassland community (K-H 1997b; PTI 1997a). The largest expanse of needle-and-thread grassland at RFETS occurs along the ridgetop north of the former East Access Road.

Reclaimed Mixed Grassland

Reclaimed mixed grassland covers 640 acres, primarily in the southeastern portion of the site that was formerly cultivated for agriculture (Figure 2.22). Most of these areas have been reseeded with a mixture of smooth brome and intermediate wheatgrass *(Agropyron intermedium),* both introduced species. Other common species include crested wheatgrass *(Agropyron cristatum),* sweetclover (*Melitotus ssp.*), and field bindweed *(Convolvulus arvensis)* (K-H 1997b).

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Short Grassland

This grassland is typified by buffalograss *(Buchloe dactyloides)* and blue grama, both short grass prairie species. Ten acres of this community are found on the site (K-H 1997b), typically in relatively small, isolated areas near the RFETS eastern boundary at Indiana Street.

Ponderosa Pine Woodland

Isolated patches of ponderosa pine woodland cover 9 acres in the uppermost reaches of the Rock Creek and Woman Creek drainages near the western edge of the site. These scattered pines represent an eastward extension of the nearby foothills forests. While much of the understory is similar to the adjacent grassland communities, other associated plants are more likely to occur in foothills environments (DOE 1997).

Disturbed and Developed Areas

Disturbed and developed areas consist of existing or former facilities associated with the previous use of the site. They include roads, landfills, dams, and other facilities, such as groundwater treatment systems. They also include former facilities that have been revegetated with native and introduced grass species.

2.9.1.5 Noxious Weeds

Noxious weeds are exotic, aggressive plants that invade native habitat and cause adverse economic or environmental impacts. Since 1990, the site has experienced a large increase in noxious weeds (DOE 1997). At RFETS, the noxious weed species with the greatest potential to degrade the native plant communities and that are the most difficult to control include diffuse knapweed, musk thistle, Dalmatian toadflax *(Linaria dalmatica),* and Canada thistle. Other increasingly problematic weeds are downy brome (cheatgrass) *(Bromus tectorum),* field bindweed, and jointed goatgrass *(Aegilops cylindrica)* (Lane 2004). Diffuse knapweed, an aggressive tumbleweed, is currently given highest control priority. Canada thistle is common in and around most of the wetlands, musk thistle is found across mesic grasslands, and Dalmatian toadflax is common in xeric grasslands and other areas (Figure 2.22).

Prioritized noxious weed lists and select weed control measures are found in the 2002 Annual Vegetation Management Plan (K-H 2002d). The three most abundant noxious weeds identified during 2001 mapping were diffuse knapweed (1,957 acres) (Figure 2.24), common mullein *(Verbascum thapsus)* (1,357 acres) (Figure 2.25), and musk thistle (869 acres) (Figure 2.26) (Table 2.11) (DOE/USFWS 2001; K-H 2002d).

2.9.1.6 Rare Plants

No federally listed plant species, such as the Ute ladies'-tresses orchid *(Spiranthes diluvialis)* or Colorado butterfly plant *(Gaura neomexicana ssp. coloradensis),* are known to occur at RFETS. Aside from the rare xeric tallgrass prairie and tall upland shrubland communities, RFETS also supports populations of four plant species that are listed as rare or imperiled by CNHP. These species are the mountain-loving sedge *(Carex oreocharis)*, forktip three-awn *(Aristida basiramea)*, carrionflower greenbriar, and dwarf wild indigo *(Amorpha nana)*. Forktip three-awn primarily occurs in previously disturbed sites near the western edge of the IA OU. The other three species occur primarily along the pediment slopes in the Rock Creek drainage (K-H 2002c).

2.9.1.7 Fire History

Historical documentation indicates grasslands in the RFETS area have been subjected to lightning- and human-caused fires for thousands of years (DOE 1999). These fires likely played a major role in promoting native vegetation growth and diversity (DOE 1999). Since 1972, wildfires have not been allowed to burn and only one controlled burn has been conducted in the grasslands at RFETS. As a result, a fuel load of dead vegetation has been building up in the grasslands at the site for at least 30 years. This buildup of dead vegetation has contributed to an invasion of noxious weeds on the site, particularly in the last 10 years (DOE 1999). Seven wildfires have been documented on the site since 1993. In addition, a prescribed burn was conducted on April 6, 2000. These grassland fires are summarized in Table 2.12.

2.9.2 Wildlife Resources

Many areas of the site have remained relatively undisturbed for the past 30 to 50 years, allowing them to retain diverse habitat and associated wildlife. These wildlife communities are supported by the regional network of protected open space that surrounds the site on three sides, buffering wildlife habitat from the surrounding urban development.

2.9.2.1 Mammals

One of the most abundant and conspicuous mammal species at RFETS is the mule deer *(Odocoileus hemiomus)*. A resident herd of approximately 160 individuals inhabits the site. While mule deer distribution varies by season, they appear to have a general preference for the following areas:

- Open grasslands of the upper Rock Creek drainage;
- Shrublands of the lower Rock Creek drainage;
- Grasslands of the upper Walnut Creek drainage;
- Hillsides above lower Walnut Creek drainage;
- Riparian bottomlands around Woman Creek and Antelope Springs; and
- Grasslands below the pediment in the Smart Ditch drainage.

In the spring, mule deer exhibit an affinity for woody habitat and secondarily for grasslands. In the summer, deer use is more generally divided among different habitats. In the fall, mule deer primarily use woody habitats, with grasslands also being important.

In the winter, mule deer are commonly observed in grasslands and tall upland shrublands (K-H 2001).

Other ungulates also use the site. Whitetail deer *(Odocoileus virginianus)* have become more common at the site and are often observed in company with mule deer. RFETS is in Colorado Division of Wildlife (CDOW) Game Management Unit (GMU) #38 and is adjacent to GMU #29, which collectively make up the Boulder deer herd. American elk *(Cervus elahus)* visit the site, but are not resident (DOE 1997). In 2003, 11 cow elk were observed with 9 calves in the Rock Creek drainage (Wedermyer 2003).

Other mammals observed at RFETS include the desert cottontail *(Sylvilagus audubonii)*, white-tailed jackrabbit *(Lepus townsendii)*, black-tailed jackrabbit *(Lepus californicus)*, muskrat *(Ondatra zibethicus)*, and porcupine *(Erethizon dorsatum)*. Muskrats generally occur in and around the ponds, while porcupine populations are limited to the shrubland and ponderosa pine habitats in the upper Rock Creek drainage (DOE 1997). Black-tailed prairie dogs *(Cynomys ludovicianus)* inhabit the site in limited numbers and are discussed in greater detail below. Numerous small mammal species, such as the water shrew (*Sorex palustris*), harvest mouse *(Reithrodontomys megalotis)*, deer mouse *(Peromyscus maniculatus)*, pocket mouse *(Perognathus flavus)*, meadow vole *(Microtus pennsylvanicus)*, prairie vole *(Microtus ochrogaster)*, and Mexican woodrat *(Neotoma mexicana)*, inhabit certain vegetation community types at Rocky Flats. The PMJM *(Zapus hudsonius preblei)*, a threatened species, is described in Section 2.9.3. Various species of bats have been observed at RFETS including the western small-footed myotis (*Myotis ciliolabrum*), the little brown myotis (*Myotis lucifugus*), the hoary bat (*Lasiurus cinereus*), and the big brown bat (*Eptesicus fuscus*) (K-H 1998). These bats are found in a variety of habitats including dwellings, rock outcrops, and trees.

Two commonly observed carnivore species at RFETS are the coyote *(Canis latrans)*, which occurs throughout the site, and raccoon *(Procyon lotor)*, which is often seen in the IA OU and near watercourses. Typically at RFETS, three to six coyote dens support an estimated 14 to 16 individuals at any given time (K-H 2001).

Twenty-two coyote dens used between 1991 and 2002 have been identified at RFETS. The coyote dens generally occur on hillsides near watercourses. Six dens were active in 2002. One active den was located in the upper Rock Creek drainage, two were located on the slopes above either side of Walnut Creek near Indiana Street, one was near Pond D-1, one was near Antelope Springs, and one was in the upper South Woman Creek drainage (Nelson 2003). Other carnivores include striped skunk *(Mephitis mephitis)*, gray fox *(Urocyon cinereoargenteus)*, red fox *(Vulpes vulpes)*, long-tailed weasel *(Mustela frenata)*, American badger *(Taxidea taxus)*, and mink *(Mustela vison)*. Black bear *(Ursus americanus)* and mountain lion *(Felis concolor)* tracks are occasionally seen at the site (K-H 2000a, 2001).

<u>Black-Tailed Prairie Dog</u>

The black-tailed prairie dog is a controversial species in terms of U.S. conservation activities (CDOW 2003). The prairie dog is often described and disputed as a "keystone species" because it has a large effect on community structure or ecosystem function (Power et al. 1996; CDOW 2003).

In August 2004, USFWS removed the prairie dog from consideration as a candidate species under the Endangered Species Act (ESA) (USFWS 2004b). Candidate species are plants and animals for which USFWS has sufficient information on their biological status to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher-priority listing activities. Candidate species receive no statutory protection under the ESA (USFWS 2002).

Regardless of its status as a keystone species, prairie dogs play an important role in grassland ecosystems. Several studies found that prairie dogs alter plant species' composition and structure. Typically, areas occupied by prairie dogs have greater cover and abundance of perennial grasses and annual forbs compared to nonoccupied sites (Whicker and Detling 1988; Witmer et al. 2002). Prairie dogs can contribute to overall landscape heterogeneity, affect nutrient cycling, and provide nest sites and shelter for wildlife such as rattlesnakes and burrowing owls (Whicker and Detling 1988). However, prairie dogs can also denude the surface by clipping aboveground vegetation and contributing to exposed bare ground by digging up roots (Kuford 1958; Smith 1967) and are susceptible to and can spread Sylvatic plague.

Three black-tailed prairie dog colonies, comprising 112.8 acres of grasslands, were mapped at RFETS in 2000. These colonies are in similar locations as in 1991 (Ebasco 1992). Mapping conducted in 2002 shows a smaller area of colonies. This reflects plague outbreaks since 2000 that eventually reduced the active colonies to an area of approximately 10 acres (Stone 2004). Mapping conducted in 2005 shows the colonies in generally the same locations with some expansions at a few locations. There is one previous location where they no longer occur and another location where a colony now exists (Figure 2.27).

The site contains approximately 2,460 acres of potential prairie dog habitat based on the following soil, vegetation, and slope attributes that prairie dogs are known to prefer (Clippinger 1989):

- 30- to 90-percent herbaceous cover;
- 2- to 10-inch vegetation height;
- Slopes less than 20 percent (prefer less than 10 percent); and
- Rock-free soils with less than 70 percent sand content.

2.9.2.2 Birds

The most commonly observed raptors at RFETS are the red-tailed hawk *(Buteo jamaicensis)*, great horned owl *(Bubo virginianus)*, and American kestrel *(Falco sparverius)*. Other less abundant raptors include Swainson's hawk *(Buteo swainsoni)*, ferruginous hawk *(Buteo regalis)*, prairie falcon *(Falco mexicanus)*, and long-eared owl

(Asio otus). Most raptor species use riparian woodlands or tall upland shrublands for nesting and roosting habitat and forage in all habitats at the site.

Over 185 species of migratory birds have been recorded at RFETS, of which approximately 75 are believed to breed at the site. Of the estimated 100 neotropical migrants (migratory birds that breed north of the U.S./Mexico border and winter south of the border) (K-H 1999), approximately 45 are confirmed or suspected breeders at the site.

Commonly observed bird species in wetland habitats include the red-winged blackbird *(Agelaius phoeniceus),* song sparrow *(Melospiza melodia),* common yellowthroat *(Geothlypis trichas),* and common snipe *(Gallinago gallinago).* Common birds in riparian woodland areas include the northern oriole *(Icterus galbula),* American goldfinch *(Carduelis tristis),* house finch *(Carpodacus mexicanus),* and yellow warbler *(Dendroica petechia).* The tall upland shrubland habitat is inhabited by the song sparrow, rufus-sided towhee *(Pipilo maculatus)*, black-billed magpie *(Pica hudsonia),* yellow-breasted chat *(Icteria virens)*, and black-capped chickadee *(Poecile atricapilla).* Common grassland birds include the vesper sparrow *(Pooecetes gramineus),* western meadowlark *(Sturnella neglecta),* grasshopper sparrow (*Ammodramus savannarum*), and mourning dove *(Zenaida macroura)* (DOE 1997). The reclaimed mixed grassland provides habitat for birds such as the western meadowlark and vesper sparrow (K-H 1999).

Several waterfowl and wading bird species use the RFETS ponds. The most common waterfowl is mallard *(Anas platyrhynchos)* (Ebasco 1992; K-H 2000a). Other species are common during certain seasons such as Canada goose *(Branta canadensis)* and lesser scaup (*Aythya affinis*) (K-H 2000). Great blue heron *(Ardea herodias)* feed in mudflats and short marshlands, while double-crested cormorant *(Phalacrocorax auritus)* are common summer residents. Species documented as breeding at the site include pied-billed grebe (*Podilymbus podiceps*), American coot (*Fulica americana*), mallard, and blue-winged teal (*Anas discors*) (K-H 2000a).

Plains Sharp-Tailed Grouse

The site and surrounding areas contain potential habitat for the plains sharp-tailed grouse *(Tympanuchus phasianellus).* The grouse is not known to have occurred at RFETS prior to 2003 (DOE 1997). The City of Boulder Open Space and Mountain Parks Department, along with Boulder County Parks and Open Space and CDOW, have initiated a sharp-tailed grouse reintroduction program on joint City/County-owned open space land north of the site. Approximately 25 individuals were transplanted to the open space area in 2003, while several more are planned to be reintroduced in the future (Brennan 2003). Several of the transplanted individuals are believed to have used RFETS grasslands (Wedermyer 2003).

According to the CDOW Plains Sharp-Tailed Grouse Recovery Plan (CDOW 1992), grouse use different habitats seasonally with extensive use of grassland and grassland-low shrub transition zones. Riparian areas and wooded draws are important winter habitat. Reasons for the decline of sharp-tailed grouse include land cultivation, livestock grazing, and fire control. Other threats to grouse include urban development and alteration of habitat by weed infestation (Gershman 1992).

2.9.2.3 Reptiles and Amphibians

In general, reptiles and amphibians are found in small numbers at the site due to an absence of suitable habitat. The most common reptiles are the bullsnake *(Pituophis melanoleucus)*, yellow-bellied racer *(Coluber constrictor)*, plains garter snake *(Thamnophis radix)*, and prairie rattlesnake *(Crotalus viridis)*. All of these species occur in the open grassland habitats, although the plains garter snake typically lives close to water bodies. Other reptiles include the short-horned lizard *(Phynosoma douglassi)* in open grasslands and the western painted turtle *(Chrysemys picta)* in ponds (DOE 1997).

The most abundant amphibian at RFETS is the boreal chorus frog *(Pseudacris triseriatus maculata)*, which breeds in water bodies throughout the site. The northern leopard frog *(Rana pipiens)* is less common and is found only in permanent water bodies such as ponds (DOE 1997). The boreal chorus frog is relatively abundant in the streams and wetlands at Rocky Flats (K-H 2000a). Other amphibians include the bullfrog *(Rana catesbeiana)*, Woodhouse's toad *(Bufo woodhousii)*, plains spadefoot *(Spea bombifrons)*, and tiger salamander *(Ambystoma tigrinum)* (DOE 1997).

2.9.2.4 Aquatic Species

Each of the primary drainages at the site contains pond and stream habitats, varying with the amounts of habitat modification and seasonal water flows available. Streams at RFETS are flow-limited; however, in general, the upper reaches of the creek drainages flow perennially while the downstream reaches have intermittent flows. The low and irregular flows in the Rock, Walnut, and Woman Creeks limit the amount of quality habitat for aquatic fauna and therefore limit the number and variety of aquatic species at RFETS. However, aquatic fauna are found in both stream and pond habitats. Past sampling results (Ebasco 1992; DOE 1996; Exponent 1998; AAI 2003) have shown that the macroinvertebrate stream communities have a moderate amount of diversity, and are comprised mostly of hardy and tolerant species. Aquatic macroinvertebrates include a variety of fauna such as insects and other arthropods, worms, and mollusks including clams and snails. The dominant macroinvertebrates in each stream are similar, with midges (*Chironomidae*) and black flies (*Diptera*) being the most common organisms in Walnut and Rock Creeks, and aquatic worms (*Oligochaeta*) being the most common in Woman Creek. Other common taxa found within all three streams include mayfly larvae (*Ephemeroptera*), scuds (*Amphipoda*), and snails (*Gastropoda*). Stonefly larvae have been found in Rock and Woman Creeks, while populations of caddisflies (*Tricoptera*) and damselfly larvae (*Odonata*) have been found in Walnut Creek (AAI 2003).

Macroinvertebrate community sampling has also been performed in 9 retention ponds in the Walnut Creek drainage and in 2 retention ponds in the Woman Creek drainage (Ebasco 1992; DOE 1995, 1996; AAI 199 8; WWE 2003). A variety of taxa and abundances were found in the ponds. Aquatic worms and midges were the most common

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organisms found in all the ponds (DOE 1996, 1997). A larger variety of taxa including mayflies, damselflies, and snails were found in the A- and B-Series Ponds in the Walnut Creek drainage. Pond A-1 had the greatest species richness of benthic macroinvertebrates found on RFETS. The Woman Creek drainage detention ponds were not found to support a wide variety of organisms besides midges and aquatic worms (DOE 1996). Large macroinvertebrates such as crayfish (Order *Decapoda*, Family *Cambaridae*) and snails are found in both streams and ponds. All macroinvertebrates are important prey for other fish, waterfowl, and mammal species.

Fish abundance and distribution in the Walnut, Woman and Rock Creek are limited due to the lack of permanent water (AAI 2003). There is a larger variety of species found in the retention ponds of the drainages, which is largely due to the introduction of non-native fish species such as rainbow trout (*Salmo gairdneri*), carp (*Cyprinus carpio*), bass (*Micropterus* spp.) and goldfish (*Carassius auratus*) into some of the Rock, Walnut, and Woman Creek impoundments and retention ponds.

The only fish found in Walnut and Rock Creek was fathead minnows (*Pimephales promelas*). Sampling of Woman Creek resulted in the findings of creek chubs (*Semotilus atromaculatus*), fathead minnows, largemouth bass (*Micropterus salmoides*), stonerollers (*Campostoma anomalum*) and carp (*Cyprinus carpio*) (Ebasco 1992). A single specimen of longnose dace (*Rhinichthys cataractae*) was also found in Woman Creek during another sampling occasion (AAI 2003).

Fish community sampling performed in the detention ponds located within the Rock, Walnut, and Woman Creek drainages has resulted in finding a variety of both native and introduced fish species. Fathead minnows, white suckers (*Catostomus commersoni*), and largemouth bass were found in Lindsay Pond, which is located in the Rock Creek drainage. Fathead minnows, golden shiners (*Notemigonus crysoleucas*), and largemouth bass were found in the A-Series Ponds located in the Walnut Creek drainage, while only fathead minnows were found in the B-Series Ponds. Goldfish (*Carassius auratus*) were found in an isolated pond in the headwaters of the Walnut Creek drainage. The fish species found in the retention ponds in the Woman Creek drainage were fathead minnows, creek chubs, green sunfish (*Lepomis cyanellus*), golden shiners, white suckers, and largemouth bass (Ebasco 1992).

Each of the primary drainages at the site contains a variety of pond and stream habitats, varying amounts of habitat modification, and seasonal water flows. According to the Colorado Vertebrate Ranking System (CDOW 2001), the Iowa darter (*Etheostoma exile*) and common shiner (*Luxilus cornutus*) rank high enough to merit reevaluation, and the redbelly dace (*Phoxinus eos*) is potentially imperiled. Threats to these species include extirpation through habitat degradation (such as siltation, pollution, and/or bank destabilization), effects of urbanization, and predation by introduced non-native fish.

<u>Native Fish Restoration</u>

The 2001 Rock Creek Reserve Integrated Natural Resources Management Plan (DOE/USFWS 2001) called for the establishment of native fish populations within the

Rock Creek drainage. Rock Creek supports favorable habitat for native fish such as the common shiner and northern redbelly dace. Monitoring during the drought of 2002 demonstrated that Rock Creek flows remain consistent in dry years.

Native fish restoration efforts began in 2002, when largemouth bass *(Micropterus salmoides)* and other non-native fish were removed from the Lindsay Ponds with rotenone (a piscicide). In June and August 2003, common shiner and northern redbelly dace were introduced to the Rock Creek drainage, with the intention of establishing a new population of these rare and declining native fish species (Rosenlund 2003).

2.9.2.5 Wildlife Species of Special Concern

In addition to federally listed wildlife species described in Section 2.9.3, RFETS has been known to support numerous species with special status designated by CDOW because of their rare or imperiled status. The western burrowing owl *(Athene cunicularia)* has been observed in grasslands, and the ferruginous hawk has been observed in riparian woodlands and open grasslands (PTI 1997b; DOE 1997).

2.9.2.6 Wildlife Corridors

While RFETS is surrounded on three sides by major roads, many wildlife species move between the site and habitat in surrounding areas. However, movement corridors between the site and adjacent lands are not well defined. Movement of most terrestrial species occurs along broad areas where disturbance and barriers to movement are minimized (Howard 2003; Wedermyer 2003). In general, mule deer and elk use the xeric grasslands in the western portion of the site as a travel corridor to access grasslands west of Highway 93 and the foothills.

On the western side of RFETS, east-west movement across Highway 93 can be impeded by the South Boulder Diversion Canal and mining areas. Given these barriers, the most likely areas for wildlife movement are the open lands in the upper Rock Creek and upper Woman Creek areas between the mining areas (on land owned by the State of Colorado) and the West Access Road.

Prairie dogs cross Highway 128 in the northeastern corner of RFETS, to access other colonies on adjacent open space lands. Otherwise, north-south prairie dog movement across Highway 128 does not likely occur at any specific location. The Rock Creek drainage along the highway is impeded by the highway embankment and the culverts for the creek are too small for use by larger species of mammals. Likewise, the eastern portion of the site is open in most places and wildlife moves across a broad front, although the Walnut Creek and Woman Creek drainages provide natural corridors for east-west movement for small and mid-size mammals across Indiana Street.

Most deer on RFETS do not migrate off site and elk periodically descend from the foothills and enter RFETS from the west. In spring of 2003, several cow elk used the Rock Creek drainage as a calving ground (Wedermyer 2003). The behavior of other species is less known.

2.9.2.7 Potential Effects of Contamination on Wildlife and Vegetation

Extensive studies have been conducted since the mid-1970s, primarily by CSU researchers, on potential effects of contamination on RFETS wildlife and vegetation (Geiger and Winsor 1977; Bly and Whicker 1979; Little et al. 1980; Symonds and Alldredge 1992). These studies include two deer studies as well as studies of small mammals, arthropods (insects), snakes, and cattle. Samples were taken of various species for the Draft Ecological Risk Assessments (ERAs) for Walnut Creek and Woman Creek Watersheds at RFETS (DOE 1996) and included samples consisting of small mammals, insects, benthic invertebrates, and fish. Additional studies were conducted by CSU researchers on vegetation uptake of plutonium in both terrestrial and aquatic species (Paine 1980; Arthur and Alldredge 1982). In general, these studies have shown minimal to no impact to these organisms, resulting in the discontinuance of these types of studies.

Tissue samples, including edible tissues of deer harvested at RFETS in 2002, have been analyzed for contaminants. The results of these analyses indicate radionuclide tissue levels of nondetectable quantities or at method detection limits. In all cases the edible tissue levels are below the risk-based level for consumption of RFETS deer tissue (Todd and Sattelberg 2004).

2.9.3 Federal Threatened and Endangered Species

The site supports one wildlife species, the PMJM, listed as threatened or endangered under the ESA. In addition to the PMJM, bald eagles occasionally forage at the site. Both the PMJM and bald eagle are listed as threatened. As discussed in Section 2.9.2, the black-tailed prairie dog is no longer listed as a candidate species (USFWS 2004b).

2.9.3.1 Preble's Meadow Jumping Mouse

Listed by USFWS as a threatened species in 1998, the PMJM occurs in habitat adjacent to streams and waterways along the Front Range of Colorado and southeastern Wyoming. The PMJM occurs in every major creek drainage on the site (Figure 2.28). The PMJM also has been found in wetlands and shrubland communities adjacent to the Rock Creek and Woman Creek drainages. Single PMJM were also caught along Smart Ditch in 1993 and 2001 (K-H 2002e). From 1998 to 2000, intensive radiotelemetry studies of PMJM were conducted along Rock, Walnut, and Woman Creeks. Therefore, PMJM distribution, movement patterns, and habitat preferences on RFETS are well understood. A PMJM Protection Plan was created by DOE and areas mapped under this plan have been adopted by USFWS with some revisions (USFWS 2004c).

In general, PMJM are restricted to streamside (riparian) areas with an adjacent narrow band of grasslands (Armstrong et al. 1997). Habitat contains two components: riparian and upland. Riparian habitat is thick, multistrata vegetation consisting of shrubs and trees as an overstory and thick herbaceous vegetation as understory. Uplands are comprised of thick grasslands with scattered upland shrubs.

The three drainages where PMJM are found contain varying habitat characteristics. Rock Creek contains narrow, but largely contiguous, stretches of dense riparian shrubs and trees. Walnut Creek has fragmented habitat comprised of three isolated sections: the A-Series Ponds, the B-Series Ponds, and Lower Walnut Creek. Woman Creek is characterized by contiguous, narrow riparian vegetation similar to Rock Creek, but has a shorter stream reach where habitat occurs.

Based on radiotelemetry, PMJM movements were associated with riparian habitats and individuals rarely traveled far from a stream. Table 2.13 presents a summary of telemetry endpoints. Most movements follow riparian corridors. Over the 3 years of radiotelemetry studies at RFETS, 93 percent of all points were within 48 m of water and 66 percent were within 16 m (K-H 2001). Individuals traveling away from a pond or stream were typically found in the dense vegetation associated with hillside seeps. During the 3 years of study, only one mouse was observed traveling overland between drainages (K-H 1999, 2000b, 2001). PMJM were observed using aboveground nests along the riparian upland habitat edge (Ryon 2001).

Continued study of this species may change the understanding of their habitat needs and associations. In 2003, USFWS designated critical habitat for the PMJM. The critical habitat did not include any of the drainages at RFETS because the site is to become a Refuge (USFWS 2003).

In March 2004, USFWS initiated a status review of the PMJM based on two petitions to remove the mouse from federal protection under the ESA. When the status review is finished, USFWS will issue a finding regarding whether the subspecies should remain listed or should be proposed for delisting (USFWS 2004d). However, until the status review and finding are finalized, USFWS will continue to manage the PMJM as a threatened species in accordance with existing laws and policies, and the Comprehensive Risk Assessment (CRA) will address the PMJM separately from all other wildlife receptors.

2.9.3.2 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) occasionally forages at RFETS although no nests have been identified. An active nest is located east of the site near Standley Lake. Eagles feed primarily on fish and waterbirds but also on small mammals and mammal carcasses (DOE/USFWS 2001). The bald eagle was federally listed as endangered in 1967 and was downlisted to threatened in 1994.

2.9.3.3 Plant Species

No federally listed plant species are known to occur at RFETS. While many of the riparian and wetland communities support potential habitat for the Ute ladies'-tresses orchid and Colorado butterfly plant, these species are not known to occur at the site (ESCO 1994). Vegetation at RFETS includes several rare and sensitive plant communities. These include the xeric tallgrass grassland, tall upland shrubland, riparian shrubland, mountain-loving sedge, forktip three-awn, carrionflower greenbriar,

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dwarf wild indigo, and plains cottonwood riparian woodland communities. Each of these communities is described in detail in Section 2.9.1.

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Table 2.1
Summary of Geotechnical Properties of Soil and Overburden

Soil Name	Sample Depth (inches)	Unified Soil Classification	Percentage Passing Sieve Number				Liquid Limit	Plasticity Index	Permeability (inches/hr)	Available Water Capacity (inches/inch)
			4	10	40	200				
Flatirons	0 – 13	GM, SM	40 – 80	35 – 70	20 – 45	10 – 30	15 – 25	0 – 5	2.0 – 6.0	0.07 – 0.10
	13 – 47	GC	40 – 60	35 – 55	30 – 50	25 – 40	35 – 60	20 – 50	0.06 – 0.2	0.08 – 0.10
	47 – 60	GC	40 – 60	35 – 55	30 – 50	15 – 30	25 – 35	10 – 20	0.6 – 2.0	0.08 – 0.10
Nederland	0 – 10	SM-SC	70 – 90	70 – 85	40 – 55	25 – 35	20 – 30	5 – 10	2.0 – 6.0	0.10 – 0.12
	10 – 62	SC	70 – 90	70 – 90	40 – 65	25 – 50	30 – 40	10 – 20	0.6 – 2.0	0.08 – 0.12
	62 – 70	SM-SC, SC	65 – 80	60 – 80	30 – 50	20 – 30	20 – 35	5 – 15	---	---
Denver	0 – 6	CL	95 – 100	90 – 100	75 – 100	70 – 90	30 – 50	10 – 25	0.2 – 0.6	0.16 – 0.20
	6 – 29	CH-CL	95 – 100	95 – 100	90 – 100	85 – 100	40 – 75	20 – 45	0.06 – 0.2	0.14 – 0.18
	29 – 60	CL, CH	95 – 100	90 – 100	80 – 100	75 – 95	35 – 60	15 – 30	0.06 – 0.6	0.014 – 0.18
Kutch	0 – 3	CL	95 – 100	90 – 100	90 – 100	70 – 80	30 – 50	15 – 30	0.2 – 0.6	0.15 – 0.20
	3 – 26	CH, CL	95 – 100	90 – 100	90 – 100	75 – 95	45 – 60	20 – 35	0.06 – 0.2	0.18 – 0.20
Midway	0 – 3	CL	75 – 100	75 – 100	70 – 100	70 – 95	30 – 40	10 – 20	0.2 – 0.6	0.14 – 0.18
	3 – 14	CL, CH	95 – 100	95 – 100	90 – 100	70 – 95	35 – 60	20 – 35	0.06 – 0.2	0.14 – 0.18
Haverson	0 – 6	ML	95 – 100	90 – 100	85 – 100	55 – 70	25 – 35	0 – 10	0.6 – 2.0	0.14 – 0.18
	6 – 46	CL, CL-ML	95 – 100	85 – 100	70 – 95	50 – 70	25 – 40	5 – 15	0.2 – 0.6	0.14 – 0.18
	46 – 60	GM, SM	35 – 55	30 – 50	20 – 40	5 – 15	---	0	0.2 – 0.6	0.04 – 0.06

(Price and Amen 1983)

GM = Silty-gravels, gravel-sand-silt mixtures
SM = Silty sands, sand-silt mixtures
GC = Clayey gravels, gravel-sand-clay mixtures
SC = Clayey sands, sand-clay mixtures
CL = Inorganic clays of low to medium plasticity, gravelly/sandy/silt/lean clays
CH = Inorganic clays or high plasticity, fat clays
ML = Inorganic silts, very fine sands, rock four, silty or clayey fine sands

Table 2.2
Flow Data at Select Gaging Stations Site Configuration During Accelerated Actions

Drainage	Tributary	Gaging Station	Mean Annual Discharge Volume (ac-ft)	Dates of Record	Peak Flow Rate (cfs) (15-min record)	Date of Peak Flow
Rock Creek	-	GS04	234.9	10/1/96-7/31/05	35.4	3/26/03
Walnut Creek	McKay Ditch	GS35	69.3	10/1/97-7/31/05	23.6	3/26/03
	No Name Gulch	GS33	16.6	10/1/97-7/31/05	6.8	5/1/99
	N. Walnut Creek	SW093	145.2	10/1/96-7/31/05	134.9	7/14/01
	S. Walnut Creek	GS10	98.6	10/1/96-7/31/05	112.6	8/27/00
	Entire Watershed	GS03	433.9	10/1/96-7/31/05	56.5	3/26/03
Woman Creek	SID	SW027	21.6	10/1/96-7/31/05	10.2	8/27/00
	N. Woman Creek	GS05	108.4	10/1/96-7/31/05	24.7	4/4/98
	Owl Branch	GS06	21.0	10/1/96-6/6/05	12.1	4/27/97
	Antelope Springs	GS16	93.4	10/1/96-7/31/05	8.6	4/4/98
	Entire Watershed	GS01	271.9	10/1/96-7/31/05	79.5	4/30/99

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Table 2.3
Summary Table Retention Ponds Characteristics

Drainage	Pond	Capacity (ac-ft)	Dam Characteristics	Inflow From:	Outflow To:	Function	Pond Operating Protocol
North Walnut Creek	A-1	4.3	- Earthen dam - notched with stoplog outlet structure - Not keyed into firm foundation rock - No toe/interior drain	N. Walnut Creek	Pond A-2	Sustain wetlands, minor flow attenuation, and settling of suspended solids	Flow-through
	A-2	21.4	- Earthen dam - notched with stoplog outlet structure - Keyed into firm foundation rock -Toe/interior drain	Pond A-1	Pond A-3	Sustain wetlands, minor flow attenuation, and settling of suspended solids	Flow-through
	A-3	37.9	- Earthen dam - Keyed into firm foundation rock -Toe/interior drain - Outlet works	N. Walnut Bypass <u>or</u> Pond A-2	Pond A-4	Sustain wetlands, minor flow attenuation, and settling of suspended solids	Batch-release (released through outlet works when pool level reaches approx. 50% of capacity)
	A-4	98.6	- Earthen dam - Keyed into firm foundation rock - No toe/interior drain - Outlet works with standpipe inlet	Pond A-3	N. Walnut Creek	Sustain wetlands, storm flow storage, and settling of suspended solids	Batch-release (released through outlet works when pool level reaches approx. 50% of capacity)
South Walnut Creek	B-1	1.85 Estimated	- Earthen dam - notched with stoplog outlet structure - Unknown if keyed into bedrock - Toe/interior drain	S. Walnut Creek	Pond B-2	Sustain wetlands, minor flow attenuation, and settling of suspended solids	Flow-through
	B-2	4.55 Estimated	- Earthen dam - notched with stoplog outlet structure - Unknown if keyed into bedrock - Toe/interior drain	Pond B-1	Pond B-3	Sustain wetlands, minor flow attenuation, and settling of suspended solids	Flow-through

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Table 2.3
Summary Table Retention Ponds Characteristics

Drainage	Pond	Capacity (ac-ft)	Dam Characteristics	Inflow From:	Outflow To:	Function	Pond Operating Protocol
	B-3	0.84 Estimated	- Earthen dam - notched with stoplog outlet structure - Unknown if keyed into bedrock - Toe/interior drain	Pond B-2	Pond B-4	Sustain wetlands, minor flow attenuation, and settling of suspended solids	Flow-through
	B-4	0.6	- Earthen dam - notched with stoplog outlet structure - Unknown if keyed into bedrock - Toe/interior drain	S. Walnut Bypass <u>or</u> Pond B-3	Pond B-5	Sustain wetlands, minor flow attenuation, and settling of suspended solids	Flow-through
	B-5	73.6	- Earthen dam - Keyed into bedrock - Toe/interior drain - Outlet works with standpipe inlet	Pond B-4	S. Walnut Creek	Sustain wetlands, storm flow storage, and settling of suspended solids	Batch-release (released through outlet works when pool level reaches approx. 50% of capacity)
Woman Creek	C-1	1.8	- Earthen dam - Unknown if keyed into bedrock - Toe/interior drain - No outlet works	Woman Creek	Woman Creek	Sustain wetlands, minor flow attenuation, and settling of suspended solids	Flow-through
	C-2	69.6	- Earthen dam - Keyed into bedrock - Toe/interior drain - Outlet works	SID	Woman Creek	Sustain wetlands, storm flow storage, and settling of suspended solids	Batch-release (released through outlet works when pool level reaches approx. 50% of capacity)
No Name Gulch	Land-fill Pond	26.0 Estimated	- Earthen dam - Unknown if keyed into bedrock - Toe/interior drain - Outlet works	Former Present Landfill area watershed	No Name Gulch	Sustain wetlands, minor flow attenuation, and settling of suspended solids	Flow-through via spillway or lower pond level via outlet works

Table 2.4
Surface Water Discharge Volumes - During and After Accelerated Actions

Drainage	Tributary	Gaging Station	During Accelerated Actions[a] (Measured Discharge)		After Accelerated Actions[b] (Model-Predicted Discharge)	Predicted Annual Discharge Volume (ac-ft)[d]	Percent of Historic Mean Discharge Volume[d]
			Mean Annual Discharge Volume (ac-ft)	Dates of Record	Model Climate[c]		
Walnut Creek	No Name Gulch	GS33	17.2	10/1/97 - 7/31/05	Typical[1]	-	-
					Wet year[2]	-	-
					Dry year[3]	-	-
	North Walnut Creek	SW093	149.9	10/1/96-7/31/05	Typical[1]	51.4	34%
					Wet year[2]	76.9	51%
					Dry year[3]	44.9	30%
	South Walnut Creek	GS10	102.7	10/1/96-7/31/05	Typical[1]	13.0	11%
					Wet year[2]	17.2	18%
					Dry year[3]	10.5	11%
	Entire Watershed	GS03	453.1	10/1/96-7/31/05	Typical[1]	55.9	12%
					Wet year[2]	124.8	28%
					Dry year[3]	49.5	11%
Woman Creek	S. Interceptor Ditch	SW027	22.8	10/1/96-7/31/05	Typical[1]	2.3	7%
					Wet year[2]	3.2	14%
					Dry year[3]	1.3	6%
	Entire Watershed	GS01	269.1	10/1/96-7/31/05	Typical[1]	130.1	48%
					Wet year[2]	186.6	69%
					Dry year[3]	115.8	43%

Note: The dash in the discharge volume column indicates no estimate.

[a]Mean annual discharge during accelerated actions based on measured flow data.

[b]Mean annual discharge after accelerated actions based on MIKE SHE model simulations.

[c]Model climate: (1) Typical = Water Year 2000 precipitation depth = 13.8 inches (compared to RFETS annual depth of 14.8 inches), (2) Wet year simulation based on 19.4 inches annual precipitation depth (Ft. Collins mean depth plus 1 standard deviation), (3) Dry year simulation based on 11 inches annual precipitation depth (Ft. Collins mean depth minus 1 standard deviation).

[d]Model-predicted values are subject to uncertainty. Model results are best utilized to evaluate relative changes observed in the RFETS hydrology resulting from changing watershed and/or climate conditions. Use of model predictions as absolute values for future changing conditions is not advised.

Table 2.5
Summary of Monthly Precipitation Data

Month	Precipitation Water Equivalent (inches)		
	Monthly Mean	**Monthly Maximum (Year)**	**Daily Maximum (Date)**
January	0.40	1.12 (1974)	0.50 (1/12/72)
February	0.52	1.28 (1971)	0.70 (2/20/71)
March	1.18	4.70 (1970)	1.06 (3/30/70)
April	1.77	4.73 (1973)	2.30 (4/13/67)
May	2.65	9.70 (1969)	3.40 (5/6/69)
June	1.56	4.79 (1969)	2.94 (6/27/87)
July	1.47	5.10 (1965)	1.57 (7/16/00)
August	1.42	3.69 (1967)	2.10 (8/30/67)
September	1.48	4.53 (1976)	1.81 (9/26/76)
October	0.90	4.83 (1969)	1.83 (10/4/84)
November	0.79	2.00 (1972)	0.75 (11/1/72)
December	0.40	1.45 (1973)	0.50 (12/23/73)

(AeroVironment 1995) (1964 through 1977 and 1984 through 1993) and K-H precipitation data (1994 through 2004)

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Table 2.6
Summary of Monthly Temperature Data

Month	Average Temperatures (°F)			Extreme Temperatures (°F)	
	Monthly Average Temperature	Highest Monthly Average Temperature (Year)	Lowest Monthly Average Temperature (Year)	Maximum Temperature (Date)	Minimum Temperature (Date)
January	32.9	40.2 (1986)	19.4 (1984)	69.7 (01/02/97)	-12.4 (01/12/97)
February	33.9	40.7 (1999)	22.9 (1964)	71.0 (02/28/72)	-9.3 (02/24/03)
March	38.7	46.5 (1972)	28.0 (1965)	82.0 (03/26/71)	-5.0 (03/25/65)
April	45.9	52.0 (1992)	38.4 (1973)	80.7 (04/30/92)	5.0 (04/09/73)
May	55.4	61.3 (1974)	48.0 (1969)	92.7 (05/29/00)	26.0 (05/01/70)
June	64.4	71.8 (1971)	58.9 (1969)	99.0 (06/23/71)	31.5 (06/05/98)
July	71.1	76.6 (2003)	66.1 (1992)	102.0 (07/12/71)	37.6 (07/17/75)
August	69.0	72.6 (1970)	64.6 (2004)	97.0 (08/08/69)	43.0 (08/28/04)
September	60.8	66.6 (1998)	53.2 (1965)	91.0 (09/10/74)	24.0 (09/19/71)
October	50.8	57.1 (1965)	38.8 (1969)	82.1 (10/16/91)	4.0 (10/14/69)
November	39.9	51.0 (1965)	30.7 (2000)	72.0 (11/25/70)	-3.3 (11/24/93)
December	33.7	39.7 (1976)	25.8 (1990)	72.0 (12/04/65)	-23.6 (12/21/90)
Extremes		Highest Annual Average Temperature (°F)	Lowest Annual Average Temperature (°F)	Maximum Temperature (°F)	Minimum Temperature (°F)
		52.5 (1988)	31.3 (1985)	102 (07/12/71)	-23.6 (12/21/90)

Source: AeroVironment (1995) (1964 through 1977 and 1984 through 1993) and K-H AIR database (1997 through 2004)

Table 2.7
Summary of Wind Speed Data

Month	Average Wind Speed (mph)[a]	Average Peak Wind Speed (mph)[b]
January	11.9	50.3
February	11.0	62.3
March	10.4	65.6
April	10.2	61.8
May	9.1	54.3
June	8.6	55.0
July	8.3	46.7
August	8.0	44.0
September	8.1	50.0
October	8.4	52.8
November	9.9	67.8
December	10.7	70.9
Annual Average	**9.5**	

(AeroVironment 1995) (1964 through 1977 and 1984 through 1993) and K-H AIR database (1997 through 2004)

[a]Based on data collected from 1964 through 1977, 1984 through 1993, and 1997 through 2004
[b]Based on data collected from 1953 through 1977, 1984 through 1993, and 1997 through 2004

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Table 2.8
Population and Households in Denver Metropolitan Area Counties

County	2000 Population[a] (Households)	2004 Population[b] (Households)
Adams	348,618 (127,299)	398,165 (148,889)
Arapahoe	487,967 (196,835)	524,414 (217,220)
Boulder	274,234 (113,464)	290,588 (121,483)
Broomfield	38,272 (14,322)	44,951 (17,268)
Clear Creek	9,322 (5,128)	9,607 (5,344)
Denver	554,636 (251,435)	572,862 (265,428)
Douglas	175,766 (63,333)	234,193 (85,966)
Gilpin	4,757 (2,929)	5,032 (3,213)
Jefferson	525,507 (211,916)	531,654 (220,619)
Region	2,419,079 (986,661)	2,611,466 (1,085,430)

(DRCOG 2004)

[a]Based on U.S. Census 2000
[b]Based on DRCOG estimate for Jan. 1, 2004

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Table 2.9
List of Private Easement Holders

Reference No. on Figure 2.4	Easement/License Holder	Purpose	Recording Information (Jefferson County) Book/Page or Reception Numbers
1, 2, 3, 4	Industrial Gas Services, Inc.	Natural gas pipeline	(1)2530/987; (2)2531/801; (3)2534/289; (4)2521/438
5, 7, 8, 9	Colorado-Wyoming Gas Co.	Oil and gas pipelines	(5)1570/443; (7)771/9120; (8)1570/430; (9)1570/437
6	Western Slope Gas Co.	Gas pipeline	(6)Reception No.103793
10	No easement documentation	Believed to be occupied by a gas pipeline	No recording information available
11, 12, 13, 14, 15, 16, 17, 18, 20	Public Service Co. of Colorado	Electric power and transmission lines	(11)2211/438 and 2866/666; (12)1794/504 (warranty deed); (13)No recording information available; (14)1838/14; (15)1766/542; (16)1838/12; (17)750/379 and 857/553; (18)No easement documents created; (20)No recording information available
19	Public Service Co. of Colorado	Electric transmission line and access road	(19)No recording information available
21	Union Rural Electric Ass'n, Inc.	Electric transmission line and access driveways	(21)No recording information available
22	Perry McKay	Ingress/egress	(22)Reception No.87067103
23	N/A (License to DOE from Denver and Rio Grande Western Railroad for telecommunications cable)	N/A	(23)No recording information available
24	N/A (License to DOE from Denver Water Board for bridge and road construction over ditch)	N/A	(24)No recording information available
25, 26	Mountain States Tel. & Tel.	Underground telecommunications cable	(25)1804/238; (26)No recording information available

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Table 2.9
List of Private Easement Holders

Reference No. on Figure 2.4	Easement/License Holder	Purpose	Recording Information (Jefferson County) Book/Page or Reception Numbers
27	City of Broomfield	McKay bypass pipeline for water conveyance	(27)No recording information available
28	No easement	Telecommunications cable	(28)N/A
29	No easement	Electric power line providing power to single residence on east side of Indiana Street, traffic lights at SH128/Indiana, SH128/McCaslin	(29)N/A
30	N/A (DOE-owned power line)	N/A	(30)N/A
31	N/A (DOE-owned right of way for water pipeline and railroad spur)	N/A	(31)N/A

Table 2.10
Vegetation Communities

Vegetation Community	Acres
Grasslands	
Xeric Tallgrass Grassland	1,568
Mesic Mixed Grassland	2,199
Xeric Needle and Thread Grassland	187
Reclaimed Mixed Grassland	640
Short Grassland	10
Shrublands	
Tall Upland Shrubland	34
Riparian Shrubland	41
Other Shrubland	70
Woodlands	
Riparian Woodland	28
Ponderosa Pine Woodland	9
Wetlands	
Tall Marsh Wetland	31
Short Marsh Wetland	121
Wet Meadow	254
Open Water/Mudflats	51
Other	
Disturbed and Developed Areas	997
Total	**6,240**

Source: Rocky Flats National Wildlife Refuge Final CCP and EIS (USFWS 2004a)

Table 2.11
Major Noxious Weeds Inventory

Weed Name	High Density (acres)	Medium Density (acres)	Low Density (acres)	Scattered Density (acres)	Total Infested Area (acres)
Mullein	147	183	627	500	1357
Diffuse knapweed	381	525	674	377	1957
Musk thistle	9	84	430	346	869

Source: 2001 Annual Vegetation Report for the Rocky Flats Environmental Technology Site (K-H 2002c)

Table 2.12
Grassland Fires Documented at RFETS Since 1993[a]

Date	Wildfire or Controlled Burn	Location	Estimated Burn Area (acres)
1993	Wildfire	South BZ, approximately 0.2 mile southeast of Pond C-1	0.14
1994	Wildfire	North BZ, adjacent to Highway 128, directly north of IA	70
1996 (Labor Day)	Wildfire	Southwest BZ, contained by BZ roads	104
2000 (April 6)	Controlled burn	Southwest BZ, contained by BZ roads (partial overlap with 1996 Labor Day fire area)	48
2000 (July 10)	Wildfire	Southeast BZ, approximately 0.3 mile south of east access gate on Indiana Street	8
2000 (September 10)	Wildfire	Northwest BZ, north of Pond A-4 and approximately 0.2 mile south of Highway 128	0.52
2002 (February 24)	Wildfire	Northeast BZ, adjacent to Highway 128, north of Landfill Pond	26
2002 (February 24)	Wildfire	Northeast BZ, between Highway 128 and Lindsay Pond 1	1

[a] In 2005, two incidences involving fires of erosion control material occurred at the Original Landfill. The first incident involved less than 1 acre and the second involved less than 10 ft^2 of erosion control material.

Source: Rocky Flats National Wildlife Refuge Final CCP and EIS (USFWS 2004a)

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Table 2.13
Summary of PMJM Radio Telemetry Studies at Rocky Flats (1998-2000)

Drainage /Study Year	Density Estimate[a] (Population /linear km of stream)	Stream Length[a]	Population Estimate[a]	Maximum Distance Perpendicular to Stream	Average Distance Moved in 24 Hours	Maximum Distance Moved in 24 Hours	Average Linear Reach	Maximum Linear Reach	Average Home Range
Rock Creek 1998[d]	2.7	12.8km	35	245m[b]	142m[b]	1,025m[b]	715m[b]	1610m[b]	4.3 ha[c]
Walnut Creek 1999[e]	3.6	5.5km	20	68m[c]	57m/55m[c, g]	485m[c]	320m/282m[c, g]	597m[c]	1.5 ha[c]
Woman Creek 2000[f]	6.5	3.4km	22	73m[a]	68m[a]	443m[a]	629m[a]	1397m[a]	1.9-5.9ha[a, h]

[a]Source: K-H 2001

[b]Source: K-H 1999

[c]Source: K-H 2000

[d] Rock Creek 1998; Session 1: June 17 – July 2; Session 2: August 24- September 11

[e] Walnut Creek 1999; Session 1: May 20-June 18; Session 2: August 23 – September 16

[f] Woman Creek 2000; May 30-June 20; Session 2: August 21 – September 14

[g] Session 1/Session 2

[h] Only a range was given

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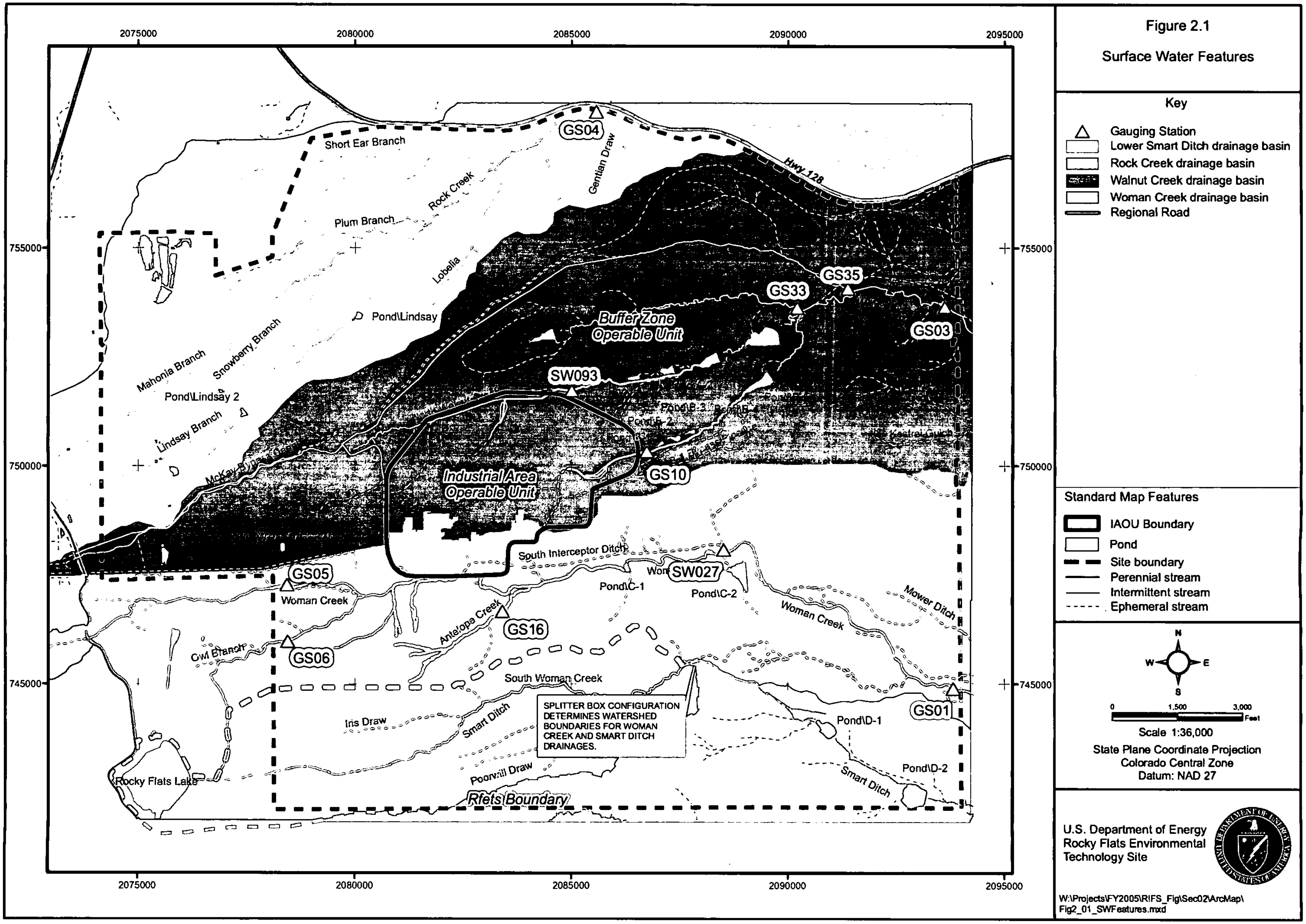

Figure 2.1

Surface Water Features

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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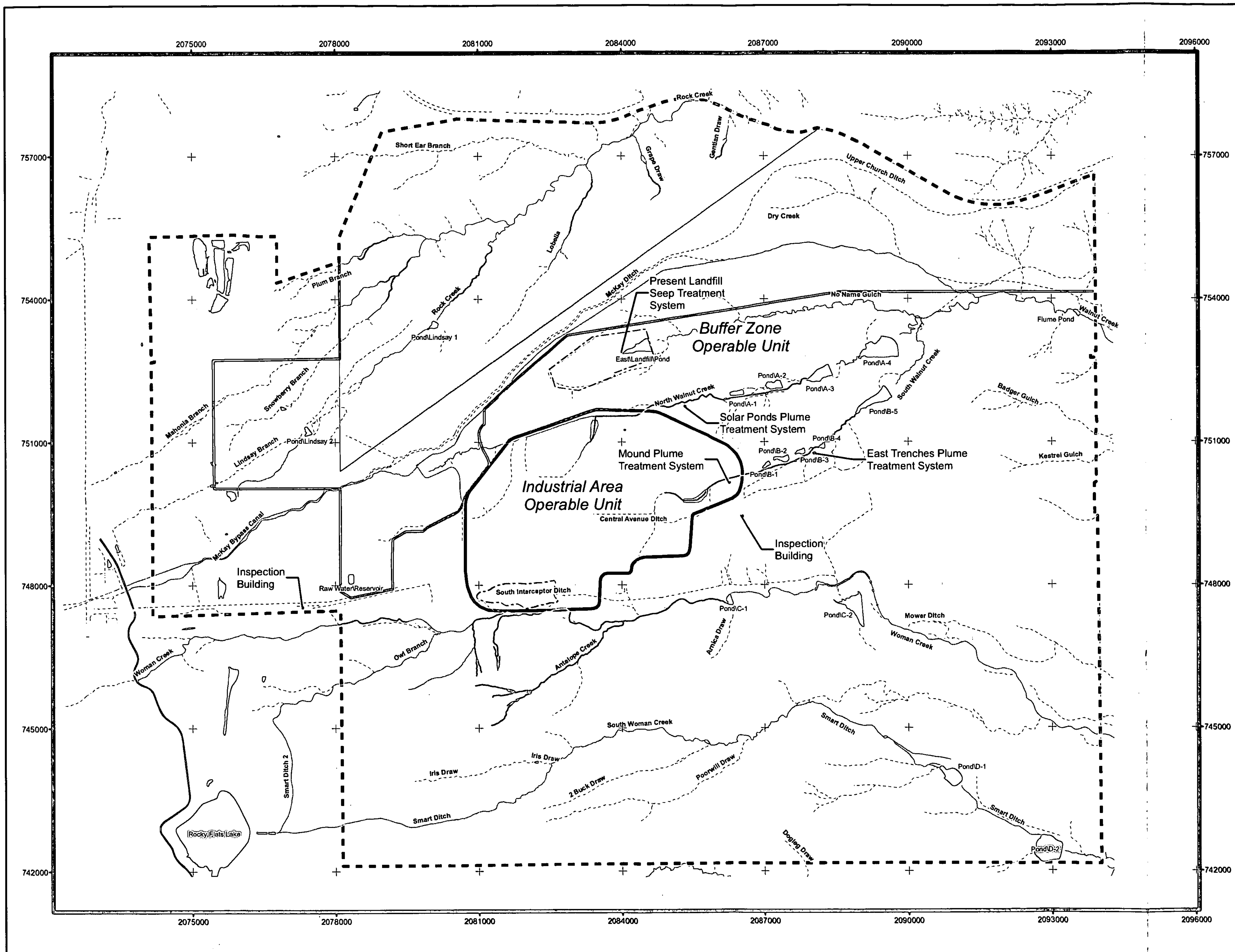
Figure 2.2

RFETS Surface Features and Treatment Systems After Accelerated Action



Key

- Original landfill
- Present landfill
- Existing Rock Creek Reserve (852 acres)
- Proposed Rock Creek Reserve (1789 acres)

Note:
The reserve boundary is an estimate only and does not represent a legal boundary

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 1,000 2,000
Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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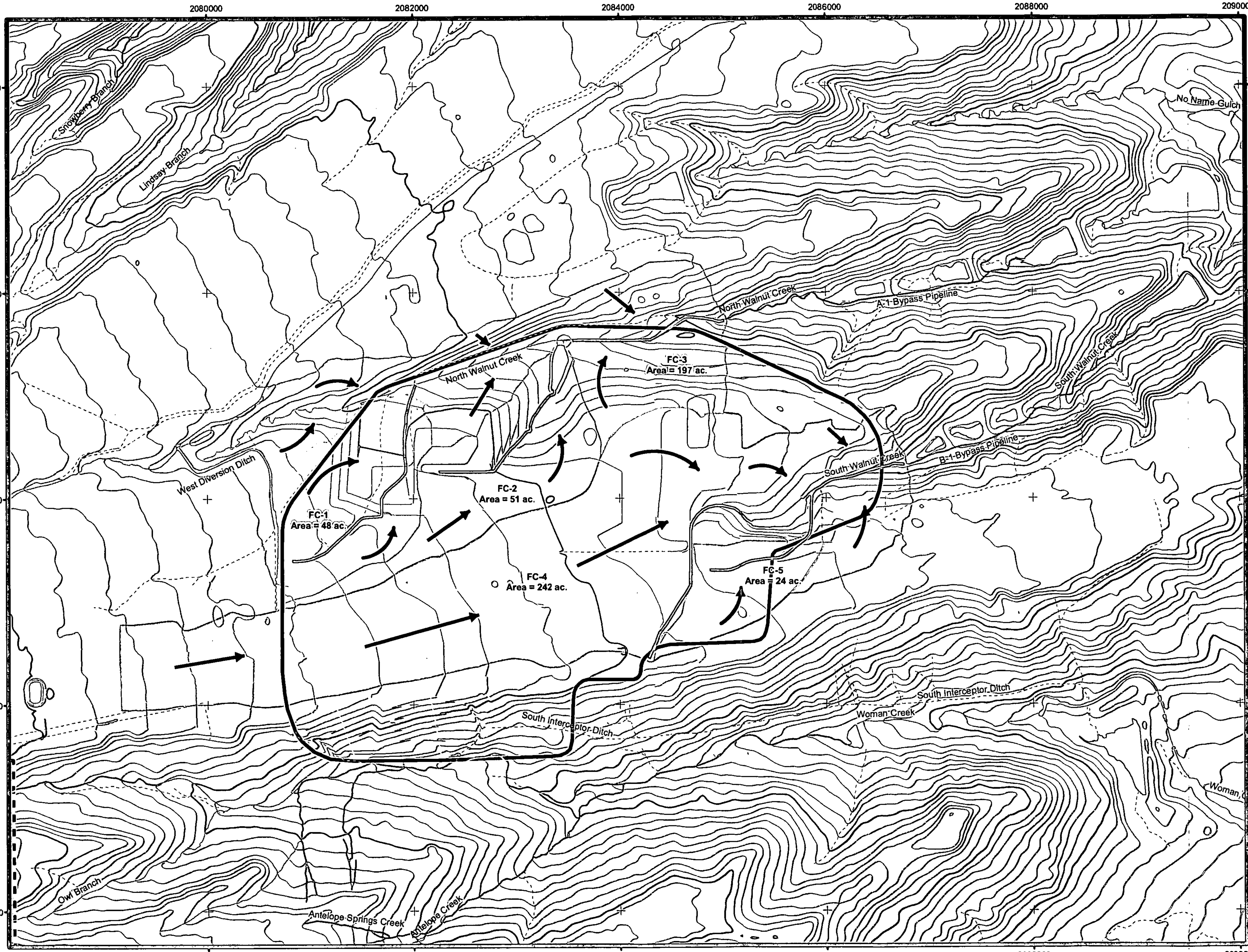

Figure 2.3

Overland Flow Directions

Key

- General surface water runoff flow direction
- Functional channel
- Topographic Contour (100 ft)
- Topographic Contour (10 ft)

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 500 1,000
Feet

Scale 1:12,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

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\ArcMap\Fig_2_03_Overlandflow.mxd

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Easement Number	Easement Description
1	Natural gas pipeline
2	Natural gas pipeline
3	Natural gas pipeline
4	Natural gas pipeline
5	Oil and gas pipeline
6	Natural gas pipeline
7	Oil and gas pipeline
8	Oil and gas pipeline
9	Oil and gas pipeline
10	No documentation available for gas pipeline
11	Electric power and transmission line
12	Electric power and transmission line
13	Electric power and transmission line
14	Electric power and transmission line
15	Electric power and transmission line
16	Electric power and transmission line
17	Electric power and transmission line
18	Electric power line, no easement documents created
19	Electric power and transmission line and access road
20	Electric power and transmission line
21	Electric power transmission line and driveways
22	Access
23	Telecom to Building 060
24	License Agreement to cross Boulder Ditch
25	Underground telecommunications cable
26	Underground telecommunications cable
27	Water conveyance pipeline
28	Telecommunications cable
29	Electric power line
30	DOE owned Electric power line
31	DOE owned right-of-way for water pipeline and railroad spur

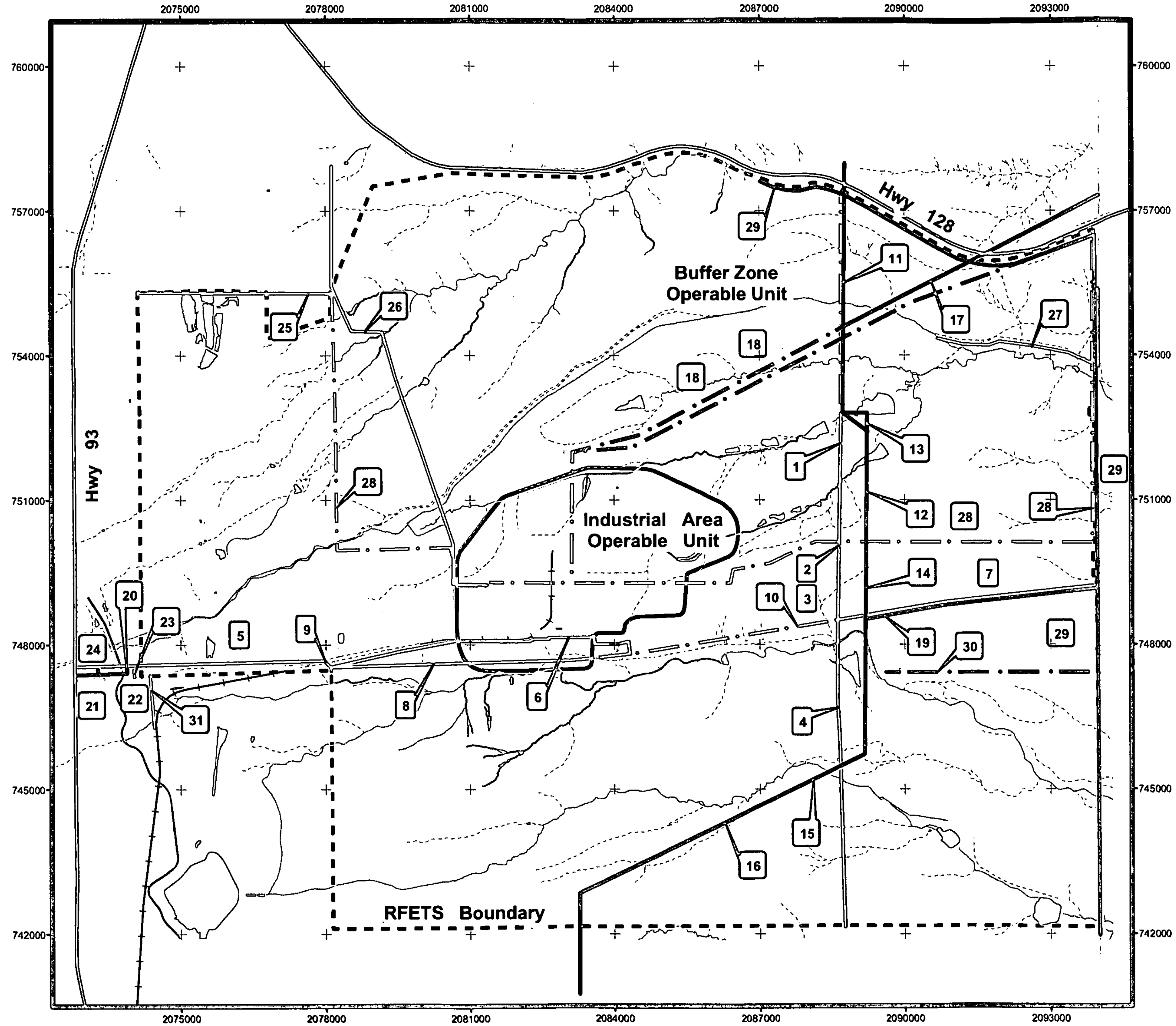

Figure 2.4

Easement Location Map

Key

- RegionalRoads
- Electrical (No Easement Documents)
- Electrical Transmission Easement
- Railroad Right-Of-Way
- Site Railroad
- Raw Water Easement
- Natural Gas Easement
- Natural Gas (No Easement Documents)
- Telephone Easement
- Telephone (No Easement Documents)

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N W E S

0 1,250 2,500 Feet

Scale 1:30,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_04Easements.mxd

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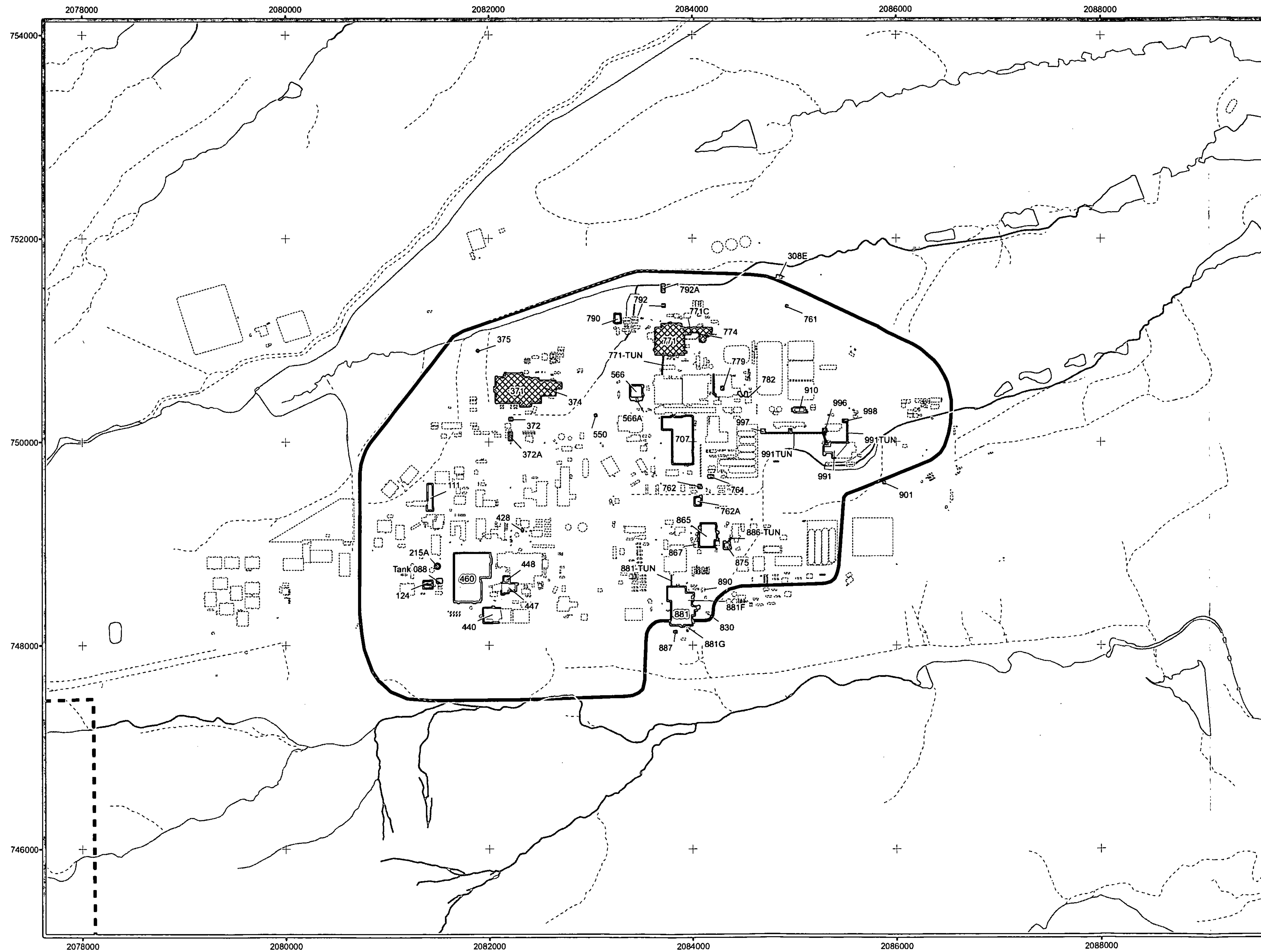

Figure 2.5

Subsurface Features after Accelerated Actions (Slabs, Building Foundations and Tunnels)

Key

- Slab Remaining
- Basement Slab Remaining
- Tunnel Remaining (slab, walls, foundations, ceiling)
- Foundation Remaining (includes caissons and/or grade beams)
- Contaminated Below 6'
- Removed Buildings & Structures

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 600 1,200
Feet

Scale 1:12,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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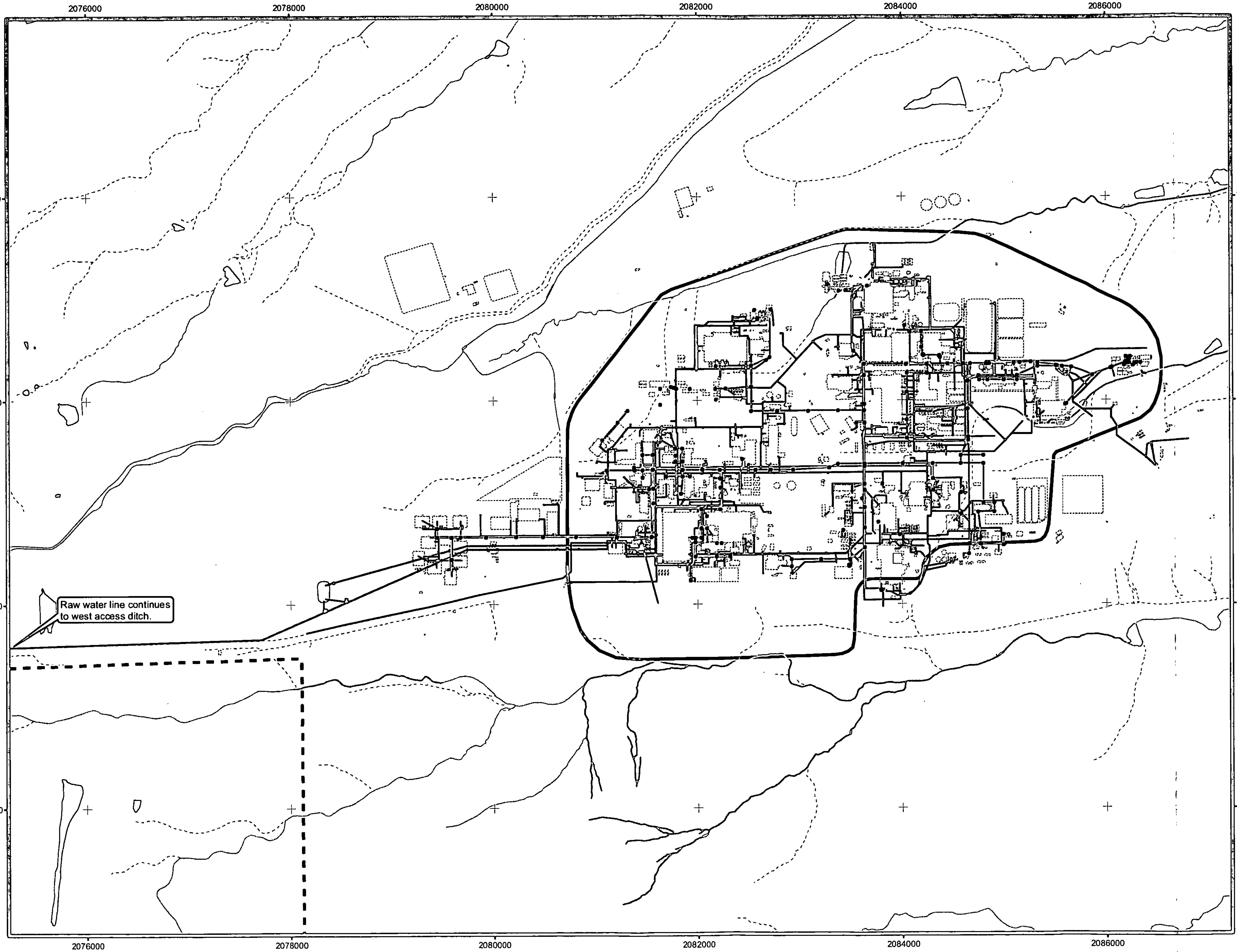

Figure 2.6

Subsurface Features after Accelerated Actions (Sewer Lines & Water Lines)

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Rocky Flats Environmental Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_06_SubsurfaceFeaturesSewerWater.mxd

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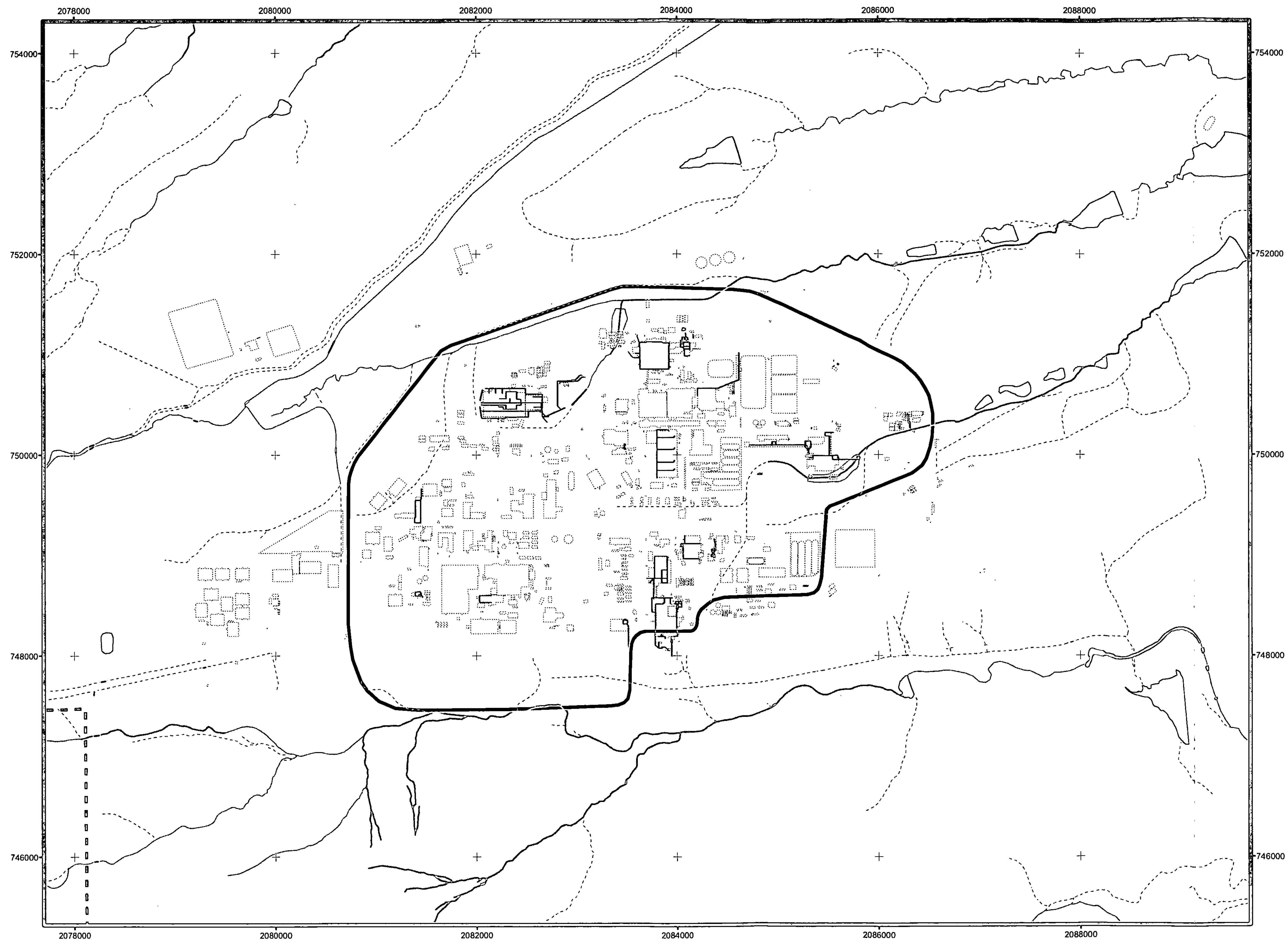
Figure 2.7

Subsurface Features after Accelerated Actions (Culverts & Drains)



Key

- Culverts
- Footing Drains
- Storm Drains
- Removed Structure

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 600 1,200 Feet

Scale 1:12,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_07_SubsurfaceFeaturesCulverts.mxd

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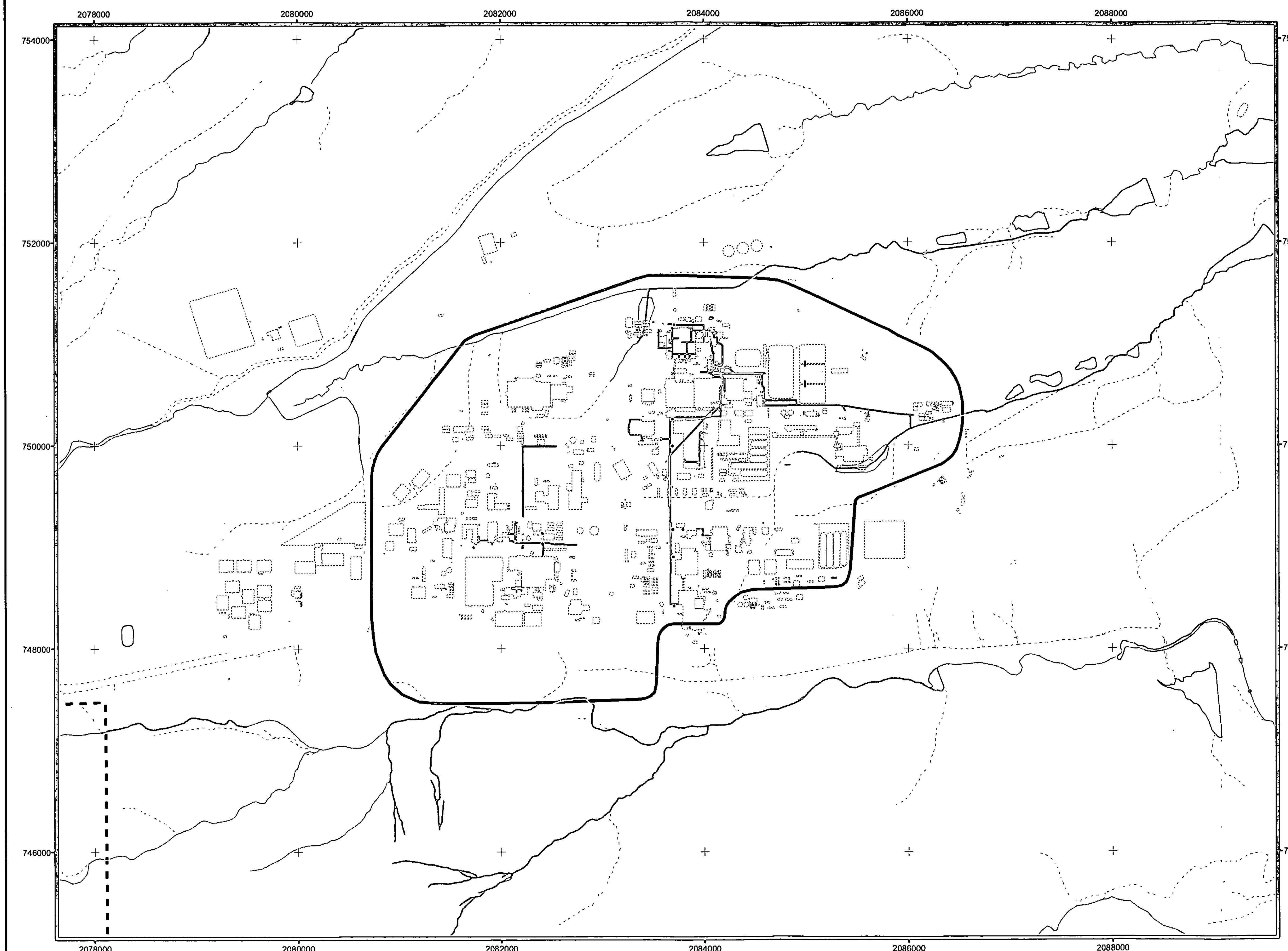
Figure 2.8

Subsurface Features after Accelerated Actions (Process Waste Lines & Valve Vaults)



Key

- Original Process Waste Line
- New Process Waste Line
- Valve Vault (foundations only)
- Valve Vault (foundations only-contaminated)
- Removed Buildings & Structures

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 600 1,200
Feet

Scale 1:12,000
State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
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170

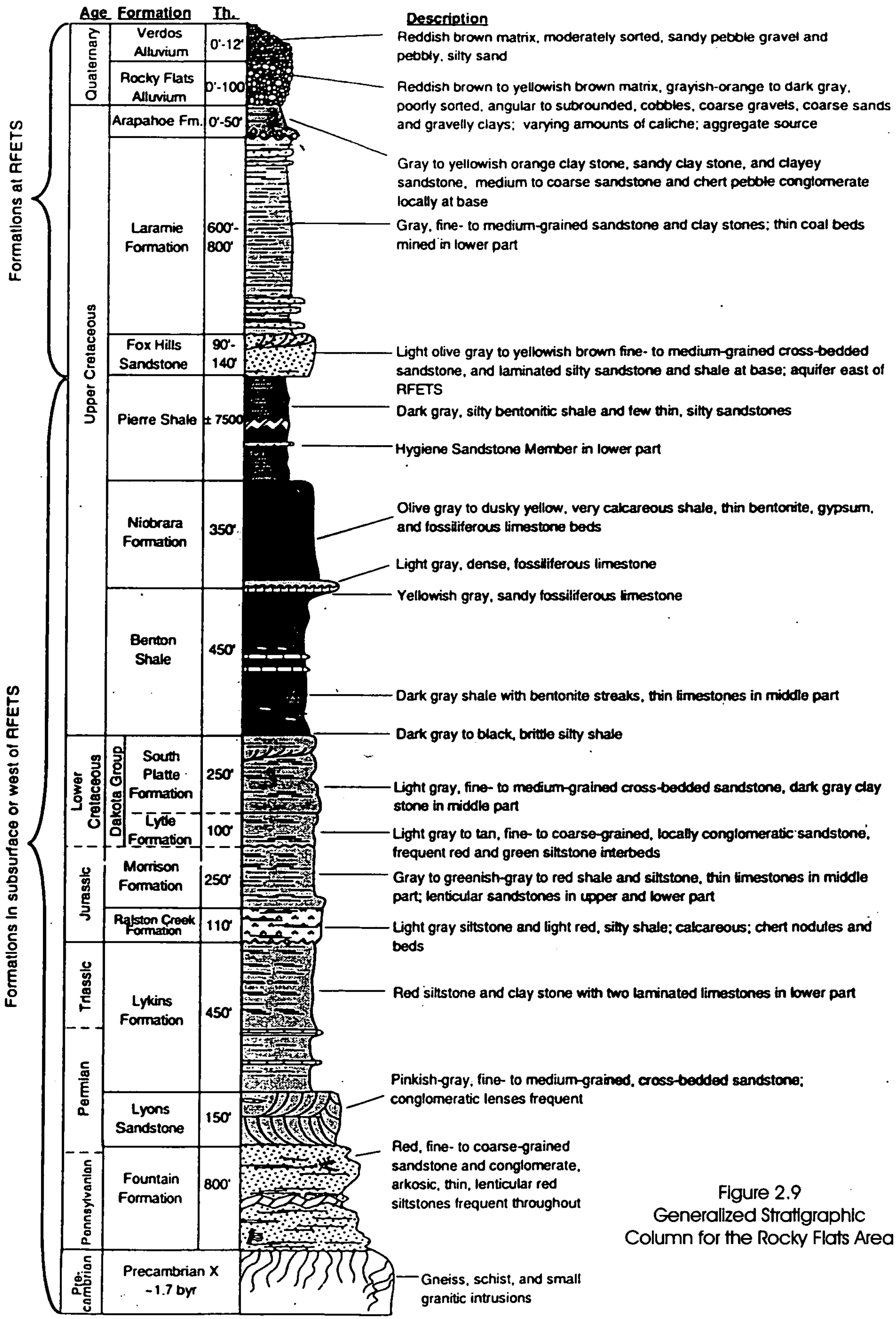

Figure 2.9
Generalized Stratigraphic
Column for the Rocky Flats Area

Modified from LeRoy and Weimer (1971)

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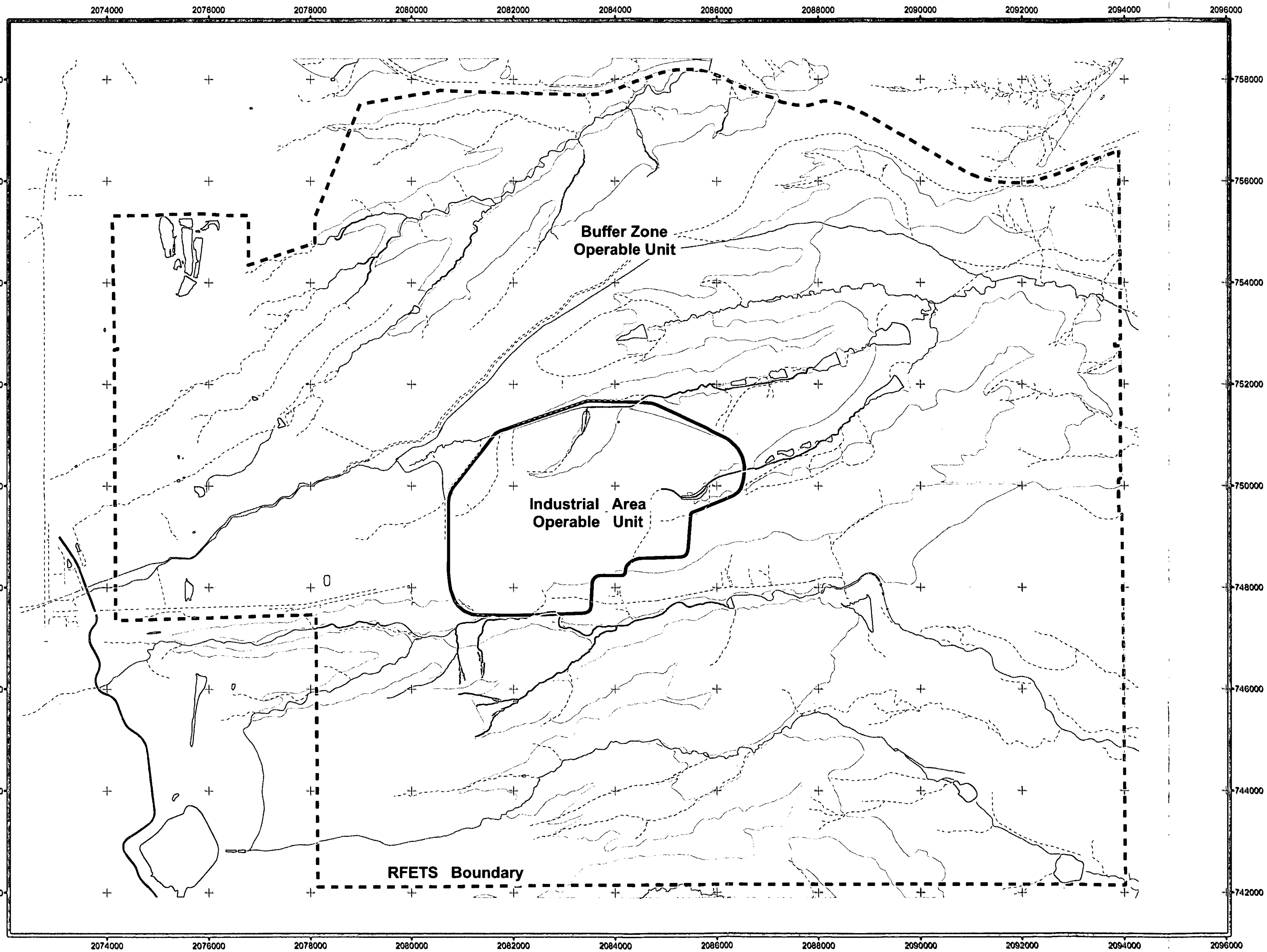

Figure 2.10

Landslide and High Erosion Areas

Key

Areas of landslide and high ersion

Source: RFCA Attachment 5 May 28, 2003

Standard Map Features
- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N W E S

0 1,000 2,000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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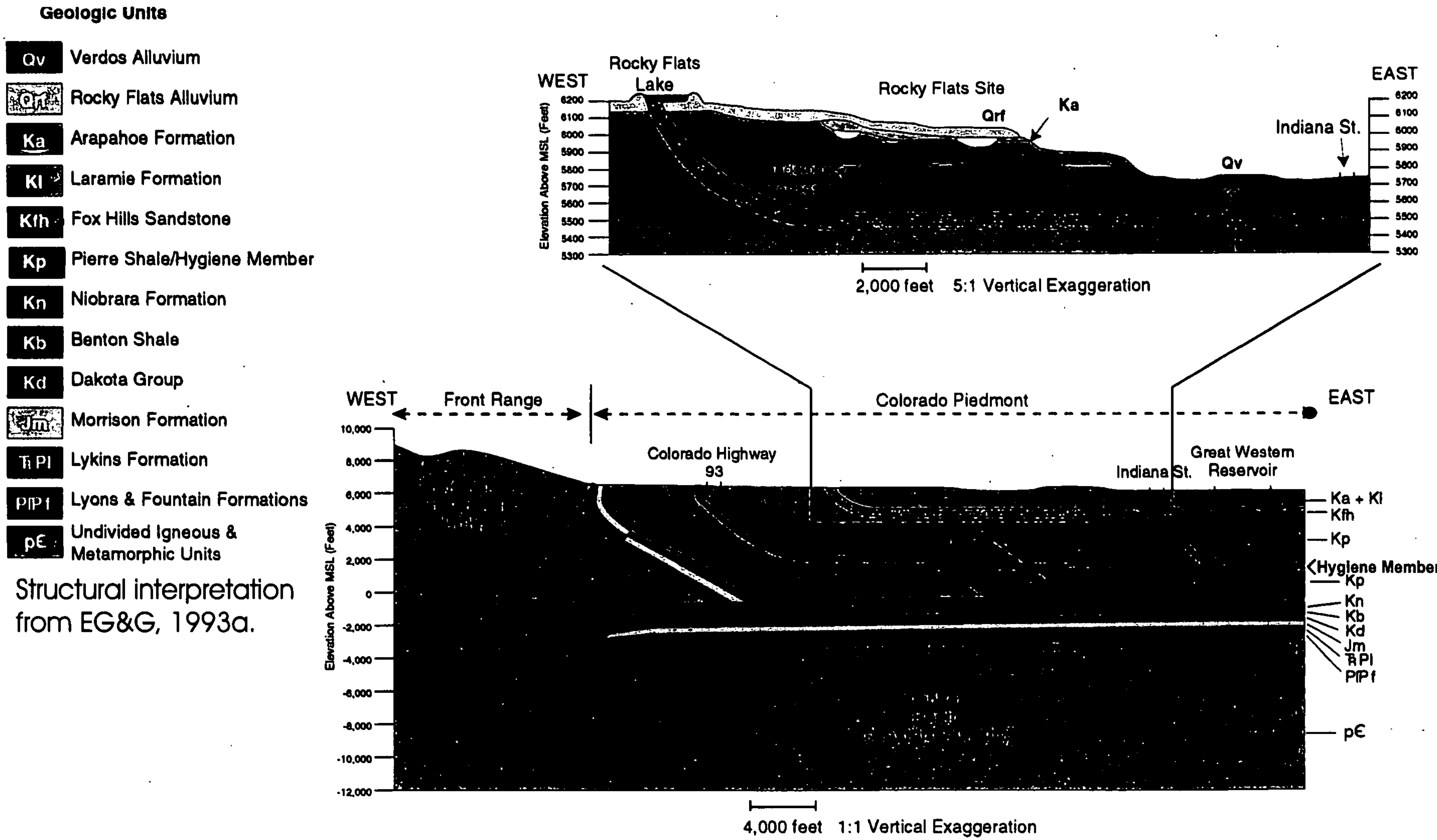

Figure 2.12
Generalized Geologic Cross Section of the Front Range and the Rocky Flats Area

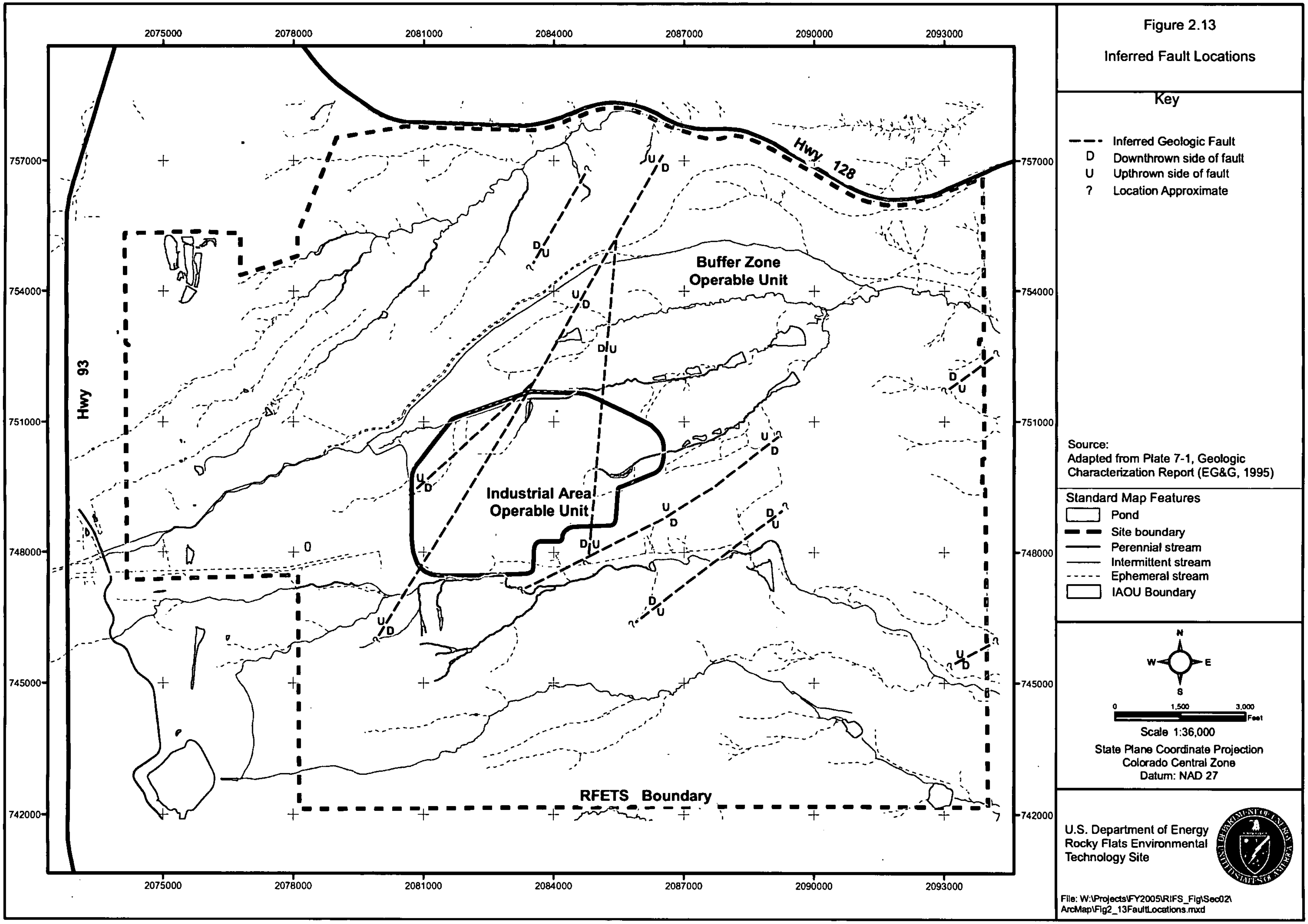
Figure 2.13
Inferred Fault Locations
Key
Inferred Geologic Fault
D Downthrown side of fault
U Upthrown side of fault
? Location Approximate
Source:
Adapted from Plate 7-1, Geologic Characterization Report (EG&G, 1995)
Standard Map Features
Pond
Site boundary
Perennial stream
Intermittent stream
Ephemeral stream
IAOU Boundary
N
W
E
S
0
1,500
3,000
Feet
Scale 1:36,000
State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27
U.S. Department of Energy
Rocky Flats Environmental Technology Site
File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_13FaultLocations.mxd
Hwy 128
Hwy 93
Buffer Zone Operable Unit
Industrial Area Operable Unit
RFETS Boundary
2075000
2078000
2081000
2084000
2087000
2090000
2093000
757000
754000
751000
748000
745000
742000

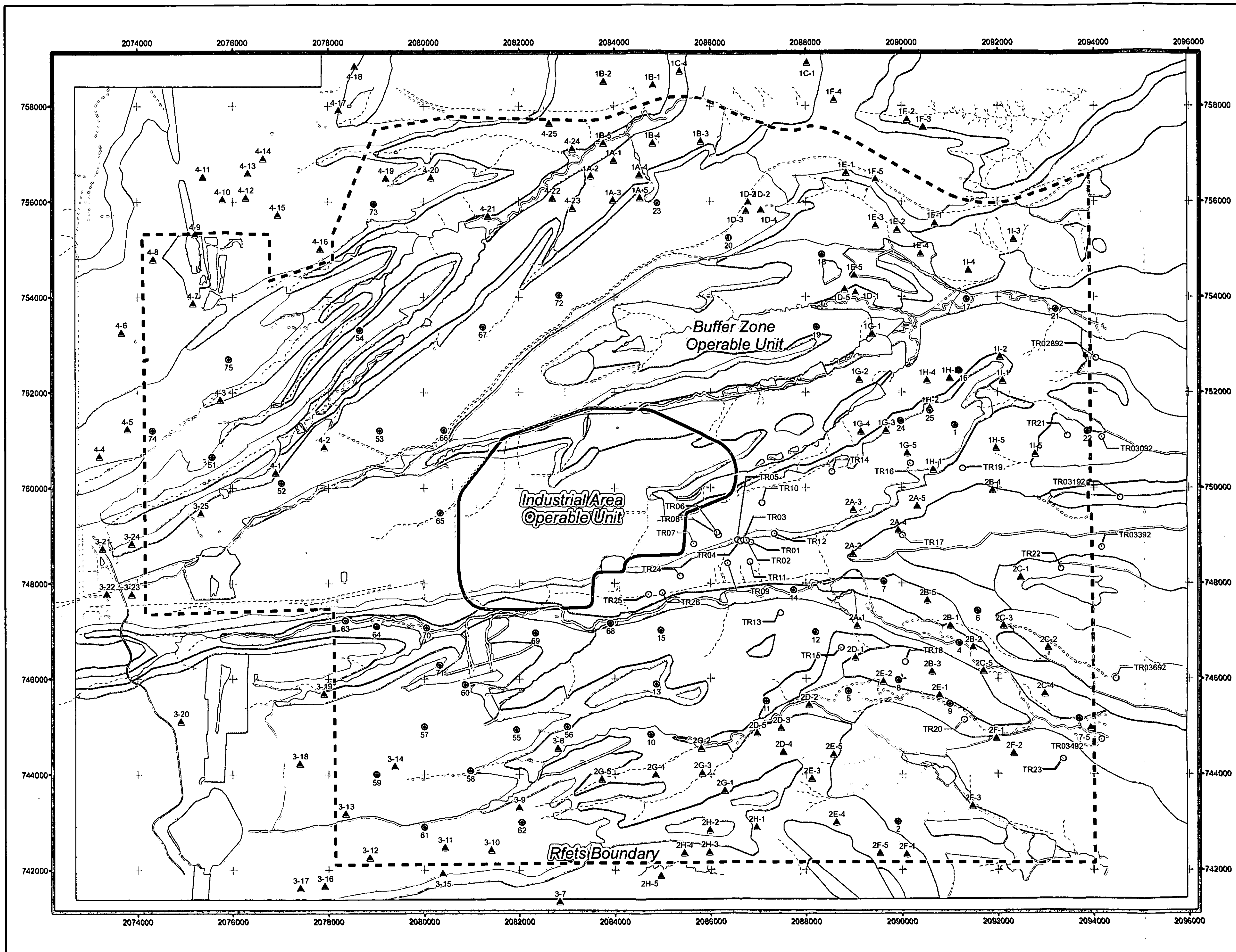

Figure 2.14
Rocky Flats Soil Map with Hydraulic Conductivity Measurement and Soil Sampling Locations

Key

- Tension Infiltrometer Sampling Location
- Soil Pit Location
- CDPHE Sample

Soil

- Denver clay loam (2 - 5%)
- Denver clay loam (5 - 9%)
- Denver-Kutch clay loam (5 - 9%)
- Denver-Kutch-Midway clay loam (9 - 15%)
- Denver-Kutch-Midway clay loam
- Englewood clay loam (0 - 2%)
- Englewood clay loam (2 - 5%)
- Flatirons cobbly sandy loam (0 - 3%)
- Flatirons stoney sandy loam (0- 5%)
- Haverson loam (0 - 3%)
- Leyden-Primen-Standley cobbly clay loams (15 -50%)
- McClave clay loam (0 - 3%)
- Midway clay loam (9 - 30%)
- Nederland very cobbly sandy loam (15 - 50%)
- Nunn clay loam (0 - 2%)
- Nunn clay loam (2 - 5%)
- Pits (gravel)
- Rock outcrop (Sedimentary)
- Standley-Nunn gravelly clay loam (0 - 5%)
- Valmont clay loam (0 - 3%)
- Veldkamp-Nederland very cobbly sandy loams (0 - 3%)
- Willowman-Leyden cobbly loam (9 - 30%)
- Yoder Variant-Midway complex (15 - 60%)

Data Source:
Soils data from the U.S. Conservation Service.
Uncertified Golden Area Soil survey - 1980.

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 1,000 2,000
Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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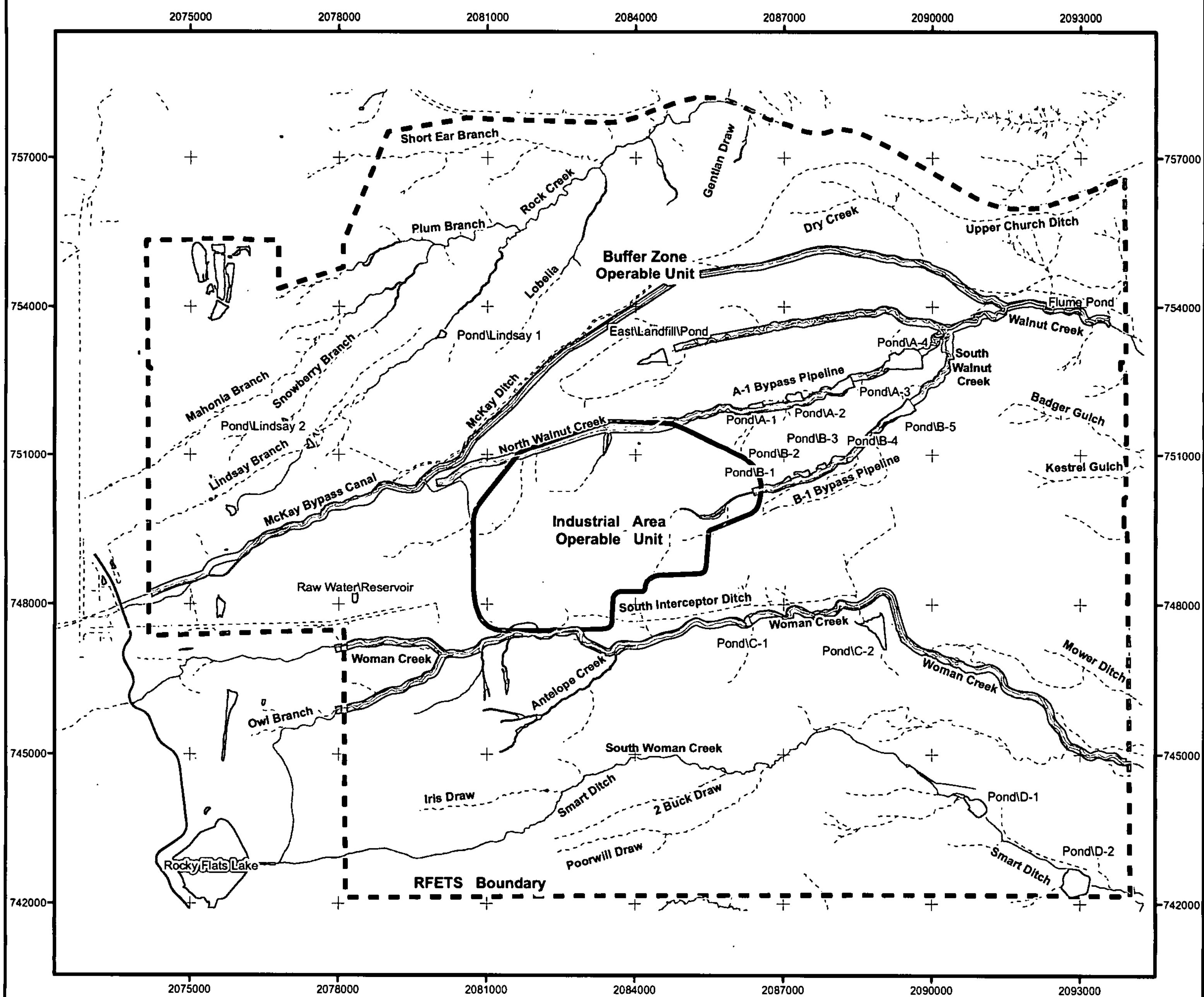

Figure 2-15
Colorado Water Quality Control Commission (CWQCC) Stream Segment Classifications (Big Dry Creek Basin)

Key

Stream Segment
- 4a
- 4b
- 5

Notes:
1) Rock Creek is designated as segment 8 of the Boulder Creek Basin.
2) South Woman Creek, including the Smart Ditches, is designated as segment 6 of the Big Dry Creek Basin.

Standard Map Features
- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 1,500 3,000 Feet

Scale 1:36,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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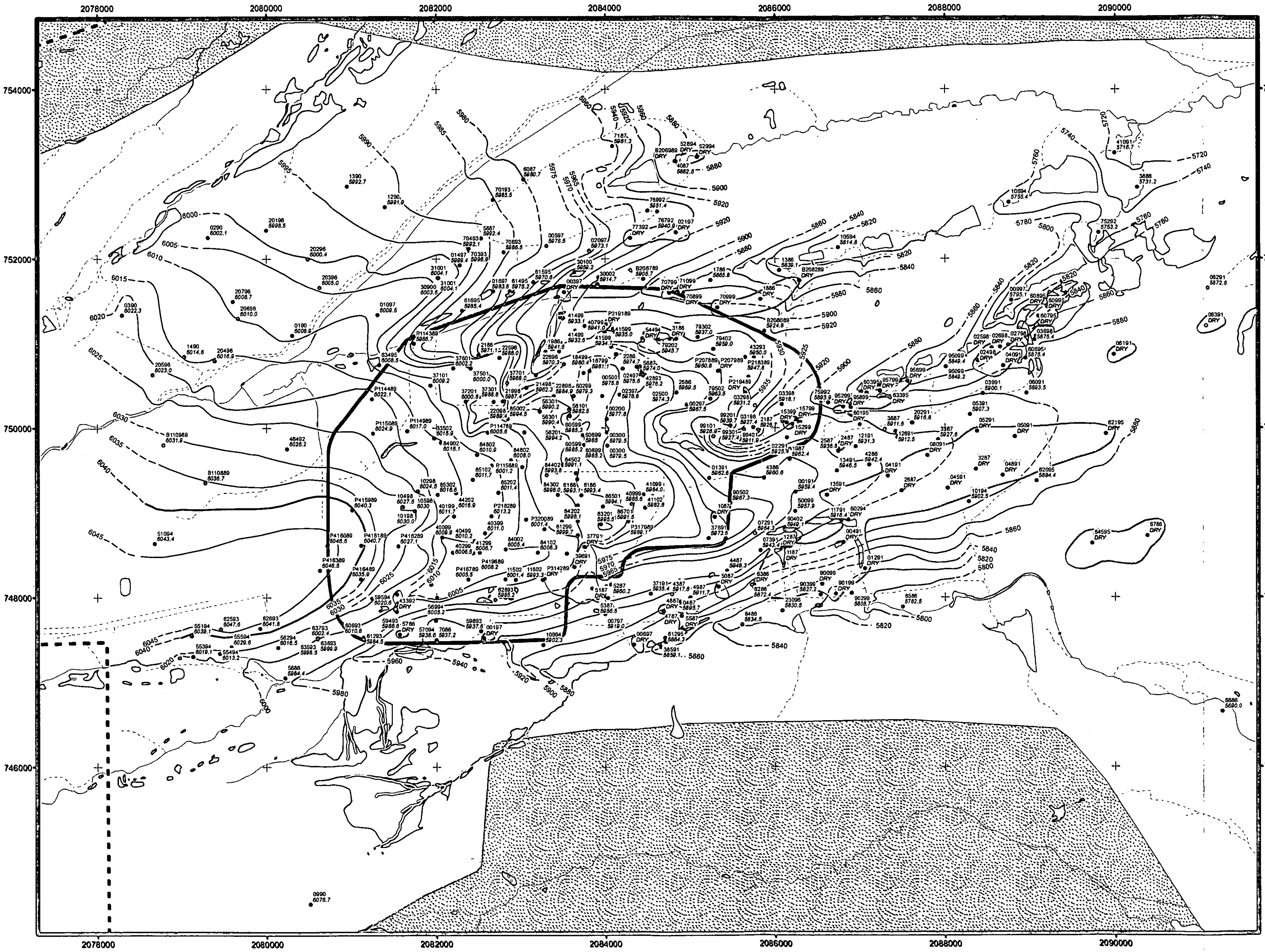
Figure 2.16

Potentiometric Surface of Permeable Units of the UHSU Second Quarter (2003)



Key

- Well with Water Level
- Dry Well
- Potentiometric Contour (5 ft)
- Inferred Potentiometric Contour (5 ft)
- Potentiometric Contour (20 ft)
- Inferred Potentiometric Contour (20 ft)
- Seeps
- Approximate Extent of Unsaturated Alluvium
- Areas Without GW Elevations

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 600 1,200
Feet

Scale 1:14,400

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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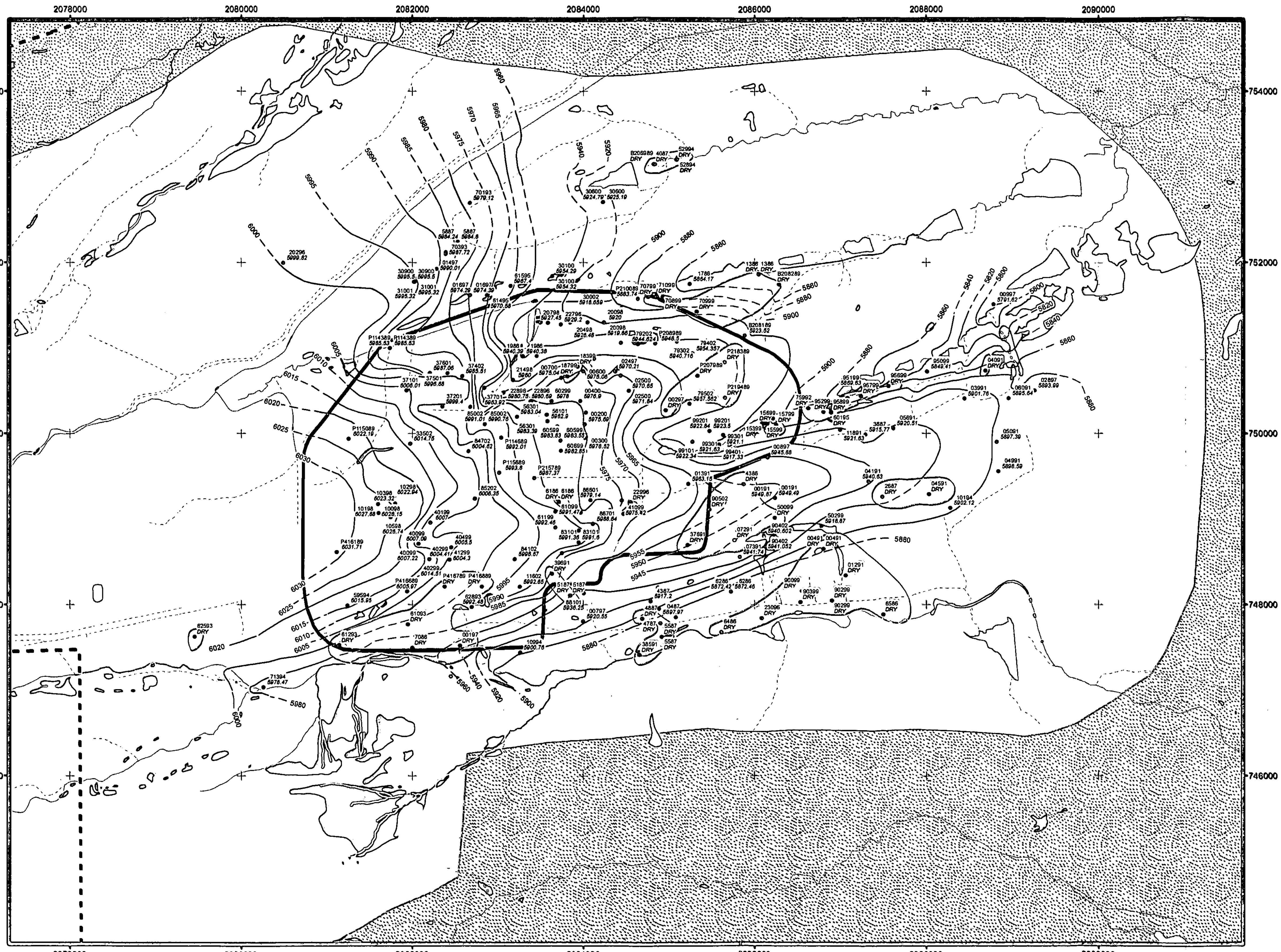

Figure 2.17

Potentiometric Surface of Permeable Units of the UHSU Fourth Quarter (2003)

Key

- Well with Water Level
- Dry Well
- Potentiometric Contour (5ft)
- Inferred Potentiometric Contour (5ft)
- Potentiometric Contour (20ft)
- Inferred Potentiometric Contour (20ft)
- Seeps
- Approximate Extent of Unsaturated Alluvium
- Areas Without GW Elevations

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N E S W

0 600 1,200 Feet

Scale 1:14,400

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_17Potentio4q03.mxd

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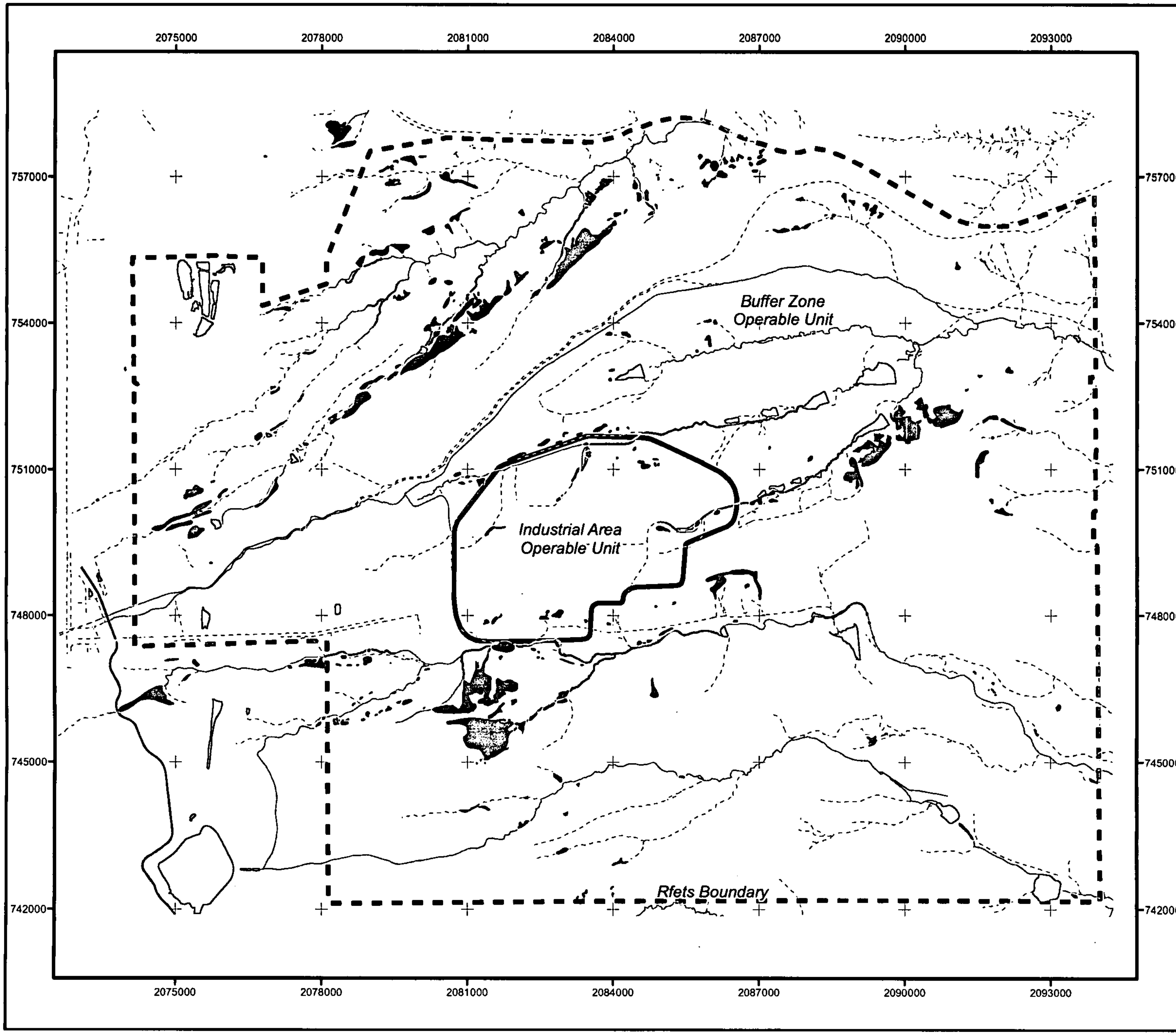

Figure 2.18

Seep Areas

Key

Seeps

Data Source:
Seep locations from EG&G, 1995
Hydrogeologic Characterization
Report for the Rocky Flats
Environmental Technology Site

Standard Map Features

IAOU Boundary

Pond

Site boundary

Perennial stream

Intermittent stream

Ephemeral stream

N
W E
S

0 1,500 3,000 Feet

Scale 1:36,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_18SeepAreas.mxd

Figure 2.19 Wind Speed and Direction- 2004

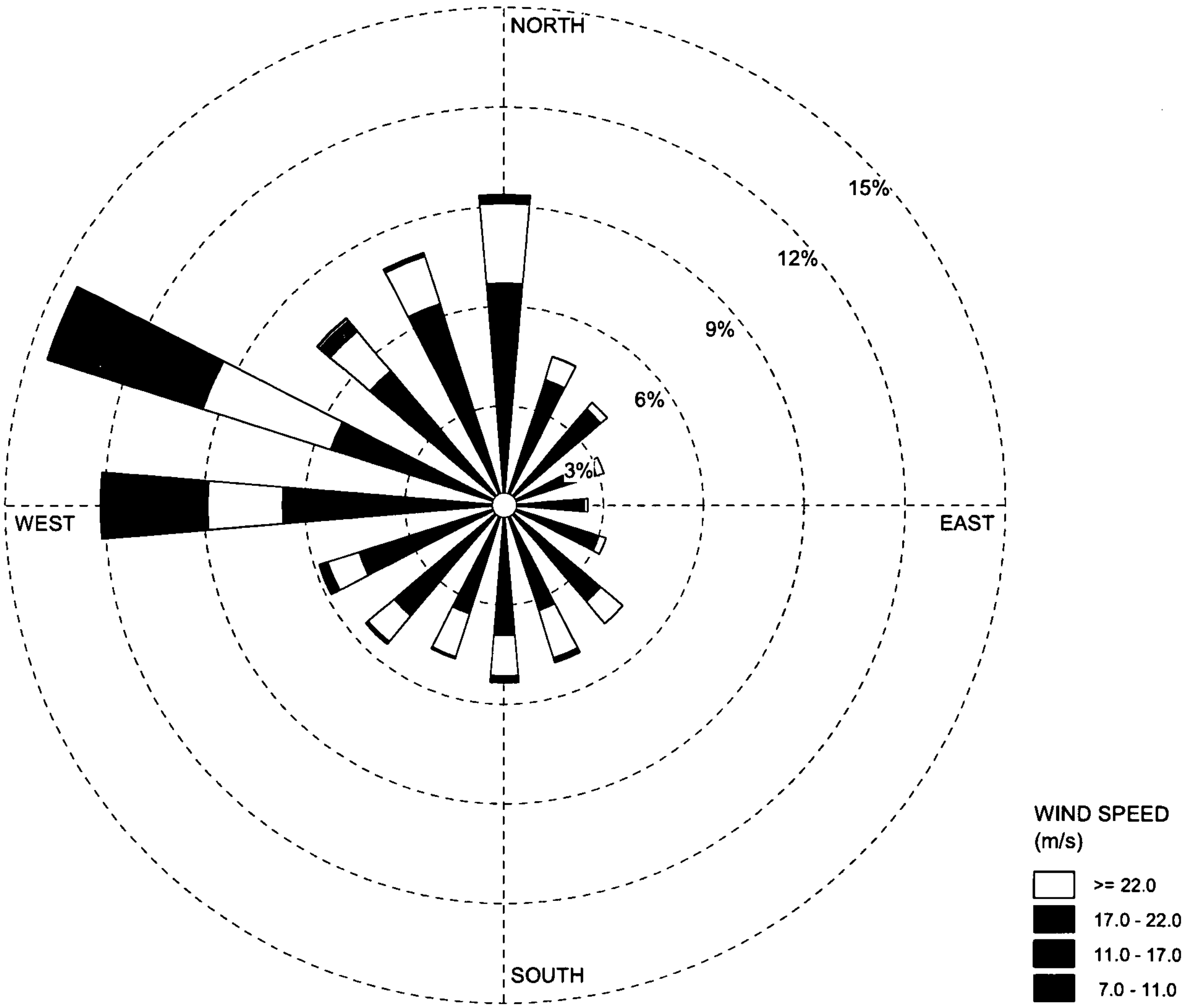

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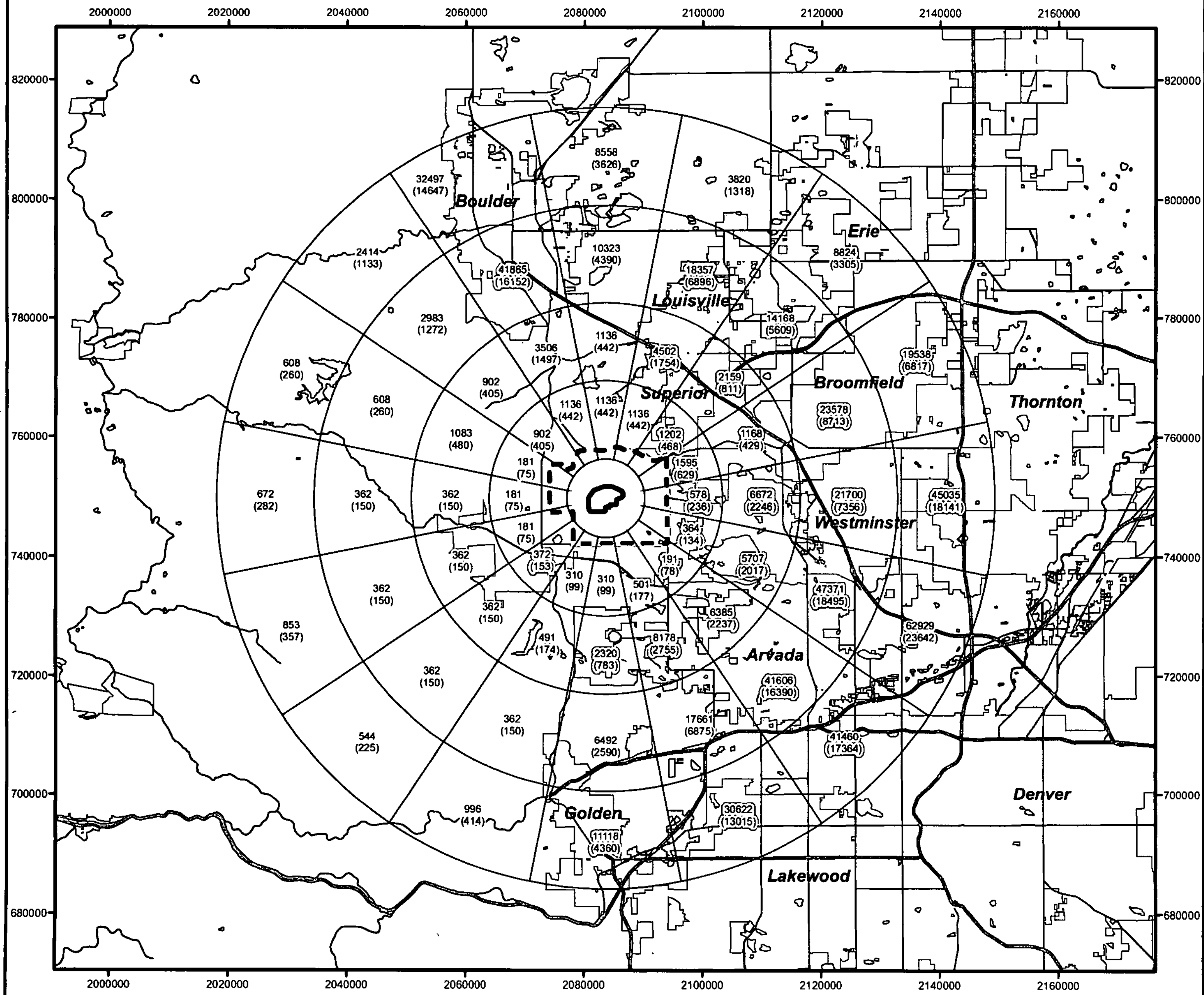
Figure 2.20
Population Distribution, 2004



Key

- Population Distribution
- Waterbodies
- Site Boundary
- City Boundary
- IAOU Boundary

Major Transportation Routes

- Other
- Interstate

Note:
The center of the pie chart is the location of the former Industrial Area at the Rocky Flats Environmental Technology Site. The numbers represent the population of each pie area. The numbers in parentheses represent the number of households.

N W E S

0 12,500 25,000 Feet

Scale 1:300,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_20_PopulationDistribution2004.mxd

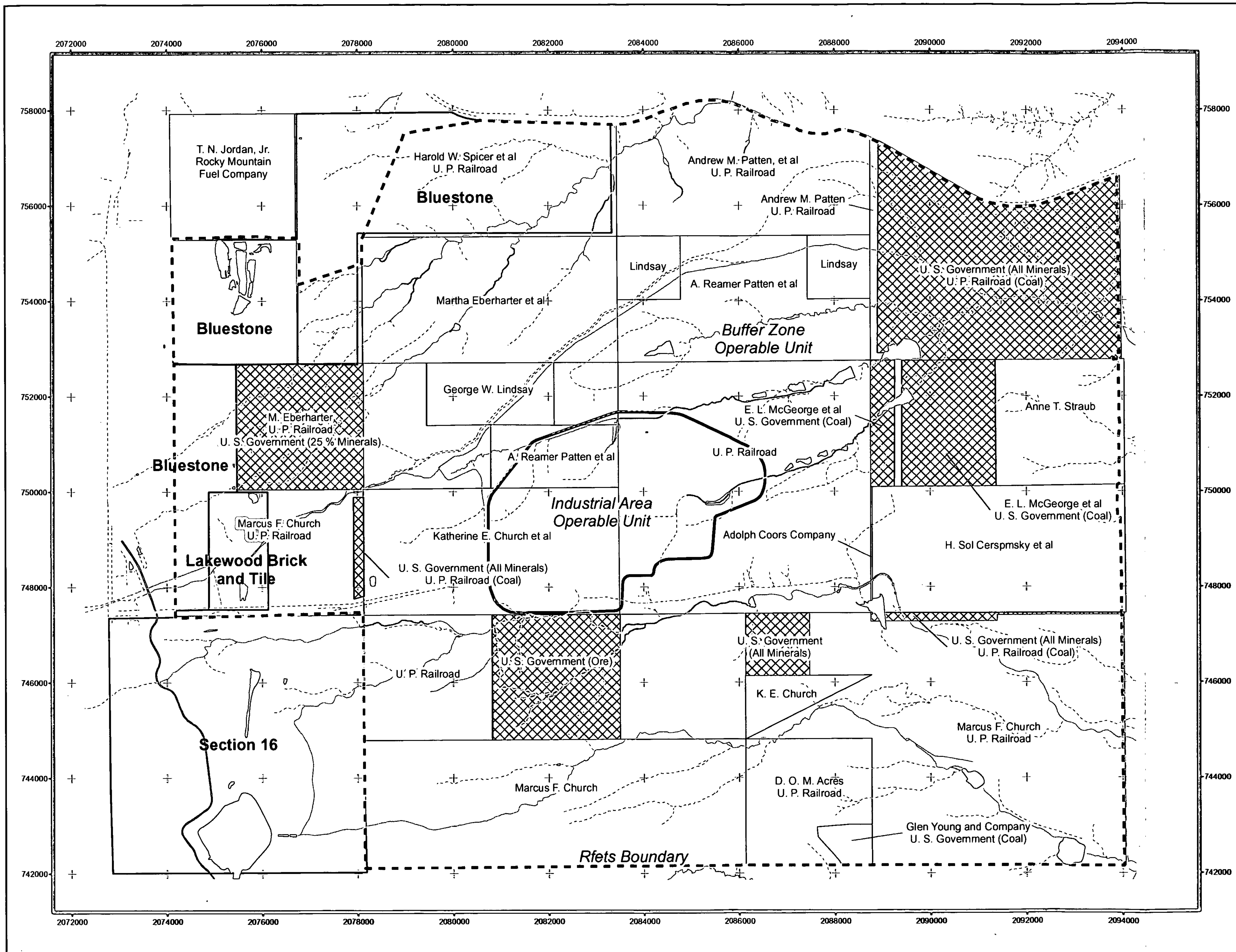


Figure 2.21
Mineral Rights
at Rocky Flats Environmental Technology Site

Key

- Existing Mining Permit
- Mineral Right Boundary
- Government
- Lakewood Brick & Tile
- Bluestone
- Section 16

Data Source:
Mineral Right's Lease Boundaries approved by RFCSS Facility Planning Department., POC Norm Sprolas, 303-966-2303

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N W E S

0 1,000 2,000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_21_MineralRights.mxd

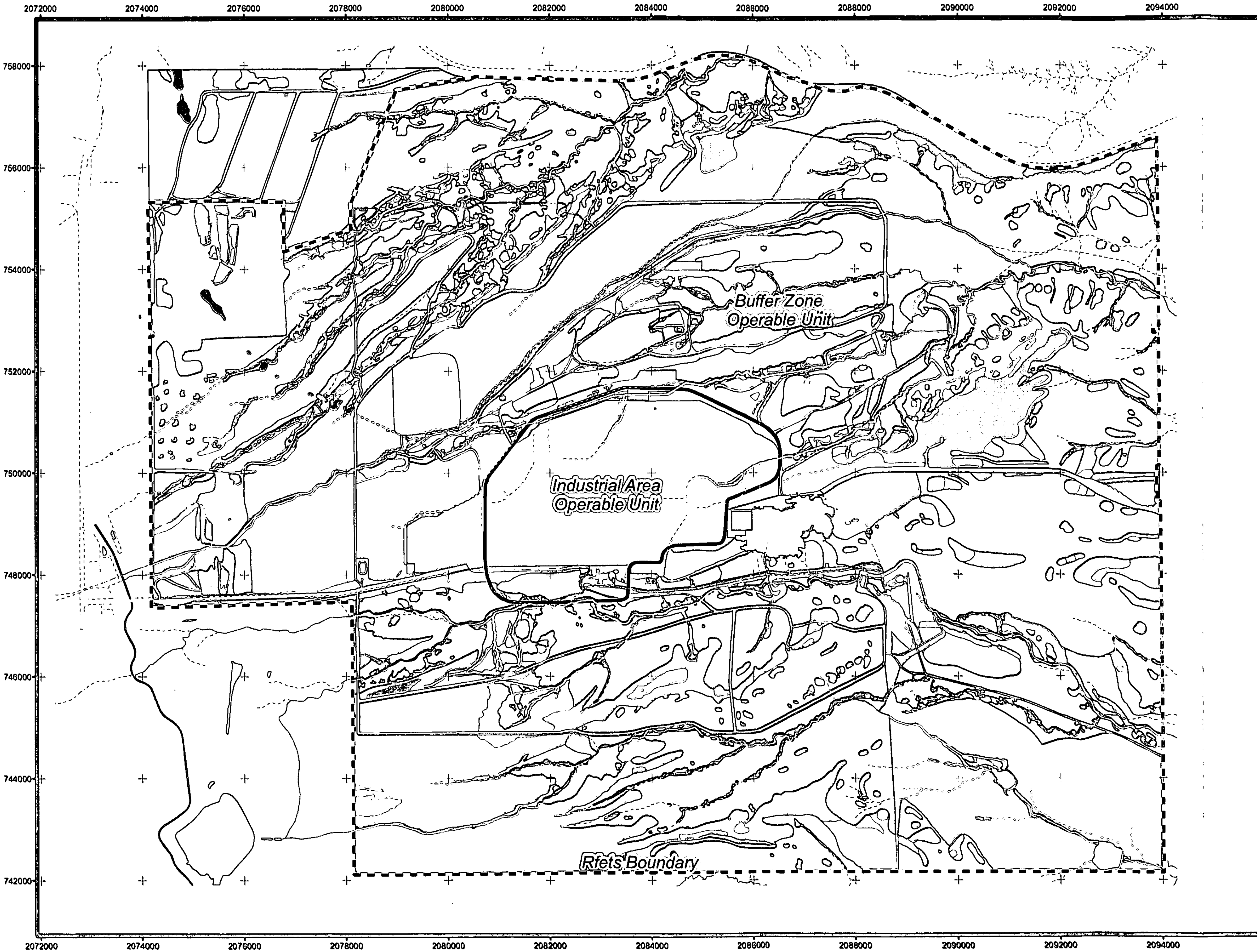


Figure 2.22

Rocky Flats Vegetation Map

Key

DESCRIPTION

- Annual Grass/Forb Community
- Disturbed Areas
- Disturbed and Revegetated Areas
- Leadplant Riparian Shrubland
- Mesic Mixed Grassland
- Mudflats
- Open Water
- Ponderosa Woodland
- Reclaimed Mixed Grassland
- Riparian Woodland
- Riprap, Rock, and Gravel Piles
- Savannah Shrubland
- Short Grassland
- Short Marsh
- Short Upland Shrubland
- Tall Marsh
- Tall Upland Shrubland
- Tree Plantings
- Wet Meadow/Marsh Ecotone
- Willow Riparian Shrubland
- Xeric Needle and Thread Grass Prairie
- Xeric Tallgrass Prairie

Data Source:
Vegetarian map data provided by PTI Environmental Services Ecology

Note:
This map does not show all Federally designated wetlands. See the 1995 Site wetlands map prepared by the U.S. Army Corps of Engineers for delineated wetland features.

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 1,000 2,000
Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_22_Vegetation.mxd

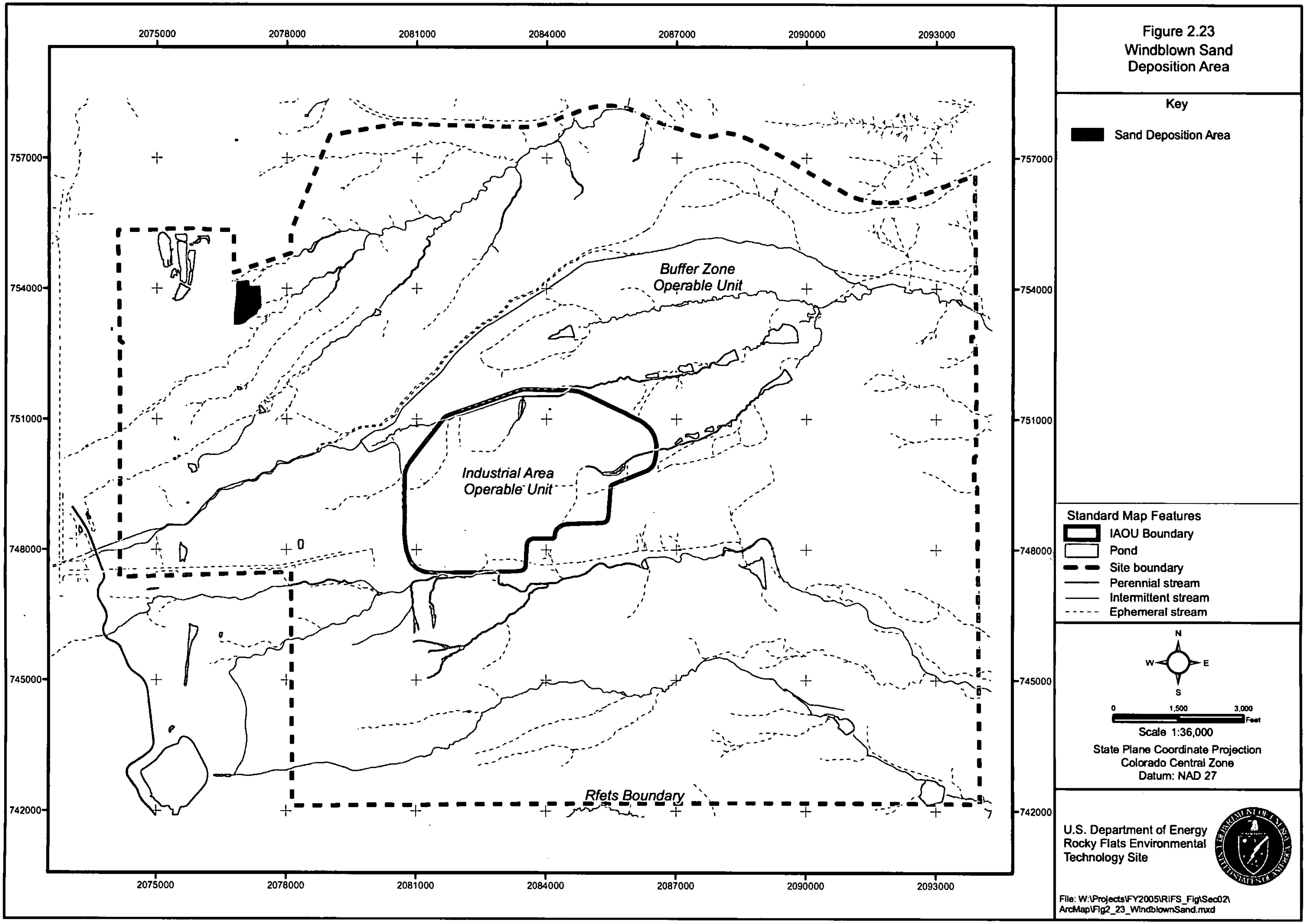


Figure 2.23
Windblown Sand Deposition Area

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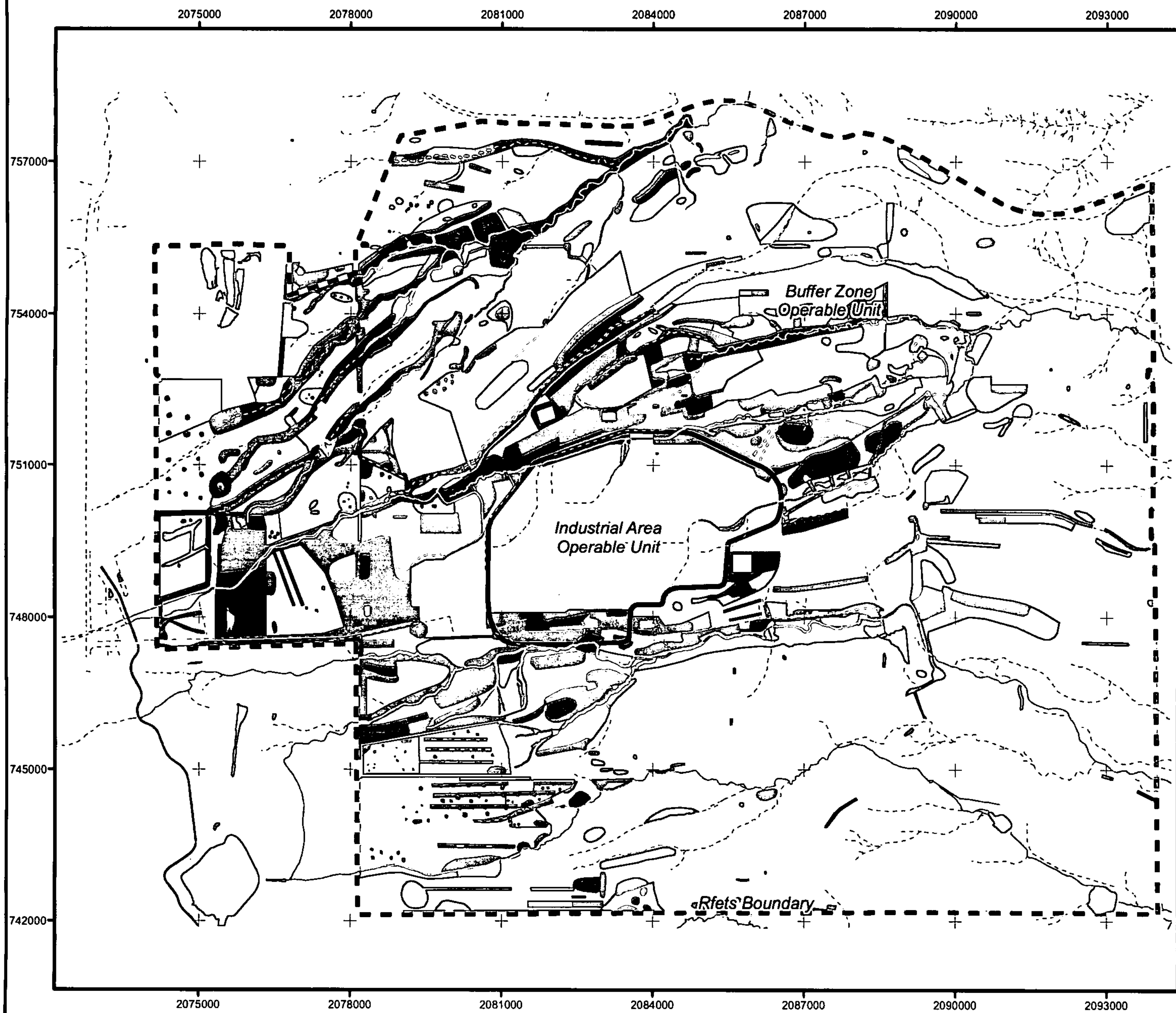

Figure 2.24
Diffuse Knapweed
(Centaurea diffuse)
2001 Distribution

Key

Diffuse Knapweed Distribution
- High Density Area
- Medium Density Area
- Low Density Area
- Scattered Density Area

Source Data:
2001 Annual Vegetation Report for the RFETS, Kaiser-Hill Company, LLC, May 2002

Standard Map Features
- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N W E S

0 1,500 3,000 Feet
Scale 1:36,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_24_Knapweed.mxd

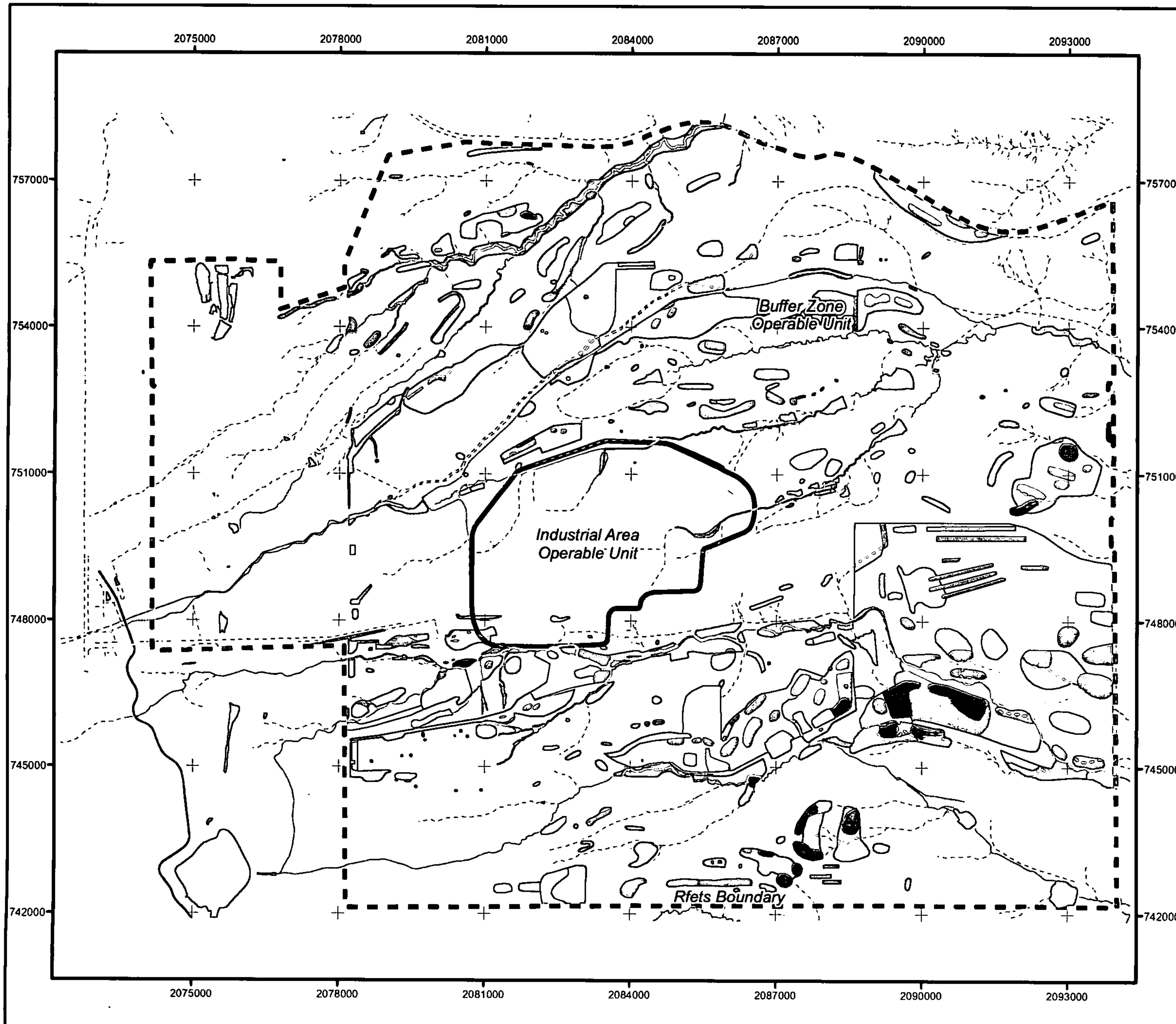

Figure 2.25
Common Mullein
(Verbascum thapsus)
2001 Distribution

Key

Common Mullein Distribution
- High Density Area
- Medium Density Area
- Low Density Area
- Scattered Density Area

Source Data:
2001 Annual Vegetation Report for the RFETS, Kaiser-Hill Company, LLC, May 2002

Standard Map Features
- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 1,500 3,000 Feet

Scale 1:36,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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Rocky Flats Environmental
Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_25_CommonMullein.mxd

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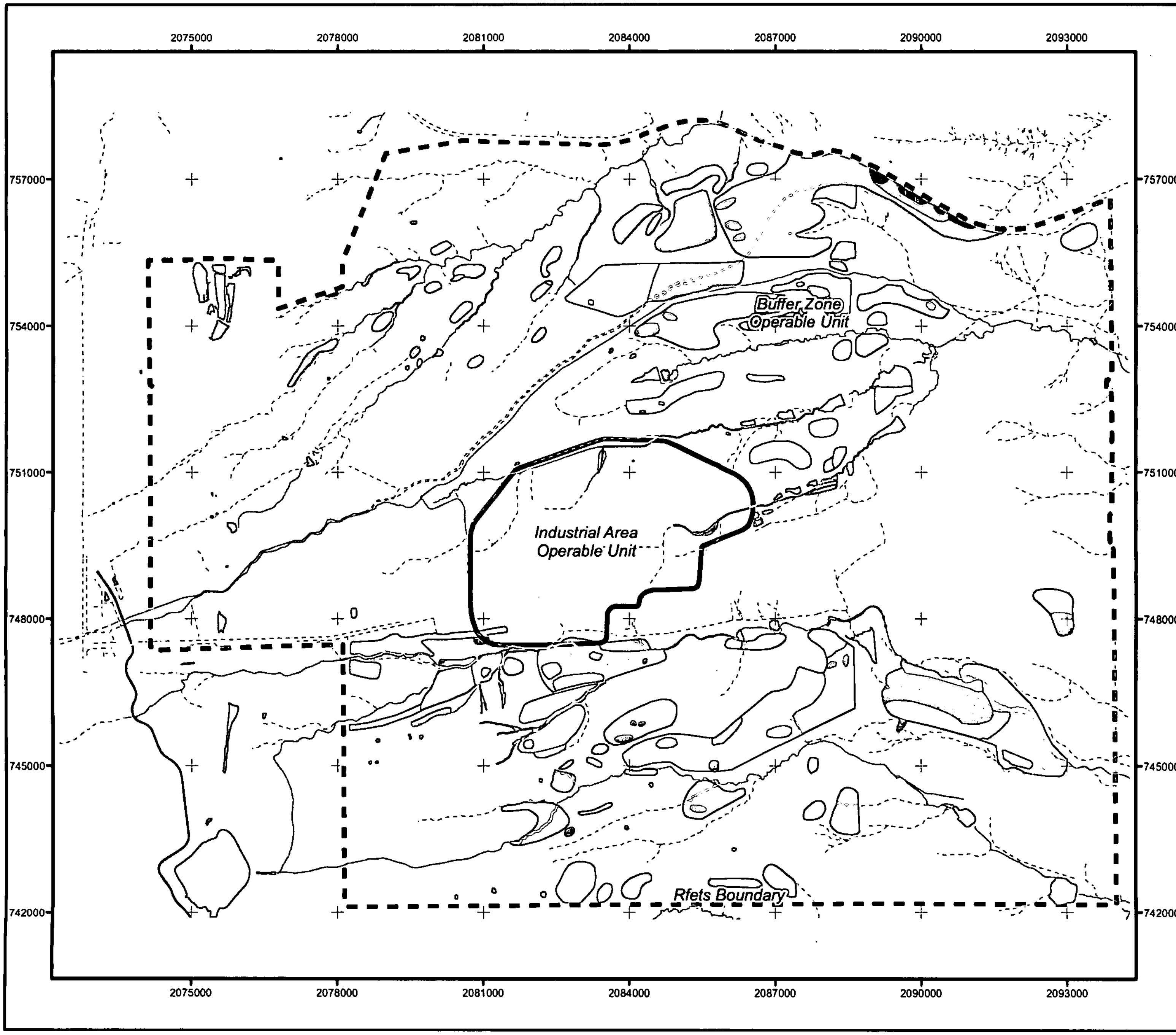

Figure 2.26
Musk Thistle
(Carduus nutans)
2001 Distribution

Key

Musk Thistle Distribution
- High Density Area
- Medium Density Area
- Low Density Area
- Scattered Density Area

Source Data:
2001 Annual Vegetation Report for the RFETS, Kaiser-Hill Company, LLC. May 2002

Standard Map Features
- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W
E
S

0 1,500 3,000 Feet

Scale 1:36,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_26_MuskThistle.mxd

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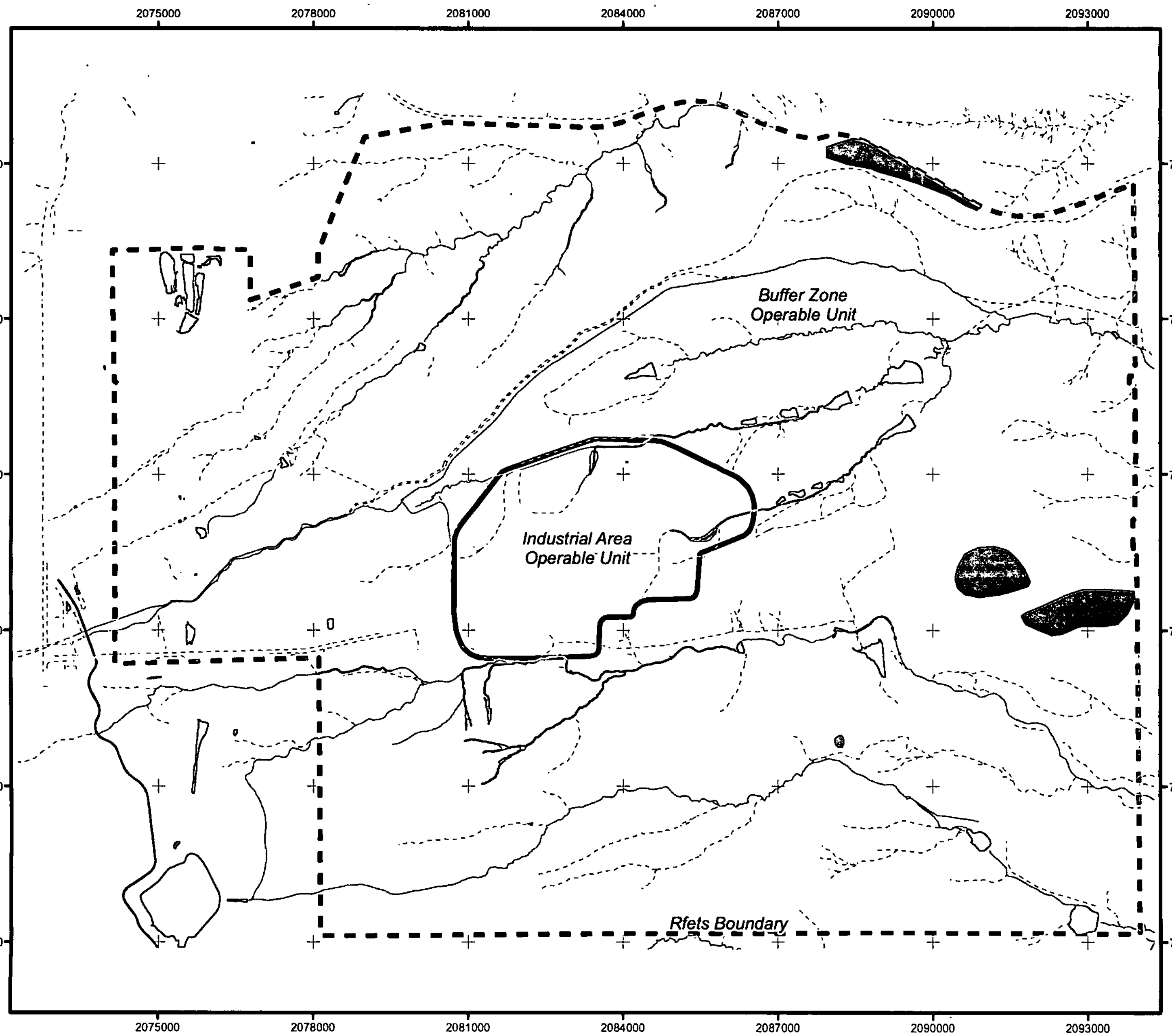

Figure 2.27
Prarie Dog Colonies

Key

2005 Prairie Dog Colonies

Data Source:
K-H, 2005, 2003, 2002 Annual Ecology Report for the Rocky Flats Environmental Site. Prepared by Kaiser-Hill Company LLC, Rocky Flats Environmental Technolgy Site, Golden, CO. Prepared for the U.S. Department of Energy, Rocky Flats Field Office, Golden, CO.

Standard Map Features
IAOU Boundary
Pond
Site boundary
Perennial stream
Intermittent stream
Ephemeral stream

N
W E
S

0 1,500 3,000 Feet
Scale 1:36,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_27_PrarieDogs.mxd

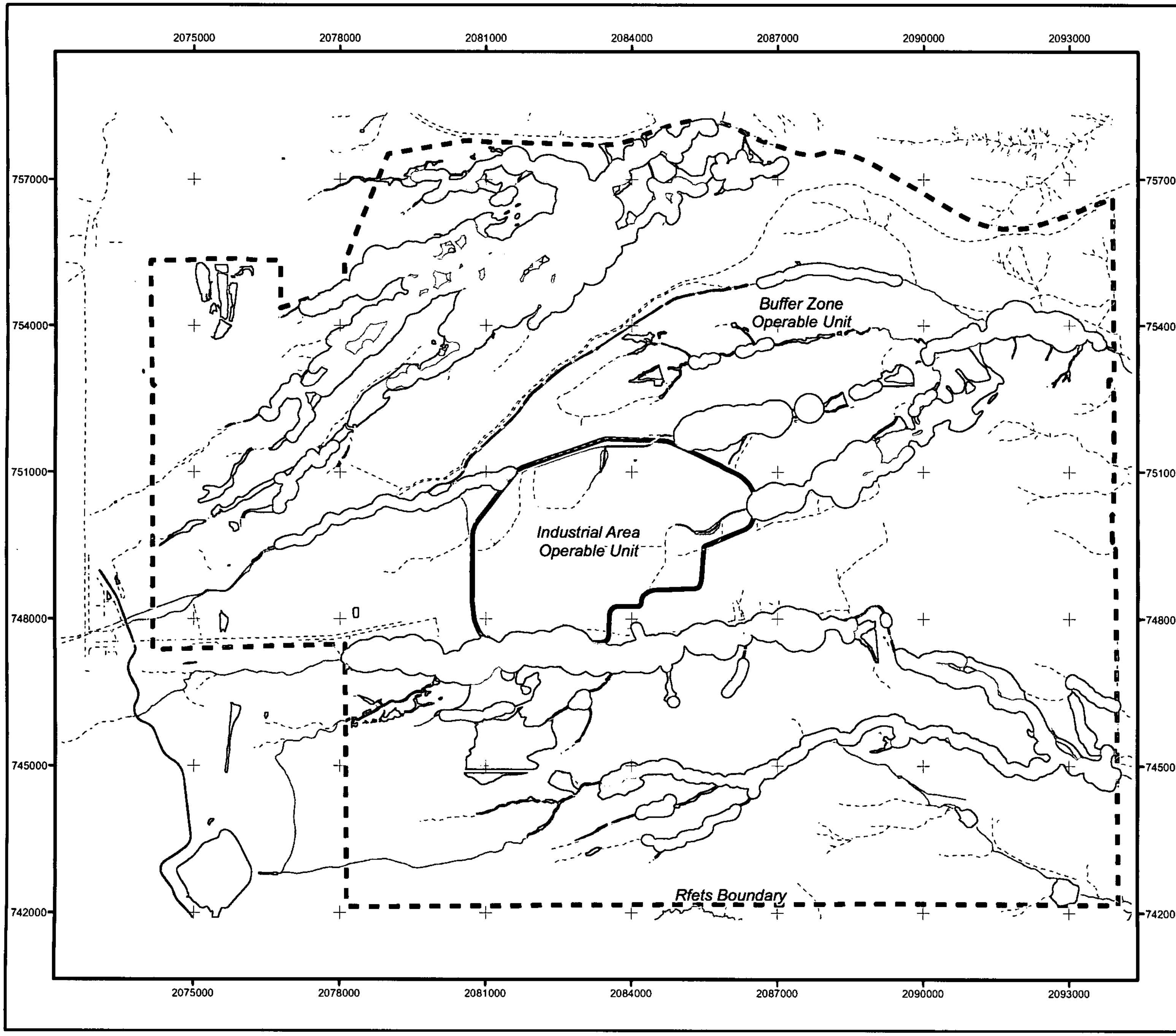

Figure 2.28
Preble's Meadow Jumping Mouse Habitat

Key

Habitat
- Protection Area
- Contiguous Wetlands
- Undefined PMJM Area

Data Source:
DOE 2004, Programmatic Biological Assessment for the Department of Energy Activities at the Rocky Flats Environmental Site, Part II, Revision 7. U.S. Department of Energy, Rocky Flats Field Office, Golden, CO. April 2004

Standard Map Features
- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N W E S

0 1,500 3,000 Feet

Scale 1:36,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

File: W:\Projects\FY2005\RIFS_Fig\Sec02\ArcMap\Fig2_28_PreblesMeadowMouse.mxd

DRAFT

RCRA Facility Investigation – Remedial Investigation/ Corrective Measures Study – Feasibility Study Report for the Rocky Flats Environmental Technology Site

Section 3.0
Nature and Extent of Soil Contamination

This Draft was prepared by Kaiser-Hill Company, L.L.C.
for the U.S. Department of Energy

October 2005

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3.0 NATURE AND EXTENT OF SOIL CONTAMINATION

3.1 Introduction

This section defines the nature and the horizontal and vertical extent of analytes of interest (AOIs) present in soil, for all areas within the Rocky Flats Environmental Technology Site (RFETS or site) boundary after completion of Rocky Flats Cleanup Agreement (RFCA) accelerated actions. AOIs are those analytes[1] with concentrations greater than the wildlife refuge worker (WRW) preliminary remediation goals (PRGs). The purpose of soil AOIs is to focus the nature and extent evaluation on constituents that were detected at concentrations that may contribute to the risk of future receptors, and to show overall trends of those constituents on a sitewide basis. Soil concentrations are compared to ecological screening levels and potential risks to ecological receptors from soil exposure are presented in the Comprehensive Risk Assessment (CRA).

The WRW PRGs[2] were developed using a hazard quotient (HQ) of 0.1 or risk of $1x10^{-6}$. The more conservative of the two values were used for the PRG. The WRW PRGs for soil contaminants are calculated in accordance with the CRA Workplan and Methodology (CRA Methodology) (DOE 2004a) and are contained in Appendix A of the CRA Methodology. This comparison to WRW PRGs was performed to illustrate the range of residual concentrations of contaminants that exist across the site. Soil AOIs will be carried forward and evaluated in Section 7.0. Soil concentrations greater than WRW PRGs do not necessarily trigger the need for a response action or define unacceptable levels of contaminants in the soil. Concentrations above these levels may indicate possible contamination for which a remedy evaluation is necessary.

Data used in this section are the result of previous investigations conducted at the site prior to RFCA, from samples to determine whether RFCA accelerated actions were required or to confirm that RFCA accelerated actions were complete. Data collected to support the CRA are also included in this section. Soil data for RFETS were collected in accordance with agency-approved Sampling and Analysis Plans (SAPs)[3] and standardized contract-required analytical procedures. Approved Work Plans and SAPs specified the use of U.S. Environmental Protection Agency (EPA)-approved sampling

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[1] For purposes of this section, the concentration of contaminants is the total concentration and not the Toxicity Characteristic Leaching Procedure (TCLP) concentration.

[2] The WRW PRGs were developed using a hazard quotient (HQ) of 0.1 or risk of $1x10^{-6}$. The more conservative of the two values were used for the PRG. Comparison to human health risk screening levels based on $1x10^{-6}$ risk is consistent with the Colorado Department of Public Health and the Environment (CDPHE) guidance on Resource Conservation and Recovery Act (RCRA) corrective action.

[3] Pursuant to the 1991 Interagency Agreement (IAG), RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plans and SAPs were prepared for 16 Operable Units (OUs) that existed at that time (1991-1996). Between 1996 and 2000, SAPs were prepared for Individual Hazardous Substance Sites (IHSSs) or groups of IHSSs in close geographic proximity. In 2000, two SAPs were developed: the Industrial Area (IA) SAP (IASAP) (DOE 2000a), and the Buffer Zone (BZ) SAP (BZSAP) (DOE 2002). In 2004, the IA and BZ SAPs were combined into one SAP called the "IABZSAP" (DOE 2004b), which was approved by EPA and CDPHE on August 24, 2004.

procedures and analytical methods, data quality requirements, and data management processes, and specified the appropriate data quality objectives (DQOs)[4]. The soil nature and extent evaluations are based on data collected from June 28, 1991,[5] through August 22, 2005. Section 3.2 also discusses historical documented sources of soil contamination to provide a historical perspective of soil characterization at the site.

Surface soil measurements are for soil within the top 6 inches at the time of sampling, and subsurface soil measurements are for soil deeper than 6 inches from the surface at the time of sampling. Subsurface measurements are further sorted by the following depth intervals: 6 inches to 3 feet, 3 to 8 feet, 8 to 12 feet, and greater than 12 feet. These depths are used in relation to the following general considerations:

- Less than or equal to 6 inches – Contamination is accessible to surface users by direct contact or suspension from WRW surface use activities or wind or precipitation erosion.
- Greater than 6 inches and less than or equal to 3 feet – Contamination may be accessible by localized disturbance of small areas related to WRW surface uses, such as post-hole digging or vegetation management, and by burrowing receptors (that is, prairie dogs).
- Greater than 3 feet and less than or equal to 8 feet – Contamination may be accessible by possible deeper disturbances related to WRW surface users, such as localized disturbance of small areas by burrowing receptors (including the top 6 inches to 3 feet).
- Greater than 8 feet and less than or equal to 12 feet – This is below the average depth of excavation by burrowing receptors.[6]
- Greater than 12 feet – Contamination measurements at depth intervals below 12 feet are presented to further show the vertical gradation of soil contamination levels.

3.2 Characterization of Soil Contamination

Soil contamination originated from the industrial uses of hazardous substances, waste management practices, and accidental events at RFETS. Knowledge about the nature and extent of soil contamination is based on documented historical information about sources, location of hazardous substances released to the environment, and on measurement of contamination levels in soil. Figure 3.1 illustrates the location of historical site features (historical IHSSs, PACs and UBCs) that have potentially impacted soil, and have been

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[4] For historical investigations, specific information is available in OU- and IHSS specific Work Plans and SAPs. For accelerated actions, specific information is available in the IABZSAP. CRA sampling investigations were conducted in accordance with the CRA Methodology (DOE 2004a) and the IABZSAP (DOE 2004b).

[5] This date correlates to approved Work Plans and SAPs developed pursuant to the 1991 IAG.

[6] While excavation is unlikely, this depth is generally accepted as within the range of excavation depths for a building basement and is consistent with CDPHE's risk assessment guidance for RCRA corrective action (CDPHE 1994).

dispositioned through RFCA accelerated actions. These locations are a subset of the areas that may have impacted groundwater, as discussed in Section 4.0. See Section 1.0 for details regarding the disposition of these historical source locations known as IHSSs. No other areas had activities that indicated any waste management or industrial activities that would potentially affect subsurface soil or other environmental media. Thus, any contamination from the IA and nearby BZ sources would be evident in surface soil samples (with the exception of volatile organic compounds [VOCs] that would volatilize in surface soil) or from other environmental media.

The U.S. Department of Energy (DOE) began more than 20 years ago to develop the extensive body of documentation about the use of hazardous substances and the known or suspected release of hazardous substances at RFETS. Information was gathered from an extensive review of Rocky Flats operating records and contemporaneous documents. In addition, interviews were conducted of persons with knowledge of Rocky Flats operations and of events that did or were suspected of releasing hazardous substances. As discussed in Section 1.0, the information collected is organized in the Rocky Flats Historical Release Report (HRR), originally published in 1992, which has been periodically updated as investigation and cleanup of the site progressed (DOE 1992).

The original HRR organized these known or suspected sources of contamination as Individual Hazardous Substance Sites (IHSSs), Potential Areas of Concern (PACs), and Under Building Contamination (UBC) sites. Over the course of cleanup under the 1991 Interagency Agreement (IAG) and the 1996 RFCA, DOE has investigated and characterized the soil contamination associated with these IHSSs to disposition them through appropriate remedial actions or by determining that no action is required pursuant to the applicable IAG and/or RFCA requirements.

Site buildings are also dispositioned by removal in accordance with RFCA requirements, regardless of whether a particular building is associated with one or more IHSSs. The building disposition process includes reconnaissance-level characterization, which includes evaluation of historical information and/or sampling and analysis requirements, to determine whether hazardous substances may be present in a building (K-H 2001). If hazardous substances are present at levels that require building removal with a RFCA decision document, the disposition process included additional appropriate characterization and monitoring activities during the removal. Section 1.4, Site Investigations and Cleanup History, summarizes these investigations and remedial action activities to disposition all buildings.

Nearly all IHSSs and buildings were located in the Industrial Area (IA) Operable Unit (OU) (see Site Background, Section 1.0 and Table 1.2 and Table 1.3 for IHSSs included in RFCA designated OUs, Figure 1.2 and Figure 1.3 for IHSSs and PACs in the BZ and IA OUs respectively, and Figure 1.3 for UBC areas in the IA OU.) The notable exceptions were IHSSs resulting from waste management practices in the Buffer Zone (BZ) OU adjacent to the IA where wastes containing hazardous substances were buried (for example, the Present Landfill). Of the few buildings located outside the IA OU, such as site entrance security guard posts, none were used in manufacturing or processing activities.

Historical sources of subsurface soil contamination that remain after accelerated actions include two landfills with closure covers: the Present Landfill and the Original Landfill.

Sampling and analysis of surface and subsurface soil, groundwater, and surface water was extensively used to locate and measure hazardous substance contamination at historical IHSSs and to guide the conduct and completion of remediation activities for contaminated soil.

3.3 Soil Data

3.3.1 Data Source

Soil data used in this nature and extent are extracted from the Soil Water Database (SWD) in accordance with procedures developed to support the CRA (Appendix A, Volume 2, Attachment 2). The data are further processed through a series of data quality filters to ensure usability that supports CRA requirements and DQOs. For nature and extent of soil contamination, the same data quality filters used on soil above 8 feet for purposes of the CRA were also applied to subsurface soil at depths greater than 8 feet for consistency between depth intervals. The CRA also uses the same data source to screen and evaluate analytes for purposes of quantifying human health and ecological risk. Only data identified as "CRA Ready = Yes" were used in this evaluation. The data set used for identification of the AOIs are contained on CD/ROM (Nature and Extent Soils data set) in Attachment 1.

All reported values including U-qualified data (nondetects), are reported. A value of one-half the reported value was used for all U-qualified inorganic and organic data (DOE 2004a). This does not apply to radionuclides, for which all reported values were used (DOE 1991). Analytes detected without an associated WRW PRG were removed from this evaluation. WRW PRGs are not available for certain analytes because there is no available toxicity information. These analytes are presented in Table A3.1 in Attachment 3, on a companion Compact Disc-Read Only Memory (CD/ROM). These analytes are listed and discussed in the uncertainty section of the human health and ecological risk assessments for each exposure unit (EU) in Appendix A. After the data were determined to meet data quality, approximately 820,000 records were used in this evaluation.

The environmental medium classification for the samples used in this section, including the CRA, is as documented during sample collection, that is no attempt has been made to alter the environmental medium classification based on future hydrologic conditions or future land configuration. For example, confirmation samples collected from the floor of excavation areas are designated as surface soil samples. Although the samples are not at the surface after imported clean backfill has been placed in the excavation, the samples are still classified as surface soil samples in the database. Also, some of the soil sampling locations no longer exist as they had at the time of sampling (for example, areas have been remediated). Samples determined to be no longer representative (NLR) have been removed from the nature and extent evaluation and for the CRA.[7] For nature and extent of soil contamination, it is assumed that land surface contouring has not altered the surface and subsurface soil depth profile of the soil samples.

Approximately 7,230 surface soil sampling locations (Figure 3.2); 12,250 subsurface soil sampling locations at depth intervals of 0.5 to 3 feet, 3 to 8 feet, and 8 to 12 feet (Figure 3.3); and 3,640 subsurface soil sampling locations at depth intervals of 12 to 30 feet, 30 to 50 feet and greater than 50 feet (Figure 3.4) have been collected since June 28, 1991 through August 22, 2005.

Various analytical suites have been used in sampling and analysis based on the knowledge of IHSSs and the consultative process with the regulatory agencies. Soil sampling and analysis have included the following suites of analyses from EPA's Target Compound List (TCL) (organics) and Target Analyte List (TAL) (metals and cyanide), which are included in this evaluation: dioxins and furans, explosives, herbicides, metals, pesticides, polychlorinated biphenyls (PCBs) aroclors, radionuclides, semivolatile organic compounds (SVOCs), VOCs, and wet chemistry parameters (ammonia, anions [fluoride, nitrate, and nitrite], and cyanide).

A laboratory qualifier table (Table A3.2) is included in Attachment 3.

3.3.2 Data Adequacy and Data Quality

Soil data quality and data adequacy of the final data set are evaluated in Appendix A, Volume 2, Attachments 2 and 3, respectively. Data used to evaluate the soil nature and extent meet data adequacy and data quality criteria for the CRA. Through RFCA accelerated actions, all sources of contamination have been well characterized in accordance with EPA- and Colorado Department of Public Health and Environment (CDPHE)-approved SAPs. In addition, the distribution of soil data, both spatially and temporally, was assessed to ensure that the nature and extent of contamination is well characterized.

A Data Quality Assessment (DQA) for soil is included in Attachment 2 to this section.

3.3.3 Dioxin Toxicity Equivalence

In lieu of performing a PRG comparison for individual dioxin and furan or congeners, a different framework was used, for comparison of analytical results, which focused on the toxicity of the variable mixtures of dioxin-like compounds.

The polychlorinated dibenzodioxins (CDDs) and polychlorinated dibenzofurans (CDFs) include 75 and 135 individual compounds, respectively. These individual compounds are technically referred to as congeners. Only 7 of the 75 congeners of CDDs are thought to have dioxin-like toxicity; these are ones with chlorine substitutions in at least the 2, 3, 7,

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[7] NLR samples are identified in SWD according to the criteria for data processing in Attachment 4 of Appendix A, Volume 2.

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and 8 positions. Only 10 of the 135 possible congeners of CDFs are thought to have dioxin-like toxicity; these also are ones with substitutions in the 2, 3, 7, and 8 positions. These dioxin-like compounds are frequently found in complex mixtures. For nature and extent purposes (consistent with the CRA), a toxicity equivalency procedure was developed to describe the cumulative toxicity of these mixtures.

This procedure involves assigning individual toxicity equivalency factors (TEFs) to each dioxin-like congener, which estimates the potential health or ecological effects of exposure to a complex mixture of these dioxin-like compounds (DOE 2005a). This procedure estimates the dioxin-like effects of a mixture by assuming dose-additivity and describes the mixture in terms of an equivalent mass of 2,3,7,8-TCDD (Tetrachlorodibenzodioxin) (the most toxic member of the group). The TEF for a congener is a measure of the potency of that congener divided by the potency of 2,3,7,8-TCDD. As a result, 2,3,7,8-TCDD is assigned a TEF of 1.0. All other congeners have lower TEF values ranging from 0.5 to 0.00001. Generally accepted TEF values for the dioxin-like congeners are listed in Table 3.1.

The combined toxicity resulting from a mixture of dioxin-like compounds can be computed using the TEFs and assuming that the toxicities are additive, giving a single 2,3,7,8-TCDD equivalent concentration or total toxic equivalency (TEQ). Calculating the TEQ of a mixture in a sample involves multiplying the concentration of individual congeners by their respective TEF. The sum of the TEQ concentrations for the individual congeners in the mixture is the total TEQ concentration for each sampling location. These values are presented in Table A3.3, which is contained in Attachment 3. The highest concentration for each depth interval is used in the PRG comparison screen discussed in Section 3.4 below.

3.4 Identification of Soil AOIs

Soil AOIs were identified using the screening approach presented on Figure 3.5. This approach is described in the following sections. ("Screening" refers to the process of identifying and focusing evaluations on important areas, contaminants, and conditions at the site.) Knowledge of processes that focuses on historical uses of analytes at the site is used in a weight-of-evidence approach for those analytes detected above background levels. AOIs were selected for both surface soil and subsurface soil.

3.4.1 AOI Screening Step 1 - Background Comparison

The background comparison is used to distinguish between contamination associated with RFETS activities and naturally occurring or other non-RFETS-related background conditions for inorganics and radionuclides. The background data for the site were originally collected under two programs and the data are summarized in two separate reports. Surface soil background data are summarized in the Geochemical Characterization of Background Surface Soils: Background Soils Characterization Program (BSCP), Final Report (DOE 1995). Subsurface soil background data are summarized in the Background Geochemical Characterization Report (DOE 1993). Background data summary statistics, including mean, standard deviation, and mean plus two standard deviations, were calculated in the data description and evaluation portion of Appendix A, Volume 2, Attachment 5. These background data summary tables are also presented, as Table 3.2 and Table 3.3.

The background mean plus two standard deviations is used for comparison in this soil evaluation. This is the same background comparison used in evaluating the need for accelerated actions because this evaluation focuses on performing a point-by-point comparison of the data, where each point is compared to an upper-bound background value. The CRA uses the same background data set; however, it uses statistical comparison tests rather than the mean plus two standard deviations for background screening and compares the sample distributions within a specific Exposure Unit (EU) to the background data sets.

Soil background data are not available for organics; therefore, no background comparison is performed.

In AOI Screening Step 1, an analyte is eliminated as a potential AOI when all sample results within a specified depth interval are less than the background mean plus two standard deviations. Analytes that have sample results within a specified depth interval greater than the background concentration are carried forward to AOI Screening Step 2. For analytes that do not have a background concentration (for example, organic constituents) and are detected above the detection limit, this screening step is not applicable and the analyte proceeds to AOI Screening Step 2.

3.4.2 AOI Screening Step 2 - PRG Comparison

Surface and subsurface soil PRGs were calculated based on different exposure scenarios. For example, subsurface soil PRGs were calculated based on limited exposure of workers to contact subsurface soil at a maximum depth of 8 feet[8] during certain activities (CRA Methodology, Appendix A [DOE 2004a]). For data collected at depths greater than 8 feet, the nature and extent evaluation used the subsurface soil WRW PRGs, calculated based on an exposure scenario to a maximum depth of 8 feet.

AOIs identified in Screening Step 1 are compared against the WRW PRGs. For each analyte where all sample results are below the WRW PRG for surface or subsurface soil as applicable, the analyte is eliminated as an AOI. For analytes that have one or more sample results above the WRW PRG, the analyte is carried forward to AOI Screening Step 3.[9]

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[8] The subsurface soil PRG was used as a means to screen data below 8 feet. If the potential existed for people to be exposed at depths greater than 8 feet, the exposure scenario might be different and the PRGs may also change based on the different scenario.

[9] For arsenic, cesium-137, and radium-228 the PRG values are less than the background values. Therefore, only those concentrations that are greater than both background and the PRG are carried forward to AOI Screening Step 3.

For dioxins and furans, the reported TEQ concentrations for each sampling location (considered the 2,3,7,8-TCDD TEQ) is then compared against the PRG for 2,3,7,8-TCDD.

AOIs identified in Screening Step 2 are plotted on a figure to assess the location and aerial extent. Each figure plots the maximum detected concentration (MDC) and the minimum nondetect value within a specified depth interval. Analytes that have sample results within a specified depth interval greater than the WRW PRG are carried forward to AOI Screening Step 3. The figures for each analyte that passed Screening Step 2 are discussed further in Sections 3.5.2 and 3.5.3.

3.4.3 AOI Screening Step 3 – Process Knowledge/Frequency of Detection Evaluation

AOI Screening Step 3 involves the determination of whether certain analytes should be retained or eliminated as AOIs based on process knowledge and/or frequency of detection greater than the WRW PRG. The process knowledge evaluation takes into account historical RFETS-related manufacturing and operations that may have resulted in release of metal and/or radionuclide analytes. Process knowledge of the historical use of metals and radionuclides at the site, or lack of use, and an understanding of the natural occurrence and distribution of these analytes in the environment, all provide useful information regarding the distribution of an analyte in the environment.

In addition, AOIs that passed the screen but were detected only in a very small percentage of the samples collected (less than 1 percent) may reflect an isolated area of contamination rather than an area of widespread contamination. Metal analytes that are infrequently detected may also indicate localized variability of background analyte concentrations within soil. As a result, those AOIs with a frequency of detection greater than the WRW PRGs of less than 1 percent are eliminated as AOIs, unless the location of the samples are in one contiguous location or if process knowledge indicates that the analyte is associated with RFETS activities (such as Uranium).

Analytes eliminated as soil AOIs based on Screening Step 3 and the rationale for their elimination are summarized in Table 3.4. The Figures (Figures A3.1 through A3.22) for these analytes are included in Attachment 3. Analytes carried forward as AOIs are discussed in Sections 3.4.4 and 3.4.5 below.

3.4.4 Results of Surface Soil AOI Screening

Iron, manganese, cesium-134, cesium-137, and radium-228 were eliminated as AOIs based on process knowledge and antimony, cadmium, uranium (total), benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, pentachlorophenol, and tetrachloroethene were eliminated as AOIs based on a frequency of detection greater than the WRW PRGs of less than 1 percent. Cobalt and mercury were eliminated as AOIs based on both process knowledge and a frequency of detection greater than the WRW PRGs of less than 1 percent.

Surface soil analytes listed in Table 3.5 were screened using this approach to determine the AOIs for surface. Fourteen surface soil AOIs were identified and are presented in

Table 3.6. The specific AOIs include four metals, two PCB Aroclors, one dioxin/furan, two SVOCs, and five radionuclides, as identified below. Each of these AOIs is discussed further in Section 3.5.

Surface Soil AOIs (> WRW PRG)
Metals
Aluminum
Arsenic
Chromium (total)
Vanadium
PCBs
Aroclor-1254
Aroclor-1260
Dioxin/Furan
2,3,7,8-TCDD TEQ
SVOCs
Benzo(a)Pyrene
Dibenz (a,h)anthracene
Radionuclides
Americium-241
Plutonium-239/240
Uranium-233/234
Uranium-235
Uranium-238

For those analytes with concentrations greater than WRW PRGs, a frequency of detection above the WRW PRG is also identified in Table 3.5. The detection frequency refers to the percentage of total samples in which an analyte was detected above the WRW PRG. Green highlighted rows indicate those AOIs with a frequency of detection greater than 0 percent and less than 1 percent above the WRW PRG and, based on process knowledge or the contiguous location of the samples, were retained as AOIs. The yellow highlighted rows indicate those AOIs with a frequency of detection greater than or equal to 1 percent and less than 5 percent above the WRW PRG. Orange highlighted rows indicate those AOIs with a frequency of detection greater than or equal to 5 percent above the WRW PRG.

3.4.5 Results of Subsurface Soil AOI Screening

Radium-228 was eliminated as an AOI based on process knowledge and chromium (total), benzo(a)anthracene, benzo(b)fluoranthene, and dibenz(a,h)anthracene were eliminated as AOIs based on a frequency of detection greater than the WRW PRGs of less than 1 percent. Arsenic was eliminated as an AOI based on both process knowledge and a frequency of detection greater than the WRW PRGs of less than 1 percent.

Subsurface soil analytes listed in Table 3.7, Table 3.9, Table 3.11, Table 3.13, Table 3.15, and Table 3.16 were screened using this approach to determine the AOIs for subsurface soil. Results of the AOI screening process for subsurface soil are presented in Table 3.8, Table 3.10, Table 3.12, and Table 3.14. Subsurface soil data are presented in the

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following depth increments: 0.5 - 3 feet, 3 - 8 feet, 8 -12 feet, 12 - 30 feet, 30 – 50 feet, and greater than 50 feet (with a maximum sample depth of 209 feet). The data were aggregated by these depths and by analyte.

Fourteen subsurface soil AOIs (to a depth of 30 feet) were identified (which vary over depth): two metals, one PCB Aroclor, one SVOC, six VOCs, and four radionuclides, as identified below. Each of these AOIs is discussed further in Section 3.5.

Subsurface Soil AOIs (>WRW PRG)
Metals
Chromium (total)
Lead
PCBs
Aroclor-1260
SVOCs
Benzo(a)Pyrene
VOCs
1,1,2,2-Tetrachloroethane
Carbon tetrachloride
Chloroform
Methylene Chloride
Tetrachloroethene
Trichloroethene
Radionuclides
Americium-241
Plutonium-239/240
Uranium-235
Uranium-238

The surface and subsurface soil AOIs for each depth interval are summarized in Table 3.17 for those analytes with concentrations greater than the WRW PRGs. A frequency of detection above the WRW PRGs has also been identified in Table 3.7 through Table 3.16, and Table 3.17 for each AOI using a color-coding system. The color-coding for these tables is the same as discussed in Section 3.4.4 for surface soil AOIs.

3.5 Nature and Extent of Soil Contamination

This section summarizes the nature and extent of screened AOIs present in surface and subsurface soil and as highlighted in Table 3.6, Table 3.8, Table 3.10, Table 3.12, and Table 3.14. For each of the 14 AOIs in surface soil and the 14 AOIs in subsurface soil, maps were created and are presented on Figure 3.6 through Figure 3.34. The purpose of these figures is to show the sampling locations and relative concentration of AOIs as a means to depict areal extent (that concentrations of contaminants in soil have been delineated to below WRW PRGs, to below background or are not detected) and vertical extent (that concentration of contaminants in soil have been delineated to below WRW PRGs, to below background, are not detected or show decreasing trends). For each figure, the results are separated into four categories, as follows, to provide information relevant to human health screening levels:

- Locations where the constituent was not detected (dark gray);
- Locations where the constituent concentration is greater than the detection limit and less than or equal to background for radionuclides and metals (blue);
- Locations where the constituent concentration is greater than the detection limit (or background) and less than the WRW PRG (green); and
- Locations where the constituent concentration is greater than or equal to the WRW PRG (yellow).[10]

For subsurface soil figures, additional symbols (squares and triangles) have been provided to represent the various depth intervals for each analyte.

The extent of contamination in soil is defined when each AOI concentration is defined to a WRW PRG concentration.

3.5.1 Nature of Soil Contamination

Historically, manufacturing of weapon components at RFETS involved the production of plutonium and uranium parts. During the course of manufacturing these metal products, waste were produced which consisted of lubricating and cleaning compounds and process wastes.

Historically, materials defined as hazardous substances and hazardous constituents have been produced and disposed or released at various locations on-site. The nature of these materials were radionuclides such as plutonium-239/240, uranium-233/234, uranium-235, uranium-238; radioactively contaminated chlorinated solvents such as carbon tetrachloride, tetrachloroethene, 1,1,1-trichloroethane, trichloroethene; and metals such as cadmium, chromium, and lead. Metals and radionuclides have been used as indicator parameters for contamination during historical investigations and RFCA accelerated actions.

For clarification, historical use information is provided for metals.

As discussed in Section 1.0, the IA OU identifies the area of the site with the highest likelihood of residual contamination to be present based on past industrial-type activities and after RFCA accelerated actions.

In this section, chromium (total) concentrations were compared to the more conservative chromium (VI) PRG versus chromium (III), because chromium (VI) is more indicative of material used in on-site processes. However, the chromium (VI) sample results available (collected in areas where process contaminants were expected) were all below the WRW PRG for chromium (VI). Chromium concentrations in soil are strongly related to the parent-rock source. Chromium is essentially immobilized as the reduced cation

[10] For arsenic, cesium-137 and radium-228 the surface soil background mean plus two standard deviations is greater than the WRW PRG. Therefore, locations with concentrations greater than both background and the WRW PRG are yellow.

chromium (III) in most rocks and minerals. Chromium is present almost exclusively as chromium (III) adsorbed to organic matter and iron oxyhydroxide, precipitated as chromium hydroxide, or as a mineral (chromium clay and micas). In soil, organic matter and ferrous iron act as electron donors and readily reduce chromium (VI) to chromium (III) with chromium being sorbed to organic matter and iron oxyhydroxide or precipitating as a hydroxide. As a result, chromium is essentially immobilized as the reduced cation chromium (III) in most rocks, minerals, and soil.

The SVOCs identified as AOIs in soil are halogenated aromatic semivolatile organics (pentachlorophenol) and the others are polynuclear aromatic hydrocarbons (PAHs). PAHs are found in exhaust from motor vehicles and other gasoline and diesel engines; emission from coal-, oil-, and wood-burning stoves and furnaces; cigarette smoke; general soot and smoke of industrial, municipal, and domestic origin; cooked foods, especially charcoal-broiled; incinerators; coke ovens; and asphalt processing and use (EPA 2005).

Soil contamination has been subject to migration processes, such as surface erosion by wind and precipitation, and precipitation to groundwater. Site-specific factors influencing migration of soil contamination are addressed in Section 7.0.

3.5.2 Extent of Surface Soil Contamination

Approximately 7,200 surface soil locations (Figure 3.2) have been sampled and analyzed. Surface soil samples typically consist of three components: randomly chosen locations, targeted locations, and borehole locations. The samples may have been composited from several areas surrounding the designated location, or they may have been discrete samples collected from a single point.

Each of the 14 surface soil AOIs are mapped on Figure 3.6 through Figure 3.19 and are discussed by analyte group below.

Surface Soil AOIs (>WRW PRG)	Percent >WRW PRG
Metals	
Aluminum	4.0
Arsenic	2.7[11]
Chromium (total)	5.6
Vanadium	0.6
PCBs	
Aroclor-1254	2.4
Aroclor-1260	2.0
Dioxin/Furan	
2,3,7,8-TCDD TEQ	4.6
SVOCs	
Benzo(a)Pyrene	15.2
Dibenz(a,h)anthracene	1.6

[11] Only those surface soil results greater than background and the WRW PRG are included in the percent greater than the WRW PRG value.

Surface Soil AOIs (≥ WRW PRG)	Percent ≥ WRW PRG
Radionuclides	
Americium-241	1.1
Plutonium-239/240	5.5
Uranium-233/234	0.1
Uranium-235	0.2
Uranium-238	0.3

Metals

Aluminum

Figure 3.6 shows the extent of aluminum in surface soil. Some aluminum concentrations are greater than background (17.2 percent). Surface soil concentrations of aluminum greater than the WRW PRG are found primarily within the IA OU, with a few locations scattered throughout the BZ OU. The majority of the aluminum results in the BZ OU are below background.

Aluminum was used in metallurgical operations within former Buildings 444, 779, 865, and 883 (DOE 2005b). Aluminum parts were disassembled and recycled or prepared for disposal in former Building 707, and aluminum nitrate was used in an aqueous dissolution process within former Building 771. There are no records of spills associated with aluminum within any of these former buildings. No RFCA accelerated actions were taken for aluminum (DOE 2005b).

Arsenic

Figure 3.7 shows the extent of arsenic in surface soil. Some arsenic concentrations are greater than background (2.7 percent).[12] Arsenic concentrations greater than WRW PRG are located primarily within the IA OU, with a few locations scattered throughout the BZ OU. Arsenic was detected in all locations within the BZ OU, with the majority of the arsenic results below background.

Arsenic was used in very small quantities at the site and was used as laboratory standards in former Buildings 444, 559, 779, and 881 (DOE 2005b). Based on the limited use of arsenic compounds, and because their annual usage rates exceeded inventory quantities, its release to the environment was estimated to be minimal or there would be no release. There is no record of spills involving arsenic within these former buildings. RFCA accelerated actions for arsenic were taken at the following locations: former Building 712/713 cooling towers in which arsenic may have been a component of the rust inhibitors used in the cooling towers; at the historical East Firing Range as a component of lead shot; and at the downspouts to former Building 707, which may have been associated with rat poison used on the roof or the presence of treated lumber also located on the roof.

[12] For arsenic, the surface soil background mean plus two standard deviations is greater than the WRW PRG.

Chromium (total)

Figure 3.8 shows the extent of chromium (total) in surface soil. Some chromium (total) concentrations are greater than background (25.7 percent). Chromium (total) concentrations greater than the WRW PRG are located primarily within the IA OU, with a few locations within the BZ OU. The majority of the sampling locations within the BZ OU contain concentrations below background.

Chromium was used for plating in former Building 444, it was present in anion exchange resins in former Building 371, and chromates were added to the water as a rust inhibitor used in the former Building 712/713 cooling tower (DOE 2005b). Spills involving process waste (containing cadmium, chromium, and lead) occurred within former Buildings 371, 374, and 559. Chromium was used in insignificant quantities, extremely limited in scope and/or duration, and the form of the material was not expected to have significant off-site releases. Emission source maps did not identify buildings or processes in which chromium was used as an emission source. A chromic acid spill occurred in 1989, from the basement of former Building 444, which passed through the sanitary sewer system and reached on-site retention Pond B-3. A RFCA accelerated action for chromium was taken near former Building 551.

Vanadium

Figure 3.9 shows the extent of vanadium in surface soil. Some vanadium concentrations are greater than background (11.6 percent). The soil locations greater than the WRW PRG are located within the IA OU in the area of the former Oil Burn Pit Number 1 (IHSS 300-128) and within the BZ OU in the area of the former Property Utilization and Disposal (PU&D) storage yard (IHSS NE-174).

Exotic materials such as vanadium were used occasionally in plutonium pit construction in former Building 707. Metallurgical operations in former Building 865 used vanadium in the development of alloys. Vanadium was also identified with metalworking in former Building 444. Estimated quantities of vanadium were less than 1 kilogram in inventory. No RFCA accelerated actions were required for vanadium.

PCBs

PCB AOIs identified in surface soil include Aroclors 1254 and 1260. Figure 3.10 and Figure 3.11 shows the extent of both Aroclors 1254 and 1260 in surface soil. The PCB results are located within the IA OU.

Dioxin/Furans

Figure 3.12 shows the extent of 2,3,7,8-TCDD TEQ in surface soil (refer to section 3.3.3 for a discussion regarding TEQ). There is one 2,3,7,8-TCDD TEQ concentration greater than the WRW PRG located in the area of the historical incinerator facility (PAC SW-133.5) within the BZ OU. Confirmation samples collected from the floor of excavation areas (approximately 20 feet below grade) were designated as surface soil samples.

Although the samples are not at the surface after imported clean backfill has been placed in the excavation, the samples are still classified as surface soil samples in the database and the TEQ concentration is based on these samples.

SVOCs

Benzo(a)pyrene

Figure 3.13 shows the extent of benzo(a)pyrene in surface soil. Concentrations greater than the WRW PRG are located primarily within the IA OU, with a few locations in the BZ OU at the Present Landfill (IHSS NE-114) and the Original Landfill (IHSS SW-115). Although the samples at the Present Landfill and the Original Landfill are no longer at the surface after the covers have been placed over the landfills, the samples are still classified as a surface soil samples in the database. A majority of the sample results within the BZ OU did not include benzo(a)pyrene detections.

Dibenz(a,h)anthracene

Figure 3.14 shows the extent of dibenz(a,h)anthracene in surface soil. Concentrations greater than the WRW PRG are primarily located within the IA OU, with a couple of locations in the BZ OU at the Original Landfill (IHSS SW-115). A majority of the sample results within the BZ OU did not detect dibenz(a,h)anthracene.

Radionuclides

Americium-241

Figure 3.15 shows the extent of americium-241 in surface soil. Americium-241 activities greater than the WRW PRG are located in a few areas within the IA OU (former 700 Area), but primarily within the BZ OU, east of the historical 903 Pad (IHSS 900-112). One location near the southwest corner of the former Building 776 (CE45-128) is actually located at least 5 feet below grade. A confirmation sample collected from the floor of an excavation area at the southeast corner of former Building 776 (CE45-128) (approximately 5 feet below grade) was designated as a surface soil sample. Although the sample was not at the surface after imported clean backfill had been placed in the excavation, the sample is still classified as a surface soil sample in the database (DOE 2005c).

Plutonium-239/240

Figure 3.16 shows the extent of plutonium-239/240 in surface soil. Plutonium-239/240 activities greater than the WRW PRG are located in a few areas within the IA OU, but primarily within the BZ OU east of the historical 903 Pad. Confirmation samples collected from the floor of excavation area at the southeast corner of former Building 776 (CE45-128 and CE45-134) (approximately 5 feet below grade) were designated as surface soil samples. Although the samples are not at the surface after imported clean

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backfill has been placed in the excavation, the samples are still classified as surface soil samples in the database (DOE 2005c).

Uranium

Figure 3.17 through Figure 3.19 shows the extent of uranium-233/234, uranium-235, and uranium-238 in surface soil. Uranium activities (uranium-233/234, uranium-235, and uranium-238) greater than the WRW PRGs are located primarily within the IA OU, with a few locations within the BZ OU. There are two uranium-233/234 activities greater than the WRW PRG, one within the IA OU in the area of the historical Solar Evaporation Ponds (IHSS 000-101) and one within the BZ OU in the area of the historical Ash Pits (IHSSs SW-133.1 through 133.4). The uranium-235 activities greater than the WRW PRG are identical to the uranium-233/234 activities with the addition of one location within the BZ OU at the Original Landfill (IHSS SW-115). There are five uranium-238 activities greater than the WRW PRG. Two locations are within the BZ OU in the area of the historical Ash Pits (IHSSs SW-133.1 through 133.4) and in the area of the Original Landfill (IHSS SW-115) (Identical to the locations described for uranium-233/234 and uranium-235). Three locations are within the IA OU at the southwest corner of the former Building 444. Although the sample at the Original Landfill (for both uranium-235 and uranium-238) is not at the surface after a cover has been placed over the landfill, the sample is still classified as a surface soil sample in the database.

Summary of Surface Soil Contamination

Fourteen surface soil AOIs were identified within the IA and BZ OUs. Four of these AOIs (uranium-233/234, uranium-235, uranium-238 and vanadium) were identified as having concentrations or activities in surface soil, with a low frequency of detection (less than 1 percent greater than the WRW PRGs). Seven of the AOIs (aluminum, arsenic, PCB-1254, 2,3,7,8-TCDD TEQ, PCB-1260, dibenz(a,h)anthracene, and americium-241) were identified to have concentrations or activities in surface soil with a frequency of detection less than 5 percent greater than the WRW PRGs. Three of the AOIs (chromium [total], benzo(a)pyrene, and plutonium-239/240) were identified to have concentrations or activities in surface soil with a frequency of detection greater than 5 percent greater than the WRW PRGs. In general, areas of contamination in surface soil were bound by reaching concentrations or activities below the WRW PRG, background or nondetections. All 14 AOIs will be evaluated in Section 7.0.

3.5.3 Extent of Subsurface Soil Contamination

Approximately 13,800 subsurface soil locations (Figure 3.3 and Figure 3.4) have been sampled at RFETS. Subsurface soil samples typically consist of samples composited over some depth interval (for example, 2-foot interval, 4-foot interval, or 6-foot interval), and collected from a single-point borehole location, monitoring well location, or piezometer location. The sample intervals precluded attempts to positively correlate the presence or absence of contamination with specific geologic media. Specifically, a 6-foot composite sample could have included more than one alluvial lithofacies or included vadose zone and saturated materials. Therefore, the contamination distribution discussions in the following sections do not relate contaminant occurrence to geologic or hydrogeologic features, but focus on the lateral and vertical extent of contaminants in both the saturated and unsaturated strata down to bedrock.

Each of the 10 subsurface soil AOIs are mapped on Figure 3.20 through Figure 3.34 and are discussed by depth interval and analyte group below. Each analyte is mapped on two figures: one representing the depth intervals of 0.5 to 3.0 feet, 3.0 to 8.0 feet, and 8.0 to 12 feet; and the other figure representing depth intervals of 12 to 30 feet, 30 to 50 feet, and greater than 50 feet.

3.5.3.1 Subsurface Soil (0.5 to 3.0 feet)

The two AOIs in subsurface soil at a depth of 0.5 to 3.0 feet are listed below.

Subsurface Soil AOIs (>WRW PRG)	Percent > WRW PRG
Metals	
Lead	0.18
SVOCs	
Benzo(a)pyrene	1.0

The depth interval of 0.5 to 3.0 feet is identified on these figures using a round dot for each sampling location.

Metals

Lead

Figure 3.21[13] shows the extent of lead in subsurface soil at depths between 0.5 and 3.0 feet. Some lead concentrations are greater than background (8.5 percent). Some lead concentrations in subsurface soil are greater than the WRW PRG (3 out of 1,686 samples). One of the three lead concentrations greater than the WRW PRG is located within the IA OU in an area north of the former Building 444. Two of the three lead concentrations greater than the WRW PRG are located in the BZ OU in the area historically known as the East Firing Range (IHSS SE-1602, both the North and South Target Areas). None of these locations are co-located with surface soil locations because there were no lead concentrations in surface soil greater than WRW PRGs. Lead concentrations in soil from 0.5 to 3.0 feet were below background in a majority of the locations sampled.

Metallic lead was mainly used for radiation shielding for plutonium operations (former 300 Area, former Building 559 and former 700 Area Buildings); used for non-destructive testing in former Building 460; lead compounds were used in former Building 771 for laboratory-scale alloying and it was used in small quantities in plating operations; it was discharged as bullets at the historical East and North Firing Ranges; and lead gaskets

[13] Since each figure represents three depth intervals and they are alphabetized by analyte groups, Figure 3.20 is for chromium (total) beginning at the depth interval of 3.0-8.0 feet and discussed in Section 3.5.3.2.

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were used in some older pipelines, mainly process waste and sanitary sewer (DOE 2005b). Spills involving process waste (containing cadmium, chromium and lead) did occur within former buildings 371, 374 and 559. Lead was identified to be above the RFCA action level requiring an accelerated action for an underground tank associated with former Building 441, at UBC site 123 and at both the historical East and North Firing Ranges.

SVOCs

Benzo(a)pyrene

Figure 3.22 shows the extent of benzo(a)pyrene (a PAH) in subsurface soil at depths between 0.5 and 3.0 feet. Benzo(a)pyrene concentrations greater than WRW PRGs are located primarily within the IA OU, with one location in the BZ OU in the area of the historical East Trenches area (IHSS NE-111). Within the IA OU, one location is near the historical Oil Burn Pit Number 1 (IHSS 300-128), three locations are at or near former Building 444, and one location is north of former Building 776. Three locations are co-located with three surface soil locations (BY35-008, BX39-008, and CF47-008).

Summary of Subsurface Soil Contamination (0.5 to 3.0 feet)

Two subsurface soil AOIs were identified within the IA and BZ OUs at a depth of 0.5 to 3.0 feet. Lead had concentrations in subsurface soil greater than the WRW PRGs with a frequency of detection of less than 1 percent. Lead was retained as an AOI because two of the three locations were in an area known to contain lead concentrations in soil (historical East Firing Range). Benzo(a)pyrene had concentrations in subsurface soil greater than the WRW PRG with a frequency of detection just slightly above 1 percent (1.03 percent).

In general, AOIs in subsurface soil (0.5 to 3.0 feet) were bound laterally by having concentrations below background, were nondetections, or were below WRW PRG concentrations. In general, AOIs in subsurface soil (0.5 to 3.0 feet) were bound vertically by being below background concentrations, were nondetections, or were below WRW PRG levels. A decreasing trend for benzo(a)pyrene was not apparent until the subsequent depth interval. All of these AOIs will be evaluated in Section 7.0.

3.5.3.2 Subsurface Soil (3.0 to 8.0 feet)

The eight AOIs in subsurface soil at a depth of 3.0 to 8.0 feet are listed below.

Subsurface Soil AOIs (>WRW PRG)	Percent > WRW PRG
Metals	
Chromium (total)	0.3
Lead	0.1
SVOCs	
Benzo(a)pyrene	0.9
VOCs	
Tetrachloroethene	0.2

Subsurface Soil AOIs (>WRW PRG)	Percent > WRW PRG
Radionuclides	
Americium-241	0.3
Plutonium-239/240	1.0
Uranium-235	0.3
Uranium-238	0.3

The depth interval of 3.0 to 8.0 feet is identified on these figures using a square for each sampling location.

Metals

Chromium (total)

Figure 3.20 shows the extent of chromium (total) in subsurface soil at depths between 3.0 and 8.0 feet. Some chromium (total) concentrations are greater than background (3.1 percent). Some chromium (total) concentrations in subsurface soil are greater than the WRW PRG in four separate and distinct locations. Two locations are within the IA OU, with one located south of former Building 444 and one is located north of former Building 776. Two locations are within the BZ OU, with one located in the area of the historical East Trenches (IHSSs NE-110 and 111.1 through 111.8) and one in the area of the historical Ash Pits (IHSSs SW-133.1 through 133.4). None of these locations are co-located with surface or subsurface soil locations above this depth interval greater than WRW PRG. (See Section 3.5.2.1 for a discussion of site process knowledge associated with chromium.)

Lead

Figure 3.21 shows the extent of lead contamination in subsurface soil at depths between 3.0 and 8.0 feet. Some lead concentrations are greater than background (4.1 percent). There is one sample with a lead concentration greater than the WRW PRG within the BZ OU in the area of the historical Ash Pits (IHSS SW-133.1 through 133.4). This location is not co-located with surface or subsurface soil locations above this depth interval. Lead concentrations from 3.0 to 8.0 feet were below background in a majority of the locations within the BZ OU and within the IA OU. (See Section 3.5.3.1 for a discussion of the site process knowledge associated with lead.)

SVOCs

Benzo(a)pyrene

Figure 3.22 shows the extent of benzo(a)pyrene in subsurface soil at depths between 3.0 and 8.0 feet. Some benzo(a)pyrene concentrations in subsurface soil are greater than the WRW PRG (5 locations). Benzo(a)pyrene concentrations are located within the IA OU and BZ OU. Three of the locations are within the BZ OU in an area historically known as the East Trenches (IHSSs NE-110 and 111.1 through 111.8). None of these locations are co-located with surface or subsurface soil locations above this depth interval greater than WRW PRG.

VOCs

Tetrachloroethene

Figure 3.23 shows the extent of tetrachloroethene in subsurface soil at depths between 3.0 and 8.0 feet. The concentrations of tetrachloroethene greater than the WRW PRG (four locations) are located within the IA OU in an area known as the historical Oil Burn Pit Number 2 (IHSS 900-153) (three locations) and south of former Building 991 (one location). None of these locations are co-located with surface or subsurface soil locations above this depth interval greater than WRW PRG.

Radionuclides

Americium-241

Figure 3.24 shows the extent of americium-241 in subsurface soil at depths between 3.0 and 8.0 feet. The activities of americium-241 greater than the WRW PRG (3 locations) are located within the BZ OU in an area known as the East Trenches (IHSSs NE-110 and 111.1 through 111.8). None of these locations are co-located with surface or subsurface soil locations above this depth interval greater than WRW PRGs.

Plutonium-239/240

Figure 3.25 shows the extent of plutonium-239/240 in subsurface soil at depths between 3.0 and 8.0 feet. The activities of plutonium-239/240 greater than the WRW PRG are located within the BZ OU east of the historical areas of the 903 Pad (IHSS 900-112) and East Trenches (IHSSs NE-110 and 111.1 through 111.8), and within the IA OU in the former 700 Area. None of these locations are co-located with surface or subsurface soil locations above this depth interval greater than WRW PRG.

Uranium

Figure 3.26 and Figure 3.27 shows the extent of uranium-235 and uranium-238 in subsurface soil at depths between 3.0 and 8.0 feet. There are three locations with activities greater than the WRW PRG, which are located within the BZ OU in the area of the historical Ash Pits (IHSSs SW-133.1 through 133.4). Two locations include both uranium-235 and the uranium-238 activities greater than the WRW PRGs (55994 and 56393). None of the uranium-235 and uranium-238 locations are co-located with surface soil locations greater than WRW PRGs.

Summary of Subsurface Soil Contamination (3.0 to 8.0 feet)

Eight subsurface soil AOIs were identified within the IA and BZ OUs at a depth interval of 3.0 to 8.0 feet. Seven of these AOIs were identified as having concentrations in subsurface soil greater than the WRW PRGs with a frequency of detection of less than 1 percent. These seven analytes were retained as AOIs based on knowledge of the usage of these analytes used in site processes and/or the analytes were detected in areas of historical releases. One AOI (plutonium-239/240) was identified as having a concentration in subsurface soil greater than the WRW PRG with a frequency of detection of slightly greater than 1 percent and less than 5 percent (1.02 percent). All of these AOIs indicate a low potential for widespread contamination with such a low frequency of detection greater than the WRW PRG.

In general, AOIs in subsurface soil (3.0 to 8.0 feet) were bound laterally by having concentrations below background, were nondetections, or were below WRW PRG concentrations. In general, AOIs in subsurface soil (3.0 to 8.0 feet) were bound vertically by being below background concentrations, were nondetections, were below WRW PRG levels or showed decreasing trends. For some AOIs (such as tetrachloroethene), a decreasing trend was not apparent until a subsequent depth interval. All of these AOIs will be evaluated in Section 7.0.

3.5.3.3 Subsurface Soil (8.0 to 12.0 feet)

The six AOIs in subsurface soil at a depth of 8.0 to 12.0 feet are listed below.

Subsurface Soil AOIs (>WRW PRG)	Percent > WRW PRG
Metals	
Chromium (total)	0.2
SVOCs	
Benzo(a) pyrene	1.2
VOCs	
Tetrachloroethene	0.1
Radionuclides	
Plutonium-239/240	0.5
Uranium-235	0.5
Uranium-238	0.5

The depth interval of 8.0 to 12.0 feet is identified on these figures using a triangle for each sampling location.

Metals

<u>Chromium (total)</u>

Figure 3.20 shows the extent of chromium (total) in subsurface soil at depths between 8.0 and 12.0 feet. Some chromium (total) concentrations are greater than background (3.3 percent). There is one sample with a chromium (total) concentration greater than the WRW PRG within the BZ OU in the area of the historical Ash Pits (IHSS SW-133.1 through 133.4). This location is not co-located with surface or subsurface soil locations above this depth interval greater than WRW PRG, however chromium (total) was also detected above the WRW PRG at 3.0 to 8.0 feet and in surface soil within the area of the historical Ash Pits. (See Section 3.5.2.1 for a discussion of the site process knowledge associated with chromium [total].)

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SVOCs

Benzo(a)pyrene

Figure 3.22 shows the extent of benzo(a)pyrene in subsurface soil at depths between 8.0 and 12.0 feet. Benzo(a)pyrene concentrations greater than WRW PRGs are located primarily within the IA OU, with locations within the Original Landfill (SW-115) and in the area of the former 700 Area. One of these concentrations is co-located with a location in the depth interval of 3.0 to 8.0 feet (10395).

VOCs

Tetrachloroethene

Figure 3.23 shows the extent of tetrachloroethene in subsurface soil at depths between 8.0 and 12.0 feet. One concentration of tetrachloroethene is greater than the WRW PRG within the BZ OU in an area known historically as Oil Burn Pit Number 2 (IHSS 900-153). This location is not co-located with a location above this interval in surface or subsurface soil greater than WRW PRG.

Radionuclides

Plutonium-239/240

Figure 3.25 shows the extent of plutonium-239/240 in subsurface soil at depths between 8.0 and 12.0 feet. The activities of plutonium-239/240 greater than the WRW PRG are located within the IA OU in the former 700 Area. One location is co-located with a sample from 3.0 to 8.0 feet (12795), but none above this depth interval in surface or subsurface soil.

Uranium

Figure 3.26 and Figure 3.27 shows the extent of uranium-235 and uranium-238 in subsurface soil at depths between 8.0 and 12.0 feet. Uranium activities in soil greater than WRW PRGs are located within the BZ OU in the area of the historical Ash Pits (IHSS SW-133.1 through 133.4). None of the uranium-235 or uranium-238 locations are co-located with subsurface soil locations above this depth interval, however there are additional activities of uranium in subsurface soil between 3.0 to 8.0 feet at the historical Ash Pits (IHSS SW-133.1 through 133.4). Two locations between 8.0 and 12.0 feet include both the uranium-235 and the uranium-238 activities greater than the WRW PRG (55694 and 56893).

Summary of Subsurface Soil Contamination (8.0 to 12.0 feet)

Six subsurface soil AOIs were identified within the IA and BZ OUs at a depth interval of 8.0 to 12.0 feet. Five of these AOIs have concentrations greater than the WRW PRGs in subsurface soil with a frequency of detection less than 1 percent. One of the AOIs was identified at concentrations in subsurface soil greater than the WRW PRGs with a frequency of detection slightly greater than 1 percent (1.2 percent). With a low frequency of detection all of these AOIs indicate a low potential for widespread contamination at RFETS.

In general, AOIs in subsurface soil (8.0 to 12.0 feet) were bound laterally by having concentrations below background, were nondetections, or were below WRW PRG concentrations. In general, AOIs in subsurface soil (8.0 to 12.0 feet) were bound vertically by being below background concentrations, were nondetections, were below WRW PRG levels or showed decreasing trends. All of these AOIs will be evaluated in Section 7.0.

3.5.3.4 Subsurface Soil (12.0 to 30.0 feet)

The seven AOIs in subsurface soil at a depth of 12.0 to 30.0 feet are listed below.

Subsurface Soil AOIs (>WRW PRG)	Percent > WRW PRG
PCBs	
Aroclor 1260	1.9
VOCs	
1,1,2,2-Tetrachloroethane	0.1
Carbon Tetrachloride	0.7
Chloroform	0.1
Methylene Chloride	0.1
Tetrachloroethene	0.5
Trichloroethene	0.2

The depth interval of 12.0 to 30.0 feet is identified on these figures using a round dot for each sampling location.

PCBs

The PCB AOI identified in subsurface soil is Aroclor-1260. Figure 3.28 shows the extent of Aroclor 1260 in subsurface soil. The elevated concentrations of Aroclor-1260 are from a transformer located at the northeast corner of former Building 776, within the IA OU. None of these locations are co-located with surface or subsurface soil locations greater than the WRW PRG above this depth interval.

VOCs

<u>1,1,2,2-Tetrachloroethane</u>

Figure 3.29 shows the extent of 1,1,2,2-tetrachloroethane in subsurface soil at depths between 12.0 and 30.0 feet. There is one sample with a 1,1,2,2-tetrachloroethane concentration greater than the WRW PRG within the IA OU in the area of the Carbon Tetrachloride Plume (IHSS 700-118.1) (north of former Buildings 776 and 777). This location is not co-located with surface or subsurface soil locations above this depth interval greater than the WRW PRG.

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Carbon Tetrachloride

Figure 3.30 shows the extent of carbon tetrachloride in subsurface soil at depths between 12.0 and 30.0 feet. The concentrations of carbon tetrachloride greater than the WRW PRG are within the IA OU in an area known as the Carbon Tetrachloride Plume (IHSS 700-118.1). There are no concentrations of carbon tetrachloride above this depth interval that are greater than WRW PRG. This location is not co-located with surface and subsurface soil locations above this depth interval.

Chloroform

Figure 3.31 shows the extent of chloroform in subsurface soil at depths between 12.0 and 30.0 feet. There is one chloroform concentration in subsurface soil greater than the WRW PRG within the IA OU in an area known as the Carbon Tetrachloride Plume (IHSS 700-118.1). There are no concentrations of chloroform above this depth interval in surface or subsurface soil greater than the WRW PRG.

Methylene Chloride

Figure 3.32 shows the extent of methylene chloride in subsurface soil at depths between 12.0 and 30.0 feet. There is one methylene chloride concentration in subsurface soil greater than the WRW PRG within the IA OU in an area known as the Carbon Tetrachloride Plume (IHSS 700-118.1). There are no concentrations of methylene chloride above this depth interval in surface or subsurface soil greater than the WRW PRG.

Tetrachloroethene

Figure 3.33 shows the extent of tetrachloroethene in subsurface soil at depths between 12.0 and 30.0 feet. The concentrations of tetrachloroethene greater than the WRW PRG are located within the IA OU in areas historically known as the Mound Site (IHSS 900-113), Oil Burn Pit Number 2 (IHSS 900-153), Oil Burn Pit Number 1 (IHSS 300-128) and Carbon Tetrachloride Plume (IHSS 700-118.1). None of these locations are co-located with surface or subsurface soil above this depth interval greater than WRW PRGs.

Trichloroethene

Figure 3.34 shows the extent of trichloroethene in subsurface soil at depths between 12.0 and 30.0 feet. The concentration of trichloroethene greater than the WRW PRG are located within the IA OU in an area historically known as the Oil Burn Pit Number 2 (900-153) and in the BZ OU in an area historically known as the East Trenches (IHSSs NE-110 and 111.1 through 111.8). This location is not co-located with locations above this depth interval.

Summary of Subsurface Soil Contamination (12.0 to 30.0 feet)

Seven subsurface soil AOIs were identified within the IA and BZ OUs at a depth interval of 12.0 to 30.0 feet. Six of these AOIs have concentrations in subsurface soil greater than the WRW PRGs with a frequency of detection less than 1 percent. One of the AOIs (Aroclor-1260) was identified to have concentrations in subsurface soil greater than the WRW PRGs with a frequency of detection of less than 5 percent (1.8 percent). With a low frequency of detection all of these AOIs indicate a low potential for widespread contamination at RFETS.

In general, AOIs in subsurface soil (12.0 to 30.0 feet) were bound laterally by having concentrations below background, were nondetections, or were below WRW PRG concentrations. In general, AOIs in subsurface soil (12.0 to 30.0 feet) were bound vertically by being below background concentrations, were nondetections, were below WRW PRG levels or showed decreasing trends. For one AOI (trichloroethene), a decreasing trend was not apparent until a subsequent depth interval. All of these AOIs will be evaluated in Section 7.0.

3.5.3.5 Subsurface Soil (30.0 to 50.0 feet)

No AOIs were identified in subsurface soil at a depth of 30.0 to 50.0 feet.

3.5.3.6 Subsurface Soil (Greater than 50.0 feet)

No AOIs were identified in subsurface soil at a depth of greater than 50.0 feet (to a maximum depth of 209 feet).

3.6 References

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Table 3.1
TEFs for Dioxins/Furans

Analyte	TEF[a]
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	0.01
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	0.01
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.1
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(HxCDD)	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran(HxCDF)	0.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	1.0
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	0.05
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.1
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.5
2,3,7,8-Tetrachlorodibenzodioxin (TCDD)	1.0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.1
Octachlorodibenzo-p-dioxin (OCDD)	0.0001
Octachlorodibenzofuran (OCDF)	0.0001
Heptachlorodibenzofuran[b]	0.01
Heptachlorodibenzo-p-dioxin[b]	0.01
Hexachlorodibenzofuran[b]	0.1
Hexachlorodibenzo-p-dioxin[b]	0.1
Pentachlorodibenzofuran[b]	0.5
Pentachlorodibenzo-p-dioxin[b]	1.0
Tetrachlorodibenzo-p-dioxin[b]	1.0

[a]TEFs are from Table 1.9 of the Risk Assessment for the Upper Woman Drainage Exposure Unit, Appendix A, Volume 10, July 2005.
[b]For results listed as a group of congeners or as a generic dioxin/furan, the highest TEF within the series was assigned.

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Table 3.2
Sitewide Surface Soil Background Data Summary

Analyte	Unit	Number of Samples	Number of Detects	Percent Detected	Maximum Concentration Detected	Minimum Concentration Detected	Mean Concentration	Standard Deviation	Mean +2StDev
Aluminum	mg/kg	20	20	100%	17,100	4,050	10,203	3,256	16,715
Americium-241	pCi/g	50	50	100%	0.025	1.00E-03	0.010	0.006	0.022
Ammonia	mg/kg	20	13	65%	7.00	1.00	2.03	1.90	5.83
Antimony	mg/kg	20	0	0	N/A	N/A	0.279[a]	0.078	0.436
Arsenic	mg/kg	20	20	100%	9.60	2.30	6.09	2.00	10.1
Barium	mg/kg	20	20	100%	134	45.7	102	19.4	141
Beryllium	mg/kg	20	20	100%	0.900	0.240	0.660	0.152	0.964
Cadmium	mg/kg	20	13	65%	2.30	0.670	0.708	0.455	1.62
Calcium	mg/kg	20	20	100%	4,550	1,450	2,965	750	4,464
Cesium	mg/kg	20	0	0	N/A	N/A	6.54[a]	0.224	6.99
Cesium-134	pCi/g	70	70	100%	0.300	0.050	0.148	0.059	0.266
Cesium-137	pCi/g	70	70	100%	1.80	0.070	0.911	0.391	1.69
Chromium	mg/kg	20	20	100%	16.9	5.50	11.2	2.78	16.8
Cobalt	mg/kg	20	20	100%	11.2	3.40	7.27	1.79	10.9
Copper	mg/kg	20	20	100%	16.0	5.20	13.0	2.58	18.1
Iron	mg/kg	20	20	100%	16,100	7,390	12,409	2,596	17,601
Lead	mg/kg	20	20	100%	53.3	8.60	33.5	10.5	54.6
Lithium	mg/kg	20	20	100%	11.6	4.80	7.66	1.89	11.4
Magnesium	mg/kg	20	20	100%	2,800	1,310	1,909	463	2,834
Manganese	mg/kg	20	20	100%	357	129	237	63.9	365
Mercury	mg/kg	20	8	40%	0.120	0.090	0.072	0.031	0.133
Molybdenum	mg/kg	20	0	0	N/A	N/A	0.573[a]	0.184	0.941
Nickel	mg/kg	20	20	100%	14.0	3.80	9.60	2.59	14.8
Nitrate	mg/kg	20	20	100%	7.00	2.00	4.00	1.69	7.37
Plutonium-239/240	pCi/g	50	50	100%	0.350	0.017	0.045	0.047	0.066/0.138[b]
Potassium	mg/kg	20	20	100%	2,830	1,110	2,055	449	2,952
Radium-226	pCi/g	20	20	100%	0.870	0.100	0.620	0.156	0.932
Radium-228	pCi/g	20	20	100%	2.30	0.200	1.35	0.480	2.31
Selenium	mg/kg	20	12	60%	1.40	0.680	0.628	0.305	1.24
Silica	mg/kg	20	20	100%	1,650	934	1,385	178	1,741
Silver	mg/kg	20	0	0	N/A	N/A	0.207[a]	0.007	0.221
Sodium	mg/kg	20	20	100%	105	43.8	63.6	15.7	95.0

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Table 3.2
Sitewide Surface Soil Background Data Summary

Analyte	Unit	Number of Samples	Number of Detects	Percent Detected	Maximum Concentration Detected	Minimum Concentration Detected	Mean Concentration	Standard Deviation	Mean +2StDev
Strontium	mg/kg	20	20	100%	45.2	9.60	28.4	10.2	48.8
Strontium-89/90	pCi/g	50	50	100%	0.610	0.063	0.251	0.128	0.508
Thallium	mg/kg	14	0	0	N/A	N/A	0.414[a]	0.015	0.443
Tin	mg/kg	20	0	0	N/A	N/A	2.06[a]	0.410	2.88
Uranium-233/234	pCi/g	20	20	100%	3.10	0.660	1.10	0.578	2.25
Uranium-235	pCi/g	20	20	100%	0.110	0.033	0.054	0.020	0.095
Uranium-238	pCi/g	20	20	100%	2.60	0.740	1.09	0.456	2.00
Vanadium	mg/kg	20	20	100%	45.8	10.8	27.7	7.68	43.1
Zinc	mg/kg	20	20	100%	75.9	21.1	49.8	12.2	74.2

[a] The mean concentration is based on one-half the detection limit.

[b] The plutonium-239/240 calculated background mean + 2StDev. is 0.138 pCi/g. However, for the purpose of the nature and extent of soil contamination, it is agreed to continue using the approved 1995 DOE Geochemical Characterization Report plutonium-239/240 background mean plus two standard deviation of 0.066 pCi/g.

N/A = not applicable

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Table 3.3
Sitewide Subsurface Soil Background Data Summary

Analyte	Unit	Number of Samples	Number of Detects	Percent Detected	Maximum Concentration Detected	Minimum Concentration Detected	Mean Concentration	Standard Deviation	Mean +2StDev
Aluminum	mg/kg	44	44	100%	40,700	4,300	14,160	8,116	30,392
Americium-241	pCi/g	13	13	100%	0.010	-0.010	-0.002	0.006	0.010
Antimony	mg/kg	28	2	7%	8.20	2.90	4.21	2.78	9.78
Arsenic	mg/kg	45	42	93%	41.8	1.70	5.48	6.02	17.5
Barium	mg/kg	45	40	89%	491	36.8	114	88.6	291
Beryllium	mg/kg	45	43	96%	22.4	1.00	5.76	5.01	15.8
Cadmium	mg/kg	37	2	5%	1.50	1.40	0.569	0.254	1.08
Calcium	mg/kg	45	45	100%	157,000	1,130	10,426	23,141	56,708
Cesium	mg/kg	43	1	2%	274	274	118	27.2	172
Cesium-137	pCi/g	45	45	100%	0.200	0.00E+00	0.027	0.058	0.143
Chromium	mg/kg	45	45	100%	69.6	5.80	18.4	11.9	42.2
Cobalt	mg/kg	45	12	27%	20.5	4.50	5.99	4.71	15.4
Copper	mg/kg	45	43	96%	31.6	2.20	11.6	6.09	23.8
Gross Alpha	pCi/g	45	45	100%	46.0	3.00	26.2	8.95	44.1
Gross Beta	pCi/g	45	45	100%	41.0	6.00	24.0	7.00	38.0
Iron	mg/kg	45	45	100%	35,900	5,750	15,046	6,707	28,459
Lead	mg/kg	45	45	100%	25.8	4.20	13.9	6.31	26.5
Lithium	mg/kg	45	25	56%	31.3	3.30	9.83	5.32	20.5
Magnesium	mg/kg	45	42	93%	5,580	1,290	2,803	1,362	5,526
Manganese	mg/kg	45	45	100%	747	16.0	171	158	487
Mercury	mg/kg	41	12	29%	0.640	0.190	0.155	0.166	0.488
Molybdenum	mg/kg	45	30	67%	41.0	3.50	13.5	7.80	29.1
Nickel	mg/kg	44	44	100%	54.2	4.30	20.9	11.1	43.0
Nitrate	mg/kg	44	27	61%	7.08	1.10	1.57	1.38	4.33
Plutonium-239/240	pCi/g	45	45	100%	0.030	-0.002	0.006	0.008	0.022
Potassium	mg/kg	44	29	66%	3,830	698	1,351	938	3,227
Radium-226	pCi/g	31	31	100%	1.30	0.400	0.784	0.279	1.34
Radium-228	pCi/g	31	31	100%	2.10	1.00	1.45	0.320	2.09
Selenium	mg/kg	38	0	0	N/A	N/A	0.592[a]	0.543	1.68
Silver	mg/kg	37	18	49%	40.9	1.50	6.39	10.1	26.6
Sodium	mg/kg	45	10	22%	3,680	194	349	551	1,450
Strontium	mg/kg	45	27	60%	226	25.1	50.3	42.6	136
Strontium-89/90	pCi/g	45	45	100%	0.800	-0.600	-0.038	0.304	0.570
Sulfide	mg/kg	41	16	39%	7.20	2.00	2.20	1.48	5.16
Thallium	mg/kg	35	2	6%	0.400	0.220	0.476	0.472	1.42

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Table 3.3
Sitewide Subsurface Soil Background Data Summary

Analyte	Unit	Number of Samples	Number of Detects	Percent Detected	Maximum Concentration Detected	Minimum Concentration Detected	Mean Concentration	Standard Deviation	Mean +2StDev
Tin	mg/kg	41	15	37%	441	25.7	86.0	134	354
Uranium-233/234	pCi/g	45	45	100%	3.40	0.200	0.829	0.625	2.08
Uranium-235	pCi/g	45	45	100%	0.300	0.00E+00	0.036	0.063	0.162
Uranium-238	pCi/g	45	45	100%	3.20	0.200	0.792	0.491	1.77
Vanadium	mg/kg	45	44	98%	70.0	11.4	33.8	14.8	63.3
Zinc	mg/kg	44	44	100%	79.8	0.520	36.2	21.0	78.3

[a]The mean concentration is based on one-half the detection limit.
N/A = not applicable

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Table 3.4
Screen 3 Evaluation Summary

Analyte	Basis	Details for Eliminating as a Soil AOI
Surface Soil		
Metals		
Antimony	Less than 1 percent frequency of detection greater than WRW PRG.	Only two isolated sampling locations had concentrations greater than the WRW PRG and they were in two separate locations (out of 2,482 samples). (See Figure A3.1 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Cadmium	Less than 1 percent frequency of detection greater than WRW PRG.	Only one isolated sampling location had a concentration greater than the WRW PRG (out of 2,603 samples). This one location (CK46-DR07) is in the area of the historical solar evaporation ponds (IHSS 000-101). This sample location was identified as an in process sample and is located above the confirmation samples that were collected (DOE 2003). This sample should be identified as no longer representative (NLR), consistent with sample locations CK46-DR06, DR08, DR09, and DR10. (See Figure A3.2 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Cobalt	Process Knowledge and less than 1 percent frequency of detection greater than WRW PRG.	A review of possible contaminants of concern at RFETS did not identify any buildings where cobalt was reported used in any processes and showed only small quantities of cobalt in inventory with the exception of cobalt oxide reported in 1974 at 677 kilograms (DOE 2005b). In 1988 the inventory was reported as less than 1 kilogram. Based on limited quantities, cobalt's release to the environment was estimated to be minimal or there would be no release. While there is extensive process information related to uses of many chemicals on site, there is no reported process information regarding the use of cobalt, indicating there was no specific or widespread use of cobalt. There are no records of spills involving cobalt within buildings onsite, based on a review of RLCRs and PDSRs. The IABZSAP (DOE 2004b) also does not identify any under building contamination areas that required a RFCA accelerated action. No cobalt soil contamination has been identified in Data Summary or Closeout Reports that required a RFCA accelerated action. Cobalt was detected at a concentration greater than the WRW PRG in one location within the IA OU (frequency of detection greater than the WRW PRG is 0.04 percent or 1 out of 2,622 samples). Cobalt also occurs naturally in the environment in air, water, soil, rocks, plants and animals. (See Figure A3.3 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Iron	Process Knowledge	Iron was not used in the manufacturing or production processes at RFETS (DOE 2005b). Certain components used within the manufacturing processes may have contained iron, such as graphite crucibles (Buildings 444, 445, 450, and 455). These buildings involved radiological operations and included extensive HEPA filtration systems. A review of

Table 3.4
Screen 3 Evaluation Summary

Analyte	Basis	Details for Eliminating as a Soil AOI
		possible contaminants of concern at RFETS did not identify iron as a metal or any chemical compound used at RFETS. Iron was not identified above a RFCA AL requiring an accelerated action based on SAPs, SAP Addenda, Data Summary, or Closeout Reports for IHSSs. The frequency of iron detection greater than the WRW PRG is 0.7 percent (18 out of 2,622 samples). Locations are both within the IA and BZ OUs. Iron is also a ubiquitous naturally occurring constituent in soil. (See Figure A3.4 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Manganese	Process Knowledge	A review of possible contaminants of concern at RFETS did not identify any buildings where manganese was reported used in any processes and showed only small quantities of manganese in inventory with the exception of manganous sulfate reported in 1974 at 2,560 kilograms (DOE 2005b). In 1988 the inventory was reported as 0.8 kilogram. Based on the limited use of manganese, its release into the environment was estimated to be minimal or there would be no release. While there is extensive process information related to uses of many chemicals on site, there is no reported process information regarding the use of manganese, indicating there was no specific or widespread use of manganese. The IABZSAP (DOE 2004b) also does not identify any UBC areas that required a RFCA accelerated action. No manganese soil contamination has been identified in Data Summary or Closeout Reports that required a RFCA accelerated action. The frequency of manganese detection greater than the WRW PRG is 7 percent (183 out of 2,617 samples). Manganese is also a ubiquitous naturally occurring constituent in soil. (See Figure A3.5 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Mercury	Process Knowledge and less than 1 percent frequency of detection greater than WRW PRG.	Mercury was not used in the manufacturing or production processes at RFETS (DOE 2005b). Mercury was found in instruments such as barometers, manometers, thermometers, plant machinery, mercury switches, and experimental apparatus. Mercury was collected from Plant sources and purified by distillation in Building 881. Mercury has not been found associated with UBC sites except the Building 443 subfloor piping (it did not occur outside the pipes) and a report of a broken mercury gauge in the Building 447 steam plant. Mercury was identified as a spill within Building 774; however, it was not identified as a contaminant of concern for this building because it was expected that this spill was properly remediated. Based on the limit use of mercury, its release to the environment was estimated to be minimal or there would be no release. Mercury was not identified above a RFCA AL requiring an accelerated action based on SAPs, SAP Addenda, Data Summary, or Closeout Reports for IHSSs. Mercury was detected at concentrations greater than the WRW PRG in

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Table 3.4
Screen 3 Evaluation Summary

Analyte	Basis	Details for Eliminating as a Soil AOI
		one location within the IA OU (frequency of detection greater than the WRW PRG is 0.04 percent or 1 out of 2,541 samples). Mercury occurs in trace amounts in crustal rocks, but is highly enriched in shales (DOE 1995). (See Figure A3.6 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Uranium (total)	Less than 1 percent frequency of detection greater than WRW PRG.	Only one isolated sampling location had a concentration greater than the WRW PRG (out of 1,296 samples). (See Figure A3.7 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
SVOCs		
Benzo(a)anthracene	Less than 1 percent frequency of detection greater than WRW PRG.	Four isolated sampling locations had concentrations greater than the WRW PRG and they were in separate locations (out of 1,226 samples). Two of these locations are within the Original Landfill and these locations are now are under a landfill cover and are no longer on the surface. (See Figure A3.8 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Benzo(b)fluoranthene	Less than 1 percent frequency of detection greater than WRW PRG.	Six isolated sampling locations had concentrations greater than the WRW PRG and they were in separate locations (out of 1,231 samples). Two of these locations are within the Original Landfill and these locations are now under a landfill cover and are no longer on the surface. (See Figure A3.9 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Indeno(1,2,3-cd)pyrene	Less than 1 percent frequency of detection greater than WRW PRG.	Only one isolated sampling location had a concentration greater than the WRW PRG (out of 1,220 samples). (See Figure A3.10 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Pentachlorophenol	Less than 1 percent frequency of detection greater than WRW PRG.	Only one isolated sampling location had a concentration greater than the WRW PRG (out of 1,180 samples). (See Figure A3.11 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
VOCs		
Tetrachloroethene	Less than 1 percent frequency of detection greater than WRW PRG.	Only one isolated sampling locations had concentrations greater than the WRW PRG (out of 633 samples). (See Figure A3.12 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Radionuclides		
Cesium-137	Process Knowledge	A review of possible contaminants of concern at RFETS identified cesium-137 as a radionuclide used for research, analytical, and calibration activities (for example, sealed and plated sources) (DOE 2005b). Based on limited quantities, cesium-137 release to the

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Table 3.4
Screen 3 Evaluation Summary

Analyte	Basis	Details for Eliminating as a Soil AOI
		environment was estimated to be minimal or there would be no release. The detection of cesium-137 (along with other radionuclides) in environmental samples from 1970 through 1981 was consistent with the presence of fission products from worldwide fallout and the levels were typical of other sites sampled in the western United States. The Background Soils Characterization Program conducted in the early 1990's stated that cesium-134, cesium-137 and strontium-89+90 were not windborne contaminants from RFETS (DOE 1995). In addition, the Citizen's Environmental Sampling Committee (CESC) conducted an off-site soil sampling study in 1993 and 1994. Background levels of cesium-137 were detected in some soil samples; however, this report concluded that "no evidence has been found to suggest that cesium-137 or strontium-90 were released during the operational period of the Rocky Flats Plant". (CESC 1996) Cesium-137 has a half life of 30.0 years. The background value for cesium-137 (1.7 pCi/g) is greater than the WRW PRG (0.2 pCi/g). The frequency of detection greater than the WRW PRG and background for cesium-137 is 3.6 percent (13 out of 360 samples). Cesium-137 is distributed in regional soils as a result of fallout from nuclear-weapons explosions (DOE 1995). In a September 2005 report summarizing the June 2005 aerial radiological survey of the site, the report concluded that the observed cesium-137 soil activity levels within the site were consistent with known worldwide fallout levels that have been measured throughout the United States and there was no indication that any of the cesium-137 deposition detected was due to past RFETS operations (DOE 2005d). (See Figure A3.14 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Radium-228	Process Knowledge	Radium-228 was not identified as a radionuclide used at the Rocky Flats Plant (DOE 2005b). Radium-228 is in the thorium-232 decay chain and thorium-232 was used in metals fabrication in Building 881. Thorium-232 has not been a significant component of airborne effluent from the Rocky Flats Plant and it was not used in significant quantities relative to other production radionuclides. Thorium operations were insignificant relative to the primary production activities and little data exist to support the quantification of release. The frequency of detection greater than the WRW PRG is 12.2 percent (21 out of 172 samples). Radium-228 occurs naturally in soil due to the radioactive decay of thorium-232 (DOE 1995). The half-life of radium-228 is approximately 6.7 years (DOE 1995). This rationale is also the basis for eliminating radium-228 as a subsurface soil AOI. (See Figure A3.15 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)

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Table 3.4
Screen 3 Evaluation Summary

Analyte	Basis	Details for Eliminating as a Soil AOI
Subsurface Soil		
Metals		
Arsenic	Process Knowledge and less than 1 percent frequency of detection greater than WRW PRG.	Arsenic was used in very small quantities at the site and was used as laboratory standards in Buildings 444, 559, 779, and 881 (DOE 2005b). Based on the limited use of arsenic compounds, and because their annual usage rates exceeded inventory quantities, its release to the environment was estimated to be minimal or there would be no release. There is no record of spills involving arsenic within these buildings. RFCA accelerated actions for arsenic were taken due to isolated incidences at the following locations: Building 712/713 cooling towers in which arsenic may have been a component of the rust inhibitors used in the cooling towers; at the East Firing Range as a component of lead shot; and at the downspouts to Building 707, which may have been associated with rat poison used on the roof or the presence of treated lumber also located on the roof. A majority of the locations are believed to be associated with variations in background concentrations as identified in data summary and closeout reports. Each location is isolated and does not indicate widespread contamination. (See Figure A3.16 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Chromium (total)	Less than 1 percent frequency of detection greater than WRW PRG.	Only one isolated sampling location within the depth interval of 0.5 to 3.0 feet had a concentration greater than the WRW PRG (out of 1,683 samples). (See Figure A3.17 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.) Only one isolated sampling location within the depth interval of 12 to 30.0 feet had a concentration greater than the WRW PRG (out of 662 samples). (See Figure A3.22 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
SVOCs		
Benzo(a)anthracene	Less than 1 percent frequency of detection greater than WRW PRGs.	Only one isolated sampling location within the depth interval of 8.0 to 12.0 feet had a concentration greater than the WRW PRG (out of 259 samples). (See Figure A3.18 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Benzo(b)fluoranthene	Less than 1 percent frequency of detection greater than WRW PRGs.	Only one isolated sampling location within the depth interval of 8.0 to 12.0 feet had a concentration greater than the WRW PRG (out of 257 samples). (See Figure A3.19 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)
Dibenz(a,h)anthracene	Less than 1 percent frequency of detection greater than WRW PRG.	Only one isolated sampling location within the depth interval of 0.5 to 3.0 feet had a concentration greater than the WRW PRG (out of 584 samples). (See Figure A3.20 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)

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Table 3.4
Screen 3 Evaluation Summary

Analyte	Basis	Details for Eliminating as a Soil AOI
Radionuclides		
Radium-228	Process Knowledge	The rationale presented above for surface soil is also the basis for eliminating radium-228 as a subsurface soil AOI. (See Figures A3.21 and A3.23 on CD ROM [Maps of Nature and Extent of Soil] in Attachment 3.)

Table 3.5
Surface Soil AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Metal	Barium	7440-39-3	mg/kg	2624	2622	99.92%	1500		141	449	17.11%	2,872		0.00%	
Metal	Beryllium	7440-41-7	mg/kg	2623	2142	81.66%	26.8		0.964	393	14.98%	100		0.00%	
Metal	Boron	7440-42-8	mg/kg	1303	1117	85.73%	28				0.00%	9,477		0.00%	
Metal	Chromium VI	18540-29-9	mg/kg	17	1	5.88%	0.85				0.00%	28.4		0.00%	
Metal	Copper	7440-50-8	mg/kg	2621	2575	98.24%	1860		18.1	729	27.81%	4,443		0.00%	
Metal	Lead[b]	7439-92-1	mg/kg	2618	2618	100.00%	814		54.6	158	6.04%	1,000		0.00%	
Metal	Lithium	7439-93-2	mg/kg	2433	2300	94.53%	50		11.4	530	21.78%	2,222		0.00%	
Metal	Molybdenum	7439-98-7	mg/kg	2421	1138	47.01%	19.1		0.941	351	14.50%	555		0.00%	
Metal	Nickel	7440-02-0	mg/kg	2620	2554	97.48%	280		14.8	666	25.42%	2,222		0.00%	
Metal	Selenium	7782-49-2	mg/kg	2590	345	13.32%	2.2		1.24	20	0.77%	555		0.00%	
Metal	Silver	7440-22-4	mg/kg	2589	735	28.39%	364		0.221	552	21.32%	555		0.00%	
Metal	Strontium	7440-24-6	mg/kg	2423	2422	99.96%	413		48.8	409	16.88%	66,652		0.00%	
Metal	Thallium	7440-28-0	mg/kg	2597	366	14.09%	5.8		0.443	245	9.43%	7.78		0.00%	
Metal	Tin	7440-31-5	mg/kg	2423	243	10.03%	161		2.88	141	5.82%	66,652		0.00%	
Metal	Titanium	7440-32-6	mg/kg	1303	1303	100.00%	1730				0.00%	169,568		0.00%	
Metal	Zinc	7440-66-6	mg/kg	2622	2617	99.81%	11900		74.2	496	18.92%	33,326		0.00%	
Wet Chem	Ammonia	7664-41-7	mg/kg	32	25	78.13%	4.81		5.83		0.00%	910,997		0.00%	
Wet Chem	Cyanide	57-12-5	mg/kg	245	6	2.45%	0.29				0.00%	2,222		0.00%	
Wet Chem	Fluoride	16984-48-8	mg/kg	9	9	100.00%	3.61				0.00%	6,665		0.00%	
Wet Chem	Nitrate / Nitrite	ConID 184	mg/kg	450	375	83.33%	765		7.37	111	24.67%	177,739		0.00%	
Wet Chem	Nitrite	ConID 187	mg/kg	11	10	90.91%	2	B			0.00%	11,109		0.00%	
Explosive	HMX	2691-41-0	µg/kg	5	1	20.00%	230	J			0.00%	4.01E+06		0.00%	
Herbicide	2,4,5-T	93-76-5	µg/kg	9	1	11.11%	1.8	J			0.00%	801,440		0.00%	
Herbicide	2,4,5-TP (Silvex)	93-72-1	µg/kg	11	0	0.00%					0.00%	169,369		0.00%	
Herbicide	2,4-D	94-75-7	µg/kg	11	0	0.00%					0.00%	801,435		0.00%	
Herbicide	2,4-DB	94-82-6	µg/kg	9	0	0.00%					0.00%	641,148		0.00%	
Herbicide	4-Nitrophenol	100-02-7	µg/kg	1169	2	0.17%	320	J			0.00%	641,148		0.00%	
Herbicide	Dalapon	75-99-0	µg/kg	9	0	0.00%					0.00%	2.40E+06		0.00%	
Herbicide	Dicamba	1918-00-9	µg/kg	9	5	55.56%	150				0.00%	2.40E+06		0.00%	
Herbicide	Dinoseb	88-85-7	µg/kg	9	0	0.00%					0.00%	80,144		0.00%	
Herbicide	MCPA	94-74-6	µg/kg	9	1	11.11%	1100	J			0.00%	40,072		0.00%	
Herbicide	MCPP	93-65-2	µg/kg	9	0	0.00%					0.00%	80,144		0.00%	
PCB	PCB-1016[c]	12674-11-2	µg/kg	795	6	0.75%	95				0.00%	1,349		0.00%	
PCB	PCB-1221[c]	11104-28-2	µg/kg	845	0	0.00%					0.00%	1,349		0.00%	
PCB	PCB-1232[c]	11141-16-5	µg/kg	845	0	0.00%					0.00%	1,349		0.00%	

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Table 3.5
Surface Soil AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
PCB	PCB-1242[c]	53469-21-9	µg/kg	845	2	0.24%	350				0.00%	1,349		0.00%	
PCB	PCB-1248[c]	12672-29-6	µg/kg	845	6	0.71%	840				0.00%	1,349		0.00%	
Pesticide	4,4'-DDD	72-54-8	µg/kg	468	2	0.43%	10	J			0.00%	15,528		0.00%	
Pesticide	4,4'-DDE	72-55-9	µg/kg	468	7	1.50%	7.2	J			0.00%	10,961		0.00%	
Pesticide	4,4'-DDT	50-29-3	µg/kg	468	4	0.85%	26				0.00%	10,927		0.00%	
Pesticide	Aldrin	309-00-2	µg/kg	468	4	0.85%	17				0.00%	176		0.00%	
Pesticide	alpha-BHC	319-84-6	µg/kg	468	1	0.21%	7.9	J			0.00%	570		0.00%	
Pesticide	alpha-Chlordane	5103-71-9	µg/kg	433	0	0.00%					0.00%	10,261		0.00%	
Pesticide	beta-BHC	319-85-7	µg/kg	467	2	0.43%	11				0.00%	1,995		0.00%	
Pesticide	beta-Chlordane	5103-74-2	µg/kg	411	1	0.24%	2.6	P			0.00%	10,261		0.00%	
Pesticide	Chlordane		µg/kg	34	0	0.00%					0.00%	10,261		0.00%	
Pesticide	Chlorpyriphos	2921-88-2	µg/kg	7	0	0.00%					0.00%	240,431		0.00%	
Pesticide	delta-BHC	319-86-8	µg/kg	468	1	0.21%	23				0.00%	570		0.00%	
Pesticide	Demeton	8065-48-3	µg/kg	7	0	0.00%					0.00%	3,206		0.00%	
Pesticide	Dieldrin	60-57-1	µg/kg	468	11	2.35%	92	P			0.00%	187		0.00%	
Pesticide	Endosulfan I	959-98-8	µg/kg	468	2	0.43%	7.4	J			0.00%	480,861		0.00%	
Pesticide	Endosulfan II	33213-65-9	µg/kg	461	3	0.65%	9.9	J			0.00%	480,861		0.00%	
Pesticide	Endosulfan sulfate	1031-07-8	µg/kg	468	3	0.64%	24				0.00%	480,861		0.00%	
Pesticide	Endrin	72-20-8	µg/kg	468	6	1.28%	17	J			0.00%	24,043		0.00%	
Pesticide	Endrin aldehyde	7421-93-4	µg/kg	66	2	3.03%	9.2	J			0.00%	24,043		0.00%	
Pesticide	Endrin ketone	53494-70-5	µg/kg	437	1	0.23%	36				0.00%	33,326		0.00%	
Pesticide	gamma-BHC (Lindane)	58-89-9	µg/kg	468	1	0.21%	8.3	J			0.00%	2,771		0.00%	
Pesticide	gamma-Chlordane	12789-03-6	µg/kg	23	0	0.00%					0.00%	10,261		0.00%	
Pesticide	Heptachlor	76-44-8	µg/kg	468	0	0.00%					0.00%	665		0.00%	
Pesticide	Heptachlor epoxide	1024-57-3	µg/kg	467	3	0.64%	23				0.00%	329		0.00%	
Pesticide	Hexachlorocyclopentadiene	77-47-4	µg/kg	1208	0	0.00%					0.00%	380,452		0.00%	
Pesticide	Methoxychlor	72-43-5	µg/kg	468	8	1.71%	450				0.00%	400,718		0.00%	
Pesticide	Toxaphene	8001-35-2	µg/kg	468	0	0.00%					0.00%	2,720		0.00%	
SVOC	1,2,4-Trichlorobenzene	120-82-1	µg/kg	1549	5	0.32%	150	J			0.00%	151,360		0.00%	
SVOC	2,4,5-Trichlorophenol	95-95-4	µg/kg	1180	1	0.08%	1100				0.00%	8.01E+06		0.00%	
SVOC	2,4,6-Trichlorophenol	88-06-2	µg/kg	1180	1	0.08%	950				0.00%	272,055		0.00%	
SVOC	2,4,6-Trinitrotoluene	118-96-7	µg/kg	8	1	12.50%	56	J			0.00%	40,072		0.00%	
SVOC	2,4-Dichlorophenol	120-83-2	µg/kg	1180	0	0.00%					0.00%	240,431		0.00%	
SVOC	2,4-Dimethylphenol	105-67-9	µg/kg	1180	3	0.25%	88	J			0.00%	1.60E+06		0.00%	
SVOC	2,4-Dinitrophenol	51-28-5	µg/kg	1173	0	0.00%					0.00%	160,287		0.00%	

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Table 3.5
Surface Soil AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
SVOC	2,4-Dinitrotoluene	121-14-2	µg/kg	1232	0	0.00%					0.00%	160,287		0.00%	
SVOC	2,6-Dinitrotoluene	606-20-2	µg/kg	1232	0	0.00%					0.00%	80,144		0.00%	
SVOC	2-Chloronaphthalene	91-58-7	µg/kg	1227	0	0.00%					0.00%	6.41E+06		0.00%	
SVOC	2-Chlorophenol	95-57-8	µg/kg	1180	0	0.00%					0.00%	555,435		0.00%	
SVOC	2-Methylnaphthalene	91-57-6	µg/kg	1223	85	6.95%	12000				0.00%	320,574		0.00%	
SVOC	2-Methylphenol	95-48-7	µg/kg	1180	0	0.00%					0.00%	4.01E+06		0.00%	
SVOC	2-Nitroaniline	88-74-4	µg/kg	1224	0	0.00%					0.00%	192,137		0.00%	
SVOC	3,3'-Dichlorobenzidine	91-94-1	µg/kg	1190	0	0.00%					0.00%	6,667		0.00%	
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	µg/kg	1176	1	0.09%	390	J			0.00%	8,014		0.00%	
SVOC	4-Chloroaniline	106-47-8	µg/kg	1217	0	0.00%					0.00%	320,574		0.00%	
SVOC	4-Methylphenol	106-44-5	µg/kg	1180	5	0.42%	270	J			0.00%	400,718		0.00%	
SVOC	4-Nitroaniline	100-01-6	µg/kg	1218	4	0.33%	820	J			0.00%	207,917		0.00%	
SVOC	4-Nitrotoluene	99-99-0	µg/kg	5	0	0.00%					0.00%	244,608		0.00%	
SVOC	Acenaphthene	83-32-9	µg/kg	1239	276	22.28%	44000	D			0.00%	4.44E+06		0.00%	
SVOC	Anthracene	120-12-7	µg/kg	1245	315	25.30%	47000	D			0.00%	2.22E+07		0.00%	
SVOC	Benzo(k)fluoranthene	207-08-9	µg/kg	1218	429	35.22%	25000	XD			0.00%	37,927		0.00%	
SVOC	Benzoic Acid	65-85-0	µg/kg	1135	126	11.10%	1100	J			0.00%	3.21E+08		0.00%	
SVOC	Benzyl Alcohol	100-51-6	µg/kg	1114	8	0.72%	2800				0.00%	2.40E+07		0.00%	
SVOC	bis(2-Chloroethyl) ether	111-44-4	µg/kg	1222	0	0.00%					0.00%	3,767		0.00%	
SVOC	bis(2-Chloroisopropyl) ether	108-60-1	µg/kg	1207	0	0.00%					0.00%	59,301		0.00%	
SVOC	bis(2-ethylhexyl)phthalate	117-81-7	µg/kg	1227	365	29.75%	75000				0.00%	213,750		0.00%	
SVOC	Butylbenzylphthalate	85-68-7	µg/kg	1226	120	9.79%	7100				0.00%	1.60E+07		0.00%	
SVOC	Carbazole	86-74-8	µg/kg	39	21	53.85%	700				0.00%	150,001		0.00%	
SVOC	Chrysene	218-01-9	µg/kg	1240	636	51.29%	46000	D			0.00%	379,269		0.00%	
SVOC	Dibenzofuran	132-64-9	µg/kg	1227	134	10.92%	20000	D			0.00%	222,174		0.00%	
SVOC	Diethylphthalate	84-66-2	µg/kg	1224	8	0.65%	420	J			0.00%	6.41E+07		0.00%	
SVOC	Dimethoate	60-51-5	µg/kg	7	0	0.00%					0.00%	16,029		0.00%	
SVOC	Dimethylphthalate	131-11-3	µg/kg	1227	18	1.47%	460	J			0.00%	8.01E+08		0.00%	
SVOC	Di-n-butylphthalate	84-74-2	µg/kg	1227	98	7.99%	10000	E			0.00%	8.01E+06		0.00%	
SVOC	Di-n-octylphthalate	117-84-0	µg/kg	1225	48	3.92%	11000				0.00%	3.21E+06		0.00%	
SVOC	Fluoranthene	206-44-0	µg/kg	1235	720	58.30%	140000	D			0.00%	2.96E+06		0.00%	
SVOC	Fluorene	86-73-7	µg/kg	1244	234	18.81%	39000	D			0.00%	3.21E+06		0.00%	
SVOC	Hexachlorobenzene	118-74-1	µg/kg	1224	4	0.33%	380	J			0.00%	1,870		0.00%	
SVOC	Hexachlorobutadiene	87-68-3	µg/kg	1550	1	0.06%	2.2	J			0.00%	22,217		0.00%	
SVOC	Isophorone	78-59-1	µg/kg	1227	6	0.49%	850				0.00%	3.16E+06		0.00%	

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Table 3.5
Surface Soil AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
SVOC	Naphthalene	91-20-3	µg/kg	1567	221	14.10%	41000	D			0.00%	1.40E+06		0.00%	
SVOC	Nitrobenzene	98-95-3	µg/kg	1218	0	0.00%					0.00%	43,246		0.00%	
SVOC	N-Nitroso-di-n-propylamine	621-64-7	µg/kg	1222	1	0.08%	400				0.00%	429		0.00%	
SVOC	N-nitrosodiphenylamine	86-30-6	µg/kg	1227	0	0.00%					0.00%	612,250		0.00%	
SVOC	Parathion	56-38-2	µg/kg	7	0	0.00%					0.00%	480,861		0.00%	
SVOC	Phenol	108-95-2	µg/kg	1180	5	0.42%	130	J			0.00%	2.40E+07		0.00%	
SVOC	Pyrene	129-00-0	µg/kg	1242	711	57.25%	120000	D			0.00%	2.22E+06		0.00%	
SVOC	Tetraethyl dithiopyrophosphate	3689-24-5	µg/kg	7	0	0.00%					0.00%	40,070		0.00%	
VOC	1,1,1,2-Tetrachloroethane	630-20-6	µg/kg	517	0	0.00%					0.00%	91,018		0.00%	
VOC	1,1,1-Trichloroethane	71-55-6	µg/kg	633	10	1.58%	47.7				0.00%	9.18E+06		0.00%	
VOC	1,1,2,2-Tetrachloroethane	79-34-5	µg/kg	632	1	0.16%	1.39	JB			0.00%	10,483		0.00%	
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	µg/kg	517	1	0.19%	1.83	J			0.00%	2.38E+09		0.00%	
VOC	1,1,2-Trichloroethane	79-00-5	µg/kg	633	0	0.00%					0.00%	28,022		0.00%	
VOC	1,1-Dichloroethane	75-34-3	µg/kg	633	0	0.00%					0.00%	2.72E+06		0.00%	
VOC	1,1-Dichloroethene	75-35-4	µg/kg	633	1	0.16%	7.9				0.00%	17,366		0.00%	
VOC	1,2,3-Trichloropropane	96-18-4	µg/kg	517	1	0.19%	1.47	JB			0.00%	2,079		0.00%	
VOC	1,2,4-Trimethylbenzene	95-63-6	µg/kg	515	46	8.93%	1300	E			0.00%	132,620		0.00%	
VOC	1,2-Dibromo-3-chloropropane	96-12-8	µg/kg	516	0	0.00%					0.00%	2,968		0.00%	
VOC	1,2-Dibromoethane	106-93-4	µg/kg	517	0	0.00%					0.00%	35.1		0.00%	
VOC	1,2-Dichlorobenzene	95-50-1	µg/kg	1329	0	0.00%					0.00%	2.89E+06		0.00%	
VOC	1,2-Dichloroethane	107-06-2	µg/kg	629	0	0.00%					0.00%	13,270		0.00%	
VOC	1,2-Dichloroethene	540-59-0	µg/kg	101	1	0.99%	16				0.00%	999,783		0.00%	
VOC	1,2-Dichloropropane	78-87-5	µg/kg	633	2	0.32%	140				0.00%	38,427		0.00%	
VOC	1,3,5-Trimethylbenzene	108-67-8	µg/kg	515	34	6.60%	490	E			0.00%	114,340		0.00%	
VOC	1,3-Dichlorobenzene	541-73-1	µg/kg	1549	0	0.00%					0.00%	3.33E+06		0.00%	
VOC	1,4-Dichlorobenzene	106-46-7	µg/kg	1329	9	0.68%	110	J			0.00%	91,315		0.00%	
VOC	2-Butanone	78-93-3	µg/kg	631	16	2.54%	155				0.00%	4.64E+07		0.00%	
VOC	2-Chlorotoluene	95-49-8	µg/kg	515	0	0.00%					0.00%	2.22E+06		0.00%	
VOC	4-Methyl-2-pentanone	108-10-1	µg/kg	630	15	2.38%	73	B			0.00%	8.32E+07		0.00%	
VOC	Acetone	67-64-1	µg/kg	632	122	19.30%	1280				0.00%	1.00E+08		0.00%	
VOC	Benzene	71-43-2	µg/kg	633	6	0.95%	11	J			0.00%	23,563		0.00%	
VOC	Bromodichloromethane	75-27-4	µg/kg	633	0	0.00%					0.00%	67,070		0.00%	
VOC	Bromoform	75-25-2	µg/kg	633	0	0.00%					0.00%	419,858		0.00%	
VOC	Bromomethane	74-83-9	µg/kg	629	0	0.00%					0.00%	20,959		0.00%	
VOC	Carbon Disulfide	75-15-0	µg/kg	633	1	0.16%	4	J			0.00%	1.64E+06		0.00%	

Table 3.5
Surface Soil AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
VOC	Carbon Tetrachloride	56-23-5	µg/kg	633	21	3.32%	103				0.00%	8,446		0.00%	
VOC	Chlorobenzene	108-90-7	µg/kg	633	2	0.32%	2.03	JB			0.00%	666,523		0.00%	
VOC	Chloroethane	75-00-3	µg/kg	630	0	0.00%					0.00%	1.43E+06		0.00%	
VOC	Chloroform	67-66-3	µg/kg	633	7	1.11%	7	J			0.00%	7,850		0.00%	
VOC	Chloromethane	74-87-3	µg/kg	633	3	0.47%	1.7	J			0.00%	115,077		0.00%	
VOC	cis-1,2-Dichloroethene	156-59-2	µg/kg	517	9	1.74%	15				0.00%	1.11E+06		0.00%	
VOC	cis-1,3-Dichloropropene	10061-01-5	µg/kg	633	0	0.00%					0.00%	19,432		0.00%	
VOC	Dibromochloromethane	124-48-1	µg/kg	633	0	0.00%					0.00%	49,504		0.00%	
VOC	Dichlorodifluoromethane	75-71-8	µg/kg	499	0	0.00%					0.00%	229,820		0.00%	
VOC	Ethylbenzene	100-41-4	µg/kg	633	47	7.42%	173				0.00%	5.39E+06		0.00%	
VOC	Hexachloroethane	67-72-1	µg/kg	1227	0	0.00%					0.00%	111,087		0.00%	
VOC	Isopropylbenzene	98-82-8	µg/kg	515	10	1.94%	27				0.00%	32,680		0.00%	
VOC	Methylene Chloride	75-09-2	µg/kg	631	76	12.04%	45	B			0.00%	271,792		0.00%	
VOC	Styrene	100-42-5	µg/kg	633	1	0.16%	7.8	J			0.00%	1.38E+07		0.00%	
VOC	Toluene	108-88-3	µg/kg	633	57	9.00%	990				0.00%	3.09E+06		0.00%	
VOC	trans-1,2-Dichloroethene	156-60-5	µg/kg	532	0	0.00%					0.00%	287,340		0.00%	
VOC	trans-1,3-Dichloropropene	10061-02-6	µg/kg	633	0	0.00%					0.00%	20,820		0.00%	
VOC	Trichloroethene	79-01-6	µg/kg	633	26	4.11%	200	E			0.00%	1,770		0.00%	
VOC	Trichlorofluoromethane	75-69-4	µg/kg	517	29	5.61%	31.9				0.00%	1.51E+06		0.00%	
VOC	Vinyl acetate	108-05-4	µg/kg	78	0	0.00%					0.00%	2.65E+06		0.00%	
VOC	Vinyl Chloride	75-01-4	µg/kg	633	0	0.00%					0.00%	2,169		0.00%	
VOC	Xylene	1330-20-7	µg/kg	633	66	10.43%	933	E			0.00%	1.06E+06		0.00%	
Radionuclide	Cesium-134[e]	13967-70-9	pCi/g	162	99	61.11%	0.15		0.266		0.00%	0.080		0.00%	
Radionuclide	Curium-244	13981-15-2	pCi/g	1	0	0.00%					0.00%	8.63		0.00%	
Radionuclide	Curium-245/246		pCi/g	1	1	100.00%	0.126	J			0.00%	1.80		0.00%	
Radionuclide	Neptunium-237	13994-20-2	pCi/g	13	13	100.00%	0.01873				0.00%	5.43		0.00%	
Radionuclide	Plutonium-238	13981-16-3	pCi/g	83	61	73.49%	1.53				0.00%	5.97		0.00%	
Radionuclide	Radium-226	13982-63-3	pCi/g	149	146	97.99%	2.078	X	0.932	78	52.35%	2.69		0.00%	
Radionuclide	Strontium-89/90		pCi/g	289	262	90.66%	2.87		0.508	35	12.11%	13.2		0.00%	
Metal	Cobalt	7440-48-4	mg/kg	2622	2573	98.13%	137		10.9	205	7.82%	122	1	0.04%	Yes
Metal	Cadmium	7440-43-9	mg/kg	2603	940	36.11%	270		1.62	124	4.76%	91.4	1	0.04%	Yes
Metal	Mercury	7439-97-6	mg/kg	2541	1239	48.76%	48		0.133	121	4.76%	32.9	1	0.04%	Yes
Metal	Uranium (total)[d]		mg/kg	1296	114	8.80%	370		5.98E+00	24	1.85%	333	1	0.08%	Yes
Metal	Antimony	7440-36-0	mg/kg	2482	497	20.02%	348		0.436	323	13.01%	44.4	2	0.08%	Yes
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	µg/kg	1220	408	33.44%	32000	D			0.00%	3,793	1	0.08%	Yes

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Table 3.5
Surface Soil AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
SVOC	Pentachlorophenol	87-86-5	µg/kg	1180	12	1.02%	39000				0.00%	17,633	1	0.08%	Yes
Radionuclide	Uranium-233/234		pCi/g	1901	1887	99.26%	47.4833		2.25	100	5.26%	25.3	2	0.11%	No
Radionuclide	Uranium-235	15117-96-1	pCi/g	1900	1129	59.42%	2.2385		0.095	231	12.16%	1.05	3	0.16%	No
VOC	Tetrachloroethene	127-18-4	µg/kg	633	54	8.53%	29000				0.00%	6,705	1	0.16%	Yes
Radionuclide	Uranium-238	7440-61-1	pCi/g	1901	1894	99.63%	209.2773		2.00	152	8.00%	29.3	5	0.26%	No
SVOC	Benzo(a)anthracene	56-55-3	µg/kg	1226	605	49.35%	45000	D			0.00%	3,793	4	0.33%	Yes
SVOC	Benzo(b)fluoranthene	205-99-2	µg/kg	1231	523	42.49%	49000	XD			0.00%	3,793	6	0.49%	Yes
Metal	Vanadium	7440-62-2	mg/kg	2622	2621	99.96%	5300		43.1	304	11.59%	111	16	0.61%	No
Metal	Iron	7439-89-6	mg/kg	2622	2621	99.96%	130000		17,601	413	15.75%	33,326	18	0.69%	Yes
Radionuclide	Americium-241	86954-36-1	pCi/g	2024	1551	76.63%	51.2	B	0.022	1097	54.20%	7.69	22	1.09%	No
SVOC	Dibenz(a,h)anthracene	53-70-3	µg/kg	1217	164	13.48%	9200	DJ			0.00%	379	19	1.56%	No
PCB	PCB-1260[c]	11096-82-5	µg/kg	838	144	17.18%	7800				0.00%	1,349	17	2.03%	No
PCB	PCB-1254[c]	11097-69-1	µg/kg	842	151	17.93%	8900	C			0.00%	1,349	20	2.38%	No
Metal	Arsenic[e]	7440-38-2	mg/kg	2613	2586	98.97%	56.2		10.1	70	2.68%	2.41	70	2.68%	No
Radionuclide	Cesium-137[e]	10045-97-3	pCi/g	360	315	87.50%	2.5		1.69	13	3.61%	0.221	13	3.61%	Yes
Metal	Aluminum	7429-90-5	mg/kg	2622	2620	99.92%	61000		16,715	450	17.16%	24,774	105	4.00%	No
Dioxins and Furans	2378-TCDD TEQ[f]	1746-01-6	µg/kg	22	22	100.00%	0.073883				0.00%	0.025	1	4.55%	No

Table 3.5
Surface Soil AOI Screening

							AOI Screen 1					AOI Screen 2		AOI Screen 3	
Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Radionuclide	Plutonium-239/240		pCi/g	2336	1987	85.06%	183	B	0.066	1289	55.18%	9.80	128	5.48%	No
Metal	Chromium (total)[g]	7440-47-3	mg/kg	2624	2604	99.24%	210		16.8	675	25.72%	28.4	147	5.60%	No
Metal	Manganese	7439-96-5	mg/kg	2617	2615	99.92%	2220		365	265	10.13%	419	183	6.99%	Yes
Radionuclide	Radium-228[h]	15262-20-1	pCi/g	172	169	98.26%	3.5		2.31	21	12.21%	0.111	21	12.21%	Yes
SVOC	Benzo(a)pyrene	50-32-8	µg/kg	1235	509	41.21%	43000	E			0.00%	379	188	15.22%	No

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%

The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%

The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a] A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.

[b] The PRG value for lead is not calculated, but rather is taken from EPA's "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (1994)".

[c] The PCBs identified above under the Analyte column are equivalent to Aroclors, for example PCB-1254 is the same as Aroclor-1254.

[d] For uranium (total) the Surface Background Mean + 2SD value was taken from the 1995 DOE Background Geochemical Characterization Report (DOE 1995).

[e] For arsenic, cesium-134, and cesium-137 the Surface Background Mean + 2SD value is greater than the WRW PRG. Therefore, only those results greater than both the Surface Background Mean + 2SD and WRW PRG are reported under AOI Screen 2.

[f] The TEQ for 2,3,7,8-TCDD is calculated in Table A3.3 in Attachment 3.

[g] Chromium (total) is conservatively compared to the chromium VI WRW PRG.

[h] For radium-228 the Surface Background Mean + 2SD value is greater than the WRW PRG. Therefore, only those results greater than both the Surface Background Mean + 2SD and WRW PRG are reported under AOI Screen 2.

Table 3.6
Surface Soil AOIs

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG
Radionuclide	Uranium-233/234		pCi/g	1901	1887	99.26%	47.4833		2.25	100	5.26%	25.3	2	0.11%
Radionuclide	Uranium-235	15117-96-1	pCi/g	1900	1129	59.42%	2.2385		0.095	231	12.16%	1.05	3	0.16%
Radionuclide	Uranium-238	7440-61-1	pCi/g	1901	1894	99.63%	209.2773		2.00	152	8.00%	29.3	5	0.26%
Metal	Vanadium	7440-62-2	mg/kg	2622	2621	99.96%	5300		43.1	304	11.59%	111	16	0.61%
Radionuclide	Americium-241	86954-36-1	pCi/g	2024	1551	76.63%	51.2	B	0.022	1097	54.20%	7.69	22	1.09%
SVOC	Dibenz(a,h)anthracene	53-70-3	µg/kg	1217	164	13.48%	9200	DJ			0.00%	379	19	1.56%
PCB	PCB-1260[b]	11096-82-5	µg/kg	838	144	17.18%	7800				0.00%	1,349	17	2.03%
PCB	PCB-1254[b]	11097-69-1	µg/kg	842	151	17.93%	8900	C			0.00%	1,349	20	2.38%
Metal	Arsenic[c]	7440-38-2	mg/kg	2613	2586	98.97%	56.2		10.1	70	2.68%	2.41	70	2.68%
Metal	Aluminum	7429-90-5	mg/kg	2622	2620	99.92%	61000		16,715	450	17.16%	24,774	105	4.00%
Dioxins and Furans	2378-TCDD TEQ[d]	1746-01-6	µg/kg	22	22	100.00%	0.073883				0.00%	0.025	1	4.55%
Radionuclide	Plutonium-239/240		pCi/g	2336	1987	85.06%	183	B	0.066	1289	55.18%	9.80	128	5.48%
Metal	Chromium (total)[e]	7440-47-3	mg/kg	2624	2604	99.24%	210		16.8	675	25.72%	28.4	147	5.60%
SVOC	Benzo(a)pyrene	50-32-8	µg/kg	1235	509	41.21%	43000	E			0.00%	379	188	15.22%

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

	The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a] A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.
[b] The PCBs identified above under the Analyte column are equivalent to Aroclors, for example PCB-1254 is the same as Aroclor-1254.
[c] For arsenic the Surface Background Mean + 2SD value is greater than the WRW PRG. Therefore, only those results greater than both the Surface Background Mean + 2SD and WRW PRG are reported under AOI Screen 2.
[d] The TEQ for 2,3,7,8-TCDD is calculated in Table A3.2 in Attachment 3.
[e] Chromium (total) is conservatively compared to the chromium VI WRW PRG.

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Table 3.7
Subsurface Soil (>0.5 and ≤3.0 ft) AOI Screen

							AOI Screen 1					AOI Screen 2		AOI Screen 3	
Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Metal	Aluminum	7429-90-5	mg/kg	1680	1680	100.00%	110000		30392.476	158	9.40%	284,902		0.00%	
Metal	Antimony	7440-36-0	mg/kg	1637	363	22.17%	350		9.778	67	4.09%	511		0.00%	
Metal	Barium	7440-39-3	mg/kg	1681	1681	100.00%	1000		291.028	36	2.14%	33,033		0.00%	
Metal	Beryllium	7440-41-7	mg/kg	1674	1447	86.44%	15		15.779		0.00%	1,151		0.00%	
Metal	Boron	7440-42-8	mg/kg	1353	1057	78.12%	23				0.00%	108,980		0.00%	
Metal	Cadmium	7440-43-9	mg/kg	1679	577	34.37%	362		1.078	82	4.88%	1,051		0.00%	
Metal	Cobalt	7440-48-4	mg/kg	1681	1677	99.76%	74		15.420	62	3.69%	1,401		0.00%	
Metal	Copper	7440-50-8	mg/kg	1681	1672	99.46%	1190		23.805	203	12.08%	51,100		0.00%	
Metal	Iron	7439-89-6	mg/kg	1680	1680	100.00%	56000		28459.460	49	2.92%	383,250		0.00%	
Metal	Lithium	7439-93-2	mg/kg	1674	1596	95.34%	64		20.463	131	7.83%	25,550		0.00%	
Metal	Manganese	7439-96-5	mg/kg	1680	1678	99.88%	1300		487.107	65	3.87%	4,815		0.00%	
Metal	Mercury	7439-97-6	mg/kg	1630	1257	77.12%	16		0.488	17	1.04%	379		0.00%	
Metal	Molybdenum	7439-98-7	mg/kg	1679	1043	62.12%	24		29.092		0.00%	6,388		0.00%	
Metal	Nickel	7440-02-0	mg/kg	1681	1656	98.51%	330		43.041	27	1.61%	25,550		0.00%	
Metal	Selenium	7782-49-2	mg/kg	1679	220	13.10%	4.3		1.678	19	1.13%	6,388		0.00%	
Metal	Silver	7440-22-4	mg/kg	1678	417	24.85%	110		26.594	3	0.18%	6,388		0.00%	
Metal	Strontium	7440-24-6	mg/kg	1679	1675	99.76%	368		135.597	51	3.04%	766,500		0.00%	
Metal	Thallium	7440-28-0	mg/kg	1673	248	14.82%	6.3		1.421	96	5.74%	89.4		0.00%	
Metal	Tin	7440-31-5	mg/kg	1675	173	10.33%	110		354.181		0.00%	766,500		0.00%	
Metal	Titanium	7440-32-6	mg/kg	1356	1356	100.00%	1420				0.00%	1.95E+06		0.00%	
Metal	Uranium (total)[b]		mg/kg	1375	180	13.09%	1600			75	5.45%	3,833		0.00%	
Metal	Vanadium	7440-62-2	mg/kg	1681	1681	100.00%	110		63.336	89	5.29%	1,278		0.00%	
Metal	Zinc	7440-66-6	mg/kg	1681	1677	99.76%	1800		78.254	119	7.08%	383,250		0.00%	
Wet Chem	Cyanide	57-12-5	mg/kg	58	5	8.62%	0.23	B			0.00%	25,550		0.00%	
Wet Chem	Cyanide	ConID 206	mg/kg	1	0	0.00%					0.00%	25,550		0.00%	
Wet Chem	Fluoride	16984-48-8	mg/kg	15	15	100.00%	17.6				0.00%	76,650		0.00%	
Wet Chem	Nitrate / Nitrite	ConID 184	mg/kg	163	100	61.35%	20000		4.328	29	17.79%	2.04E+06		0.00%	
Wet Chem	Nitrite	ConID 187	mg/kg	1	1	100.00%	2.4	B			0.00%	127,750		0.00%	
Wet Chem	Nitrite	14797-65-0	mg/kg	4	3	75.00%	2.49	J			0.00%	127,750		0.00%	
Dioxins and Furans	2378-TCDD TEQ[c]	1746-01-6	µg/kg	7	6	85.71%	0.003008515				0.00%	0.285		0.00%	
Herbicide	2,4,5-T	93-76-5	µg/kg	6	0	0.00%					0.00%	9.22E+06		0.00%	

Table 3.7
Subsurface Soil (>0.5 and ≤3.0 ft) AOI Screen

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Herbicide	2,4,5-TP (Silvex)	93-72-1	µg/kg	6	0	0.00%					0.00%	1.95E+06		0.00%	
Herbicide	2,4-D	94-75-7	µg/kg	6	0	0.00%					0.00%	9.22E+06		0.00%	
Herbicide	2,4-DB	94-82-6	µg/kg	5	0	0.00%					0.00%	7.37E+06		0.00%	
Herbicide	4-Nitrophenol	100-02-7	µg/kg	582	0	0.00%					0.00%	7.37E+06		0.00%	
Herbicide	Dalapon	75-99-0	µg/kg	5	0	0.00%					0.00%	2.76E+07		0.00%	
Herbicide	Dicamba	1918-00-9	µg/kg	5	1	20.00%	2.2	J			0.00%	2.76E+07		0.00%	
Herbicide	Dinoseb	88-85-7	µg/kg	6	0	0.00%					0.00%	921,651		0.00%	
Herbicide	MCPA	94-74-6	µg/kg	5	0	0.00%					0.00%	460,825		0.00%	
Herbicide	MCPP	93-65-2	µg/kg	5	0	0.00%					0.00%	921,651		0.00%	
PCB	PCB-1016[d]	12674-11-2	µg/kg	382	2	0.52%	65				0.00%	15,514		0.00%	
PCB	PCB-1221[d]	11104-28-2	µg/kg	382	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1232[d]	11141-16-5	µg/kg	382	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1242[d]	53469-21-9	µg/kg	382	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1248[d]	12672-29-6	µg/kg	382	8	2.09%	5900				0.00%	15,514		0.00%	
PCB	PCB-1254[d]	11097-69-1	µg/kg	382	84	21.99%	11000				0.00%	15,514		0.00%	
PCB	PCB-1260[d]	11096-82-5	µg/kg	382	64	16.75%	1300				0.00%	15,514		0.00%	
Pesticide	4,4'-DDD	72-54-8	µg/kg	47	2	4.26%	7.6	J			0.00%	178,570		0.00%	
Pesticide	4,4'-DDE	72-55-9	µg/kg	47	4	8.51%	4.8	J			0.00%	126,049		0.00%	
Pesticide	4,4'-DDT	50-29-3	µg/kg	47	2	4.26%	6.8	J			0.00%	125,658		0.00%	
Pesticide	Aldrin	309-00-2	µg/kg	47	0	0.00%					0.00%	2,024		0.00%	
Pesticide	alpha-BHC	319-84-6	µg/kg	47	1	2.13%	6.8	J			0.00%	6,555		0.00%	
Pesticide	alpha-Chlordane	5103-71-9	µg/kg	19	0	0.00%					0.00%	117,997		0.00%	
Pesticide	beta-BHC	319-85-7	µg/kg	47	0	0.00%					0.00%	22,942		0.00%	
Pesticide	beta-Chlordane	5103-74-2	µg/kg	8	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Chlordane		µg/kg	28	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Chlorpyriphos	2921-88-2	µg/kg	1	0	0.00%					0.00%	2.76E+06		0.00%	
Pesticide	delta-BHC	319-86-8	µg/kg	47	0	0.00%					0.00%	6,555		0.00%	
Pesticide	Demeton-S	126-75-0	µg/kg	1	0	0.00%					0.00%	36,866		0.00%	
Pesticide	Dieldrin	60-57-1	µg/kg	47	3	6.38%	6.4	J			0.00%	2,151		0.00%	
Pesticide	Endosulfan I	959-98-8	µg/kg	47	1	2.13%	3.6	J			0.00%	5.53E+06		0.00%	
Pesticide	Endosulfan II	33213-65-9	µg/kg	47	2	4.26%	5.1	J			0.00%	5.53E+06		0.00%	

Table 3.7
Subsurface Soil (>0.5 and ≤3.0 ft) AOI Screen

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Pesticide	Endosulfan sulfate	1031-07-8	µg/kg	47	2	4.26%	5.3	J			0.00%	5.53E+06		0.00%	
Pesticide	Endrin	72-20-8	µg/kg	47	4	8.51%	12				0.00%	276,495		0.00%	
Pesticide	Endrin aldehyde	7421-93-4	µg/kg	39	2	5.13%	9	J			0.00%	276,495		0.00%	
Pesticide	Endrin ketone	53494-70-5	µg/kg	18	0	0.00%					0.00%	383,250		0.00%	
Pesticide	gamma-BHC (Lindane)	58-89-9	µg/kg	47	1	2.13%	10	I			0.00%	31,864		0.00%	
Pesticide	gamma-Chlordane	12789-03-6	µg/kg	11	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Heptachlor	76-44-8	µg/kg	47	0	0.00%					0.00%	7,647		0.00%	
Pesticide	Heptachlor epoxide	1024-57-3	µg/kg	47	1	2.13%	4.2	J			0.00%	3,782		0.00%	
Pesticide	Hexachlorocyclopentadiene	77-47-4	µg/kg	582	0	0.00%					0.00%	4.38E+06		0.00%	
Pesticide	Methoxychlor	72-43-5	µg/kg	47	0	0.00%					0.00%	4.61E+06		0.00%	
Pesticide	Toxaphene	8001-35-2	µg/kg	47	0	0.00%					0.00%	31,284		0.00%	
SVOC	1,2,4,5-Tetrachlorobenzene	95-94-3	µg/kg	3	0	0.00%					0.00%	276,495		0.00%	
SVOC	1,2,4-Trichlorobenzene	120-82-1	µg/kg	1747	12	0.69%	2.33	J			0.00%	1.74E+06		0.00%	
SVOC	1,2-Diphenylhydrazine	122-66-7	µg/kg	2	0	0.00%					0.00%	43,021		0.00%	
SVOC	2,3,4,6-Tetrachlorophenol	58-90-2	µg/kg	1	0	0.00%					0.00%	2.76E+07		0.00%	
SVOC	2,4,5-Trichlorophenol	95-95-4	µg/kg	584	0	0.00%					0.00%	9.22E+07		0.00%	
SVOC	2,4,6-Trichlorophenol	88-06-2	µg/kg	584	0	0.00%					0.00%	3.13E+06		0.00%	
SVOC	2,4,6-Trinitrotoluene	118-96-7	µg/kg	6	0	0.00%					0.00%	460,825		0.00%	
SVOC	2,4-Dichlorophenol	120-83-2	µg/kg	584	0	0.00%					0.00%	2.76E+06		0.00%	
SVOC	2,4-Dimethylphenol	105-67-9	µg/kg	584	0	0.00%					0.00%	1.84E+07		0.00%	
SVOC	2,4-Dinitrophenol	51-28-5	µg/kg	581	1	0.17%	470	J			0.00%	1.84E+06		0.00%	
SVOC	2,4-Dinitrotoluene	121-14-2	µg/kg	586	0	0.00%					0.00%	1.84E+06		0.00%	
SVOC	2,6-Dinitrotoluene	606-20-2	µg/kg	585	0	0.00%					0.00%	921,651		0.00%	
SVOC	2-Chloronaphthalene	91-58-7	µg/kg	585	0	0.00%					0.00%	7.37E+07		0.00%	
SVOC	2-Chlorophenol	95-57-8	µg/kg	584	1	0.17%	8.5	J			0.00%	6.39E+06		0.00%	
SVOC	2-Methylnaphthalene	91-57-6	µg/kg	585	46	7.86%	83000				0.00%	3.69E+06		0.00%	
SVOC	2-Methylphenol	95-48-7	µg/kg	589	0	0.00%					0.00%	4.61E+07		0.00%	
SVOC	2-Nitroaniline	88-74-4	µg/kg	585	0	0.00%					0.00%	2.21E+06		0.00%	
SVOC	3,3'-Dichlorobenzidine	91-94-1	µg/kg	584	0	0.00%					0.00%	76,667		0.00%	
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	µg/kg	583	0	0.00%					0.00%	92,165		0.00%	
SVOC	4-Chloroaniline	106-47-8	µg/kg	584	0	0.00%					0.00%	3.69E+06		0.00%	

Table 3.7
Subsurface Soil (>0.5 and ≤3.0 ft) AOI Screen

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
SVOC	4-Methylphenol	106-44-5	µg/kg	575	1	0.17%	95	J			0.00%	4.61E+06		0.00%	
SVOC	4-Nitroaniline	100-01-6	µg/kg	584	0	0.00%					0.00%	2.39E+06		0.00%	
SVOC	Acenaphthene	83-32-9	µg/kg	585	102	17.44%	24000	J			0.00%	5.10E+07		0.00%	
SVOC	Anthracene	120-12-7	µg/kg	585	118	20.17%	13000				0.00%	2.55E+08		0.00%	
SVOC	Benzo(a)anthracene	56-55-3	µg/kg	584	177	30.31%	33000				0.00%	43,616		0.00%	
SVOC	Benzo(b)fluoranthene	205-99-2	µg/kg	584	137	23.46%	29000				0.00%	43,616		0.00%	
SVOC	Benzo(k)fluoranthene	207-08-9	µg/kg	584	127	21.75%	29000				0.00%	436,159		0.00%	
SVOC	Benzoic Acid	65-85-0	µg/kg	577	2	0.35%	300	J			0.00%	3.69E+09		0.00%	
SVOC	Benzyl Alcohol	100-51-6	µg/kg	579	2	0.35%	1600				0.00%	2.76E+08		0.00%	
SVOC	bis(2-Chloroethyl) ether	111-44-4	µg/kg	584	0	0.00%					0.00%	43,315		0.00%	
SVOC	bis(2-Chloroisopropyl) ether	108-60-1	µg/kg	585	0	0.00%					0.00%	681,967		0.00%	
SVOC	bis(2-ethylhexyl)phthalate	117-81-7	µg/kg	584	75	12.84%	1100				0.00%	2.46E+06		0.00%	
SVOC	Butylbenzylphthalate	85-68-7	µg/kg	584	14	2.40%	1300				0.00%	1.84E+08		0.00%	
SVOC	Carbazole	86-74-8	µg/kg	4	0	0.00%					0.00%	1.73E+06		0.00%	
SVOC	Chrysene	218-01-9	µg/kg	584	181	30.99%	36000				0.00%	4.36E+06		0.00%	
SVOC	Dibenzofuran	132-64-9	µg/kg	584	49	8.39%	7000	J			0.00%	2.56E+06		0.00%	
SVOC	Diethylphthalate	84-66-2	µg/kg	584	4	0.68%	330	J			0.00%	7.37E+08		0.00%	
SVOC	Dimethoate	60-51-5	µg/kg	1	0	0.00%					0.00%	184,330		0.00%	
SVOC	Dimethylphthalate	131-11-3	µg/kg	584	2	0.34%	460	J			0.00%	9.22E+09		0.00%	
SVOC	Di-n-butylphthalate	84-74-2	µg/kg	584	28	4.79%	1400				0.00%	9.22E+07		0.00%	
SVOC	Di-n-octylphthalate	117-84-0	µg/kg	584	2	0.34%	6000				0.00%	3.69E+07		0.00%	
SVOC	Fluoranthene	206-44-0	µg/kg	584	193	33.05%	66000				0.00%	3.40E+07		0.00%	
SVOC	Fluorene	86-73-7	µg/kg	584	80	13.70%	7100	J			0.00%	3.69E+07		0.00%	
SVOC	Hexachlorobenzene	118-74-1	µg/kg	585	3	0.51%	260	J			0.00%	21,508		0.00%	
SVOC	Hexachlorobutadiene	87-68-3	µg/kg	1755	0	0.00%					0.00%	255,500		0.00%	
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	µg/kg	584	115	19.69%	20000				0.00%	43,616		0.00%	
SVOC	Isophorone	78-59-1	µg/kg	584	1	0.17%	840				0.00%	3.63E+07		0.00%	
SVOC	Naphthalene	91-20-3	µg/kg	1748	341	19.51%	350000	E			0.00%	1.61E+07		0.00%	
SVOC	Nitrobenzene	98-95-3	µg/kg	590	0	0.00%					0.00%	497,333		0.00%	
SVOC	N-Nitrosodiethylamine	55-18-5	µg/kg	3	0	0.00%					0.00%	229		0.00%	
SVOC	N-Nitrosodimethylamine	62-75-9	µg/kg	3	0	0.00%					0.00%	675		0.00%	

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Table 3.7
Subsurface Soil (>0.5 and ≤3.0 ft) AOI Screen

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1: Maximum Concentration	AOI Screen 1: Data Qualifier[a]	AOI Screen 1: Background Mean + 2SD	AOI Screen 1: Number Detections > Background Mean + 2SD	AOI Screen 1: Percent Detections > Background Mean + 2SD	AOI Screen 2: WRW PRG	AOI Screen 2: Number Detections > WRW PRG	AOI Screen 2: Percent Detections > WRW PRG	AOI Screen 3: Eliminated By Process Knowledge
SVOC	N-Nitrosodi-n-butylamine	924-16-3	µg/kg	3	0	0.00%					0.00%	5,977		0.00%	
SVOC	N-Nitroso-di-n-propylamine	621-64-7	µg/kg	584	1	0.17%	700				0.00%	4,929		0.00%	
SVOC	N-nitrosodiphenylamine	86-30-6	µg/kg	575	2	0.35%	17000	J			0.00%	7.04E+06		0.00%	
SVOC	N-Nitrosopyrrolidine	930-55-2	µg/kg	1	0	0.00%					0.00%	16,387		0.00%	
SVOC	Parathion	56-38-2	µg/kg	1	0	0.00%					0.00%	5.53E+06		0.00%	
SVOC	Pentachlorobenzene	608-93-5	µg/kg	3	0	0.00%					0.00%	737,321		0.00%	
SVOC	Pentachlorophenol	87-86-5	µg/kg	584	3	0.51%	350	J			0.00%	202,777		0.00%	
SVOC	Phenol	108-95-2	µg/kg	583	5	0.86%	530				0.00%	2.76E+08		0.00%	
SVOC	Pyrene	129-00-0	µg/kg	583	187	32.08%	67000				0.00%	2.55E+07		0.00%	
SVOC	Tetraethyl dithiopyrophosphate	3689-24-5	µg/kg	1	1	100.00%	7.7	JB			0.00%	460,830		0.00%	
VOC	1,1,1,2-Tetrachloroethane	630-20-6	µg/kg	1651	0	0.00%					0.00%	1.05E+06		0.00%	
VOC	1,1,1-Trichloroethane	71-55-6	µg/kg	1973	31	1.57%	71.6				0.00%	1.06E+08		0.00%	
VOC	1,1,2,2-Tetrachloroethane	79-34-5	µg/kg	1965	1	0.05%	3	J			0.00%	120,551		0.00%	
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	µg/kg	1657	0	0.00%					0.00%	2.74E+10		0.00%	
VOC	1,1,2-Trichloroethane	79-00-5	µg/kg	1977	0	0.00%					0.00%	322,253		0.00%	
VOC	1,1-Dichloroethane	75-34-3	µg/kg	1972	6	0.30%	239	E			0.00%	3.12E+07		0.00%	
VOC	1,1-Dichloroethene	75-35-4	µg/kg	1972	10	0.51%	23.8				0.00%	199,706		0.00%	
VOC	1,2,3-Trichloropropane	96-18-4	µg/kg	1649	1	0.06%	4	J			0.00%	23,910		0.00%	
VOC	1,2,4-Trimethylbenzene	95-63-6	µg/kg	1642	89	5.42%	10000	E			0.00%	1.53E+06		0.00%	
VOC	1,2-Dibromo-3-chloropropane	96-12-8	µg/kg	1649	1	0.06%	3	J			0.00%	34,137		0.00%	
VOC	1,2-Dibromoethane	106-93-4	µg/kg	1653	0	0.00%					0.00%	403		0.00%	
VOC	1,2-Dichlorobenzene	95-50-1	µg/kg	1736	2	0.12%	260	BJ			0.00%	3.32E+07		0.00%	
VOC	1,2-Dichloroethane	107-06-2	µg/kg	1965	9	0.46%	8.3				0.00%	152,603		0.00%	
VOC	1,2-Dichloroethene	540-59-0	µg/kg	313	1	0.32%	110				0.00%	1.15E+07		0.00%	
VOC	1,2-Dichloropropane	78-87-5	µg/kg	1972	3	0.15%	13				0.00%	441,907		0.00%	
VOC	1,3,5-Trimethylbenzene	108-67-8	µg/kg	1642	47	2.86%	4300	E			0.00%	1.31E+06		0.00%	
VOC	1,3-Dichlorobenzene	541-73-1	µg/kg	1748	1	0.06%	5.3	J			0.00%	3.83E+07		0.00%	
VOC	1,4-Dichlorobenzene	106-46-7	µg/kg	1731	2	0.12%	170				0.00%	1.05E+06		0.00%	
VOC	1,4-Dioxane	123-91-1	µg/kg	6	0	0.00%					0.00%	4.35E+06		0.00%	
VOC	2-Butanone	78-93-3	µg/kg	1903	109	5.73%	5400	B			0.00%	5.33E+08		0.00%	
VOC	2-Chlorotoluene	95-49-8	µg/kg	1641	0	0.00%					0.00%	2.56E+07		0.00%	

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Table 3.7
Subsurface Soil (>0.5 and ≤3.0 ft) AOI Screen

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
VOC	2-Methyl-1-propanol	78-83-1	µg/kg	5	0	0.00%					0.00%	3.83E+08		0.00%	
VOC	4-Methyl-2-pentanone	108-10-1	µg/kg	1955	21	1.07%	77				0.00%	9.57E+08		0.00%	
VOC	Acetone	67-64-1	µg/kg	1939	462	23.83%	10000	JE			0.00%	1.15E+09		0.00%	
VOC	Benzene	71-43-2	µg/kg	1974	11	0.56%	240	B			0.00%	270,977		0.00%	
VOC	Bromodichloromethane	75-27-4	µg/kg	1971	0	0.00%					0.00%	771,304		0.00%	
VOC	Bromoform	75-25-2	µg/kg	1968	1	0.05%	1	J			0.00%	4.83E+06		0.00%	
VOC	Bromomethane	74-83-9	µg/kg	1951	0	0.00%					0.00%	241,033		0.00%	
VOC	Carbon Disulfide	75-15-0	µg/kg	1969	6	0.30%	27	J			0.00%	1.88E+07		0.00%	
VOC	Carbon Tetrachloride	56-23-5	µg/kg	1973	16	0.81%	24.3				0.00%	97,124		0.00%	
VOC	Chlorobenzene	108-90-7	µg/kg	1969	2	0.10%	74				0.00%	7.67E+06		0.00%	
VOC	Chloroethane	75-00-3	µg/kg	1956	3	0.15%	48.2				0.00%	1.65E+07		0.00%	
VOC	Chloroform	67-66-3	µg/kg	1972	13	0.66%	280	B			0.00%	90,270		0.00%	
VOC	Chloromethane	74-87-3	µg/kg	1969	0	0.00%					0.00%	1.32E+06		0.00%	
VOC	cis-1,2-Dichloroethene	156-59-2	µg/kg	1626	23	1.41%	181				0.00%	1.28E+07		0.00%	
VOC	cis-1,3-Dichloropropene	10061-01-5	µg/kg	1972	0	0.00%					0.00%	223,462		0.00%	
VOC	Dibromochloromethane	124-48-1	µg/kg	1972	0	0.00%					0.00%	569,296		0.00%	
VOC	Dichlorodifluoromethane	75-71-8	µg/kg	1625	2	0.12%	12.6				0.00%	2.64E+06		0.00%	
VOC	Ether	60-29-7	µg/kg	3	0	0.00%					0.00%	2.56E+08		0.00%	
VOC	ethyl acetate	141-78-6	µg/kg	5	0	0.00%					0.00%	1.15E+09		0.00%	
VOC	Ethylbenzene	100-41-4	µg/kg	1974	73	3.70%	1100	E			0.00%	6.19E+07		0.00%	
VOC	Hexachloroethane	67-72-1	µg/kg	585	0	0.00%					0.00%	1.28E+06		0.00%	
VOC	Isopropylbenzene	98-82-8	µg/kg	1645	8	0.49%	300	JE			0.00%	375,823		0.00%	
VOC	m,p-Xylene		µg/kg	1	0	0.00%					0.00%	1.22E+07		0.00%	
VOC	Methylene Chloride	75-09-2	µg/kg	1974	279	14.13%	100				0.00%	3.13E+06		0.00%	
VOC	o-Xylene	95-47-6	µg/kg	2	0	0.00%					0.00%	1.22E+07		0.00%	
VOC	Styrene	100-42-5	µg/kg	1964	4	0.20%	19.3				0.00%	1.59E+08		0.00%	
VOC	Tetrachloroethene	127-18-4	µg/kg	1977	159	8.04%	6100				0.00%	77,111		0.00%	
VOC	Toluene	108-88-3	µg/kg	1976	403	20.39%	2000				0.00%	3.56E+07		0.00%	
VOC	trans-1,2-Dichloroethene	156-60-5	µg/kg	1659	0	0.00%					0.00%	3.30E+06		0.00%	
VOC	trans-1,3-Dichloropropene	10061-02-6	µg/kg	1967	0	0.00%					0.00%	239,434		0.00%	
VOC	Trichloroethene	79-01-6	µg/kg	1977	47	2.38%	471	E			0.00%	20,354		0.00%	

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Table 3.7
Subsurface Soil (>0.5 and ≤3.0 ft) AOI Screen

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
VOC	Trichlorofluoromethane	75-69-4	µg/kg	1652	28	1.69%	7.39				0.00%	1.74E+07		0.00%	
VOC	Vinyl acetate	108-05-4	µg/kg	290	0	0.00%					0.00%	3.04E+07		0.00%	
VOC	Vinyl Chloride	75-01-4	µg/kg	1972	2	0.10%	7.67				0.00%	24,948		0.00%	
VOC	Xylene	1330-20-7	µg/kg	1972	134	6.80%	4500	E			0.00%	1.22E+07		0.00%	
Radionuclide	Americium-241	86954-36-1	pCi/g	772	431	55.83%	24.1		0.010	534	69.17%	88.4		0.00%	
Radionuclide	Cesium-134	13967-70-9	pCi/g	87	81	93.10%	0.15				0.00%	0.910		0.00%	
Radionuclide	Cesium-137	10045-97-3	pCi/g	126	122	96.83%	0.9565	X	0.143	51	40.48%	2.54		0.00%	
Radionuclide	Iodine-129	15046-84-1	pCi/g	7	0	0.00%					0.00%	90.3		0.00%	
Radionuclide	Nickel-59	14336-70-0	pCi/g	7	0	0.00%					0.00%	36,397		0.00%	
Radionuclide	Plutonium-238	13981-16-3	pCi/g	47	13	27.66%	0.425				0.00%	68.7		0.00%	
Radionuclide	Plutonium-239/240		pCi/g	783	531	67.82%	46.5		0.022	530	67.69%	112		0.00%	
Radionuclide	Radium-226	13982-63-3	pCi/g	34	34	100.00%	9.28	X	1.343	14	41.18%	31.0		0.00%	
Radionuclide	Strontium-89/90		pCi/g	126	118	93.65%	0.74	J	0.570	1	0.79%	152		0.00%	
Radionuclide	Uranium-233/234		pCi/g	792	783	98.86%	25.7624		2.079	47	5.93%	291		0.00%	
Radionuclide	Uranium-234	13966-29-5	pCi/g	1	1	100.00%	0.6		2.079		0.00%	291		0.00%	
Radionuclide	Uranium-235	15117-96-1	pCi/g	793	339	42.75%	4.88		0.162	89	11.22%	12.1		0.00%	
Radionuclide	Uranium-238	7440-61-1	pCi/g	793	780	98.36%	174	B	1.774	56	7.06%	337		0.00%	
Metal	Chromium (total)[e]	7440-47-3	mg/kg	1681	1680	99.94%	593		42.200	53	3.15%	327	1	0.06%	Yes
SVOC	Dibenz(a,h)anthracene	53-70-3	µg/kg	584	55	9.42%	10000				0.00%	4,362	1	0.17%	Yes
Metal	Lead[f]	7439-92-1	mg/kg	1686	1685	99.94%	8500		26.471	143	8.48%	1,000	3	0.18%	No
Metal	Arsenic	7440-38-2	mg/kg	1681	1668	99.23%	69.7		17.511	31	1.84%	27.7	6	0.36%	Yes
SVOC	Benzo(a)pyrene	50-32-8	µg/kg	584	143	24.49%	35000				0.00%	4,357	6	1.03%	No
Radionuclide	Radium-228[g]	15262-20-1	pCi/g	124	123	99.19%	3.9		2.092	8	6.45%	1.28	8	6.45%	Yes

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

	The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a] A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.

[b] For uranium (total) the Subsurface Background Mean + 2SD value was taken from the 1995 DOE Background Geochemical Characterization Report (DOE 1995).

[c] The TEQ for 2,3,7,8-TCDD is calculated in Table A3.3 in Attachment 3.

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Table 3.7
Subsurface Soil (>0.5 and ≤3.0 ft) AOI Screen

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge

[d]The PCBs identified above under the Analyte column are equivalent to Aroclors, for example PCB-1254 is the same as Aroclor-1254.

[e]Chromium (total) is conservatively compared to the chromium VI WRW PRG.

[f]The PRG value for lead is not calculated, but rather is taken from EPA's "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (1994)".

[g]For radium-228 the Subsurface Background Mean + 2SD value is greater than the WRW PRG. Therefore, only those results greater than both the Subsurface Background Mean + 2SD and WRW PRG are reported under AOI Screen 2.

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Table 3.8
Subsurface Soil (>0.5 and ≤3.0 ft) AOIs

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG
Metal	Lead[b]	7439-92-1	mg/kg	1686	1685	99.94%	8500		26.471	143	8.48%	1,000	3	0.18%
SVOC	Benzo(a)pyrene	50-32-8	µg/kg	584	143	24.49%	35000				0.00%	4,357	6	1.03%

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

	The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a]A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.

[b]The PRG value for lead is not calculated, but rather is taken from EPA's "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (1994)".

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Subsurface Soil (>3.0 and ≤8.0 ft) AOI Screening

Analyte Group	Analyte	Analyte ID	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1 Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	AOI Screen 2 WRW PRG	Number Detections > WRW PRG	AOI Screen 3 Percent Detections > WRW PRG	Eliminated By Process Knowledge
Metal	Aluminum	72	7429-90-5	mg/kg	1397	1397	100.00%	80000		30,392	79	5.65%	284,902		0.00%	
Metal	Antimony	87	7440-36-0	mg/kg	1301	241	18.52%	91.3		9.78	43	3.31%	511		0.00%	
Metal	Barium	89	7440-39-3	mg/kg	1397	1395	99.86%	1610	N	291	41	2.93%	33,033		0.00%	
Metal	Beryllium	90	7440-41-7	mg/kg	1390	1118	80.43%	446		15.8	3	0.22%	1,151		0.00%	
Metal	Boron	870	7440-42-8	mg/kg	779	584	74.97%	33				0.00%	108,980		0.00%	
Metal	Cadmium	91	7440-43-9	mg/kg	1364	353	25.88%	547		1.08	79	5.79%	1,051		0.00%	
Metal	Chromium VI	877	18540-29-9	mg/kg	1	1	100.00%	0.59				0.00%	327		0.00%	
Metal	Cobalt	93	7440-48-4	mg/kg	1397	1357	97.14%	701	*	15.4	48	3.44%	1,401		0.00%	
Metal	Copper	94	7440-50-8	mg/kg	1396	1379	98.78%	8850		23.8	91	6.52%	51,100		0.00%	
Metal	Iron	73	7439-89-6	mg/kg	1397	1397	100.00%	290000		28,459	53	3.79%	383,250		0.00%	
Metal	Lithium	75	7439-93-2	mg/kg	1373	1246	90.75%	50		20.5	74	5.39%	25,550		0.00%	
Metal	Manganese	77	7439-96-5	mg/kg	1397	1397	100.00%	2800		487	74	5.30%	4,815		0.00%	
Metal	Mercury	78	7439-97-6	mg/kg	1373	843	61.40%	25.4		0.488	21	1.53%	379		0.00%	
Metal	Molybdenum	79	7439-98-7	mg/kg	1390	641	46.12%	4100		29.1	7	0.50%	6,388		0.00%	
Metal	Nickel	80	7440-02-0	mg/kg	1397	1341	95.99%	670		43.0	32	2.29%	25,550		0.00%	
Metal	Selenium	98	7782-49-2	mg/kg	1387	166	11.97%	80.8		1.68	13	0.94%	6,388		0.00%	
Metal	Silver	82	7440-22-4	mg/kg	1378	254	18.43%	219		26.6	12	0.87%	6,388		0.00%	
Metal	Strontium	897	7440-24-6	mg/kg	1397	1394	99.79%	506		136	76	5.44%	766,500		0.00%	
Metal	Thallium	85	7440-28-0	mg/kg	1389	245	17.64%	10.8		1.42	43	3.10%	89.4		0.00%	
Metal	Tin	86	7440-31-5	mg/kg	1378	181	13.13%	189		354		0.00%	766,500		0.00%	
Metal	Titanium	900	7440-32-6	mg/kg	785	785	100.00%	936				0.00%	1.95E+06		0.00%	
Metal	Uranium (total)[b]	233		mg/kg	804	79	9.83%	94		3.04	40	4.98%	3,833		0.00%	
Metal	Vanadium	95	7440-62-2	mg/kg	1397	1392	99.64%	740		63.3	55	3.94%	1,278		0.00%	
Metal	Zinc	96	7440-66-6	mg/kg	1394	1382	99.14%	6920		78.3	69	4.95%	383,250		0.00%	
Wet Chem	Ammonia	1109	7664-41-7	mg/kg	29	8	27.59%	1.44				0.00%	1.05E+07		0.00%	
Wet Chem	Cyanide	1123	57-12-5	mg/kg	133	15	11.28%	43				0.00%	25,550		0.00%	
Wet Chem	Fluoride	1125	16984-48-8	mg/kg	22	22	100.00%	10.8				0.00%	76,650		0.00%	
Wet Chem	Nitrate / Nitrite	1131	ConID 184	mg/kg	237	194	81.86%	6100		4.33	73	30.80%	2.04E+06		0.00%	
Wet Chem	Nitrite	1136	ConID 187	mg/kg	6	0	0.00%					0.00%	127,750		0.00%	
Wet Chem	Nitrite	1208	14797-65-0	mg/kg	1	1	100.00%	1.21	J			0.00%	127,750		0.00%	
Dioxins and Fu	2378-TCDD TEQ[c]	194	1746-01-6	µg/kg	17	2	11.76%	0.001175934	J			0.00%	0.285		0.00%	
Herbicide	2,4,5-TP (Silvex)	212	93-72-1	µg/kg	3	0	0.00%					0.00%	1.95E+06		0.00%	
Herbicide	2,4-D	211	94-75-7	µg/kg	3	0	0.00%					0.00%	9.22E+06		0.00%	
Herbicide	4-Nitrophenol	100	100-02-7	µg/kg	541	0	0.00%					0.00%	7.37E+06		0.00%	
PCB	PCB-1016[d]	187	12674-11-2	µg/kg	460	4	0.87%	150				0.00%	15,514		0.00%	

Table 3.9
Subsurface Soil (>3.0 and ≤8.0 ft) AOI Screening

Analyte Group	Analyte	Analyte ID	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
								Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
PCB	PCB-1221[d]	188	11104-28-2	µg/kg	460	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1232[d]	189	11141-16-5	µg/kg	459	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1242[d]	190	53469-21-9	µg/kg	460	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1248[d]	191	12672-29-6	µg/kg	460	9	1.96%	7200				0.00%	15,514		0.00%	
PCB	PCB-1254[d]	192	11097-69-1	µg/kg	459	82	17.86%	12000				0.00%	15,514		0.00%	
PCB	PCB-1260[d]	193	11096-82-5	µg/kg	461	45	9.76%	15000				0.00%	15,514		0.00%	
Pesticide	4,4'-DDD	167	72-54-8	µg/kg	173	0	0.00%					0.00%	178,570		0.00%	
Pesticide	4,4'-DDE	168	72-55-9	µg/kg	171	0	0.00%					0.00%	126,049		0.00%	
Pesticide	4,4'-DDT	169	50-29-3	µg/kg	173	1	0.58%	19	P			0.00%	125,658		0.00%	
Pesticide	Aldrin	170	309-00-2	µg/kg	173	1	0.58%	4.4				0.00%	2,024		0.00%	
Pesticide	alpha-BHC	171	319-84-6	µg/kg	173	1	0.58%	3	P			0.00%	6,555		0.00%	
Pesticide	alpha-Chlordane	526	5103-71-9	µg/kg	142	0	0.00%					0.00%	117,997		0.00%	
Pesticide	beta-BHC	172	319-85-7	µg/kg	173	0	0.00%					0.00%	22,942		0.00%	
Pesticide	beta-Chlordane	841	5103-74-2	µg/kg	131	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Chlordane	173		µg/kg	31	0	0.00%					0.00%	117,997		0.00%	
Pesticide	delta-BHC	174	319-86-8	µg/kg	173	1	0.58%	42	P			0.00%	6,555		0.00%	
Pesticide	Dieldrin	175	60-57-1	µg/kg	171	1	0.58%	6.7	P			0.00%	2,151		0.00%	
Pesticide	Endosulfan I	176	959-98-8	µg/kg	172	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endosulfan II	177	33213-65-9	µg/kg	170	1	0.59%	12	P			0.00%	5.53E+06		0.00%	
Pesticide	Endosulfan sulfate	178	1031-07-8	µg/kg	171	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endrin	179	72-20-8	µg/kg	171	0	0.00%					0.00%	276,495		0.00%	
Pesticide	Endrin aldehyde	180	7421-93-4	µg/kg	46	1	2.17%	21	P			0.00%	276,495		0.00%	
Pesticide	Endrin ketone	181	53494-70-5	µg/kg	141	1	0.71%	62	D			0.00%	383,250		0.00%	
Pesticide	gamma-BHC (Lindane)	182	58-89-9	µg/kg	173	0	0.00%					0.00%	31,864		0.00%	
Pesticide	gamma-Chlordane	1222	12789-03-6	µg/kg	11	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Heptachlor	183	76-44-8	µg/kg	173	0	0.00%					0.00%	7,647		0.00%	
Pesticide	Heptachlor epoxide	184	1024-57-3	µg/kg	173	1	0.58%	14	P			0.00%	3,782		0.00%	
Pesticide	Hexachlorocyclopentadiene	143	77-47-4	µg/kg	536	0	0.00%					0.00%	4.38E+06		0.00%	
Pesticide	Methoxychlor	185	72-43-5	µg/kg	173	4	2.31%	22	P			0.00%	4.61E+06		0.00%	
Pesticide	Toxaphene	186	8001-35-2	µg/kg	173	0	0.00%					0.00%	31,284		0.00%	
SVOC	1,2,4,5-Tetrachlorobenzene	1024	95-94-3	µg/kg	31	0	0.00%					0.00%	276,495		0.00%	
SVOC	1,2,4-Trichlorobenzene	21	120-82-1	µg/kg	1433	26	1.81%	2000				0.00%	1.74E+06		0.00%	
SVOC	1,2-Diphenylhydrazine	271	122-66-7	µg/kg	31	0	0.00%					0.00%	43,021		0.00%	
SVOC	2,4,5-Trichlorophenol	163	95-95-4	µg/kg	542	0	0.00%					0.00%	9.22E+07		0.00%	
SVOC	2,4,6-Trichlorophenol	154	88-06-2	µg/kg	542	0	0.00%					0.00%	3.13E+06		0.00%	

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Table 3.9
Subsurface Soil (>3.0 and ≤8.0 ft) AOI Screening

Analyte Group	Analyte	Analyte ID	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
								Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
SVOC	2,4,6-Trinitrotoluene	750	118-96-7	µg/kg	3	0	0.00%					0.00%	460,825		0.00%	
SVOC	2,4-Dichlorophenol	117	120-83-2	µg/kg	542	0	0.00%					0.00%	2.76E+06		0.00%	
SVOC	2,4-Dimethylphenol	103	105-67-9	µg/kg	542	2	0.37%	89	J			0.00%	1.84E+07		0.00%	
SVOC	2,4-Dinitrophenol	132	51-28-5	µg/kg	529	0	0.00%					0.00%	1.84E+06		0.00%	
SVOC	2,4-Dinitrotoluene	118	121-14-2	µg/kg	544	1	0.18%	43	J			0.00%	1.84E+06		0.00%	
SVOC	2,6-Dinitrotoluene	138	606-20-2	µg/kg	544	0	0.00%					0.00%	921,651		0.00%	
SVOC	2-Chloronaphthalene	159	91-58-7	µg/kg	544	0	0.00%					0.00%	7.37E+07		0.00%	
SVOC	2-Chlorophenol	162	95-57-8	µg/kg	542	2	0.37%	77	J			0.00%	6.39E+06		0.00%	
SVOC	2-Methylnaphthalene	158	91-57-6	µg/kg	545	24	4.40%	1300				0.00%	3.69E+06		0.00%	
SVOC	2-Methylphenol	161	95-48-7	µg/kg	541	1	0.18%	93	J			0.00%	4.61E+07		0.00%	
SVOC	2-Nitroaniline	155	88-74-4	µg/kg	544	0	0.00%					0.00%	2.21E+06		0.00%	
SVOC	3,3'-Dichlorobenzidine	160	91-94-1	µg/kg	539	2	0.37%	160	J			0.00%	76,667		0.00%	
SVOC	4,6-Dinitro-2-methylphenol	133	534-52-1	µg/kg	541	0	0.00%					0.00%	92,165		0.00%	
SVOC	4-Chloroaniline	105	106-47-8	µg/kg	532	0	0.00%					0.00%	3.69E+06		0.00%	
SVOC	4-Methylphenol	104	106-44-5	µg/kg	534	4	0.75%	300	J			0.00%	4.61E+06		0.00%	
SVOC	4-Nitroaniline	99	100-01-6	µg/kg	530	1	0.19%	230	J			0.00%	2.39E+06		0.00%	
SVOC	Acenaphthene	145	83-32-9	µg/kg	547	46	8.41%	3600	D			0.00%	5.10E+07		0.00%	
SVOC	Anthracene	115	120-12-7	µg/kg	547	50	9.14%	7300				0.00%	2.55E+08		0.00%	
SVOC	Benzidine	376	92-87-5	µg/kg	1	0	0.00%					0.00%	150		0.00%	
SVOC	Benzo(a)anthracene	136	56-55-3	µg/kg	544	89	16.36%	8000				0.00%	43,616		0.00%	
SVOC	Benzo(b)fluoranthene	124	205-99-2	µg/kg	542	73	13.47%	7100				0.00%	43,616		0.00%	
SVOC	Benzo(k)fluoranthene	126	207-08-9	µg/kg	542	59	10.89%	8000				0.00%	436,159		0.00%	
SVOC	Benzoic Acid	140	65-85-0	µg/kg	504	34	6.75%	2300	J			0.00%	3.69E+09		0.00%	
SVOC	Benzyl Alcohol	101	100-51-6	µg/kg	505	0	0.00%					0.00%	2.76E+08		0.00%	
SVOC	bis(2-Chloroethyl) ether	109	111-44-4	µg/kg	544	0	0.00%					0.00%	43,315		0.00%	
SVOC	bis(2-Chloroisopropyl) ether	106	108-60-1	µg/kg	540	0	0.00%					0.00%	681,967		0.00%	
SVOC	bis(2-ethylhexyl)phthalate	111	117-81-7	µg/kg	546	125	22.89%	71000	E			0.00%	2.46E+06		0.00%	
SVOC	Butylbenzylphthalate	149	85-68-7	µg/kg	545	33	6.06%	6000				0.00%	1.84E+08		0.00%	
SVOC	Carbazole	1071	86-74-8	µg/kg	26	2	7.69%	1300				0.00%	1.73E+06		0.00%	
SVOC	Chrysene	128	218-01-9	µg/kg	546	106	19.41%	8500				0.00%	4.36E+06		0.00%	
SVOC	Dibenz(a,h)anthracene	134	53-70-3	µg/kg	544	26	4.78%	1700	J			0.00%	4,362		0.00%	
SVOC	Dibenzofuran	121	132-64-9	µg/kg	541	21	3.88%	2300				0.00%	2.56E+06		0.00%	
SVOC	Diethylphthalate	146	84-66-2	µg/kg	544	12	2.21%	250	J			0.00%	7.37E+08		0.00%	
SVOC	Dimethylphthalate	120	131-11-3	µg/kg	544	1	0.18%	140	J			0.00%	9.22E+09		0.00%	
SVOC	Di-n-butylphthalate	147	84-74-2	µg/kg	544	56	10.29%	3600				0.00%	9.22E+07		0.00%	
SVOC	Di-n-octylphthalate	112	117-84-0	µg/kg	544	4	0.74%	72	J			0.00%	3.69E+07		0.00%	

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Table 3.9
Subsurface Soil (>3.0 and ≤8.0 ft) AOI Screening

								AOI Screen 1					AOI Screen 2		AOI Screen 3	
Analyte Group	Analyte	Analyte ID	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
SVOC	Fluoranthene	125	206-44-0	µg/kg	546	124	22.71%	31000				0.00%	3.40E+07		0.00%	
SVOC	Fluorene	151	86-73-7	µg/kg	547	33	6.03%	4500				0.00%	3.69E+07		0.00%	
SVOC	Hexachlorobenzene	113	118-74-1	µg/kg	544	2	0.37%	160	J			0.00%	21,508		0.00%	
SVOC	Hexachlorobutadiene	62	87-68-3	µg/kg	1433	7	0.49%	310	JE			0.00%	255,500		0.00%	
SVOC	Indeno(1,2,3-cd)pyrene	123	193-39-5	µg/kg	546	56	10.26%	3800				0.00%	43,616		0.00%	
SVOC	Isophorone	144	78-59-1	µg/kg	544	0	0.00%					0.00%	3.63E+07		0.00%	
SVOC	Naphthalene	63	91-20-3	µg/kg	1434	175	12.20%	19000	E			0.00%	1.61E+07		0.00%	
SVOC	Nitrobenzene	164	98-95-3	µg/kg	544	0	0.00%					0.00%	497,333		0.00%	
SVOC	N-Nitrosodiethylamine	325	55-18-5	µg/kg	31	0	0.00%					0.00%	229		0.00%	
SVOC	N-Nitrosodimethylamine	350	62-75-9	µg/kg	31	0	0.00%					0.00%	675		0.00%	
SVOC	N-Nitrosodi-n-butylamine	374	924-16-3	µg/kg	31	0	0.00%					0.00%	5,977		0.00%	
SVOC	N-Nitroso-di-n-propylamine	139	621-64-7	µg/kg	544	0	0.00%					0.00%	4,929		0.00%	
SVOC	N-nitrosodiphenylamine	150	86-30-6	µg/kg	536	2	0.37%	250	J			0.00%	7.04E+06		0.00%	
SVOC	Pentachlorobenzene	345	608-93-5	µg/kg	31	0	0.00%					0.00%	737,321		0.00%	
SVOC	Pentachlorophenol	153	87-86-5	µg/kg	542	3	0.55%	790	J			0.00%	202,777		0.00%	
SVOC	Phenol	107	108-95-2	µg/kg	544	31	5.70%	2500				0.00%	2.76E+08		0.00%	
SVOC	Pyrene	119	129-00-0	µg/kg	546	122	22.34%	26000				0.00%	2.55E+07		0.00%	
VOC	1,1,1,2-Tetrachloroethane	36	630-20-6	µg/kg	1156	0	0.00%					0.00%	1.05E+06		0.00%	
VOC	1,1,1-Trichloroethane	40	71-55-6	µg/kg	1790	36	2.01%	2100				0.00%	1.06E+08		0.00%	
VOC	1,1,2,2-Tetrachloroethane	60	79-34-5	µg/kg	1788	4	0.22%	1000	JN			0.00%	120,551		0.00%	
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	55	76-13-1	µg/kg	1157	7	0.61%	390				0.00%	2.74E+10		0.00%	
VOC	1,1,2-Trichloroethane	58	79-00-5	µg/kg	1791	2	0.11%	3.2	J			0.00%	322,253		0.00%	
VOC	1,1-Dichloroethane	51	75-34-3	µg/kg	1792	3	0.17%	2.87	J			0.00%	3.12E+07		0.00%	
VOC	1,1-Dichloroethene	52	75-35-4	µg/kg	1791	9	0.50%	23				0.00%	199,706		0.00%	
VOC	1,2,3-Trichloropropane	68	96-18-4	µg/kg	1157	0	0.00%					0.00%	23,910		0.00%	
VOC	1,2,4-Trimethylbenzene	66	95-63-6	µg/kg	1157	37	3.20%	72300	E			0.00%	1.53E+06		0.00%	
VOC	1,2-Dibromo-3-chloropropane	67	96-12-8	µg/kg	1157	0	0.00%					0.00%	34,137		0.00%	
VOC	1,2-Dibromoethane	14	106-93-4	µg/kg	1157	0	0.00%					0.00%	403		0.00%	
VOC	1,2-Dichlorobenzene	65	95-50-1	µg/kg	1442	5	0.35%	270	BJ			0.00%	3.32E+07		0.00%	
VOC	1,2-Dichloroethane	15	107-06-2	µg/kg	1783	7	0.39%	35	J			0.00%	152,603		0.00%	
VOC	1,2-Dichloroethene	466	540-59-0	µg/kg	581	3	0.52%	32				0.00%	1.15E+07		0.00%	
VOC	1,2-Dichloropropane	56	78-87-5	µg/kg	1791	3	0.17%	3.4	J			0.00%	441,907		0.00%	
VOC	1,3,5-Trimethylbenzene	17	108-67-8	µg/kg	1157	14	1.21%	20600	E			0.00%	1.31E+06		0.00%	
VOC	1,3-Dichlorobenzene	135	541-73-1	µg/kg	1449	4	0.28%	70	J			0.00%	3.83E+07		0.00%	
VOC	1,4-Dichlorobenzene	13	106-46-7	µg/kg	1442	13	0.90%	64	J			0.00%	1.05E+06		0.00%	
VOC	2-Butanone	57	78-93-3	µg/kg	1676	123	7.34%	8100	JB			0.00%	5.33E+08		0.00%	

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Table 3.9
Subsurface Soil (>3.0 and ≤8.0 ft) AOI Screening

Analyte Group	Analyte	Analyte ID	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
								Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
VOC	2-Chlorotoluene	64	95-49-8	µg/kg	1157	2	0.17%	80	J			0.00%	2.56E+07		0.00%	
VOC	4-Methyl-2-pentanone	16	108-10-1	µg/kg	1759	11	0.63%	850	J			0.00%	9.57E+08		0.00%	
VOC	Acetone	37	67-64-1	µg/kg	1731	468	27.04%	17000				0.00%	1.15E+09		0.00%	
VOC	Benzene	39	71-43-2	µg/kg	1794	7	0.39%	100	J			0.00%	270,977		0.00%	
VOC	Bromodichloromethane	50	75-27-4	µg/kg	1791	0	0.00%					0.00%	771,304		0.00%	
VOC	Bromoform	49	75-25-2	µg/kg	1782	1	0.06%	2	J			0.00%	4.83E+06		0.00%	
VOC	Bromomethane	41	74-83-9	µg/kg	1745	1	0.06%	7450	JD			0.00%	241,033		0.00%	
VOC	Carbon Disulfide	48	75-15-0	µg/kg	1787	12	0.67%	160	J			0.00%	1.88E+07		0.00%	
VOC	Carbon Tetrachloride	32	56-23-5	µg/kg	1788	37	2.07%	6200	E			0.00%	97,124		0.00%	
VOC	Chlorobenzene	20	108-90-7	µg/kg	1791	0	0.00%					0.00%	7.67E+06		0.00%	
VOC	Chloroethane	45	75-00-3	µg/kg	1758	0	0.00%					0.00%	1.65E+07		0.00%	
VOC	Chloroform	38	67-66-3	µg/kg	1791	40	2.23%	670	JE			0.00%	90,270		0.00%	
VOC	Chloromethane	42	74-87-3	µg/kg	1782	2	0.11%	86	J			0.00%	1.32E+06		0.00%	
VOC	cis-1,2-Dichloroethene	27	156-59-2	µg/kg	1173	35	2.98%	4400				0.00%	1.28E+07		0.00%	
VOC	cis-1,3-Dichloropropene	8	10061-01-5	µg/kg	1792	0	0.00%					0.00%	223,462		0.00%	
VOC	Dibromochloromethane	22	124-48-1	µg/kg	1792	0	0.00%					0.00%	569,296		0.00%	
VOC	Dichlorodifluoromethane	54	75-71-8	µg/kg	1123	2	0.18%	10.8				0.00%	2.64E+06		0.00%	
VOC	ethyl acetate	521	141-78-6	µg/kg	1	1	100.00%	1000	JN			0.00%	1.15E+09		0.00%	
VOC	Ethylbenzene	6	100-41-4	µg/kg	1795	31	1.73%	15500	E			0.00%	6.19E+07		0.00%	
VOC	Hexachloroethane	141	67-72-1	µg/kg	544	0	0.00%					0.00%	1.28E+06		0.00%	
VOC	Isopropylbenzene	70	98-82-8	µg/kg	1156	9	0.78%	2500	JE			0.00%	375,823		0.00%	
VOC	m,p-Xylene	239		µg/kg	9	0	0.00%					0.00%	1.22E+07		0.00%	
VOC	Methylene Chloride	47	75-09-2	µg/kg	1789	432	24.15%	1500	B			0.00%	3.13E+06		0.00%	
VOC	o-Xylene	236	95-47-6	µg/kg	24	0	0.00%					0.00%	1.22E+07		0.00%	
VOC	Styrene	7	100-42-5	µg/kg	1792	5	0.28%	25.7				0.00%	1.59E+08		0.00%	
VOC	Toluene	19	108-88-3	µg/kg	1794	510	28.43%	20000	E			0.00%	3.56E+07		0.00%	
VOC	trans-1,2-Dichloroethene	28	156-60-5	µg/kg	1213	1	0.08%	90	J			0.00%	3.30E+06		0.00%	
VOC	trans-1,3-Dichloropropene	9	10061-02-6	µg/kg	1787	0	0.00%					0.00%	239,434		0.00%	
VOC	Trichloroethene	59	79-01-6	µg/kg	1788	109	6.10%	11600	E			0.00%	20,354		0.00%	
VOC	Trichlorofluoromethane	53	75-69-4	µg/kg	1156	11	0.95%	15	J			0.00%	1.74E+07		0.00%	
VOC	Vinyl acetate	768	108-05-4	µg/kg	535	0	0.00%					0.00%	3.04E+07		0.00%	
VOC	Vinyl Chloride	46	75-01-4	µg/kg	1792	0	0.00%					0.00%	24,948		0.00%	
VOC	Xylene	235	1330-20-7	µg/kg	1786	56	3.14%	115000	E			0.00%	1.22E+07		0.00%	
Radionuclide	Cesium-134	219	13967-70-9	pCi/g	75	69	92.00%	0.11				0.00%	0.910		0.00%	
Radionuclide	Cesium-137	220	10045-97-3	pCi/g	159	143	89.94%	0.573		0.143	7	4.40%	2.54		0.00%	
Radionuclide	Curium-244	421	13981-15-2	pCi/g	16	10	62.50%	0.4618				0.00%	99.3		0.00%	

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Table 3.9

Subsurface Soil (>3.0 and <8.0 ft) AOI Screening

								AOI Screen 1					AOI Screen 2		AOI Screen 3	
Analyte Group	Analyte	Analyte ID	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Radionuclide	Neptunium-237	404	13994-20-2	pCi/g	1	1	100.00%	0.003078	J			0.00%	62.5		0.00%	
Radionuclide	Plutonium-238	241	13981-16-3	pCi/g	79	60	75.95%	19.84				0.00%	68.7		0.00%	
Radionuclide	Plutonium-241	405	14119-32-5	pCi/g	4	3	75.00%	178				0.00%	5,981		0.00%	
Radionuclide	Plutonium-242	436	13982-10-0	pCi/g	16	2	12.50%	0.0145	J			0.00%	71.8		0.00%	
Radionuclide	Radium-226	400	13982-63-3	pCi/g	116	113	97.41%	6.838	X	1.34	17	14.66%	31.0		0.00%	
Radionuclide	Strontium-89/90	409		pCi/g	202	161	79.70%	1.31		0.570	15	7.43%	152		0.00%	
Radionuclide	Tritium	166	10028-17-8	pCi/g	6	6	100.00%	455		395	2	33.33%	288,449		0.00%	
Radionuclide	Uranium-232	449	14158-29-3	pCi/g	16	1	6.25%	0.0562	J			0.00%	41.5		0.00%	
Radionuclide	Uranium-233/234	232		pCi/g	900	882	98.00%	288.286896		2.08	71	7.89%	291		0.00%	
Metal	Lead[e]	74	7439-92-1	mg/kg	1402	1399	99.79%	5200		26.5	58	4.14%	1,000	1	0.07%	No
VOC	Tetrachloroethene	23	127-18-4	µg/kg	1793	195	10.88%	197000	E			0.00%	77,111	4	0.22%	No
Metal	Arsenic	88	7440-38-2	mg/kg	1397	1376	98.50%	55.1		17.5	28	2.00%	27.7	4	0.29%	Yes
Metal	Chromium (total)[f]	92	7440-47-3	mg/kg	1397	1387	99.28%	11000		42.2	43	3.08%	327	4	0.29%	No
Radionuclide	Uranium-235	4	15117-96-1	pCi/g	900	546	60.67%	36.1168604		0.162	59	6.56%	12.1	3	0.33%	No
Radionuclide	Uranium-238	5	7440-61-1	pCi/g	900	890	98.89%	1130		1.77	79	8.78%	337	3	0.33%	No
Radionuclide	Americium-241	3	86954-36-1	pCi/g	872	521	59.75%	410		0.010	337	38.65%	88.4	3	0.34%	No
SVOC	Benzo(a)pyrene	131	50-32-8	µg/kg	543	75	13.81%	11000				0.00%	4,357	5	0.92%	No
Radionuclide	Plutonium-239/240	1		pCi/g	885	594	67.12%	2450		0.022	372	42.03%	112	9	1.02%	No
Radionuclide	Radium-228[g]	401	15262-20-1	pCi/g	145	144	99.31%	2.784		2.09	20	13.79%	1.28	20	13.79%	Yes

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

	The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a] A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.

[b] For uranium (total) the Subsurface Background Mean + 2SD value was taken from the 1995 DOE Background Geochemical Characterization Report (DOE 1995).

[c] The TEQ for 2,3,7,8-TCDD is calculated in Table A3.3 in Attachment 3.

[d] The PCBs identified above under the Analyte column are equivalent to Aroclors, for example PCB-1254 is the same as Aroclor-1254.

[e] The PRG value for lead is not calculated, but rather is taken from EPA's "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (1994)".

[f] Chromium (total) is conservatively compared to the chromium VI WRW PRG.

[g] For radium-228 the Subsurface Background Mean + 2SD value is greater than the WRW PRG. Therefore, only those results greater than both the Subsurface Background Mean + 2SD and WRW PRG are reported under AOI Screen 2.

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Ta[illegible].10
Subsurface Soil (>3.0 and ≤8.0 ft) AOIs

								AOI Screen 1					AOI Screen 2		AOI Screen 3
Analyte Group	Analyte	Analyte ID	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG
Metal	Lead[b]	74	7439-92-1	mg/kg	1402	1399	99.79%	5200		26.5	58	4.14%	1,000	1	0.07%
VOC	Tetrachloroethene	23	127-18-4	µg/kg	1793	195	10.88%	197000	E			0.00%	77,111	4	0.22%
Metal	Chromium (total)[c]	92	7440-47-3	mg/kg	1397	1387	99.28%	11000		42.2	43	3.08%	327	4	0.29%
Radionuclide	Uranium-235	4	15117-96-1	pCi/g	900	546	60.67%	36.1168604		0.162	59	6.56%	12.1	3	0.33%
Radionuclide	Uranium-238	5	7440-61-1	pCi/g	900	890	98.89%	1130		1.77	79	8.78%	337	3	0.33%
Radionuclide	Americium-241	3	86954-36-1	pCi/g	872	521	59.75%	410		0.010	337	38.65%	88.4	3	0.34%
SVOC	Benzo(a)pyrene	131	50-32-8	µg/kg	543	75	13.81%	11000				0.00%	4,357	5	0.92%
Radionuclide	Plutonium-239/240	1		pCi/g	885	594	67.12%	2450		0.022	372	42.03%	112	9	1.02%

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

	The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a] A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.

[b] The PRG value for lead is not calculated, but rather is taken from EPA's "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (1994)".

[c] Chromium (total) is conservatively compared to the chromium VI WRW PRG.

Table 3.11
Subsurface Soil (>8.0 and ≤ 12.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Metal	Aluminum	7429-90-5	mg/kg	568	567	99.82%	42400	E	30,392	9	1.58%	284,902		0.00%	
Metal	Antimony	7440-36-0	mg/kg	531	76	14.31%	149		9.78	21	3.95%	511		0.00%	
Metal	Barium	7440-39-3	mg/kg	568	567	99.82%	1150		291	16	2.82%	33,033		0.00%	
Metal	Beryllium	7440-41-7	mg/kg	564	431	76.42%	190		15.8	2	0.35%	1,151		0.00%	
Metal	Boron	7440-42-8	mg/kg	229	177	77.29%	30				0.00%	108,980		0.00%	
Metal	Cadmium	7440-43-9	mg/kg	555	107	19.28%	160		1.08	31	5.59%	1,051		0.00%	
Metal	Chromium VI	18540-29-9	mg/kg	2	1	50.00%	0.56				0.00%	327		0.00%	
Metal	Cobalt	7440-48-4	mg/kg	568	548	96.48%	67.6		15.4	13	2.29%	1,401		0.00%	
Metal	Copper	7440-50-8	mg/kg	568	556	97.89%	1380		23.8	44	7.75%	51,100		0.00%	
Metal	Iron	7439-89-6	mg/kg	568	567	99.82%	107000		28,459	13	2.29%	383,250		0.00%	
Metal	Lead[b]	7439-92-1	mg/kg	568	567	99.82%	935		26.5	16	2.82%	1,000		0.00%	
Metal	Lithium	7439-93-2	mg/kg	553	501	90.60%	79.9		20.5	19	3.44%	25,550		0.00%	
Metal	Manganese	7439-96-5	mg/kg	568	566	99.65%	3140		487	30	5.28%	4,815		0.00%	
Metal	Mercury	7439-97-6	mg/kg	543	266	48.99%	19		0.488	1	0.18%	379		0.00%	
Metal	Molybdenum	7439-98-7	mg/kg	561	222	39.57%	190		29.1	3	0.53%	6,388		0.00%	
Metal	Nickel	7440-02-0	mg/kg	568	546	96.13%	4750		43.0	19	3.35%	25,550		0.00%	
Metal	Selenium	7782-49-2	mg/kg	562	52	9.25%	2.9	B	1.68	4	0.71%	6,388		0.00%	
Metal	Silver	7440-22-4	mg/kg	561	79	14.08%	311		26.6	4	0.71%	6,388		0.00%	
Metal	Strontium	7440-24-6	mg/kg	567	563	99.29%	398		136	19	3.35%	766,500		0.00%	
Metal	Thallium	7440-28-0	mg/kg	564	124	21.99%	2.5	B	1.42	14	2.48%	89.4		0.00%	
Metal	Tin	7440-31-5	mg/kg	558	85	15.23%	579		354	2	0.36%	766,500		0.00%	
Metal	Titanium	7440-32-6	mg/kg	229	229	100.00%	440				0.00%	1.95E+06		0.00%	
Metal	Uranium (total)[c]		mg/kg	238	40	16.81%	110		3.04	20	8.40%	3,833		0.00%	
Metal	Vanadium	7440-62-2	mg/kg	568	566	99.65%	118		63.3	11	1.94%	1,278		0.00%	
Metal	Zinc	7440-66-6	mg/kg	568	563	99.12%	1870		78.3	27	4.75%	383,250		0.00%	
Wet Chem	Ammonia	7664-41-7	mg/kg	14	1	7.14%	0.445				0.00%	1.05E+07		0.00%	
Wet Chem	Cyanide	57-12-5	mg/kg	69	2	2.90%	0.525				0.00%	25,550		0.00%	
Wet Chem	Fluoride	16984-48-8	mg/kg	7	7	100.00%	1.62				0.00%	76,650		0.00%	
Wet Chem	Nitrate / Nitrite	ConID 184	mg/kg	102	82	80.39%	1050		4.33	28	27.45%	2.04E+06		0.00%	
Wet Chem	Nitrite	ConID 187	mg/kg	2	0	0.00%					0.00%	127,750		0.00%	
Dioxins and Furans	2378-TCDD TEQ[d]	1746-01-6	µg/kg	3	3	100.00%	0.01203084				0.00%	0.285		0.00%	
Explosive	HMX	2691-41-0	µg/kg	1	0	0.00%					0.00%	4.61E+07		0.00%	
Herbicide	4-Nitrophenol	100-02-7	µg/kg	257	0	0.00%					0.00%	7.37E+06		0.00%	
PCB	PCB-1016[e]	12674-11-2	µg/kg	180	1	0.56%	37	J			0.00%	15,514		0.00%	
PCB	PCB-1221[e]	11104-28-2	µg/kg	180	0	0.00%					0.00%	15,514		0.00%	

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Table 3.11
Subsurface Soil (>8.0 and ≤ 12.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1: Maximum Concentration	AOI Screen 1: Data Qualifier[a]	AOI Screen 1: Background Mean + 2SD	AOI Screen 1: Number Detections > Background Mean + 2SD	AOI Screen 1: Percent Detections > Background Mean + 2SD	AOI Screen 2: WRW PRG	AOI Screen 2: Number Detections > WRW PRG	AOI Screen 3: Percent Detections > WRW PRG	AOI Screen 3: Eliminated By Process Knowledge
PCB	PCB-1232[e]	11141-16-5	µg/kg	178	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1242[e]	53469-21-9	µg/kg	180	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1248[e]	12672-29-6	µg/kg	180	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1254[e]	11097-69-1	µg/kg	180	17	9.44%	5500				0.00%	15,514		0.00%	
PCB	PCB-1260[e]	11096-82-5	µg/kg	180	9	5.00%	3000				0.00%	15,514		0.00%	
Pesticide	4,4'-DDD	72-54-8	µg/kg	99	0	0.00%					0.00%	178,570		0.00%	
Pesticide	4,4'-DDE	72-55-9	µg/kg	99	0	0.00%					0.00%	126,049		0.00%	
Pesticide	4,4'-DDT	50-29-3	µg/kg	99	0	0.00%					0.00%	125,658		0.00%	
Pesticide	Aldrin	309-00-2	µg/kg	99	0	0.00%					0.00%	2,024		0.00%	
Pesticide	alpha-BHC	319-84-6	µg/kg	99	1	1.01%	15				0.00%	6,555		0.00%	
Pesticide	alpha-Chlordane	5103-71-9	µg/kg	84	0	0.00%					0.00%	117,997		0.00%	
Pesticide	beta-BHC	319-85-7	µg/kg	99	0	0.00%					0.00%	22,942		0.00%	
Pesticide	beta-Chlordane	5103-74-2	µg/kg	79	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Chlordane		µg/kg	15	0	0.00%					0.00%	117,997		0.00%	
Pesticide	delta-BHC	319-86-8	µg/kg	99	0	0.00%					0.00%	6,555		0.00%	
Pesticide	Dieldrin	60-57-1	µg/kg	98	0	0.00%					0.00%	2,151		0.00%	
Pesticide	Endosulfan I	959-98-8	µg/kg	99	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endosulfan II	33213-65-9	µg/kg	98	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endosulfan sulfate	1031-07-8	µg/kg	98	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endrin	72-20-8	µg/kg	98	0	0.00%					0.00%	276,495		0.00%	
Pesticide	Endrin aldehyde	7421-93-4	µg/kg	22	0	0.00%					0.00%	276,495		0.00%	
Pesticide	Endrin ketone	53494-70-5	µg/kg	86	0	0.00%					0.00%	383,250		0.00%	
Pesticide	gamma-BHC (Lindane)	58-89-9	µg/kg	99	0	0.00%					0.00%	31,864		0.00%	
Pesticide	gamma-Chlordane	12789-03-6	µg/kg	5	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Heptachlor	76-44-8	µg/kg	99	0	0.00%					0.00%	7,647		0.00%	
Pesticide	Heptachlor epoxide	1024-57-3	µg/kg	99	1	1.01%	11				0.00%	3,782		0.00%	
Pesticide	Hexachlorocyclopentadiene	77-47-4	µg/kg	253	0	0.00%					0.00%	4.38E+06		0.00%	
Pesticide	Methoxychlor	72-43-5	µg/kg	99	1	1.01%	0.47	J			0.00%	4.61E+06		0.00%	
Pesticide	Toxaphene	8001-35-2	µg/kg	99	0	0.00%					0.00%	31,284		0.00%	
SVOC	1,2,4,5-Tetrachlorobenzene	95-94-3	µg/kg	28	0	0.00%					0.00%	276,495		0.00%	
SVOC	1,2,4-Trichlorobenzene	120-82-1	µg/kg	528	13	2.46%	2400				0.00%	1.74E+06		0.00%	
SVOC	1,2-Diphenylhydrazine	122-66-7	µg/kg	28	0	0.00%					0.00%	43,021		0.00%	
SVOC	2,4,5-Trichlorophenol	95-95-4	µg/kg	258	0	0.00%					0.00%	9.22E+07		0.00%	
SVOC	2,4,6-Trichlorophenol	88-06-2	µg/kg	258	0	0.00%					0.00%	3.13E+06		0.00%	
SVOC	2,4,6-Trinitrotoluene	118-96-7	µg/kg	1	0	0.00%					0.00%	460,825		0.00%	

Table 3.11
Subsurface Soil (>8.0 and ≤ 12.0 ft) AOI Screening

							AOI Screen 1					AOI Screen 2		AOI Screen 3	
Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
SVOC	2,4-Dichlorophenol	120-83-2	µg/kg	258	0	0.00%					0.00%	2.76E+06		0.00%	
SVOC	2,4-Dimethylphenol	105-67-9	µg/kg	258	0	0.00%					0.00%	1.84E+07		0.00%	
SVOC	2,4-Dinitrophenol	51-28-5	µg/kg	249	0	0.00%					0.00%	1.84E+06		0.00%	
SVOC	2,4-Dinitrotoluene	121-14-2	µg/kg	260	0	0.00%					0.00%	1.84E+06		0.00%	
SVOC	2,6-Dinitrotoluene	606-20-2	µg/kg	260	0	0.00%					0.00%	921,651		0.00%	
SVOC	2-Chloronaphthalene	91-58-7	µg/kg	259	0	0.00%					0.00%	7.37E+07		0.00%	
SVOC	2-Chlorophenol	95-57-8	µg/kg	258	2	0.78%	46	J			0.00%	6.39E+06		0.00%	
SVOC	2-Methylnaphthalene	91-57-6	µg/kg	258	8	3.10%	26000				0.00%	3.69E+06		0.00%	
SVOC	2-Methylphenol	95-48-7	µg/kg	256	1	0.39%	74	J			0.00%	4.61E+07		0.00%	
SVOC	2-Nitroaniline	88-74-4	µg/kg	259	0	0.00%					0.00%	2.21E+06		0.00%	
SVOC	3,3'-Dichlorobenzidine	91-94-1	µg/kg	256	0	0.00%					0.00%	76,667		0.00%	
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	µg/kg	258	0	0.00%					0.00%	92,165		0.00%	
SVOC	4-Chloroaniline	106-47-8	µg/kg	249	0	0.00%					0.00%	3.69E+06		0.00%	
SVOC	4-Methylphenol	106-44-5	µg/kg	258	4	1.55%	9300				0.00%	4.61E+06		0.00%	
SVOC	4-Nitroaniline	100-01-6	µg/kg	247	0	0.00%					0.00%	2.39E+06		0.00%	
SVOC	4-Nitrotoluene	99-99-0	µg/kg	1	0	0.00%					0.00%	2.81E+06		0.00%	
SVOC	Acenaphthene	83-32-9	µg/kg	259	14	5.41%	31000				0.00%	5.10E+07		0.00%	
SVOC	Anthracene	120-12-7	µg/kg	259	14	5.41%	46000				0.00%	2.55E+08		0.00%	
SVOC	Benzo(k)fluoranthene	207-08-9	µg/kg	257	9	3.50%	19000				0.00%	436,159		0.00%	
SVOC	Benzoic Acid	65-85-0	µg/kg	240	21	8.75%	3400	J			0.00%	3.69E+09		0.00%	
SVOC	Benzyl Alcohol	100-51-6	µg/kg	242	0	0.00%					0.00%	2.76E+08		0.00%	
SVOC	bis(2-Chloroethyl) ether	111-44-4	µg/kg	259	0	0.00%					0.00%	43,315		0.00%	
SVOC	bis(2-Chloroisopropyl) ether	108-60-1	µg/kg	257	0	0.00%					0.00%	681,967		0.00%	
SVOC	bis(2-ethylhexyl)phthalate	117-81-7	µg/kg	258	45	17.44%	4800				0.00%	2.46E+06		0.00%	
SVOC	Butylbenzylphthalate	85-68-7	µg/kg	259	21	8.11%	1400				0.00%	1.84E+08		0.00%	
SVOC	Carbazole	86-74-8	µg/kg	10	0	0.00%					0.00%	1.73E+06		0.00%	
SVOC	Chrysene	218-01-9	µg/kg	259	24	9.27%	53000				0.00%	4.36E+06		0.00%	
SVOC	Dibenz(a,h)anthracene	53-70-3	µg/kg	259	4	1.54%	1200				0.00%	4,362		0.00%	
SVOC	Dibenzofuran	132-64-9	µg/kg	259	9	3.47%	20000				0.00%	2.56E+06		0.00%	
SVOC	Diethylphthalate	84-66-2	µg/kg	259	2	0.77%	1300				0.00%	7.37E+08		0.00%	
SVOC	Dimethylphthalate	131-11-3	µg/kg	259	1	0.39%	2100				0.00%	9.22E+09		0.00%	
SVOC	Di-n-butylphthalate	84-74-2	µg/kg	259	28	10.81%	550	BJ			0.00%	9.22E+07		0.00%	
SVOC	Di-n-octylphthalate	117-84-0	µg/kg	259	0	0.00%					0.00%	3.69E+07		0.00%	
SVOC	Fluoranthene	206-44-0	µg/kg	259	30	11.58%	160000	E			0.00%	3.40E+07		0.00%	
SVOC	Fluorene	86-73-7	µg/kg	259	11	4.25%	35000				0.00%	3.69E+07		0.00%	

Table 3.11
Subsurface Soil (>8.0 and ≤ 12.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
SVOC	Hexachlorobenzene	118-74-1	µg/kg	259	1	0.39%	1300				0.00%	21,508		0.00%	
SVOC	Hexachlorobutadiene	87-68-3	µg/kg	529	5	0.95%	2.4	J			0.00%	255,500		0.00%	
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	µg/kg	258	10	3.88%	22000	DJ			0.00%	43,616		0.00%	
SVOC	Isophorone	78-59-1	µg/kg	259	0	0.00%					0.00%	3.63E+07		0.00%	
SVOC	Naphthalene	91-20-3	µg/kg	528	47	8.90%	61000				0.00%	1.61E+07		0.00%	
SVOC	Nitrobenzene	98-95-3	µg/kg	260	0	0.00%					0.00%	497,333		0.00%	
SVOC	N-Nitrosodiethylamine	55-18-5	µg/kg	28	0	0.00%					0.00%	229		0.00%	
SVOC	N-Nitrosodimethylamine	62-75-9	µg/kg	28	0	0.00%					0.00%	675		0.00%	
SVOC	N-Nitrosodi-n-butylamine	924-16-3	µg/kg	28	0	0.00%					0.00%	5,977		0.00%	
SVOC	N-Nitroso-di-n-propylamine	621-64-7	µg/kg	259	0	0.00%					0.00%	4,929		0.00%	
SVOC	N-nitrosodiphenylamine	86-30-6	µg/kg	259	2	0.77%	2400	J			0.00%	7.04E+06		0.00%	
SVOC	Pentachlorobenzene	608-93-5	µg/kg	28	0	0.00%					0.00%	737,321		0.00%	
SVOC	Pentachlorophenol	87-86-5	µg/kg	258	1	0.39%	160	J			0.00%	202,777		0.00%	
SVOC	Phenol	108-95-2	µg/kg	259	29	11.20%	1800				0.00%	2.76E+08		0.00%	
SVOC	Pyrene	129-00-0	µg/kg	259	26	10.04%	150000	E			0.00%	2.55E+07		0.00%	
VOC	1,1,1,2-Tetrachloroethane	630-20-6	µg/kg	365	0	0.00%					0.00%	1.05E+06		0.00%	
VOC	1,1,1-Trichloroethane	71-55-6	µg/kg	770	31	4.03%	3000				0.00%	1.06E+08		0.00%	
VOC	1,1,2,2-Tetrachloroethane	79-34-5	µg/kg	762	1	0.13%	1	J			0.00%	120,551		0.00%	
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	µg/kg	364	3	0.82%	1890	E			0.00%	2.74E+10		0.00%	
VOC	1,1,2-Trichloroethane	79-00-5	µg/kg	768	2	0.26%	55				0.00%	322,253		0.00%	
VOC	1,1-Dichloroethane	75-34-3	µg/kg	771	8	1.04%	1200				0.00%	3.12E+07		0.00%	
VOC	1,1-Dichloroethene	75-35-4	µg/kg	771	21	2.72%	370				0.00%	199,706		0.00%	
VOC	1,2,3-Trichloropropane	96-18-4	µg/kg	366	0	0.00%					0.00%	23,910		0.00%	
VOC	1,2,4-Trimethylbenzene	95-63-6	µg/kg	365	21	5.75%	200	JE			0.00%	1.53E+06		0.00%	
VOC	1,2-Dibromo-3-chloropropane	96-12-8	µg/kg	366	0	0.00%					0.00%	34,137		0.00%	
VOC	1,2-Dibromoethane	106-93-4	µg/kg	365	0	0.00%					0.00%	403		0.00%	
VOC	1,2-Dichlorobenzene	95-50-1	µg/kg	545	5	0.92%	74				0.00%	3.32E+07		0.00%	
VOC	1,2-Dichloroethane	107-06-2	µg/kg	762	5	0.66%	20	J			0.00%	152,603		0.00%	
VOC	1,2-Dichloroethene	540-59-0	µg/kg	352	1	0.28%	4	J			0.00%	1.15E+07		0.00%	
VOC	1,2-Dichloropropane	78-87-5	µg/kg	768	0	0.00%					0.00%	441,907		0.00%	
VOC	1,3,5-Trimethylbenzene	108-67-8	µg/kg	364	15	4.12%	140				0.00%	1.31E+06		0.00%	
VOC	1,3-Dichlorobenzene	541-73-1	µg/kg	545	3	0.55%	11				0.00%	3.83E+07		0.00%	
VOC	1,4-Dichlorobenzene	106-46-7	µg/kg	544	5	0.92%	84	BJ			0.00%	1.05E+06		0.00%	
VOC	2-Butanone	78-93-3	µg/kg	693	63	9.09%	2000				0.00%	5.33E+08		0.00%	
VOC	2-Chlorotoluene	95-49-8	µg/kg	364	1	0.27%	22	J			0.00%	2.56E+07		0.00%	

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Table 3.11
Subsurface Soil (>8.0 and ≤ 12.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
VOC	4-Methyl-2-pentanone	108-10-1	µg/kg	746	13	1.74%	8200				0.00%	9.57E+08		0.00%	
VOC	Acetone	67-64-1	µg/kg	725	242	33.38%	2500	BJ			0.00%	1.15E+09		0.00%	
VOC	Benzene	71-43-2	µg/kg	771	7	0.91%	250	B			0.00%	270,977		0.00%	
VOC	Bromodichloromethane	75-27-4	µg/kg	766	0	0.00%					0.00%	771,304		0.00%	
VOC	Bromoform	75-25-2	µg/kg	762	0	0.00%					0.00%	4.83E+06		0.00%	
VOC	Bromomethane	74-83-9	µg/kg	736	0	0.00%					0.00%	241,033		0.00%	
VOC	Carbon Disulfide	75-15-0	µg/kg	763	6	0.79%	290	J			0.00%	1.88E+07		0.00%	
VOC	Carbon Tetrachloride	56-23-5	µg/kg	766	20	2.61%	130				0.00%	97,124		0.00%	
VOC	Chlorobenzene	108-90-7	µg/kg	766	0	0.00%					0.00%	7.67E+06		0.00%	
VOC	Chloroethane	75-00-3	µg/kg	747	0	0.00%					0.00%	1.65E+07		0.00%	
VOC	Chloroform	67-66-3	µg/kg	768	26	3.39%	1980	E			0.00%	90,270		0.00%	
VOC	Chloromethane	74-87-3	µg/kg	763	0	0.00%					0.00%	1.32E+06		0.00%	
VOC	cis-1,2-Dichloroethene	156-59-2	µg/kg	385	13	3.38%	4800	E			0.00%	1.28E+07		0.00%	
VOC	cis-1,3-Dichloropropene	10061-01-5	µg/kg	768	0	0.00%					0.00%	223,462		0.00%	
VOC	Dibromochloromethane	124-48-1	µg/kg	767	0	0.00%					0.00%	569,296		0.00%	
VOC	Dichlorodifluoromethane	75-71-8	µg/kg	364	3	0.82%	26				0.00%	2.64E+06		0.00%	
VOC	Ethylbenzene	100-41-4	µg/kg	776	16	2.06%	350				0.00%	6.19E+07		0.00%	
VOC	Hexachloroethane	67-72-1	µg/kg	259	0	0.00%					0.00%	1.28E+06		0.00%	
VOC	Isopropylbenzene	98-82-8	µg/kg	365	8	2.19%	21				0.00%	375,823		0.00%	
VOC	m,p-Xylene		µg/kg	6	0	0.00%					0.00%	1.22E+07		0.00%	
VOC	Methylene Chloride	75-09-2	µg/kg	767	218	28.42%	1900				0.00%	3.13E+06		0.00%	
VOC	o-Xylene	95-47-6	µg/kg	23	0	0.00%					0.00%	1.22E+07		0.00%	
VOC	Styrene	100-42-5	µg/kg	767	5	0.65%	2.6	J			0.00%	1.59E+08		0.00%	
VOC	Toluene	108-88-3	µg/kg	776	276	35.57%	7600				0.00%	3.56E+07		0.00%	
VOC	trans-1,2-Dichloroethene	156-60-5	µg/kg	416	1	0.24%	96				0.00%	3.30E+06		0.00%	
VOC	trans-1,3-Dichloropropene	10061-02-6	µg/kg	760	0	0.00%					0.00%	239,434		0.00%	
VOC	Trichloroethene	79-01-6	µg/kg	772	84	10.88%	5200	E			0.00%	20,354		0.00%	
VOC	Trichlorofluoromethane	75-69-4	µg/kg	361	3	0.83%	1	J			0.00%	1.74E+07		0.00%	
VOC	Vinyl acetate	108-05-4	µg/kg	335	0	0.00%					0.00%	3.04E+07		0.00%	
VOC	Vinyl Chloride	75-01-4	µg/kg	766	1	0.13%	570	E			0.00%	24,948		0.00%	
VOC	Xylene	1330-20-7	µg/kg	769	26	3.38%	2000				0.00%	1.22E+07		0.00%	
Radionuclide	Americium-241	86954-36-1	pCi/g	369	239	64.77%	44.1		0.010	87	23.58%	88.4		0.00%	
Radionuclide	Cesium-134	13967-70-9	pCi/g	40	39	97.50%	0.12				0.00%	0.910		0.00%	
Radionuclide	Cesium-137	10045-97-3	pCi/g	88	86	97.73%	0.3		0.143	2	2.27%	2.54		0.00%	
Radionuclide	Neptunium-237	13994-20-2	pCi/g	4	4	100.00%	0.02679				0.00%	62.5		0.00%	

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Table 3.11
Subsurface Soil (>8.0 and ≤ 12.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1: Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	AOI Screen 2: WRW PRG	Number Detections > WRW PRG	AOI Screen 3: Percent Detections > WRW PRG	Eliminated By Process Knowledge
Radionuclide	Plutonium-238	13981-16-3	pCi/g	57	47	82.46%	1.93				0.00%	68.7		0.00%	
Radionuclide	Radium-226	13982-63-3	pCi/g	62	62	100.00%	2.277		1.34	13	20.97%	31.0		0.00%	
Radionuclide	Strontium-89/90		pCi/g	113	103	91.15%	1		0.570	8	7.08%	152		0.00%	
Radionuclide	Tritium	10028-17-8	pCi/g	1	1	100.00%	60				0.00%	288,449		0.00%	
Radionuclide	Uranium-233/234		pCi/g	393	391	99.49%	241		2.08	37	9.41%	291		0.00%	
Radionuclide	Uranium-234	13966-29-5	pCi/g	1	1	100.00%	0.865		2.08		0.00%	291		0.00%	
VOC	Tetrachloroethene	127-18-4	µg/kg	770	96	12.47%	91000	E			0.00%	77,111	1	0.13%	No
Metal	Arsenic	7440-38-2	mg/kg	568	563	99.12%	28.5		17.5	4	0.70%	27.7	1	0.18%	Yes
Metal	Chromium (total)[f]	7440-47-3	mg/kg	568	560	98.59%	8310		42.2	19	3.35%	327	1	0.18%	No
SVOC	Benzo(a)anthracene	56-55-3	µg/kg	259	18	6.95%	48000				0.00%	43,616	1	0.39%	Yes
SVOC	Benzo(b)fluoranthene	205-99-2	µg/kg	257	11	4.28%	48000				0.00%	43,616	1	0.39%	Yes
Radionuclide	Uranium-235	15117-96-1	pCi/g	394	288	73.10%	37.68		0.162	24	6.09%	12.1	2	0.51%	No
Radionuclide	Uranium-238	7440-61-1	pCi/g	394	393	99.75%	1160		1.77	49	12.44%	337	2	0.51%	No
Radionuclide	Plutonium-239/240		pCi/g	389	272	69.92%	223		0.022	81	20.82%	112	2	0.51%	No
SVOC	Benzo(a)pyrene	50-32-8	µg/kg	259	15	5.79%	43000				0.00%	4,357	3	1.16%	No
Radionuclide	Radium-228[g]	15262-20-1	pCi/g	81	81	100.00%	3.5		2.09	10	12.35%	1.28	10	12.35%	Yes

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

	The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a] A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.

[b] The PRG value for lead is not calculated, but rather is taken from EPA's "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (1994)".

[c] For uranium (total) the Subsurface Background Mean + 2SD value was taken from the 1995 DOE Background Geochemical Characterization Report (DOE 1995).

[d] The TEQ for 2,3,7,8-TCDD is calculated in Table A3.3 in Attachment 3.

[e] The PCBs identified above under the Analyte column are equivalent to Aroclors, for example PCB-1254 is the same as Aroclor-1254.

[f] Chromium (total) is conservatively compared to the chromium VI WRW PRG.

[g] For radium-228 the Subsurface Background Mean + 2SD value is greater than the WRW PRG. Therefore, only those results greater than both the Subsurface Background Mean + 2SD and WRW PRG are reported under AOI Screen 2.

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Table 3.12
Subsurface Soil (>8.0 and ≤ 12.0 ft) AOIs

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1: Maximum Concentration	AOI Screen 1: Data Qualifier[a]	AOI Screen 1: Background Mean + 2SD	AOI Screen 1: Number Detections > Background Mean + 2SD	AOI Screen 1: Percent Detections > Background Mean + 2SD	AOI Screen 2: WRW PRG	AOI Screen 2: Number Detections > WRW PRG	AOI Screen 3: Percent Detections > WRW PRG
VOC	Tetrachloroethene	127-18-4	µg/kg	770	96	12.47%	91000	E			0.00%	77,111	1	0.13%
Metal	Chromium (total)[b]	7440-47-3	mg/kg	568	560	98.59%	8310		42.2	19	3.35%	327	1	0.18%
Radionuclide	Uranium-235	15117-96-1	pCi/g	394	288	73.10%	37.68		0.162	24	6.09%	12.1	2	0.51%
Radionuclide	Uranium-238	7440-61-1	pCi/g	394	393	99.75%	1160		1.77	49	12.44%	337	2	0.51%
Radionuclide	Plutonium-239/240		pCi/g	389	272	69.92%	223		0.022	81	20.82%	112	2	0.51%
SVOC	Benzo(a)pyrene	50-32-8	µg/kg	259	15	5.79%	43000				0.00%	4,357	3	1.16%

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

	The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a] A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.
[b] Chromium (total) is conservatively compared to the chromium VI WRW PRG.

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Table 3.13
Subsurface Soil (>12.0 and ≤30.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 2	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Metal	Aluminum	7429-90-5	mg/kg	660	660	100.00%	34000		30,392	3	0.45%	284,902		0.00%	
Metal	Antimony	7440-36-0	mg/kg	613	65	10.60%	21		9.78	17	2.77%	511		0.00%	
Metal	Arsenic	7440-38-2	mg/kg	660	647	98.03%	18		17.5	1	0.15%	27.7		0.00%	
Metal	Barium	7440-39-3	mg/kg	660	660	100.00%	4150	*	291	29	4.39%	33,033		0.00%	
Metal	Beryllium	7440-41-7	mg/kg	659	522	79.21%	2		15.8		0.00%	1,151		0.00%	
Metal	Boron	7440-42-8	mg/kg	117	104	88.89%	9.7				0.00%	108,980		0.00%	
Metal	Cadmium	7440-43-9	mg/kg	614	105	17.10%	16.7		1.08	23	3.75%	1,051		0.00%	
Metal	Chromium VI	18540-29-9	mg/kg	16	4	25.00%	1.16				0.00%	327		0.00%	
Metal	Cobalt	7440-48-4	mg/kg	660	638	96.67%	78.1		15.4	27	4.09%	1,401		0.00%	
Metal	Copper	7440-50-8	mg/kg	660	645	97.73%	361		23.8	53	8.03%	51,100		0.00%	
Metal	Iron	7439-89-6	mg/kg	660	660	100.00%	50800		28,459	17	2.58%	383,250		0.00%	
Metal	Lead[b]	7439-92-1	mg/kg	660	657	99.55%	278	SN	26.5	19	2.88%	1,000		0.00%	
Metal	Lithium	7439-93-2	mg/kg	640	541	84.53%	29.5		20.5	4	0.63%	25,550		0.00%	
Metal	Manganese	7439-96-5	mg/kg	660	660	100.00%	3160	N*	487	49	7.42%	4,815		0.00%	
Metal	Mercury	7439-97-6	mg/kg	648	191	29.48%	1.4		0.488	2	0.31%	379		0.00%	
Metal	Molybdenum	7439-98-7	mg/kg	642	202	31.46%	241		29.1	2	0.31%	6,388		0.00%	
Metal	Nickel	7440-02-0	mg/kg	660	607	91.97%	355		43.0	17	2.58%	25,550		0.00%	
Metal	Selenium	7782-49-2	mg/kg	649	54	8.32%	2.1		1.68	2	0.31%	6,388		0.00%	
Metal	Silver	7440-22-4	mg/kg	636	97	15.25%	24		26.6		0.00%	6,388		0.00%	
Metal	Strontium	7440-24-6	mg/kg	657	656	99.85%	420		136	11	1.67%	766,500		0.00%	
Metal	Thallium	7440-28-0	mg/kg	656	141	21.49%	2.5		1.42	5	0.76%	89.4		0.00%	
Metal	Tin	7440-31-5	mg/kg	647	117	18.08%	91.1		354		0.00%	766,500		0.00%	
Metal	Titanium	7440-32-6	mg/kg	117	117	100.00%	350				0.00%	1.95E+06		0.00%	
Metal	Uranium (total)c		mg/kg	114	11	9.65%	13		3.04	3	2.63%	3,833		0.00%	
Metal	Vanadium	7440-62-2	mg/kg	660	660	100.00%	93.5		63.3	6	0.91%	1,278		0.00%	
Metal	Zinc	7440-66-6	mg/kg	660	656	99.39%	648		78.3	50	7.58%	383,250		0.00%	
Wet Chem	Ammonia	7664-41-7	mg/kg	95	24	25.26%	1.329				0.00%	1.05E+07		0.00%	
Wet Chem	Cyanide	57-12-5	mg/kg	163	4	2.45%	4.26				0.00%	25,550		0.00%	
Wet Chem	Fluoride	16984-48-8	mg/kg	2	2	100.00%	0.89				0.00%	76,650		0.00%	
Wet Chem	Nitrate / Nitrite	ConID 184	mg/kg	214	142	66.36%	1670		4.33	20	9.35%	2.04E+06		0.00%	
Wet Chem	Nitrite	ConID 187	mg/kg	1	0	0.00%					0.00%	127,750		0.00%	
Dioxins and Furans	2378-TCDD TEQ[d]	1746-01-6	µg/kg	1	0	0.00%					0.00%	0.285		0.00%	
Herbicide	2,4,5-T	93-76-5	µg/kg	3	0	0.00%					0.00%	9.22E+06		0.00%	
Herbicide	2,4,5-TP (Silvex)	93-72-1	µg/kg	10	0	0.00%					0.00%	1.95E+06		0.00%	
Herbicide	2,4-D	94-75-7	µg/kg	10	0	0.00%					0.00%	9.22E+06		0.00%	
Herbicide	2,4-DB	94-82-6	µg/kg	2	0	0.00%					0.00%	7.37E+06		0.00%	

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Table 3.13
Subsurface Soil (>12.0 and ≤30.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 2	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Herbicide	4-Nitrophenol	100-02-7	µg/kg	374	0	0.00%					0.00%	7.37E+06		0.00%	
Herbicide	Dalapon	75-99-0	µg/kg	2	0	0.00%					0.00%	2.76E+07		0.00%	
Herbicide	Dicamba	1918-00-9	µg/kg	2	0	0.00%					0.00%	2.76E+07		0.00%	
Herbicide	Dinoseb	88-85-7	µg/kg	3	0	0.00%					0.00%	921,651		0.00%	
Herbicide	MCPA	94-74-6	µg/kg	2	0	0.00%					0.00%	460,825		0.00%	
Herbicide	MCPP	93-65-2	µg/kg	2	2	100.00%	960	J			0.00%	921,651		0.00%	
PCB	PCB-1016[e]	12674-11-2	µg/kg	272	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1221[e]	11104-28-2	µg/kg	272	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1232[e]	11141-16-5	µg/kg	269	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1242[e]	53469-21-9	µg/kg	271	1	0.37%	120				0.00%	15,514		0.00%	
PCB	PCB-1248[e]	12672-29-6	µg/kg	272	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1254[e]	11097-69-1	µg/kg	272	12	4.41%	7800				0.00%	15,514		0.00%	
Pesticide	4,4'-DDD	72-54-8	µg/kg	212	0	0.00%					0.00%	178,570		0.00%	
Pesticide	4,4'-DDE	72-55-9	µg/kg	211	0	0.00%					0.00%	126,049		0.00%	
Pesticide	4,4'-DDT	50-29-3	µg/kg	212	0	0.00%					0.00%	125,658		0.00%	
Pesticide	Aldrin	309-00-2	µg/kg	212	0	0.00%					0.00%	2,024		0.00%	
Pesticide	alpha-BHC	319-84-6	µg/kg	212	0	0.00%					0.00%	6,555		0.00%	
Pesticide	alpha-Chlordane	5103-71-9	µg/kg	210	0	0.00%					0.00%	117,997		0.00%	
Pesticide	beta-BHC	319-85-7	µg/kg	212	0	0.00%					0.00%	22,942		0.00%	
Pesticide	beta-Chlordane	5103-74-2	µg/kg	197	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Chlordane		µg/kg	2	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Chlorpyriphos	2921-88-2	µg/kg	1	0	0.00%					0.00%	2.76E+06		0.00%	
Pesticide	delta-BHC	319-86-8	µg/kg	212	0	0.00%					0.00%	6,555		0.00%	
Pesticide	Demeton-S	126-75-0	µg/kg	1	0	0.00%					0.00%	36,866		0.00%	
Pesticide	Dieldrin	60-57-1	µg/kg	211	0	0.00%					0.00%	2,151		0.00%	
Pesticide	Endosulfan I	959-98-8	µg/kg	212	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endosulfan II	33213-65-9	µg/kg	212	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endosulfan sulfate	1031-07-8	µg/kg	211	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endrin	72-20-8	µg/kg	211	0	0.00%					0.00%	276,495		0.00%	
Pesticide	Endrin aldehyde	7421-93-4	µg/kg	25	0	0.00%					0.00%	276,495		0.00%	
Pesticide	Endrin ketone	53494-70-5	µg/kg	211	0	0.00%					0.00%	383,250		0.00%	
Pesticide	gamma-BHC (Lindane)	58-89-9	µg/kg	212	0	0.00%					0.00%	31,864		0.00%	
Pesticide	gamma-Chlordane	12789-03-6	µg/kg	13	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Heptachlor	76-44-8	µg/kg	212	1	0.47%	4.4	P			0.00%	7,647		0.00%	
Pesticide	Heptachlor epoxide	1024-57-3	µg/kg	212	0	0.00%					0.00%	3,782		0.00%	
Pesticide	Hexachlorocyclopentadiene	77-47-4	µg/kg	368	0	0.00%					0.00%	4.38E+06		0.00%	

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Table 3.13
Subsurface Soil (>12.0 and ≤30.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 2	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Pesticide	Methoxychlor	72-43-5	µg/kg	212	0	0.00%					0.00%	4.61E+06		0.00%	
Pesticide	Toxaphene	8001-35-2	µg/kg	212	0	0.00%					0.00%	31,284		0.00%	
SVOC	1,2,4,5-Tetrachlorobenzene	95-94-3	µg/kg	6	0	0.00%					0.00%	276,495		0.00%	
SVOC	1,2,4-Trichlorobenzene	120-82-1	µg/kg	617	17	2.76%	150				0.00%	1.74E+06		0.00%	
SVOC	1,2-Diphenylhydrazine	122-66-7	µg/kg	5	0	0.00%					0.00%	43,021		0.00%	
SVOC	2,3,4,6-Tetrachlorophenol	58-90-2	µg/kg	1	0	0.00%					0.00%	2.76E+07		0.00%	
SVOC	2,4,5-Trichlorophenol	95-95-4	µg/kg	375	0	0.00%					0.00%	9.22E+07		0.00%	
SVOC	2,4,6-Trichlorophenol	88-06-2	µg/kg	375	0	0.00%					0.00%	3.13E+06		0.00%	
SVOC	2,4-Dichlorophenol	120-83-2	µg/kg	375	1	0.27%	440	J			0.00%	2.76E+06		0.00%	
SVOC	2,4-Dimethylphenol	105-67-9	µg/kg	375	0	0.00%					0.00%	1.84E+07		0.00%	
SVOC	2,4-Dinitrophenol	51-28-5	µg/kg	358	0	0.00%					0.00%	1.84E+06		0.00%	
SVOC	2,4-Dinitrotoluene	121-14-2	µg/kg	375	0	0.00%					0.00%	1.84E+06		0.00%	
SVOC	2,6-Dinitrotoluene	606-20-2	µg/kg	375	0	0.00%					0.00%	921,651		0.00%	
SVOC	2-Chloronaphthalene	91-58-7	µg/kg	375	0	0.00%					0.00%	7.37E+07		0.00%	
SVOC	2-Chlorophenol	95-57-8	µg/kg	375	1	0.27%	55	J			0.00%	6.39E+06		0.00%	
SVOC	2-Methylnaphthalene	91-57-6	µg/kg	375	10	2.67%	9200				0.00%	3.69E+06		0.00%	
SVOC	2-Methylphenol	95-48-7	µg/kg	371	2	0.54%	1800				0.00%	4.61E+07		0.00%	
SVOC	2-Nitroaniline	88-74-4	µg/kg	375	0	0.00%					0.00%	2.21E+06		0.00%	
SVOC	3,3'-Dichlorobenzidine	91-94-1	µg/kg	356	0	0.00%					0.00%	76,667		0.00%	
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	µg/kg	375	0	0.00%					0.00%	92,165		0.00%	
SVOC	4-Chloroaniline	106-47-8	µg/kg	362	0	0.00%					0.00%	3.69E+06		0.00%	
SVOC	4-Methylphenol	106-44-5	µg/kg	373	8	2.14%	5800				0.00%	4.61E+06		0.00%	
SVOC	4-Nitroaniline	100-01-6	µg/kg	357	0	0.00%					0.00%	2.39E+06		0.00%	
SVOC	Acenaphthene	83-32-9	µg/kg	375	18	4.80%	1600				0.00%	5.10E+07		0.00%	
SVOC	Anthracene	120-12-7	µg/kg	375	19	5.07%	1800	D			0.00%	2.55E+08		0.00%	
SVOC	Benzo(a)anthracene	56-55-3	µg/kg	375	30	8.00%	4300	E			0.00%	43,616		0.00%	
SVOC	Benzo(a)pyrene	50-32-8	µg/kg	375	18	4.80%	3800	D			0.00%	4,357		0.00%	
SVOC	Benzo(b)fluoranthene	205-99-2	µg/kg	375	17	4.53%	4500	D			0.00%	43,616		0.00%	
SVOC	Benzo(k)fluoranthene	207-08-9	µg/kg	375	14	3.73%	1500	DJ			0.00%	436,159		0.00%	
SVOC	Benzoic Acid	65-85-0	µg/kg	311	18	5.79%	2600	J			0.00%	3.69E+09		0.00%	
SVOC	Benzyl Alcohol	100-51-6	µg/kg	333	0	0.00%					0.00%	2.76E+08		0.00%	
SVOC	bis(2-Chloroethyl) ether	111-44-4	µg/kg	375	0	0.00%					0.00%	43,315		0.00%	
SVOC	bis(2-Chloroisopropyl) ether	108-60-1	µg/kg	359	0	0.00%					0.00%	681,967		0.00%	
SVOC	bis(2-ethylhexyl)phthalate	117-81-7	µg/kg	372	74	19.89%	9800				0.00%	2.46E+06		0.00%	
SVOC	Butylbenzylphthalate	85-68-7	µg/kg	375	9	2.40%	1400	B			0.00%	1.84E+08		0.00%	
SVOC	Carbazole	86-74-8	µg/kg	35	2	5.71%	820				0.00%	1.73E+06		0.00%	

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Table 3.13
Subsurface Soil (>12.0 and ≤30.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 2	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
SVOC	Chrysene	218-01-9	µg/kg	375	30	8.00%	3800	D			0.00%	4.36E+06		0.00%	
SVOC	Dibenz(a,h)anthracene	53-70-3	µg/kg	374	6	1.60%	700	DJ			0.00%	4,362		0.00%	
SVOC	Dibenzofuran	132-64-9	µg/kg	375	15	4.00%	980				0.00%	2.56E+06		0.00%	
SVOC	Diethylphthalate	84-66-2	µg/kg	375	10	2.67%	3100				0.00%	7.37E+08		0.00%	
SVOC	Dimethoate	60-51-5	µg/kg	1	0	0.00%					0.00%	184,330		0.00%	
SVOC	Dimethylphthalate	131-11-3	µg/kg	375	1	0.27%	26	J			0.00%	9.22E+09		0.00%	
SVOC	Di-n-butylphthalate	84-74-2	µg/kg	375	38	10.13%	4600				0.00%	9.22E+07		0.00%	
SVOC	Di-n-octylphthalate	117-84-0	µg/kg	374	3	0.80%	580	J			0.00%	3.69E+07		0.00%	
SVOC	Fluoranthene	206-44-0	µg/kg	375	34	9.07%	11000				0.00%	3.40E+07		0.00%	
SVOC	Fluorene	86-73-7	µg/kg	375	15	4.00%	1700				0.00%	3.69E+07		0.00%	
SVOC	Hexachlorobenzene	118-74-1	µg/kg	375	0	0.00%					0.00%	21,508		0.00%	
SVOC	Hexachlorobutadiene	87-68-3	µg/kg	617	7	1.13%	11500	JE			0.00%	255,500		0.00%	
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	µg/kg	375	12	3.20%	2400	D			0.00%	43,616		0.00%	
SVOC	Isophorone	78-59-1	µg/kg	375	1	0.27%	82	J			0.00%	3.63E+07		0.00%	
SVOC	Naphthalene	91-20-3	µg/kg	617	62	10.05%	12000				0.00%	1.61E+07		0.00%	
SVOC	Nitrobenzene	98-95-3	µg/kg	375	0	0.00%					0.00%	497,333		0.00%	
SVOC	N-Nitrosodiethylamine	55-18-5	µg/kg	6	0	0.00%					0.00%	229		0.00%	
SVOC	N-Nitrosodimethylamine	62-75-9	µg/kg	6	0	0.00%					0.00%	675		0.00%	
SVOC	N-Nitrosodi-n-butylamine	924-16-3	µg/kg	6	0	0.00%					0.00%	5,977		0.00%	
SVOC	N-Nitroso-di-n-propylamine	621-64-7	µg/kg	375	0	0.00%					0.00%	4,929		0.00%	
SVOC	N-nitrosodiphenylamine	86-30-6	µg/kg	374	0	0.00%					0.00%	7.04E+06		0.00%	
SVOC	N-Nitrosopyrrolidine	930-55-2	µg/kg	1	0	0.00%					0.00%	16,387		0.00%	
SVOC	Parathion	56-38-2	µg/kg	1	0	0.00%					0.00%	5.53E+06		0.00%	
SVOC	Pentachlorobenzene	608-93-5	µg/kg	6	0	0.00%					0.00%	737,321		0.00%	
SVOC	Pentachlorophenol	87-86-5	µg/kg	375	1	0.27%	390	J			0.00%	202,777		0.00%	
SVOC	Phenol	108-95-2	µg/kg	375	4	1.07%	510				0.00%	2.76E+08		0.00%	
SVOC	Pyrene	129-00-0	µg/kg	375	29	7.73%	9400				0.00%	2.55E+07		0.00%	
SVOC	Tetraethyl dithiopyrophosphate	3689-24-5	µg/kg	1	0	0.00%					0.00%	460,830		0.00%	
VOC	1,1,1,2-Tetrachloroethane	630-20-6	µg/kg	314	0	0.00%					0.00%	1.05E+06		0.00%	
VOC	1,1,1-Trichloroethane	71-55-6	µg/kg	1070	24	2.24%	53000	JE			0.00%	1.06E+08		0.00%	
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	µg/kg	308	14	4.55%	5170	E			0.00%	2.74E+10		0.00%	
VOC	1,1,2-Trichloroethane	79-00-5	µg/kg	1070	1	0.09%	0.96	J			0.00%	322,253		0.00%	
VOC	1,1-Dichloroethane	75-34-3	µg/kg	1072	6	0.56%	18				0.00%	3.12E+07		0.00%	
VOC	1,1-Dichloroethene	75-35-4	µg/kg	1071	24	2.24%	230	J			0.00%	199,706		0.00%	
VOC	1,2,3-Trichloropropane	96-18-4	µg/kg	314	0	0.00%					0.00%	23,910		0.00%	
VOC	1,2,4-Trimethylbenzene	95-63-6	µg/kg	313	19	6.07%	51000				0.00%	1.53E+06		0.00%	

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Table 3.13
Subsurface Soil (>12.0 and ≤30.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 2	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
VOC	1,2-Dibromo-3-chloropropane	96-12-8	µg/kg	314	0	0.00%					0.00%	34,137		0.00%	
VOC	1,2-Dibromoethane	106-93-4	µg/kg	314	0	0.00%					0.00%	403		0.00%	
VOC	1,2-Dichlorobenzene	95-50-1	µg/kg	636	5	0.79%	80	J			0.00%	3.32E+07		0.00%	
VOC	1,2-Dichloroethane	107-06-2	µg/kg	1063	8	0.75%	7.4				0.00%	152,603		0.00%	
VOC	1,2-Dichloroethene	540-59-0	µg/kg	718	7	0.97%	1200	J			0.00%	1.15E+07		0.00%	
VOC	1,2-Dichloropropane	78-87-5	µg/kg	1070	4	0.37%	71.6				0.00%	441,907		0.00%	
VOC	1,3,5-Trimethylbenzene	108-67-8	µg/kg	313	12	3.83%	17000				0.00%	1.31E+06		0.00%	
VOC	1,3-Dichlorobenzene	541-73-1	µg/kg	636	6	0.94%	330	E			0.00%	3.83E+07		0.00%	
VOC	1,4-Dichlorobenzene	106-46-7	µg/kg	636	6	0.94%	2200	E			0.00%	1.05E+06		0.00%	
VOC	2-Butanone	78-93-3	µg/kg	934	106	11.35%	2200	E			0.00%	5.33E+08		0.00%	
VOC	2-Chlorotoluene	95-49-8	µg/kg	313	0	0.00%					0.00%	2.56E+07		0.00%	
VOC	2-Methyl-1-propanol	78-83-1	µg/kg	1	0	0.00%					0.00%	3.83E+08		0.00%	
VOC	4-Methyl-2-pentanone	108-10-1	µg/kg	1016	19	1.87%	360	E			0.00%	9.57E+08		0.00%	
VOC	Acetone	67-64-1	µg/kg	1010	279	27.62%	31000000	B			0.00%	1.15E+09		0.00%	
VOC	Benzene	71-43-2	µg/kg	1079	11	1.02%	270	B			0.00%	270,977		0.00%	
VOC	Bromodichloromethane	75-27-4	µg/kg	1066	1	0.09%	0.44	J			0.00%	771,304		0.00%	
VOC	Bromoform	75-25-2	µg/kg	1058	1	0.09%	1700000	J			0.00%	4.83E+06		0.00%	
VOC	Bromomethane	74-83-9	µg/kg	1028	0	0.00%					0.00%	241,033		0.00%	
VOC	Carbon Disulfide	75-15-0	µg/kg	1062	9	0.85%	110000	J			0.00%	1.88E+07		0.00%	
VOC	Chlorobenzene	108-90-7	µg/kg	1069	3	0.28%	4	J			0.00%	7.67E+06		0.00%	
VOC	Chloroethane	75-00-3	µg/kg	1046	1	0.10%	8	J			0.00%	1.65E+07		0.00%	
VOC	Chloromethane	74-87-3	µg/kg	1068	1	0.09%	250	J			0.00%	1.32E+06		0.00%	
VOC	cis-1,2-Dichloroethene	156-59-2	µg/kg	344	44	12.79%	116				0.00%	1.28E+07		0.00%	
VOC	cis-1,3-Dichloropropene	10061-01-5	µg/kg	1071	0	0.00%					0.00%	223,462		0.00%	
VOC	Dibromochloromethane	124-48-1	µg/kg	1071	0	0.00%					0.00%	569,296		0.00%	
VOC	Dichlorodifluoromethane	75-71-8	µg/kg	306	2	0.65%	6.03	J			0.00%	2.64E+06		0.00%	
VOC	Ethylbenzene	100-41-4	µg/kg	1080	25	2.31%	1200	J			0.00%	6.19E+07		0.00%	
VOC	Hexachloroethane	67-72-1	µg/kg	375	2	0.53%	3300				0.00%	1.28E+06		0.00%	
VOC	Isopropylbenzene	98-82-8	µg/kg	313	7	2.24%	1800	J			0.00%	375,823		0.00%	
VOC	m,p-Xylene		µg/kg	7	0	0.00%					0.00%	1.22E+07		0.00%	
VOC	methyl methacrylate	80-62-6	µg/kg	1	0	0.00%					0.00%	1.43E+08		0.00%	
VOC	o-Xylene	95-47-6	µg/kg	26	0	0.00%					0.00%	1.22E+07		0.00%	
VOC	Styrene	100-42-5	µg/kg	1071	8	0.75%	90				0.00%	1.59E+08		0.00%	
VOC	Toluene	108-88-3	µg/kg	1082	473	43.72%	3400	E			0.00%	3.56E+07		0.00%	
VOC	trans-1,2-Dichloroethene	156-60-5	µg/kg	356	0	0.00%					0.00%	3.30E+06		0.00%	
VOC	trans-1,3-Dichloropropene	10061-02-6	µg/kg	1058	0	0.00%					0.00%	239,434		0.00%	

Table 3.13
Subsurface Soil (>12.0 and ≤30.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 2	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
VOC	Trichlorofluoromethane	75-69-4	µg/kg	314	1	0.32%	3	JB			0.00%	1.74E+07		0.00%	
VOC	Vinyl acetate	108-05-4	µg/kg	573	0	0.00%					0.00%	3.04E+07		0.00%	
VOC	Vinyl Chloride	75-01-4	µg/kg	1071	1	0.09%	7.7				0.00%	24,948		0.00%	
VOC	Xylene	1330-20-7	µg/kg	1073	40	3.73%	7900				0.00%	1.22E+07		0.00%	
Radionuclide	Americium-241	86954-36-1	pCi/g	559	360	64.40%	29.3		0.010	127	22.72%	88.4		0.00%	
Radionuclide	Cesium-134	13967-70-9	pCi/g	44	36	81.82%	0.1				0.00%	0.910		0.00%	
Radionuclide	Cesium-137	10045-97-3	pCi/g	207	188	90.82%	0.27		0.143	6	2.90%	2.54		0.00%	
Radionuclide	Neptunium-237	13994-20-2	pCi/g	10	10	100.00%	0.05457				0.00%	62.5		0.00%	
Radionuclide	Plutonium-238	13981-16-3	pCi/g	55	44	80.00%	0.0332				0.00%	68.7		0.00%	
Radionuclide	Plutonium-239/240		pCi/g	590	413	70.00%	50.6	B	0.022	105	17.80%	112		0.00%	
Radionuclide	Radium-226	13982-63-3	pCi/g	128	122	95.31%	2.677	X	1.34	12	9.38%	31.0		0.00%	
Radionuclide	Strontium-89/90		pCi/g	237	190	80.17%	2.23		0.570	16	6.75%	152		0.00%	
Radionuclide	Tritium	10028-17-8	pCi/g	11	11	100.00%	510		395	1	9.09%	288,449		0.00%	
Radionuclide	Uranium-233/234		pCi/g	590	590	100.00%	55	B	2.08	30	5.08%	291		0.00%	
Radionuclide	Uranium-234	13966-29-5	pCi/g	2	2	100.00%	1.24		2.08		0.00%	291		0.00%	
Radionuclide	Uranium-235	15117-96-1	pCi/g	592	476	80.41%	2.1	B	0.162	13	2.20%	12.1		0.00%	
Radionuclide	Uranium-238	7440-61-1	pCi/g	591	588	99.49%	15.75		1.77	52	8.80%	337		0.00%	
VOC	Chloroform	67-66-3	µg/kg	1071	100	9.34%	3800000				0.00%	90,270	1	0.09%	No
VOC	Methylene Chloride	75-09-2	µg/kg	1071	281	26.24%	5500000	JB			0.00%	3.13E+06	1	0.09%	No
VOC	1,1,2,2-Tetrachloroethane	79-34-5	µg/kg	1055	4	0.38%	6100000	J			0.00%	120,551	1	0.09%	No
Metal	Chromium (total)[f]	7440-47-3	mg/kg	660	653	98.94%	2040	N*	42.2	12	1.82%	327	1	0.15%	Yes
VOC	Trichloroethene	79-01-6	µg/kg	1070	148	13.83%	309000	JE			0.00%	20,354	2	0.19%	No
VOC	Tetrachloroethene	127-18-4	µg/kg	1071	192	17.93%	2800000	E			0.00%	77,111	5	0.47%	No
VOC	Carbon Tetrachloride	56-23-5	µg/kg	1070	115	10.75%	160000000	E			0.00%	97,124	7	0.65%	No
PCB	PCB-1260[e]	11096-82-5	µg/kg	271	12	4.43%	70000				0.00%	15,514	5	1.85%	No
Radionuclide	Radium-228[g]	15262-20-1	pCi/g	168	168	100.00%	2.78		2.09	6	3.57%	1.28	6	3.57%	Yes

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Table 3.13
Subsurface Soil (>12.0 and ≤30.0 ft) AOI Screening

							AOI Screen 1					AOI Screen 2		AOI Screen 2	
Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

	The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a] A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.
[b] The PRG value for lead is not calculated, but rather is taken from EPA's "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (1994)".
[c] For uranium (total) the Surface Background Mean + 2SD value was taken from the 1995 DOE Background Geochemical Characterization Report (DOE 1995).
[d] The TEQ for 2,3,7,8-TCDD is calculated in Table A3.3 in Attachment 3.
[e] The PCBs identified above under the Analyte column are equivalent to Aroclors, for example PCB-1254 is the same as Aroclor-1254.
[f] Chromium (total) is conservatively compared to the chromium VI WRW PRG.
[g] For radium-228 the Subsurface Background Mean + 2SD value is greater than the WRW PRG. Therefore, only those results greater than both the Subsurface Background Mean + 2SD and WRW PRG are reported under AOI Screen 2.

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Table 3.14
Subsurface Soil (>12.0 and ≤ 30.0 ft) AOIs

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1 Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	AOI Screen 2 WRW PRG	Number Detections > WRW PRG	AOI Screen 2 Percent Detections > WRW PRG
VOC	Chloroform	67-66-3	µg/kg	1071	100	9.34%	3800000				0.00%	90,270	1	0.09%
VOC	Methylene Chloride	75-09-2	µg/kg	1071	281	26.24%	5500000	JB			0.00%	3.13E+06	1	0.09%
VOC	1,1,2,2-Tetrachloroethane	79-34-5	µg/kg	1055	4	0.38%	6100000	J			0.00%	120,551	1	0.09%
VOC	Trichloroethene	79-01-6	µg/kg	1070	148	13.83%	309000	JE			0.00%	20,354	2	0.19%
VOC	Tetrachloroethene	127-18-4	µg/kg	1071	192	17.93%	2800000	E			0.00%	77,111	5	0.47%
VOC	Carbon Tetrachloride	56-23-5	µg/kg	1070	115	10.75%	160000000	E			0.00%	97,124	7	0.65%
PCB	PCB-1260[b]	11096-82-5	µg/kg	271	12	4.43%	70000				0.00%	15,514	5	1.85%

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

	The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a] A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.

[b] The PCBs identified above under the Analyte column are equivalent to Aroclors, for example PCB-1254 is the same as Aroclor-1254.

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Table 3.15
Subsurface Soil (>30.0 and ≤50.0 ft) AOI Screening

							AOI Screen 1					AOI Screen 2		AOI Screen 3	
Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Metal	Aluminum	7429-90-5	mg/kg	147	147	100.00%	23600		30,392		0.00%	284,902		0.00%	
Metal	Antimony	7440-36-0	mg/kg	141	14	9.93%	22.4		9.78	3	2.13%	511		0.00%	
Metal	Arsenic	7440-38-2	mg/kg	147	135	91.84%	18.4		17.5	1	0.68%	27.7		0.00%	
Metal	Barium	7440-39-3	mg/kg	147	147	100.00%	589		291	5	3.40%	33,033		0.00%	
Metal	Beryllium	7440-41-7	mg/kg	144	103	71.53%	1.7		15.8		0.00%	1,151		0.00%	
Metal	Cadmium	7440-43-9	mg/kg	128	15	11.72%	24.9		1.08	8	6.25%	1,051		0.00%	
Metal	Chromium (total)[b]	7440-47-3	mg/kg	147	147	100.00%	90.5		42.2	2	1.36%	327		0.00%	
Metal	Cobalt	7440-48-4	mg/kg	147	144	97.96%	33.8		15.4	5	3.40%	1,401		0.00%	
Metal	Copper	7440-50-8	mg/kg	147	145	98.64%	149		23.8	18	12.24%	51,100		0.00%	
Metal	Iron	7439-89-6	mg/kg	147	147	100.00%	45000		28,459	5	3.40%	383,250		0.00%	
Metal	Lead[c]	7439-92-1	mg/kg	147	146	99.32%	378		26.5	2	1.36%	1,000		0.00%	
Metal	Lithium	7439-93-2	mg/kg	144	117	81.25%	16.7	B	20.5		0.00%	25,550		0.00%	
Metal	Manganese	7439-96-5	mg/kg	147	147	100.00%	734		487	4	2.72%	4,815		0.00%	
Metal	Mercury	7439-97-6	mg/kg	146	28	19.18%	0.3		0.488		0.00%	379		0.00%	
Metal	Molybdenum	7439-98-7	mg/kg	143	35	24.48%	7.4	B	29.1		0.00%	6,388		0.00%	
Metal	Nickel	7440-02-0	mg/kg	147	133	90.48%	51		43.0	1	0.68%	25,550		0.00%	
Metal	Selenium	7782-49-2	mg/kg	147	29	19.73%	5.8		1.68	6	4.08%	6,388		0.00%	
Metal	Silver	7440-22-4	mg/kg	141	22	15.60%	41.2		26.6	1	0.71%	6,388		0.00%	
Metal	Strontium	7440-24-6	mg/kg	147	147	100.00%	116		136		0.00%	766,500		0.00%	
Metal	Thallium	7440-28-0	mg/kg	140	49	35.00%	0.82		1.42		0.00%	89.4		0.00%	
Metal	Tin	7440-31-5	mg/kg	145	35	24.14%	38.7		354		0.00%	766,500		0.00%	
Metal	Vanadium	7440-62-2	mg/kg	147	147	100.00%	85.3		63.3	3	2.04%	1,278		0.00%	
Metal	Zinc	7440-66-6	mg/kg	147	147	100.00%	1010		78.3	18	12.24%	383,250		0.00%	
Wet Chem	Ammonia	7664-41-7	mg/kg	42	20	47.62%	5.82				0.00%	1.05E+07		0.00%	
Wet Chem	Cyanide	57-12-5	mg/kg	87	0	0.00%					0.00%	25,550		0.00%	
Wet Chem	Nitrate / Nitrite	ConID 184	mg/kg	99	66	66.67%	505		4.33	3	3.03%	2.04E+06		0.00%	
Herbicide	4-Nitrophenol	100-02-7	µg/kg	103	0	0.00%					0.00%	7.37E+06		0.00%	
PCB	PCB-1016[d]	12674-11-2	µg/kg	88	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1221[d]	11104-28-2	µg/kg	88	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1232[d]	11141-16-5	µg/kg	88	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1242[d]	53469-21-9	µg/kg	88	1	1.14%	1300				0.00%	15,514		0.00%	
PCB	PCB-1248[d]	12672-29-6	µg/kg	88	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1254[d]	11097-69-1	µg/kg	88	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1260[d]	11096-82-5	µg/kg	88	0	0.00%					0.00%	15,514		0.00%	
Pesticide	4,4'-DDD	72-54-8	µg/kg	70	0	0.00%					0.00%	178,570		0.00%	

Table 3.15
Subsurface Soil (>30.0 and ≤50.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Pesticide	4,4'-DDE	72-55-9	µg/kg	70	0	0.00%					0.00%	126,049		0.00%	
Pesticide	4,4'-DDT	50-29-3	µg/kg	70	0	0.00%					0.00%	125,658		0.00%	
Pesticide	Aldrin	309-00-2	µg/kg	70	0	0.00%					0.00%	2,024		0.00%	
Pesticide	alpha-BHC	319-84-6	µg/kg	70	0	0.00%					0.00%	6,555		0.00%	
Pesticide	alpha-Chlordane	5103-71-9	µg/kg	70	0	0.00%					0.00%	117,997		0.00%	
Pesticide	beta-BHC	319-85-7	µg/kg	70	0	0.00%					0.00%	22,942		0.00%	
Pesticide	beta-Chlordane	5103-74-2	µg/kg	65	0	0.00%					0.00%	117,997		0.00%	
Pesticide	delta-BHC	319-86-8	µg/kg	70	0	0.00%					0.00%	6,555		0.00%	
Pesticide	Dieldrin	60-57-1	µg/kg	70	0	0.00%					0.00%	2,151		0.00%	
Pesticide	Endosulfan I	959-98-8	µg/kg	70	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endosulfan II	33213-65-9	µg/kg	70	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endosulfan sulfate	1031-07-8	µg/kg	70	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endrin	72-20-8	µg/kg	70	0	0.00%					0.00%	276,495		0.00%	
Pesticide	Endrin ketone	53494-70-5	µg/kg	70	0	0.00%					0.00%	383,250		0.00%	
Pesticide	gamma-BHC (Lindane)	58-89-9	µg/kg	70	0	0.00%					0.00%	31,864		0.00%	
Pesticide	gamma-Chlordane	12789-03-6	µg/kg	5	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Heptachlor	76-44-8	µg/kg	70	0	0.00%					0.00%	7,647		0.00%	
Pesticide	Heptachlor epoxide	1024-57-3	µg/kg	70	0	0.00%					0.00%	3,782		0.00%	
Pesticide	Hexachlorocyclopentadiene	77-47-4	µg/kg	101	0	0.00%					0.00%	4.38E+06		0.00%	
Pesticide	Methoxychlor	72-43-5	µg/kg	70	0	0.00%					0.00%	4.61E+06		0.00%	
Pesticide	Toxaphene	8001-35-2	µg/kg	70	0	0.00%					0.00%	31,284		0.00%	
SVOC	1,2,4-Trichlorobenzene	120-82-1	µg/kg	103	0	0.00%					0.00%	1.74E+06		0.00%	
SVOC	2,4,5-Trichlorophenol	95-95-4	µg/kg	103	0	0.00%					0.00%	9.22E+07		0.00%	
SVOC	2,4,6-Trichlorophenol	88-06-2	µg/kg	103	0	0.00%					0.00%	3.13E+06		0.00%	
SVOC	2,4-Dichlorophenol	120-83-2	µg/kg	103	0	0.00%					0.00%	2.76E+06		0.00%	
SVOC	2,4-Dimethylphenol	105-67-9	µg/kg	103	0	0.00%					0.00%	1.84E+07		0.00%	
SVOC	2,4-Dinitrophenol	51-28-5	µg/kg	93	0	0.00%					0.00%	1.84E+06		0.00%	
SVOC	2,4-Dinitrotoluene	121-14-2	µg/kg	103	0	0.00%					0.00%	1.84E+06		0.00%	
SVOC	2,6-Dinitrotoluene	606-20-2	µg/kg	103	0	0.00%					0.00%	921,651		0.00%	
SVOC	2-Chloronaphthalene	91-58-7	µg/kg	103	0	0.00%					0.00%	7.37E+07		0.00%	
SVOC	2-Chlorophenol	95-57-8	µg/kg	103	0	0.00%					0.00%	6.39E+06		0.00%	
SVOC	2-Methylnaphthalene	91-57-6	µg/kg	103	0	0.00%					0.00%	3.69E+06		0.00%	
SVOC	2-Methylphenol	95-48-7	µg/kg	103	0	0.00%					0.00%	4.61E+07		0.00%	
SVOC	2-Nitroaniline	88-74-4	µg/kg	103	0	0.00%					0.00%	2.21E+06		0.00%	
SVOC	3,3'-Dichlorobenzidine	91-94-1	µg/kg	101	0	0.00%					0.00%	76,667		0.00%	
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	µg/kg	103	0	0.00%					0.00%	92,165		0.00%	

Table 3.15
Subsurface Soil (>30.0 and ≤50.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1: Maximum Concentration	AOI Screen 1: Data Qualifier[a]	AOI Screen 1: Background Mean + 2SD	AOI Screen 1: Number of Detections > Background Mean + 2SD	AOI Screen 1: Percent Detections > Background Mean + 2SD	AOI Screen 2: WRW PRG	AOI Screen 2: Number Detections > WRW PRG	AOI Screen 3: Percent Detections > WRW PRG	AOI Screen 3: Eliminated By Process Knowledge
SVOC	4-Chloroaniline	106-47-8	µg/kg	100	0	0.00%					0.00%	3.69E+06		0.00%	
SVOC	4-Methylphenol	106-44-5	µg/kg	103	1	0.97%	95	J			0.00%	4.61E+06		0.00%	
SVOC	4-Nitroaniline	100-01-6	µg/kg	96	0	0.00%					0.00%	2.39E+06		0.00%	
SVOC	Acenaphthene	83-32-9	µg/kg	103	1	0.97%	44	J			0.00%	5.10E+07		0.00%	
SVOC	Anthracene	120-12-7	µg/kg	103	2	1.94%	72	J			0.00%	2.55E+08		0.00%	
SVOC	Benzo(a)anthracene	56-55-3	µg/kg	103	2	1.94%	150	J			0.00%	43,616		0.00%	
SVOC	Benzo(a)pyrene	50-32-8	µg/kg	103	7	6.80%	350	J			0.00%	4,357		0.00%	
SVOC	Benzo(b)fluoranthene	205-99-2	µg/kg	103	4	3.88%	210	J			0.00%	43,616		0.00%	
SVOC	Benzo(k)fluoranthene	207-08-9	µg/kg	103	2	1.94%	86	J			0.00%	436,159		0.00%	
SVOC	Benzoic Acid	65-85-0	µg/kg	94	4	4.26%	610	J			0.00%	3.69E+09		0.00%	
SVOC	Benzyl Alcohol	100-51-6	µg/kg	99	0	0.00%					0.00%	2.76E+08		0.00%	
SVOC	bis(2-Chloroethyl) ether	111-44-4	µg/kg	103	0	0.00%					0.00%	43,315		0.00%	
SVOC	bis(2-Chloroisopropyl) ether	108-60-1	µg/kg	91	0	0.00%					0.00%	681,967		0.00%	
SVOC	bis(2-ethylhexyl)phthalate	117-81-7	µg/kg	103	22	21.36%	420				0.00%	2.46E+06		0.00%	
SVOC	Butylbenzylphthalate	85-68-7	µg/kg	103	0	0.00%					0.00%	1.84E+08		0.00%	
SVOC	Carbazole	86-74-8	µg/kg	4	0	0.00%					0.00%	1.73E+06		0.00%	
SVOC	Chrysene	218-01-9	µg/kg	103	2	1.94%	170	J			0.00%	4.36E+06		0.00%	
SVOC	Dibenz(a,h)anthracene	53-70-3	µg/kg	103	0	0.00%					0.00%	4,362		0.00%	
SVOC	Dibenzofuran	132-64-9	µg/kg	103	0	0.00%					0.00%	2.56E+06		0.00%	
SVOC	Diethylphthalate	84-66-2	µg/kg	103	3	2.91%	230	J			0.00%	7.37E+08		0.00%	
SVOC	Dimethylphthalate	131-11-3	µg/kg	103	0	0.00%					0.00%	9.22E+09		0.00%	
SVOC	Di-n-butylphthalate	84-74-2	µg/kg	103	16	15.53%	220	J			0.00%	9.22E+07		0.00%	
SVOC	Di-n-octylphthalate	117-84-0	µg/kg	103	2	1.94%	60	J			0.00%	3.69E+07		0.00%	
SVOC	Fluoranthene	206-44-0	µg/kg	103	3	2.91%	370	J			0.00%	3.40E+07		0.00%	
SVOC	Fluorene	86-73-7	µg/kg	103	1	0.97%	44	J			0.00%	3.69E+07		0.00%	
SVOC	Hexachlorobenzene	118-74-1	µg/kg	103	0	0.00%					0.00%	21,508		0.00%	
SVOC	Hexachlorobutadiene	87-68-3	µg/kg	103	0	0.00%					0.00%	255,500		0.00%	
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	µg/kg	103	0	0.00%					0.00%	43,616		0.00%	
SVOC	Isophorone	78-59-1	µg/kg	103	0	0.00%					0.00%	3.63E+07		0.00%	
SVOC	Naphthalene	91-20-3	µg/kg	103	0	0.00%					0.00%	1.61E+07		0.00%	
SVOC	Nitrobenzene	98-95-3	µg/kg	103	0	0.00%					0.00%	497,333		0.00%	
SVOC	N-Nitroso-di-n-propylamine	621-64-7	µg/kg	103	0	0.00%					0.00%	4,929		0.00%	
SVOC	N-nitrosodiphenylamine	86-30-6	µg/kg	103	0	0.00%					0.00%	7.04E+06		0.00%	
SVOC	Pentachlorophenol	87-86-5	µg/kg	103	0	0.00%					0.00%	202,777		0.00%	
SVOC	Phenol	108-95-2	µg/kg	103	1	0.97%	60	J			0.00%	2.76E+08		0.00%	
SVOC	Pyrene	129-00-0	µg/kg	103	3	2.91%	470				0.00%	2.55E+07		0.00%	

Table 3.15
Subsurface Soil (>30.0 and ≤50.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
VOC	1,1,1,2-Tetrachloroethane	630-20-6	µg/kg	1	0	0.00%					0.00%	1.05E+06		0.00%	
VOC	1,1,1-Trichloroethane	71-55-6	µg/kg	189	3	1.59%	6				0.00%	1.06E+08		0.00%	
VOC	1,1,2,2-Tetrachloroethane	79-34-5	µg/kg	177	0	0.00%					0.00%	120,551		0.00%	
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	µg/kg	1	0	0.00%					0.00%	2.74E+10		0.00%	
VOC	1,1,2-Trichloroethane	79-00-5	µg/kg	189	0	0.00%					0.00%	322,253		0.00%	
VOC	1,1-Dichloroethane	75-34-3	µg/kg	189	0	0.00%					0.00%	3.12E+07		0.00%	
VOC	1,1-Dichloroethene	75-35-4	µg/kg	189	1	0.53%	1	J			0.00%	199,706		0.00%	
VOC	1,2,3-Trichloropropane	96-18-4	µg/kg	1	0	0.00%					0.00%	23,910		0.00%	
VOC	1,2,4-Trimethylbenzene	95-63-6	µg/kg	1	0	0.00%					0.00%	1.53E+06		0.00%	
VOC	1,2-Dibromo-3-chloropropane	96-12-8	µg/kg	1	0	0.00%					0.00%	34,137		0.00%	
VOC	1,2-Dibromoethane	106-93-4	µg/kg	1	0	0.00%					0.00%	403		0.00%	
VOC	1,2-Dichlorobenzene	95-50-1	µg/kg	103	0	0.00%					0.00%	3.32E+07		0.00%	
VOC	1,2-Dichloroethane	107-06-2	µg/kg	188	0	0.00%					0.00%	152,603		0.00%	
VOC	1,2-Dichloroethene	540-59-0	µg/kg	183	4	2.19%	4	J			0.00%	1.15E+07		0.00%	
VOC	1,2-Dichloropropane	78-87-5	µg/kg	189	0	0.00%					0.00%	441,907		0.00%	
VOC	1,3,5-Trimethylbenzene	108-67-8	µg/kg	1	0	0.00%					0.00%	1.31E+06		0.00%	
VOC	1,3-Dichlorobenzene	541-73-1	µg/kg	103	0	0.00%					0.00%	3.83E+07		0.00%	
VOC	1,4-Dichlorobenzene	106-46-7	µg/kg	103	1	0.97%	110	J			0.00%	1.05E+06		0.00%	
VOC	2-Butanone	78-93-3	µg/kg	150	12	8.00%	78				0.00%	5.33E+08		0.00%	
VOC	2-Chlorotoluene	95-49-8	µg/kg	1	0	0.00%					0.00%	2.56E+07		0.00%	
VOC	4-Methyl-2-pentanone	108-10-1	µg/kg	175	2	1.14%	6	J			0.00%	9.57E+08		0.00%	
VOC	Acetone	67-64-1	µg/kg	181	27	14.92%	650	B			0.00%	1.15E+09		0.00%	
VOC	Benzene	71-43-2	µg/kg	192	0	0.00%					0.00%	270,977		0.00%	
VOC	Bromodichloromethane	75-27-4	µg/kg	189	0	0.00%					0.00%	771,304		0.00%	
VOC	Bromoform	75-25-2	µg/kg	188	0	0.00%					0.00%	4.83E+06		0.00%	
VOC	Bromomethane	74-83-9	µg/kg	184	0	0.00%					0.00%	241,033		0.00%	
VOC	Carbon Disulfide	75-15-0	µg/kg	189	0	0.00%					0.00%	1.88E+07		0.00%	
VOC	Carbon Tetrachloride	56-23-5	µg/kg	189	13	6.88%	230				0.00%	97,124		0.00%	
VOC	Chlorobenzene	108-90-7	µg/kg	189	0	0.00%					0.00%	7.67E+06		0.00%	
VOC	Chloroethane	75-00-3	µg/kg	185	0	0.00%					0.00%	1.65E+07		0.00%	
VOC	Chloroform	67-66-3	µg/kg	189	19	10.05%	130				0.00%	90,270		0.00%	
VOC	Chloromethane	74-87-3	µg/kg	187	0	0.00%					0.00%	1.32E+06		0.00%	
VOC	cis-1,2-Dichloroethene	156-59-2	µg/kg	1	0	0.00%					0.00%	1.28E+07		0.00%	
VOC	cis-1,3-Dichloropropene	10061-01-5	µg/kg	189	0	0.00%					0.00%	223,462		0.00%	
VOC	Dibromochloromethane	124-48-1	µg/kg	189	0	0.00%					0.00%	569,296		0.00%	
VOC	Dichlorodifluoromethane	75-71-8	µg/kg	1	0	0.00%					0.00%	2.64E+06		0.00%	

Table 3.15
Subsurface Soil (>30.0 and ≤50.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
VOC	Ethylbenzene	100-41-4	µg/kg	192	2	1.04%	17				0.00%	6.19E+07		0.00%	
VOC	Hexachloroethane	67-72-1	µg/kg	103	0	0.00%					0.00%	1.28E+06		0.00%	
VOC	Isopropylbenzene	98-82-8	µg/kg	1	0	0.00%					0.00%	375,823		0.00%	
VOC	Methylene Chloride	75-09-2	µg/kg	185	40	21.62%	66	B			0.00%	3.13E+06		0.00%	
VOC	Styrene	100-42-5	µg/kg	189	1	0.53%	47				0.00%	1.59E+08		0.00%	
VOC	Tetrachloroethene	127-18-4	µg/kg	189	30	15.87%	100				0.00%	77,111		0.00%	
VOC	Toluene	108-88-3	µg/kg	192	107	55.73%	2100	E			0.00%	3.56E+07		0.00%	
VOC	trans-1,2-Dichloroethene	156-60-5	µg/kg	1	0	0.00%					0.00%	3.30E+06		0.00%	
VOC	trans-1,3-Dichloropropene	10061-02-6	µg/kg	187	0	0.00%					0.00%	239,434		0.00%	
VOC	Trichloroethene	79-01-6	µg/kg	189	13	6.88%	1100				0.00%	20,354		0.00%	
VOC	Trichlorofluoromethane	75-69-4	µg/kg	1	0	0.00%					0.00%	1.74E+07		0.00%	
VOC	Vinyl acetate	108-05-4	µg/kg	175	0	0.00%					0.00%	3.04E+07		0.00%	
VOC	Vinyl Chloride	75-01-4	µg/kg	189	0	0.00%					0.00%	24,948		0.00%	
VOC	Xylene	1330-20-7	µg/kg	192	1	0.52%	19				0.00%	1.22E+07		0.00%	
Radionuclide	Americium-241	86954-36-1	pCi/g	121	86	71.07%	0.4725		0.010	29	23.97%	88.4		0.00%	
Radionuclide	Cesium-134	13967-70-9	pCi/g	15	6	40.00%	0.073				0.00%	0.910		0.00%	
Radionuclide	Cesium-137	10045-97-3	pCi/g	87	72	82.76%	0.14		0.143		0.00%	2.54		0.00%	
Radionuclide	Plutonium-238	13981-16-3	pCi/g	3	3	100.00%	0.001942	J			0.00%	68.7		0.00%	
Radionuclide	Plutonium-239/240		pCi/g	125	93	74.40%	3.112		0.022	19	15.20%	112		0.00%	
Radionuclide	Radium-226	13982-63-3	pCi/g	52	52	100.00%	1.7		1.34	4	7.69%	31.0		0.00%	
Radionuclide	Strontium-89/90		pCi/g	93	77	82.80%	6.54		0.570	5	5.38%	152		0.00%	
Radionuclide	Tritium	10028-17-8	pCi/g	5	5	100.00%	173				0.00%	288,449		0.00%	
Radionuclide	Uranium-233/234		pCi/g	132	132	100.00%	4.05		2.08	17	12.88%	291		0.00%	
Radionuclide	Uranium-235	15117-96-1	pCi/g	132	123	93.18%	0.22	J	0.162	6	4.55%	12.1		0.00%	
Radionuclide	Uranium-238	7440-61-1	pCi/g	132	132	100.00%	3.82		1.77	20	15.15%	337		0.00%	
Radionuclide	Radium-228[e]	15262-20-1	pCi/g	64	64	100.00%	2.1		2.09	1	1.56%	1.28	1	1.56%	Yes

Table 3.15
Subsurface Soil (>30.0 and ≤50.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%

The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%

The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a]A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.

[b]Chromium (total) is conservatively compared to the chromium VI WRW PRG.

[c]The PRG value for lead is not calculated, but rather is taken from EPA's "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (1994)".

[d]The PCBs identified above under the Analyte column are equivalent to Aroclors, for example PCB-1254 is the same as Aroclor-1254.

[e]For radium-228 the Subsurface Background Mean + 2SD value is greater than the WRW PRG. Therefore, only those results greater than both the Subsurface Background Mean + 2SD and WRW PRG are reported under AOI Screen 2.

Table 3.16
Subsurface Soil (>50.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
Metal	Aluminum	7429-90-5	mg/kg	57	57	100.00%	14400	*	30,392		0.00%	284,902		0.00%	
Metal	Antimony	7440-36-0	mg/kg	52	3	5.77%	6.1		9.78		0.00%	511		0.00%	
Metal	Arsenic	7440-38-2	mg/kg	57	56	98.25%	14		17.5		0.00%	27.7		0.00%	
Metal	Barium	7440-39-3	mg/kg	57	57	100.00%	671		291	2	3.51%	33,033		0.00%	
Metal	Beryllium	7440-41-7	mg/kg	56	48	85.71%	1.6		15.8		0.00%	1,151		0.00%	
Metal	Cadmium	7440-43-9	mg/kg	54	7	12.96%	1.1		1.08	1	1.85%	1,051		0.00%	
Metal	Chromium (total)[b]	7440-47-3	mg/kg	57	57	100.00%	28.6		42.2		0.00%	327		0.00%	
Metal	Cobalt	7440-48-4	mg/kg	57	57	100.00%	18.4		15.4	1	1.75%	1,401		0.00%	
Metal	Copper	7440-50-8	mg/kg	57	55	96.49%	25.8		23.8	2	3.51%	51,100		0.00%	
Metal	Iron	7439-89-6	mg/kg	57	57	100.00%	56500		28,459	2	3.51%	383,250		0.00%	
Metal	Lead[c]	7439-92-1	mg/kg	57	57	100.00%	33.6		26.5	1	1.75%	1,000		0.00%	
Metal	Lithium	7439-93-2	mg/kg	56	46	82.14%	13.5	B	20.5		0.00%	25,550		0.00%	
Metal	Manganese	7439-96-5	mg/kg	57	57	100.00%	1160		487	4	7.02%	4,815		0.00%	
Metal	Mercury	7439-97-6	mg/kg	56	6	10.71%	0.13		0.488		0.00%	379		0.00%	
Metal	Molybdenum	7439-98-7	mg/kg	53	7	13.21%	5.3	B	29.1		0.00%	6,388		0.00%	
Metal	Nickel	7440-02-0	mg/kg	57	48	84.21%	23.8		43.0		0.00%	25,550		0.00%	
Metal	Selenium	7782-49-2	mg/kg	56	15	26.79%	2.9		1.68	2	3.57%	6,388		0.00%	
Metal	Silver	7440-22-4	mg/kg	54	9	16.67%	3.8		26.6		0.00%	6,388		0.00%	
Metal	Strontium	7440-24-6	mg/kg	57	57	100.00%	138		136	1	1.75%	766,500		0.00%	
Metal	Thallium	7440-28-0	mg/kg	54	17	31.48%	3.5	N*	1.42	1	1.85%	89.4		0.00%	
Metal	Tin	7440-31-5	mg/kg	56	17	30.36%	69.7		354		0.00%	766,500		0.00%	
Metal	Vanadium	7440-62-2	mg/kg	57	57	100.00%	49.7		63.3		0.00%	1,278		0.00%	
Metal	Zinc	7440-66-6	mg/kg	57	51	89.47%	200		78.3	6	10.53%	383,250		0.00%	
Wet Chem	Ammonia	7664-41-7	mg/kg	8	7	87.50%	6.83				0.00%	1.05E+07		0.00%	
Wet Chem	Cyanide	57-12-5	mg/kg	25	0	0.00%					0.00%	25,550		0.00%	
Wet Chem	Nitrate / Nitrite	ConID 184	mg/kg	31	18	58.06%	0.902		4.33		0.00%	2.04E+06		0.00%	
Herbicide	4-Nitrophenol	100-02-7	µg/kg	34	0	0.00%					0.00%	7.37E+06		0.00%	
PCB	PCB-1016[d]	12674-11-2	µg/kg	19	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1221[d]	11104-28-2	µg/kg	19	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1232[d]	11141-16-5	µg/kg	19	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1242[d]	53469-21-9	µg/kg	19	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1248[d]	12672-29-6	µg/kg	19	0	0.00%					0.00%	15,514		0.00%	
PCB	PCB-1254[d]	11097-69-1	µg/kg	19	0	0.00%					0.00%	15,514		0.00%	

Table 3.16
Subsurface Soil (>50.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
PCB	PCB-1260[d]	11096-82-5	µg/kg	19	0	0.00%					0.00%	15,514		0.00%	
Pesticide	4,4'-DDD	72-54-8	µg/kg	16	0	0.00%					0.00%	178,570		0.00%	
Pesticide	4,4'-DDE	72-55-9	µg/kg	16	0	0.00%					0.00%	126,049		0.00%	
Pesticide	4,4'-DDT	50-29-3	µg/kg	16	0	0.00%					0.00%	125,658		0.00%	
Pesticide	Aldrin	309-00-2	µg/kg	16	0	0.00%					0.00%	2,024		0.00%	
Pesticide	alpha-BHC	319-84-6	µg/kg	16	0	0.00%					0.00%	6,555		0.00%	
Pesticide	alpha-Chlordane	5103-71-9	µg/kg	16	0	0.00%					0.00%	117,997		0.00%	
Pesticide	beta-BHC	319-85-7	µg/kg	16	0	0.00%					0.00%	22,942		0.00%	
Pesticide	beta-Chlordane	5103-74-2	µg/kg	13	0	0.00%					0.00%	117,997		0.00%	
Pesticide	delta-BHC	319-86-8	µg/kg	16	0	0.00%					0.00%	6,555		0.00%	
Pesticide	Dieldrin	60-57-1	µg/kg	16	0	0.00%					0.00%	2,151		0.00%	
Pesticide	Endosulfan I	959-98-8	µg/kg	16	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endosulfan II	33213-65-9	µg/kg	16	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endosulfan sulfate	1031-07-8	µg/kg	16	0	0.00%					0.00%	5.53E+06		0.00%	
Pesticide	Endrin	72-20-8	µg/kg	16	0	0.00%					0.00%	276,495		0.00%	
Pesticide	Endrin ketone	53494-70-5	µg/kg	16	0	0.00%					0.00%	383,250		0.00%	
Pesticide	gamma-BHC (Lindane)	58-89-9	µg/kg	16	0	0.00%					0.00%	31,864		0.00%	
Pesticide	gamma-Chlordane	12789-03-6	µg/kg	3	0	0.00%					0.00%	117,997		0.00%	
Pesticide	Heptachlor	76-44-8	µg/kg	16	0	0.00%					0.00%	7,647		0.00%	
Pesticide	Heptachlor epoxide	1024-57-3	µg/kg	16	0	0.00%					0.00%	3,782		0.00%	
Pesticide	Hexachlorocyclopentadiene	77-47-4	µg/kg	34	0	0.00%					0.00%	4.38E+06		0.00%	
Pesticide	Methoxychlor	72-43-5	µg/kg	16	0	0.00%					0.00%	4.61E+06		0.00%	
Pesticide	Toxaphene	8001-35-2	µg/kg	16	0	0.00%					0.00%	31,284		0.00%	
SVOC	1,2,4-Trichlorobenzene	120-82-1	µg/kg	35	0	0.00%					0.00%	1.74E+06		0.00%	
SVOC	2,4,5-Trichlorophenol	95-95-4	µg/kg	35	0	0.00%					0.00%	9.22E+07		0.00%	
SVOC	2,4,6-Trichlorophenol	88-06-2	µg/kg	35	0	0.00%					0.00%	3.13E+06		0.00%	
SVOC	2,4-Dichlorophenol	120-83-2	µg/kg	35	0	0.00%					0.00%	2.76E+06		0.00%	
SVOC	2,4-Dimethylphenol	105-67-9	µg/kg	35	0	0.00%					0.00%	1.84E+07		0.00%	
SVOC	2,4-Dinitrophenol	51-28-5	µg/kg	33	0	0.00%					0.00%	1.84E+06		0.00%	
SVOC	2,4-Dinitrotoluene	121-14-2	µg/kg	35	0	0.00%					0.00%	1.84E+06		0.00%	
SVOC	2,6-Dinitrotoluene	606-20-2	µg/kg	35	0	0.00%					0.00%	921,651		0.00%	
SVOC	2-Chloronaphthalene	91-58-7	µg/kg	35	0	0.00%					0.00%	7.37E+07		0.00%	
SVOC	2-Chlorophenol	95-57-8	µg/kg	35	0	0.00%					0.00%	6.39E+06		0.00%	
SVOC	2-Methylnaphthalene	91-57-6	µg/kg	35	0	0.00%					0.00%	3.69E+06		0.00%	

Table 3.16
Subsurface Soil (>50.0 ft) AOI Screening

							AOI Screen 1					AOI Screen 2		AOI Screen 3	
Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
SVOC	2-Methylphenol	95-48-7	µg/kg	35	0	0.00%					0.00%	4.61E+07		0.00%	
SVOC	2-Nitroaniline	88-74-4	µg/kg	35	0	0.00%					0.00%	2.21E+06		0.00%	
SVOC	3,3'-Dichlorobenzidine	91-94-1	µg/kg	35	0	0.00%					0.00%	76,667		0.00%	
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	µg/kg	35	0	0.00%					0.00%	92,165		0.00%	
SVOC	4-Chloroaniline	106-47-8	µg/kg	34	0	0.00%					0.00%	3.69E+06		0.00%	
SVOC	4-Methylphenol	106-44-5	µg/kg	35	0	0.00%					0.00%	4.61E+06		0.00%	
SVOC	4-Nitroaniline	100-01-6	µg/kg	33	0	0.00%					0.00%	2.39E+06		0.00%	
SVOC	Acenaphthene	83-32-9	µg/kg	35	0	0.00%					0.00%	5.10E+07		0.00%	
SVOC	Anthracene	120-12-7	µg/kg	35	0	0.00%					0.00%	2.55E+08		0.00%	
SVOC	Benzo(a)anthracene	56-55-3	µg/kg	35	0	0.00%					0.00%	43,616		0.00%	
SVOC	Benzo(a)pyrene	50-32-8	µg/kg	35	6	17.14%	480	J			0.00%	4,357		0.00%	
SVOC	Benzo(b)fluoranthene	205-99-2	µg/kg	35	0	0.00%					0.00%	43,616		0.00%	
SVOC	Benzo(k)fluoranthene	207-08-9	µg/kg	35	0	0.00%					0.00%	436,159		0.00%	
SVOC	Benzoic Acid	65-85-0	µg/kg	33	0	0.00%					0.00%	3.69E+09		0.00%	
SVOC	Benzyl Alcohol	100-51-6	µg/kg	33	0	0.00%					0.00%	2.76E+08		0.00%	
SVOC	bis(2-Chloroethyl) ether	111-44-4	µg/kg	35	0	0.00%					0.00%	43,315		0.00%	
SVOC	bis(2-Chloroisopropyl) ether	108-60-1	µg/kg	30	0	0.00%					0.00%	681,967		0.00%	
SVOC	bis(2-ethylhexyl)phthalate	117-81-7	µg/kg	35	8	22.86%	260	J			0.00%	2.46E+06		0.00%	
SVOC	Butylbenzylphthalate	85-68-7	µg/kg	35	1	2.86%	190	J			0.00%	1.84E+08		0.00%	
SVOC	Carbazole	86-74-8	µg/kg	1	0	0.00%					0.00%	1.73E+06		0.00%	
SVOC	Chrysene	218-01-9	µg/kg	35	0	0.00%					0.00%	4.36E+06		0.00%	
SVOC	Dibenz(a,h)anthracene	53-70-3	µg/kg	35	0	0.00%					0.00%	4,362		0.00%	
SVOC	Dibenzofuran	132-64-9	µg/kg	35	0	0.00%					0.00%	2.56E+06		0.00%	
SVOC	Diethylphthalate	84-66-2	µg/kg	35	2	5.71%	63	J			0.00%	7.37E+08		0.00%	
SVOC	Dimethylphthalate	131-11-3	µg/kg	35	0	0.00%					0.00%	9.22E+09		0.00%	
SVOC	Di-n-butylphthalate	84-74-2	µg/kg	35	9	25.71%	510				0.00%	9.22E+07		0.00%	
SVOC	Di-n-octylphthalate	117-84-0	µg/kg	35	0	0.00%					0.00%	3.69E+07		0.00%	
SVOC	Fluoranthene	206-44-0	µg/kg	35	0	0.00%					0.00%	3.40E+07		0.00%	
SVOC	Fluorene	86-73-7	µg/kg	35	0	0.00%					0.00%	3.69E+07		0.00%	
SVOC	Hexachlorobenzene	118-74-1	µg/kg	35	0	0.00%					0.00%	21,508		0.00%	
SVOC	Hexachlorobutadiene	87-68-3	µg/kg	35	0	0.00%					0.00%	255,500		0.00%	
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	µg/kg	35	0	0.00%					0.00%	43,616		0.00%	
SVOC	Isophorone	78-59-1	µg/kg	35	0	0.00%					0.00%	3.63E+07		0.00%	
SVOC	Naphthalene	91-20-3	µg/kg	35	0	0.00%					0.00%	1.61E+07		0.00%	

Table 3.16
Subsurface Soil (>50.0 ft) AOI Screening

							AOI Screen 1					AOI Screen 2		AOI Screen 3	
Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
SVOC	Nitrobenzene	98-95-3	µg/kg	35	0	0.00%					0.00%	497,333		0.00%	
SVOC	N-Nitroso-di-n-propylamine	621-64-7	µg/kg	35	0	0.00%					0.00%	4,929		0.00%	
SVOC	N-nitrosodiphenylamine	86-30-6	µg/kg	35	0	0.00%					0.00%	7.04E+06		0.00%	
SVOC	Pentachlorophenol	87-86-5	µg/kg	35	0	0.00%					0.00%	202,777		0.00%	
SVOC	Phenol	108-95-2	µg/kg	35	0	0.00%					0.00%	2.76E+08		0.00%	
SVOC	Pyrene	129-00-0	µg/kg	35	0	0.00%					0.00%	2.55E+07		0.00%	
VOC	1,1,1-Trichloroethane	71-55-6	µg/kg	113	1	0.88%	6	J			0.00%	1.06E+08		0.00%	
VOC	1,1,2,2-Tetrachloroethane	79-34-5	µg/kg	107	0	0.00%					0.00%	120,551		0.00%	
VOC	1,1,2-Trichloroethane	79-00-5	µg/kg	113	0	0.00%					0.00%	322,253		0.00%	
VOC	1,1-Dichloroethane	75-34-3	µg/kg	113	0	0.00%					0.00%	3.12E+07		0.00%	
VOC	1,1-Dichloroethene	75-35-4	µg/kg	113	1	0.88%	3	J			0.00%	199,706		0.00%	
VOC	1,2-Dichlorobenzene	95-50-1	µg/kg	35	0	0.00%					0.00%	3.32E+07		0.00%	
VOC	1,2-Dichloroethane	107-06-2	µg/kg	113	0	0.00%					0.00%	152,603		0.00%	
VOC	1,2-Dichloroethene	540-59-0	µg/kg	111	3	2.70%	11	J			0.00%	1.15E+07		0.00%	
VOC	1,2-Dichloropropane	78-87-5	µg/kg	113	0	0.00%					0.00%	441,907		0.00%	
VOC	1,3-Dichlorobenzene	541-73-1	µg/kg	35	0	0.00%					0.00%	3.83E+07		0.00%	
VOC	1,4-Dichlorobenzene	106-46-7	µg/kg	35	0	0.00%					0.00%	1.05E+06		0.00%	
VOC	2-Butanone	78-93-3	µg/kg	97	14	14.43%	63				0.00%	5.33E+08		0.00%	
VOC	4-Methyl-2-pentanone	108-10-1	µg/kg	102	4	3.92%	21	J			0.00%	9.57E+08		0.00%	
VOC	Acetone	67-64-1	µg/kg	121	13	10.74%	1400	BD			0.00%	1.15E+09		0.00%	
VOC	Benzene	71-43-2	µg/kg	114	2	1.75%	14	J			0.00%	270,977		0.00%	
VOC	Bromodichloromethane	75-27-4	µg/kg	113	0	0.00%					0.00%	771,304		0.00%	
VOC	Bromoform	75-25-2	µg/kg	113	0	0.00%					0.00%	4.83E+06		0.00%	
VOC	Bromomethane	74-83-9	µg/kg	113	0	0.00%					0.00%	241,033		0.00%	
VOC	Carbon Disulfide	75-15-0	µg/kg	113	1	0.88%	4	J			0.00%	1.88E+07		0.00%	
VOC	Carbon Tetrachloride	56-23-5	µg/kg	112	2	1.79%	110				0.00%	97,124		0.00%	
VOC	Chlorobenzene	108-90-7	µg/kg	113	1	0.88%	11	J			0.00%	7.67E+06		0.00%	
VOC	Chloroethane	75-00-3	µg/kg	111	0	0.00%					0.00%	1.65E+07		0.00%	
VOC	Chloroform	67-66-3	µg/kg	124	49	39.52%	96				0.00%	90,270		0.00%	
VOC	Chloromethane	74-87-3	µg/kg	113	0	0.00%					0.00%	1.32E+06		0.00%	
VOC	cis-1,3-Dichloropropene	10061-01-5	µg/kg	113	0	0.00%					0.00%	223,462		0.00%	
VOC	Dibromochloromethane	124-48-1	µg/kg	113	0	0.00%					0.00%	569,296		0.00%	
VOC	Ethylbenzene	100-41-4	µg/kg	113	0	0.00%					0.00%	6.19E+07		0.00%	
VOC	Hexachloroethane	67-72-1	µg/kg	35	0	0.00%					0.00%	1.28E+06		0.00%	

Table 3.16
Subsurface Soil (>50.0 ft) AOI Screening

Analyte Group	Analyte	Derived CAS No.	Unit	Number of Samples	Number of Detections	Frequency of Detection (%)	AOI Screen 1					AOI Screen 2		AOI Screen 3	
							Maximum Concentration	Data Qualifier[a]	Background Mean + 2SD	Number of Detections > Background Mean + 2SD	Percent Detections > Background Mean + 2SD	WRW PRG	Number Detections > WRW PRG	Percent Detections > WRW PRG	Eliminated By Process Knowledge
VOC	Methylene Chloride	75-09-2	µg/kg	123	23	18.70%	190	BD			0.00%	3.13E+06		0.00%	
VOC	Styrene	100-42-5	µg/kg	113	0	0.00%					0.00%	1.59E+08		0.00%	
VOC	Tetrachloroethene	127-18-4	µg/kg	113	21	18.58%	93				0.00%	77,111		0.00%	
VOC	Toluene	108-88-3	µg/kg	119	54	45.38%	3100				0.00%	3.56E+07		0.00%	
VOC	trans-1,3-Dichloropropene	10061-02-6	µg/kg	113	0	0.00%					0.00%	239,434		0.00%	
VOC	Trichloroethene	79-01-6	µg/kg	114	34	29.82%	3500	E			0.00%	20,354		0.00%	
VOC	Vinyl acetate	108-05-4	µg/kg	112	0	0.00%					0.00%	3.04E+07		0.00%	
VOC	Vinyl Chloride	75-01-4	µg/kg	113	0	0.00%					0.00%	24,948		0.00%	
VOC	Xylene	1330-20-7	µg/kg	116	8	6.90%	21	J			0.00%	1.22E+07		0.00%	
Radionuclide	Americium-241	86954-36-1	pCi/g	50	39	78.00%	0.39		0.010	21	42.00%	88.4		0.00%	
Radionuclide	Cesium-134	13967-70-9	pCi/g	3	1	33.33%	-0.0463	J			0.00%	0.910		0.00%	
Radionuclide	Cesium-137	10045-97-3	pCi/g	16	13	81.25%	0.097		0.143		0.00%	2.54		0.00%	
Radionuclide	Plutonium-238	13981-16-3	pCi/g	4	4	100.00%	0.001661	J			0.00%	68.7		0.00%	
Radionuclide	Plutonium-239/240		pCi/g	46	38	82.61%	0.455		0.022	14	30.43%	112		0.00%	
Radionuclide	Radium-226	13982-63-3	pCi/g	6	6	100.00%	1.226		1.34		0.00%	31.0		0.00%	
Radionuclide	Radium-228[e]	15262-20-1	pCi/g	10	10	100.00%	2		2.09		0.00%	1.28		0.00%	
Radionuclide	Strontium-89/90		pCi/g	19	17	89.47%	1.06		0.570	2	10.53%	152		0.00%	
Radionuclide	Tritium	10028-17-8	pCi/g	1	1	100.00%	152				0.00%	288,449		0.00%	
Radionuclide	Uranium-233/234		pCi/g	49	49	100.00%	6	B	2.08	19	38.78%	291		0.00%	
Radionuclide	Uranium-235	15117-96-1	pCi/g	49	48	97.96%	0.3		0.162	8	16.33%	12.1		0.00%	
Radionuclide	Uranium-238	7440-61-1	pCi/g	49	49	100.00%	6.1	B	1.77	19	38.78%	337		0.00%	

Note: The information presented in this table is listed in order of increasing frequency of detection greater than the WRW PRG.

	The frequency of detection of the analyte concentration above the WRW PRG is greater than (>) 0% and less than (<) 1%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 1% and less than (<) 5%
	The frequency of detection of the analyte concentration above the WRW PRG is greater than or equal to (≥) 5%

[a] A key to data qualifier codes is provided in Table A3.2, Attachment 3 on CD/ROM.

[b] Chromium (total) is conservatively compared to the chromium VI WRW PRG.

[c] The PRG value for lead is not calculated, but rather is taken from EPA's "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (1994)".

[d] The PCBs identified above under the Analyte column are equivalent to Aroclors, for example PCB-1254 is the same as Aroclor-1254.

[e] For radium-228 the Subsurface Background Mean + 2SD value is greater than the WRW PRG. Therefore, only those results greater than both the Subsurface Background Mean + 2SD and WRW PRG are reported under AOI Screen 2.

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Table 3.17
AOIs by Depth Interval

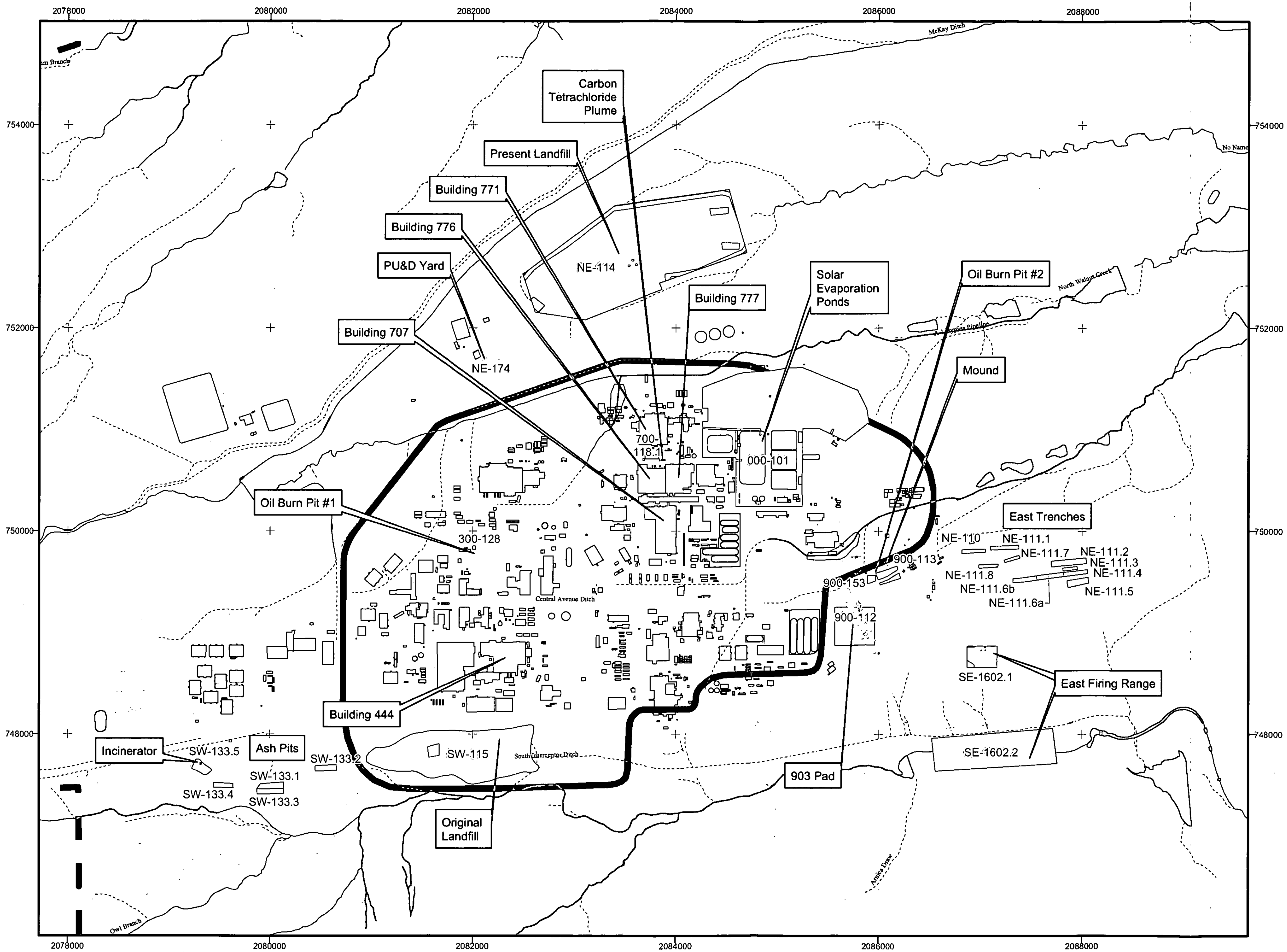
Type	Group	Standard Name	Derived CAS	Derived Unit	Table 3.6 Surface (≤ 0.5 ft*) *End Depth	Table 3.8 Subsurface (> 0.5 & ≤ 3 ft)	Table 3.10 Subsurface (> 3 & ≤ 8 ft)	Table 3.12 Subsurface (> 8 & ≤ 12 ft)	Table 3.14 Subsurface (> 12 & ≤ 30 ft)	Table 3.15 Subsurface (> 30 & ≤ 50 ft)	Table 3.16 Subsurface (> 50 ft)
Inorganic	Metal	Aluminum	7429-90-5	mg/kg	105						
Inorganic	Metal	Arsenic	7440-38-2	mg/kg	70						
Inorganic	Metal	Lead	7439-92-1	mg/kg		3	1				
Inorganic	Metal	Chromium (total)[a]	7440-47-3	mg/kg	147		4	1			
Inorganic	Metal	Vanadium	7440-62-2	mg/kg	16						
Organic	Dioxins/Furans	2,3,7,8-TCDD TEQ[b]	1746-01-6	µg/kg	1						
Organic	PCB	PCB-1254[c]	11097-69-1	µg/kg	20						
Organic	PCB	PCB-1260[c]	11096-82-5	µg/kg	17				5		
Organic	SVOC	Benzo(a)pyrene	50-32-8	µg/kg	188	6	5	3			
Organic	SVOC	Dibenz(a,h)anthracene	53-70-3	µg/kg	19						
Organic	VOC	1,1,2,2-Tetrachloroethane	79-34-5	µg/kg					1		
Organic	VOC	Carbon Tetrachloride	56-23-5	µg/kg					7		
Organic	VOC	Chloroform	67-66-3	µg/kg					1		
Organic	VOC	Methylene Chloride	75-09-2	µg/kg					1		
Organic	VOC	Tetrachloroethene	127-18-4	µg/kg			4	1	5		
Organic	VOC	Trichloroethene	79-01-6	µg/kg					2		
Radionuclide	Radionuclide	Americium-241	86954-36-1	pCi/g	22		3				
Radionuclide	Radionuclide	Plutonium-239/240		pCi/g	128		9	2			
Radionuclide	Radionuclide	Uranium-233/234		pCi/g	2						
Radionuclide	Radionuclide	Uranium-235	15117-96-1	pCi/g	3		3	2			
Radionuclide	Radionuclide	Uranium-238	7440-61-1	pCi/g	5		3	2			

	The frequency of detection of the analyte concentration above the PRG is greater than (>) 0% and less than (<) 1%
	The frequency of detection of the analyte concentration above the PRG is greater than or equal to (>) 1% and less than (<) 5%
	The frequency of detection of the analyte concentration above the PRG is greater than or equal to (>) 5%

[a]Chromium (total) is conservatively compared to the chromium VI WRW PRG.
[b]The TEQ for 2,3,7,8-TCDD is calculated in Table A3.3 in Attachment 3.
[c]The PCBs identified above under the Analyte column are equivalent to Aroclors, for example PCB-1254 is the same as Aroclor-1254.

Figure 3.1

Location of Historical Site Features



KEY

Historical IHSS

Standard Map Features

- Removed building or structure
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N W E S

0 500 1,000 1,500 Feet

Scale 1:12,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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Historical Site Features.mxd

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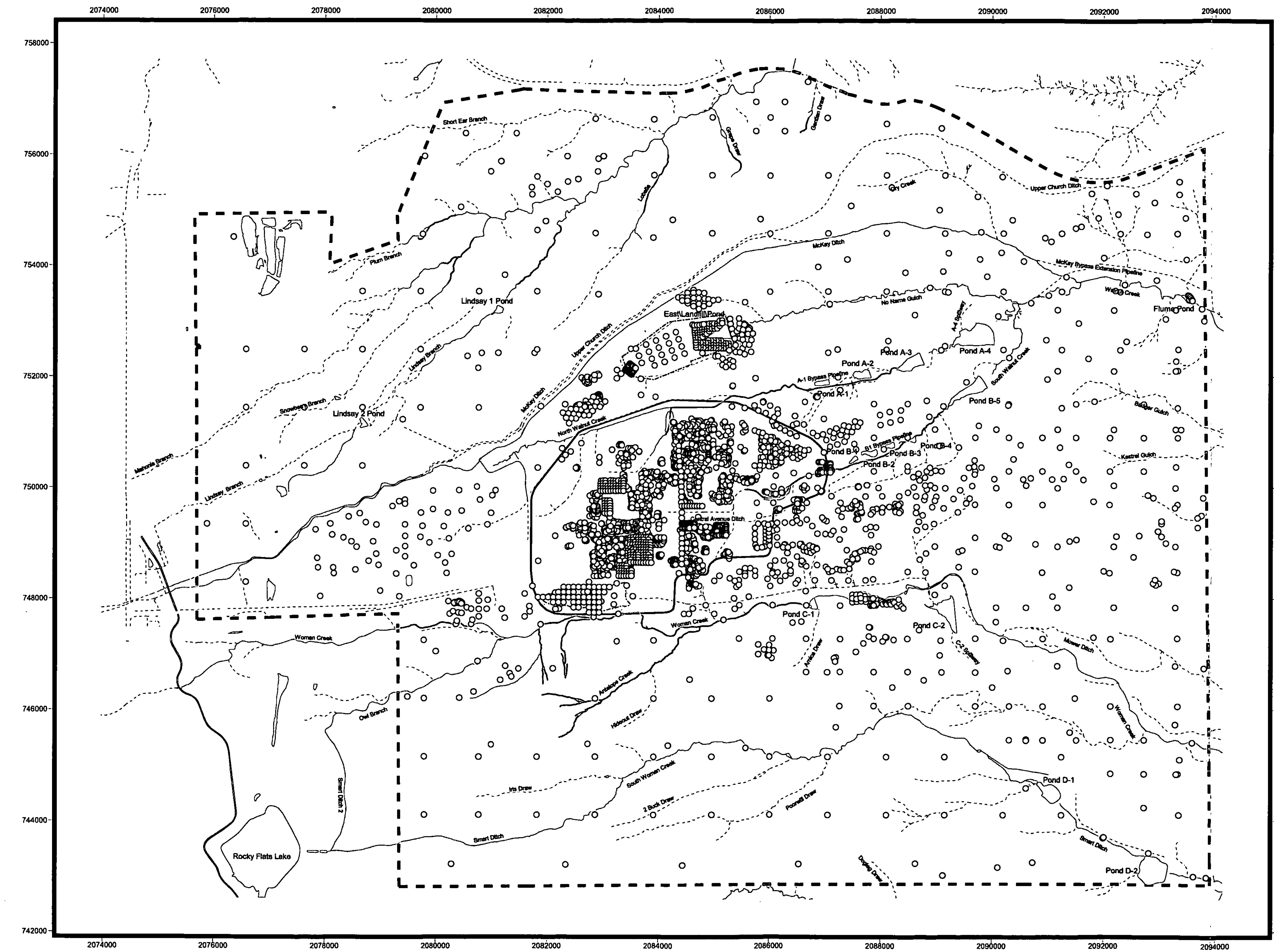

Figure 3.2

Surface Soil Sample Locations

Legend

○ Surface Soil Sample Locations

Total Samples, 7227

Note:
Data presented are the results from soil samples, collected at depths less than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N W E S

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

File: W:\Projects\FY2005\RI-FS\Nature_&_Extent\FINAL-Round\FINAL-fig_1-4.apr

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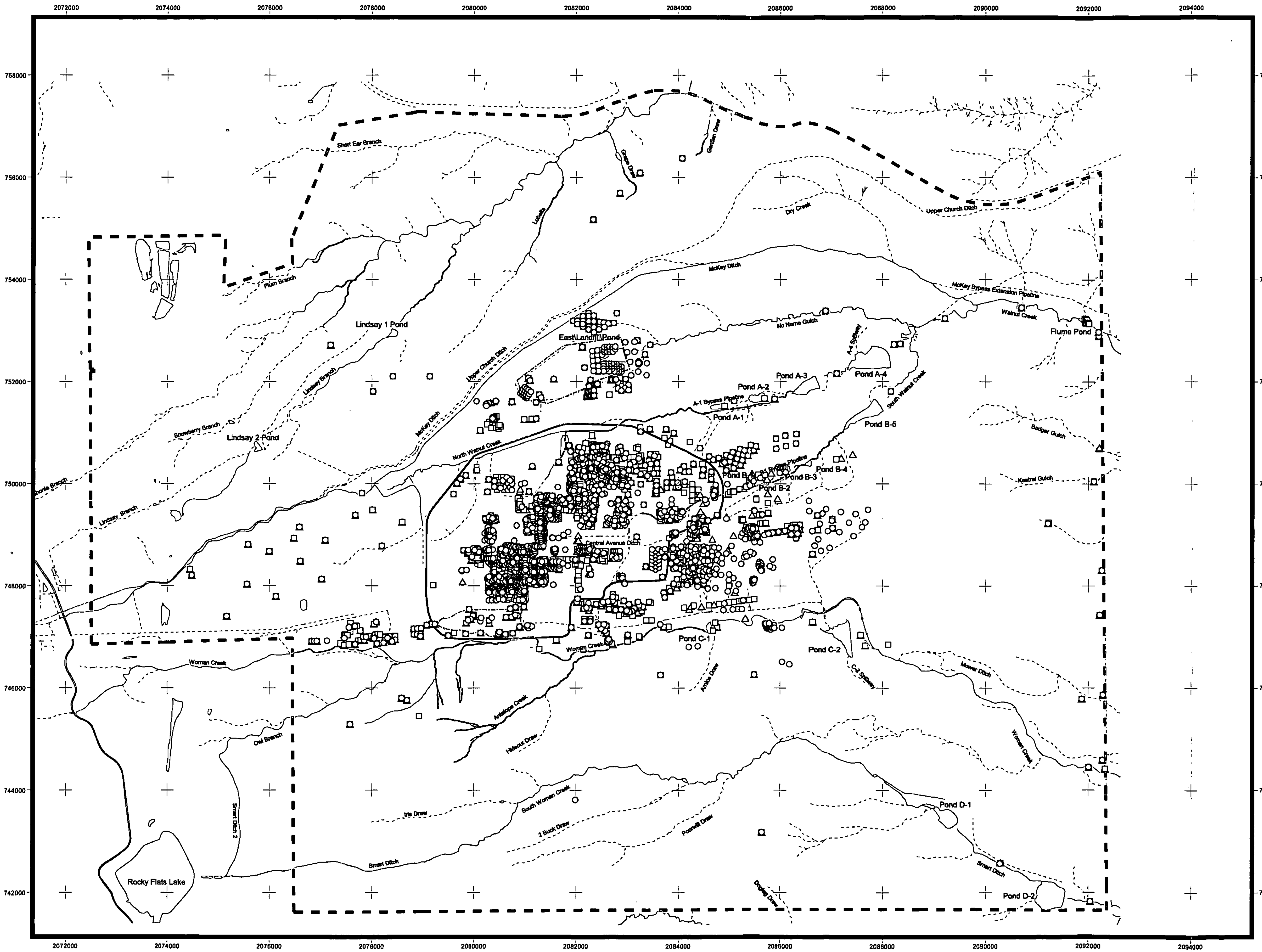

Figure 3.3

Subsurface Soil Sample Locations (0.5' -3' , 3'-8' , and 8'-12')

Legend

○ Sample collected between 0.5' and 3.0'

□ Sample collected between 3.0' and 8.0'

△ Sample collected between 8.0' and 12.0'

Total Samples, 12254

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N S E W

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

File: W:\Projects\FY2005\RI-FS\Nature_&_Extent\FINAL-Round\FINAL-fig_1-4.apr

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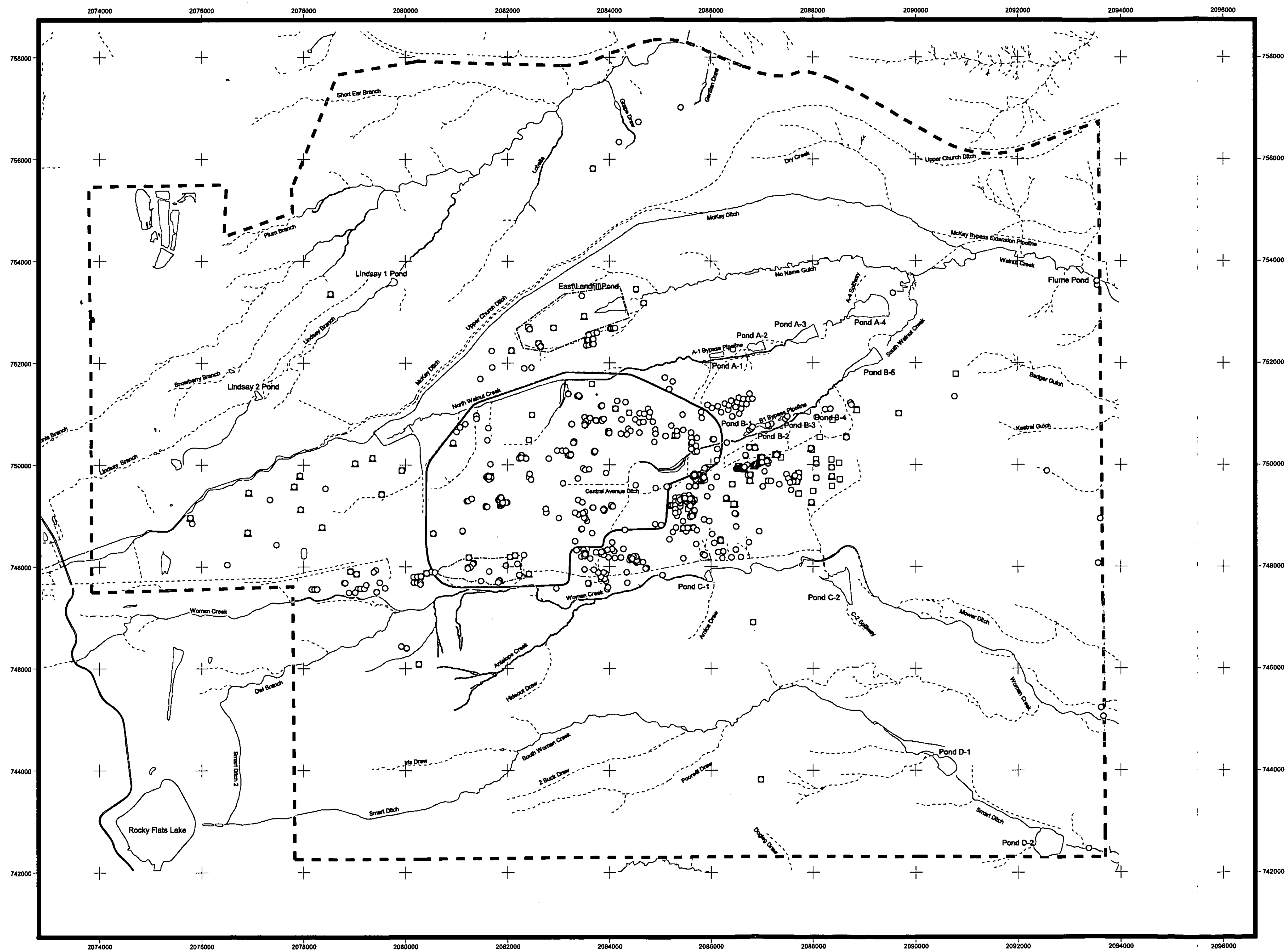

Figure 3.4

Subsurface Soil Sample Locations (12'-30' , 30'-50' , and >= 50)

Legend

- ○ Sample collected between 12' and 30'
- □ Sample collected between 30' and 50'
- △ Sample collected at or below 50'

Total Samples, 3640

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/05.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N E S W

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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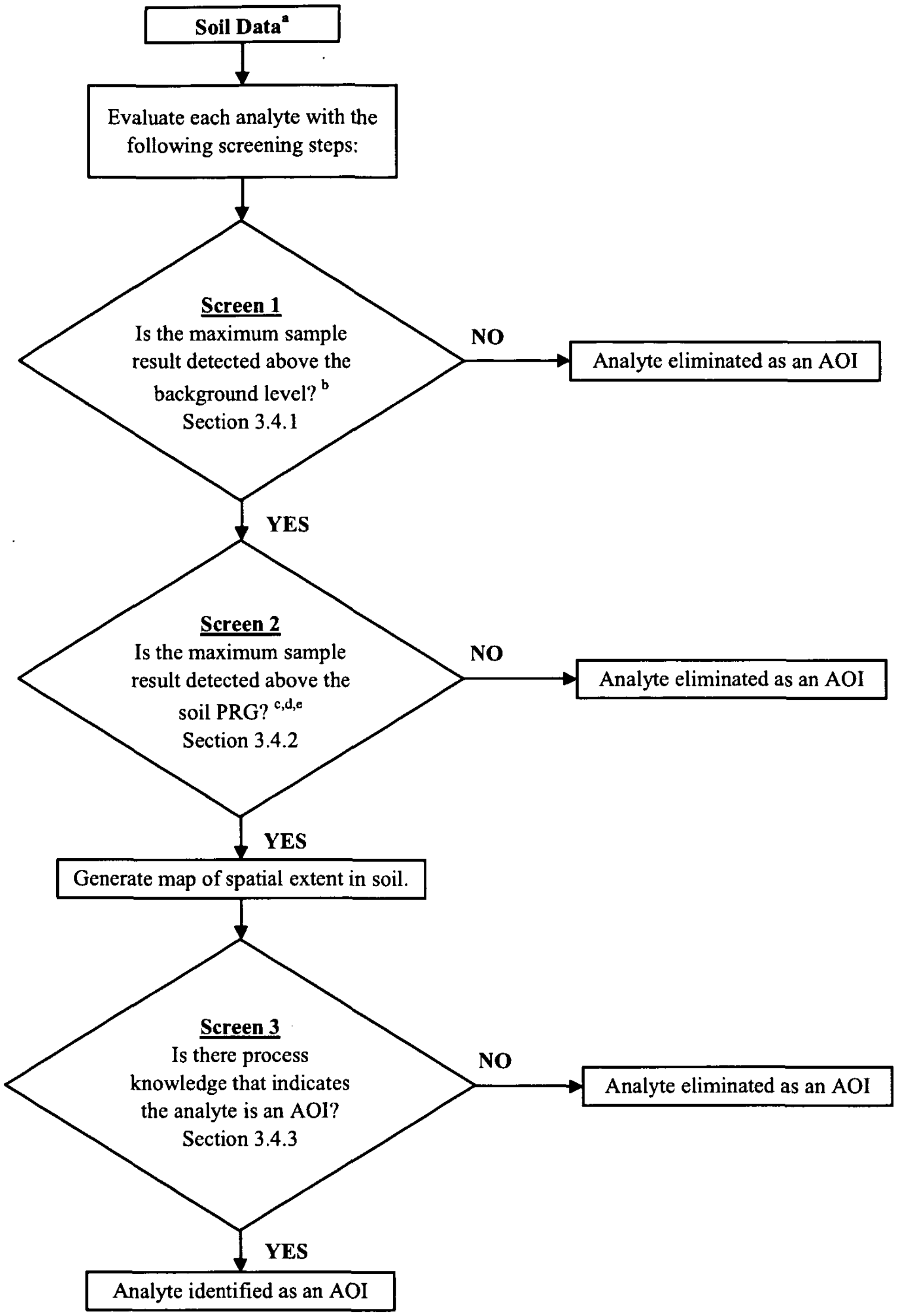
Figure 3.5
Soil Nature and Extent AOI Identification Process



NOTES:

[a] Soil "superset" for soil samples collected from June 28, 1991 through August 22, 2005.

[b] Background level is defined as the background mean +2 std. deviations (M+2SD).

[c] Soil PRG is defined as 1×10^{-6} WRW PRGs based on using a Hazard Index of 0.1 or a Risk of 1×10^{-6} (the more conservative of the two values was used for the PRG).

[d] The PRG value for lead is not a calculated PRG, but rather is taken from the EPA guidance document; Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Correction Action Facilities (1994).

[e] For surface soil (0 to 0.5 feet), WRW surface soil (0 to 0.5 feet) PRGs are used. For subsurface soil (0.5 feet to a maximum depth of 209 feet), WRW subsurface soil (0.5 to 8 feet) PRGs are used.

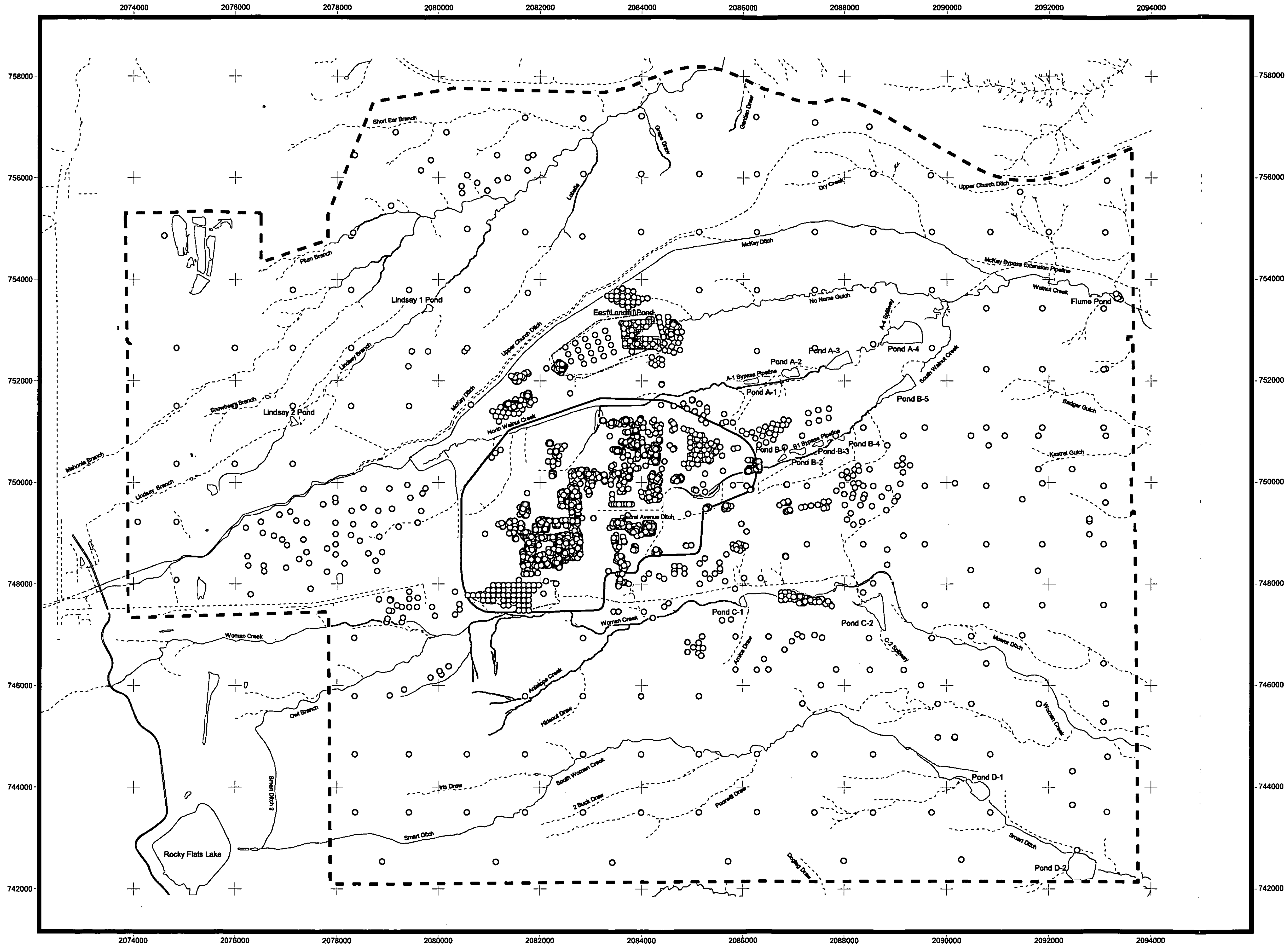


Figure 3.6

Aluminum Concentrations in Surface Soil

Key

- Constituent > OR = PRG
- Constituent > Background AND < PRG
- Constituent > Detection Limit AND < OR = Background
- Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N W E S

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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Rocky Flats Environmental Technology Site

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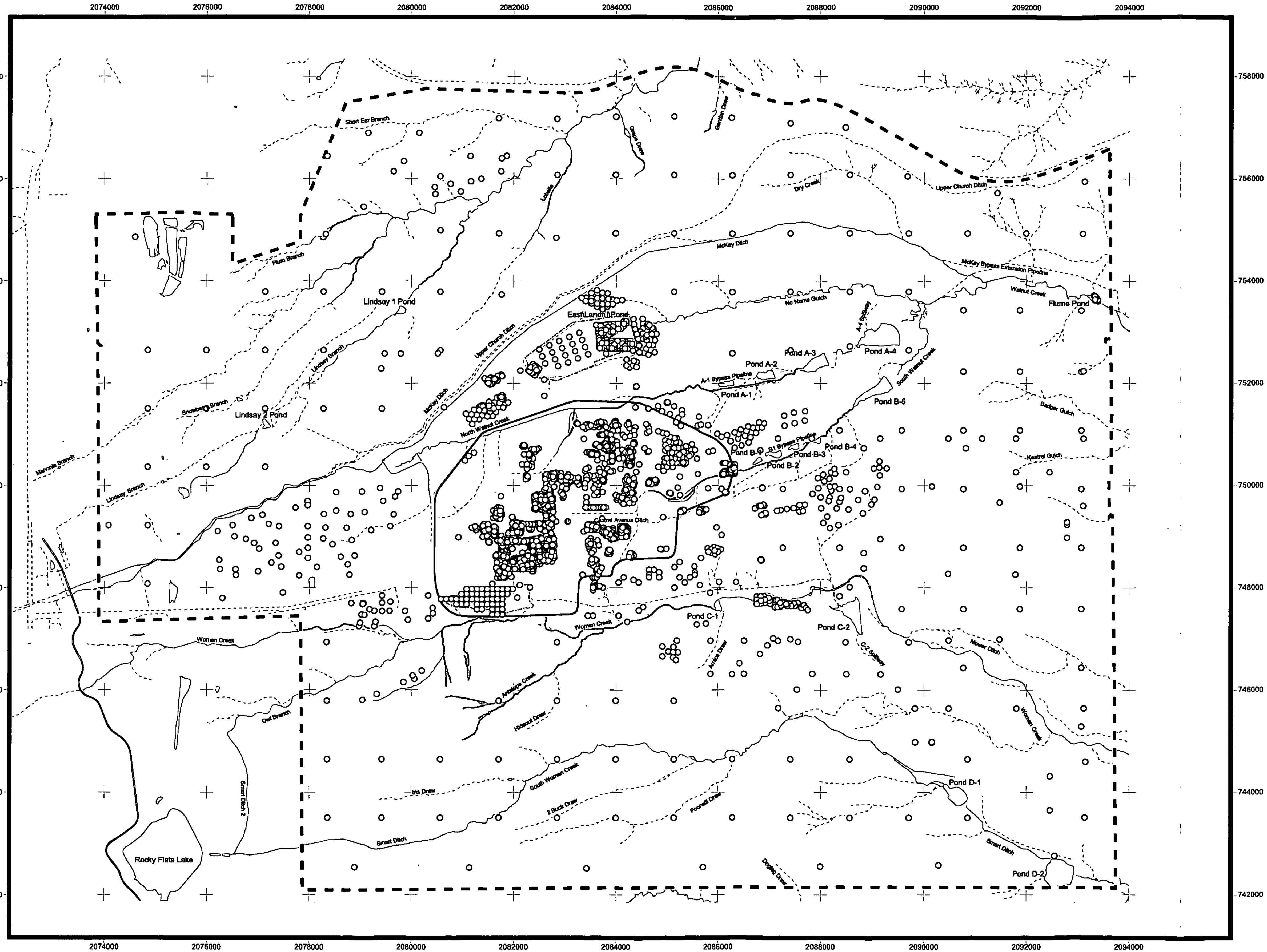

Figure 3.7

Arsenic Concentrations in Surface Soil

Key

- Constituent > Background
- Constituent > OR = PRG AND < OR = Background
- Constituent > Detection Limit AND < PRG
- Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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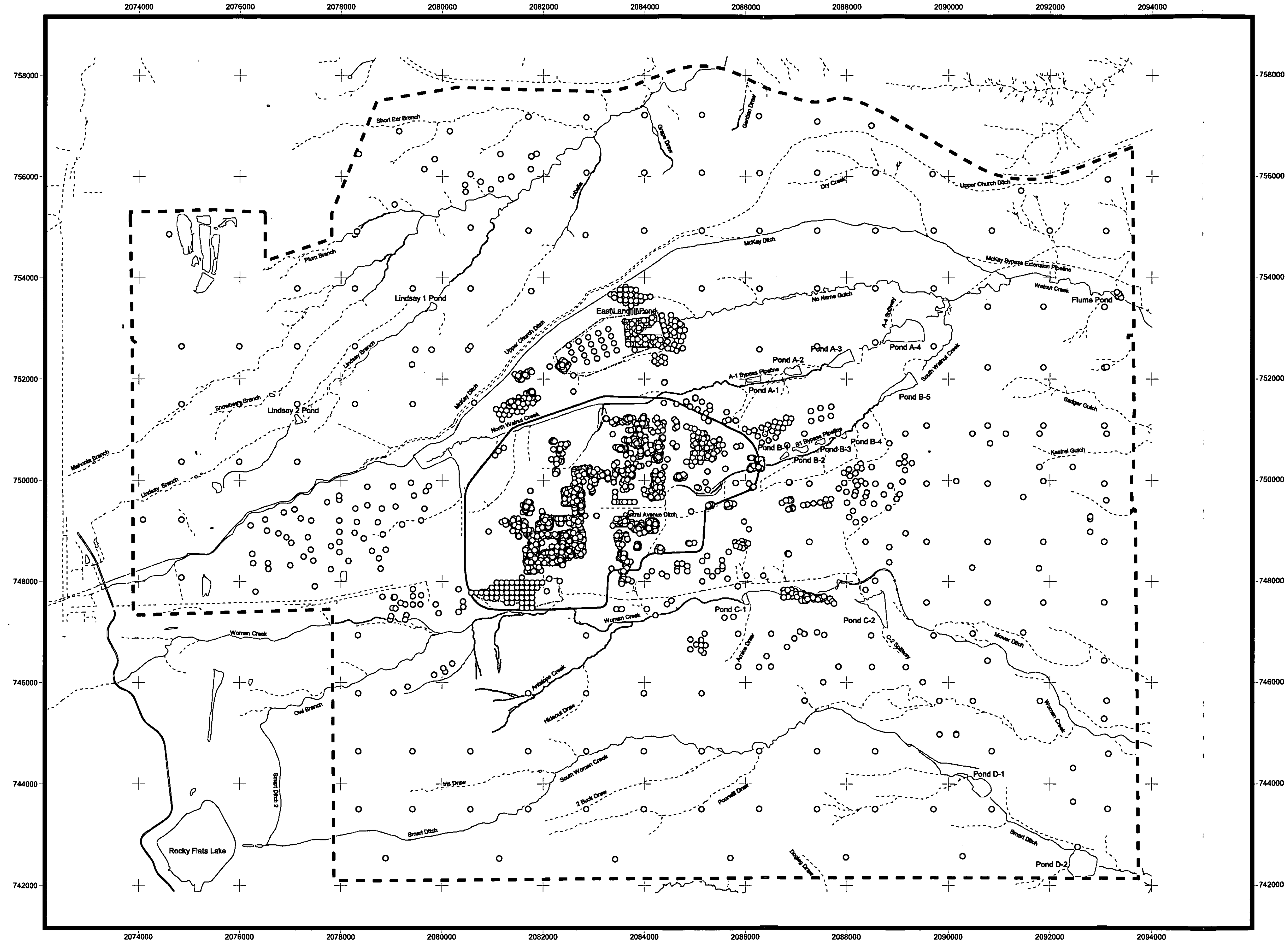

Figure 3.8

Chromium, total Concentrations in Surface Soil

Key

- Constituent > OR = PRG
- Constituent > Background AND < PRG
- Constituent > Detection Limit AND < OR = Background
- Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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Rocky Flats Environmental Technology Site

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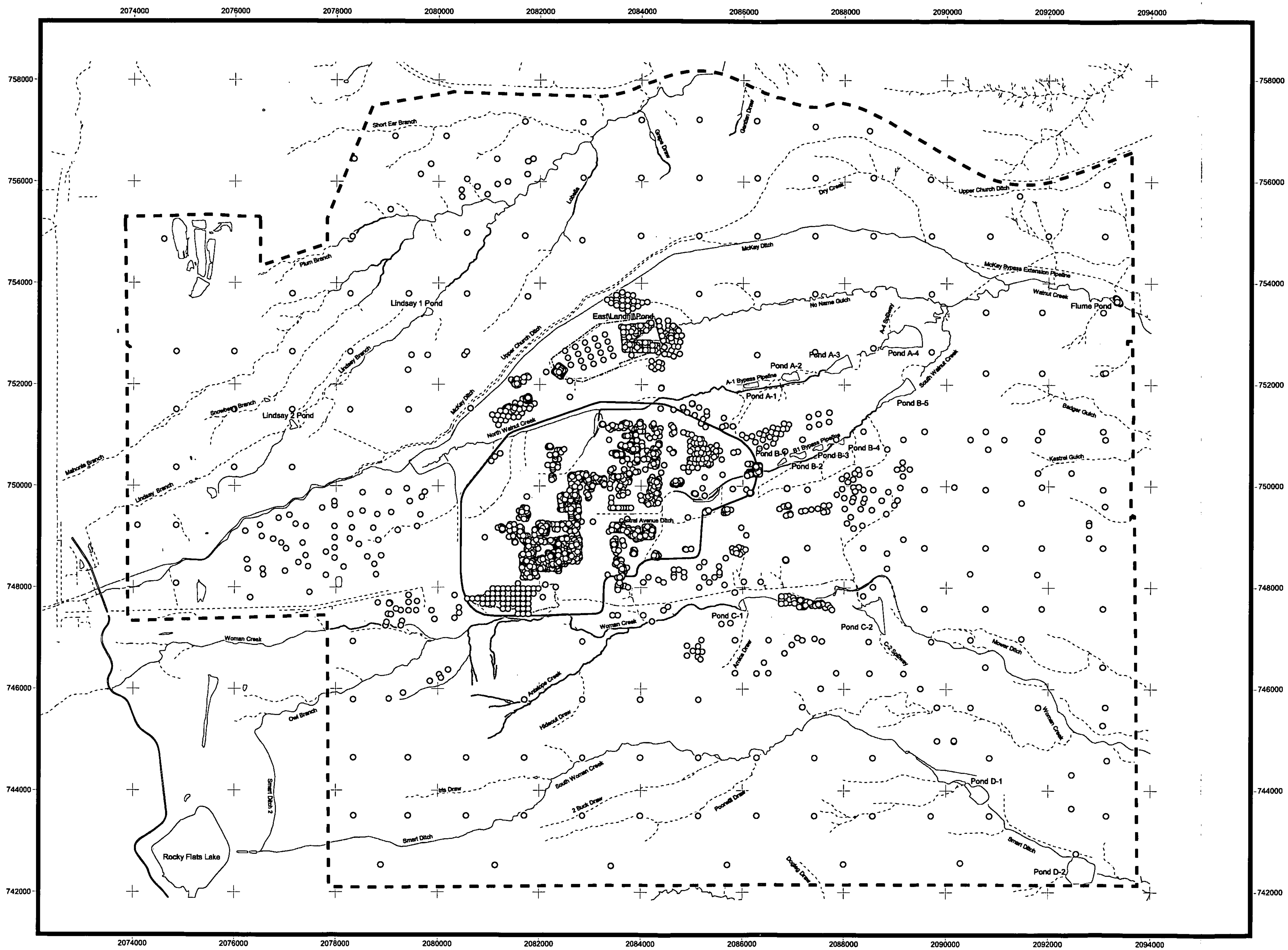

Figure 3.9

Vanadium Concentrations in Surface Soil

Key

- Constituent > OR = PRG
- Constituent > Background AND < PRG
- Constituent > Detection Limit AND < OR = Background
- Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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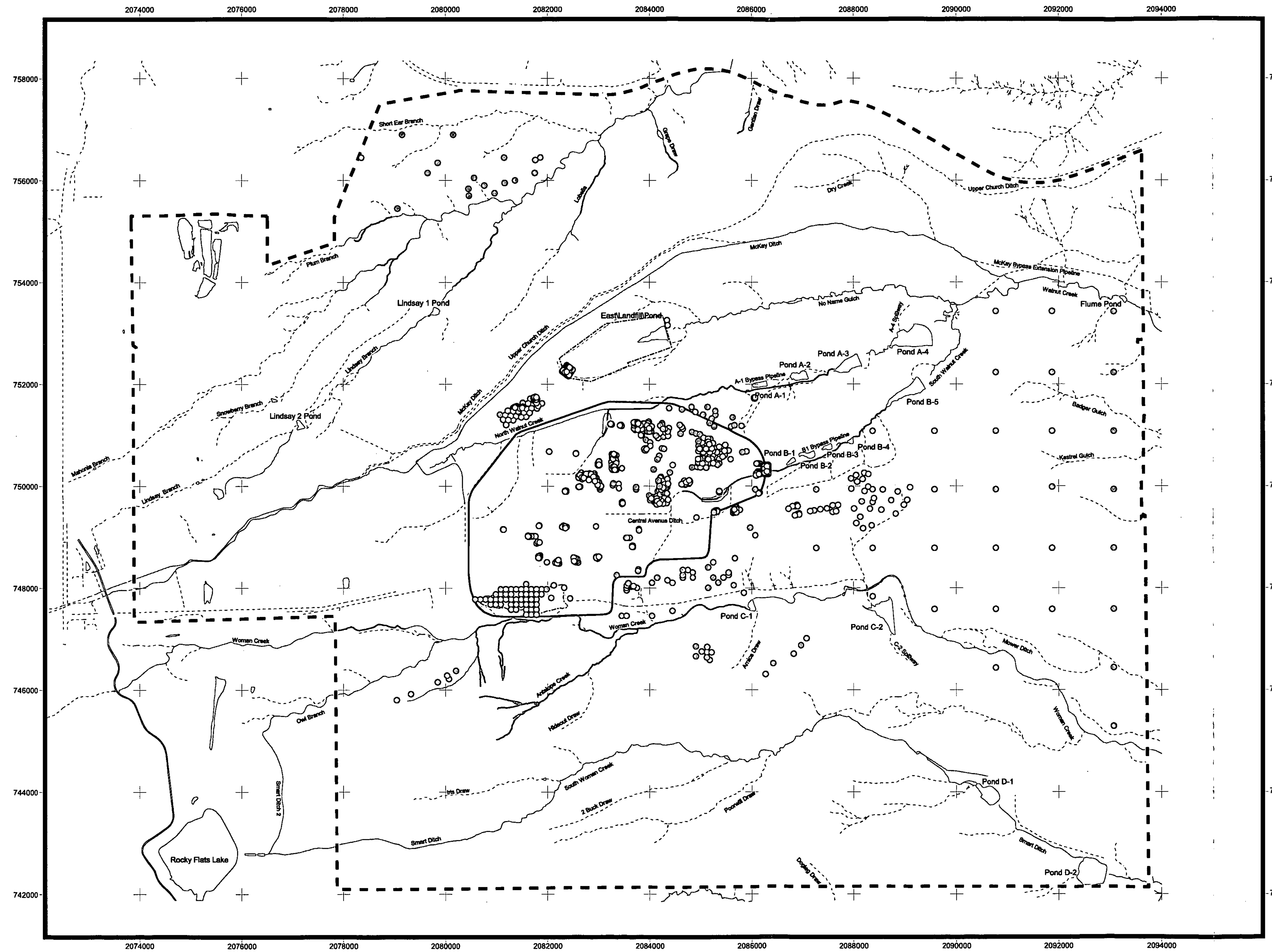

Figure 3.10

PCB-1254 Concentrations in Surface Soil

Key

- ○ Constituent > OR = PRG
- ○ Constituent > OR = Detection Limit AND < PRG
- ◎ Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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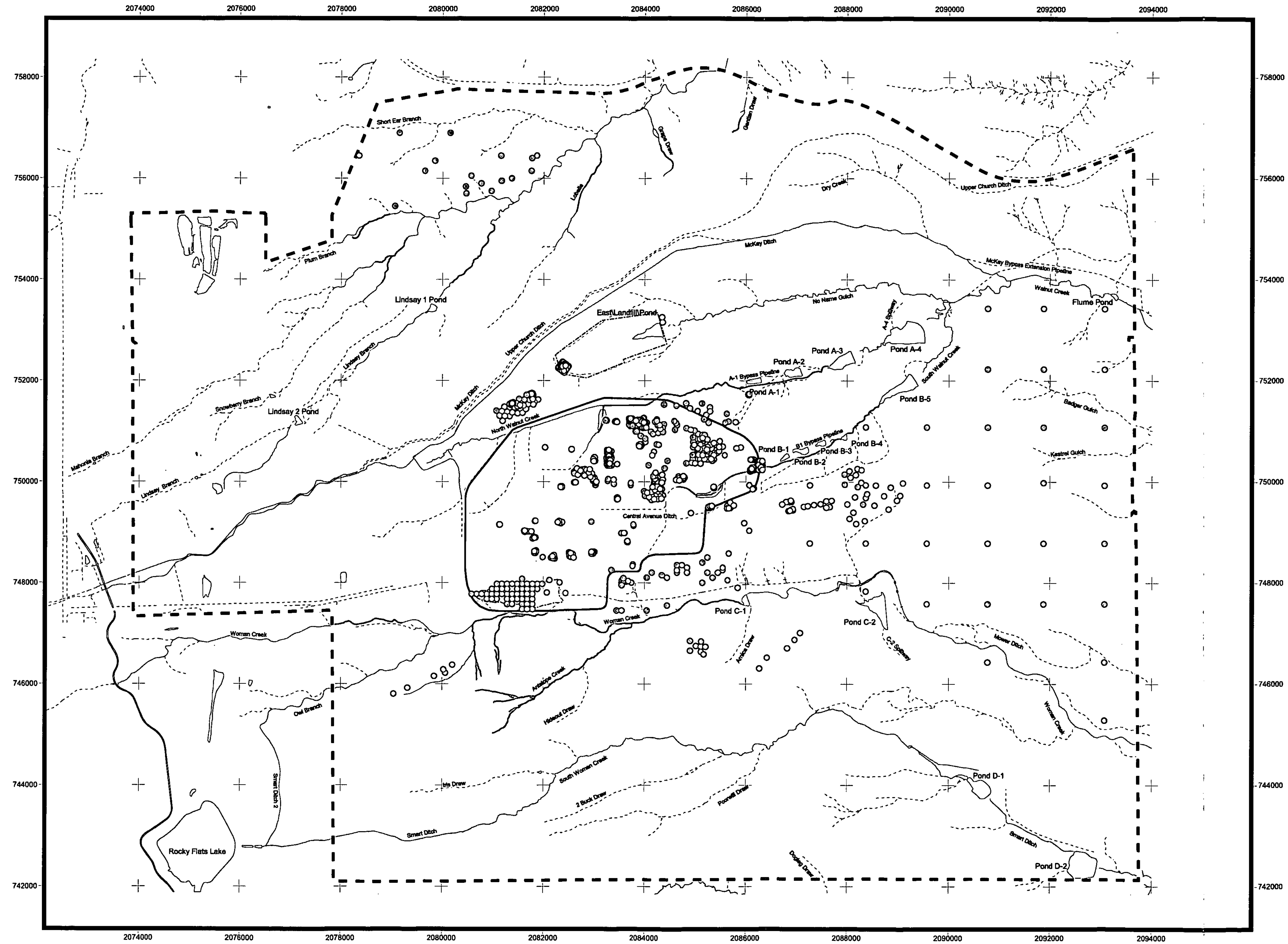

Figure 3.11

PCB-1260 Concentrations in Surface Soil

Key

- Constituent > OR = PRG
- Constituent > OR = Detection Limit AND < PRG
- Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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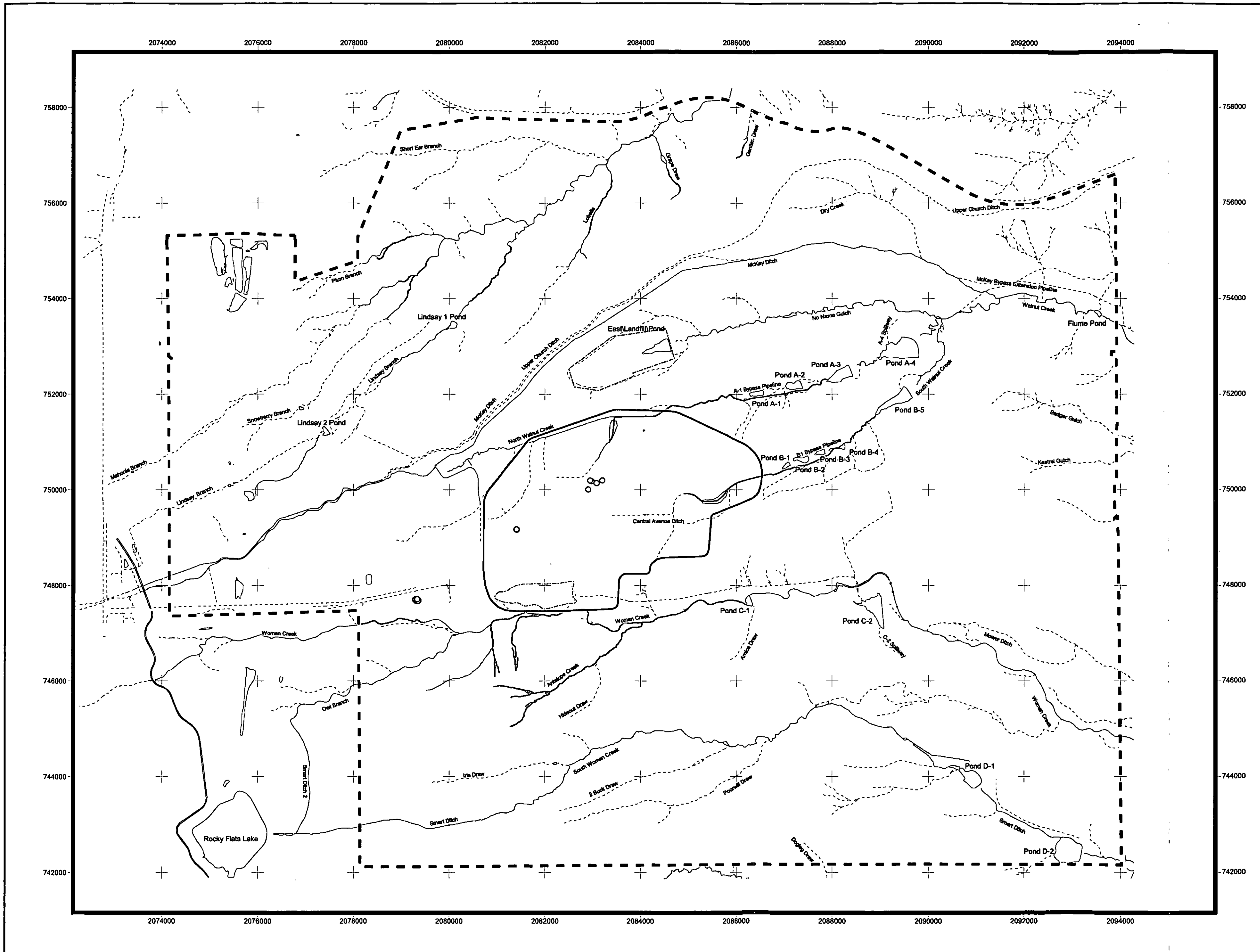

Figure 3.12

2,3,7,8-TCDD TEQ Concentrations in Surface Soil

Key

- O Constituent > OR = PRG
- O Constituent > OR = Detection Limit AND < PRG
- O Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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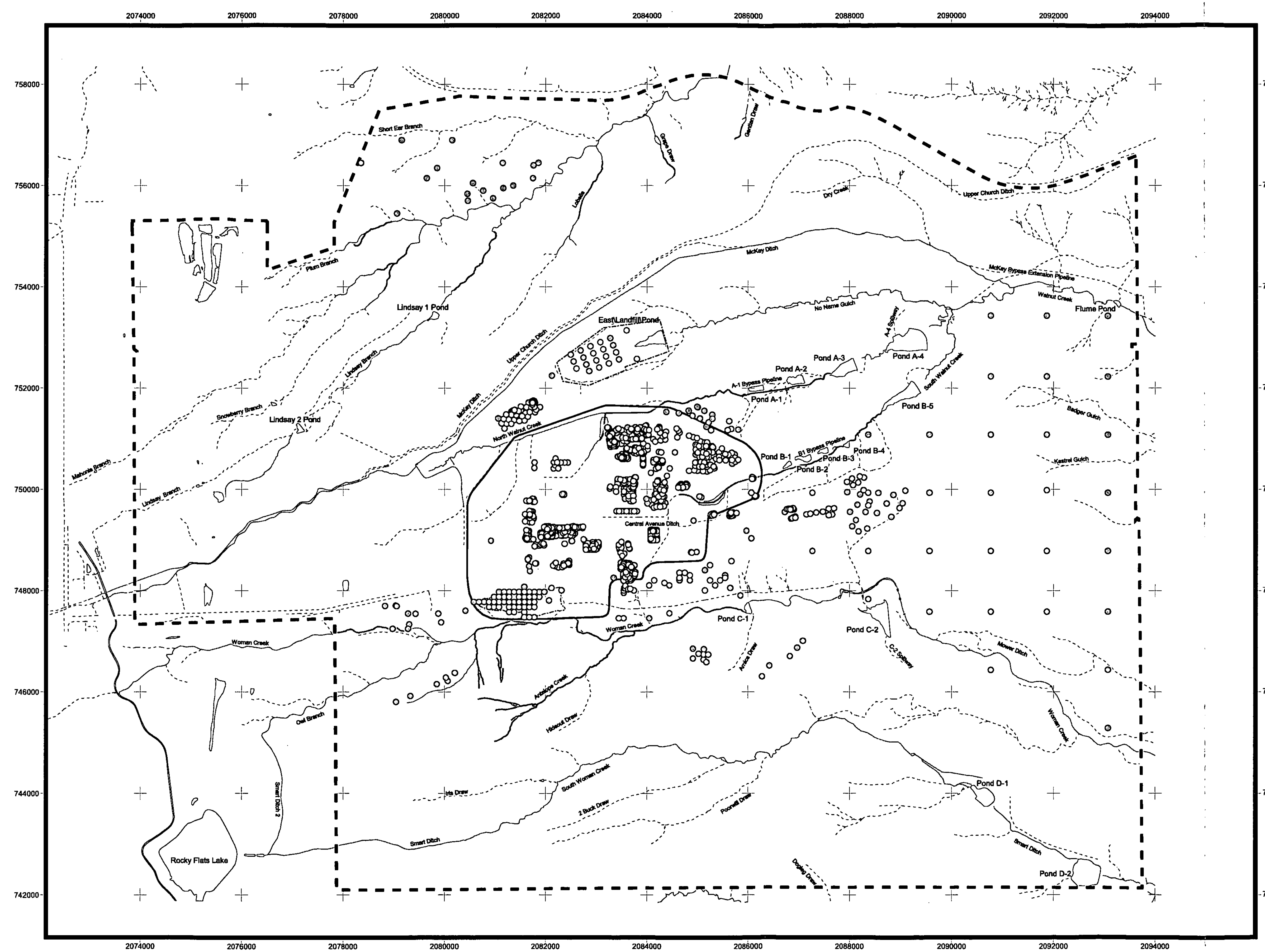

Figure 3.13

Benzo(a)pyrene Concentrations in Surface Soil

Key

- O Constituent > OR = PRG
- O Constituent > OR = Detection Limit AND < PRG
- O Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N W E S

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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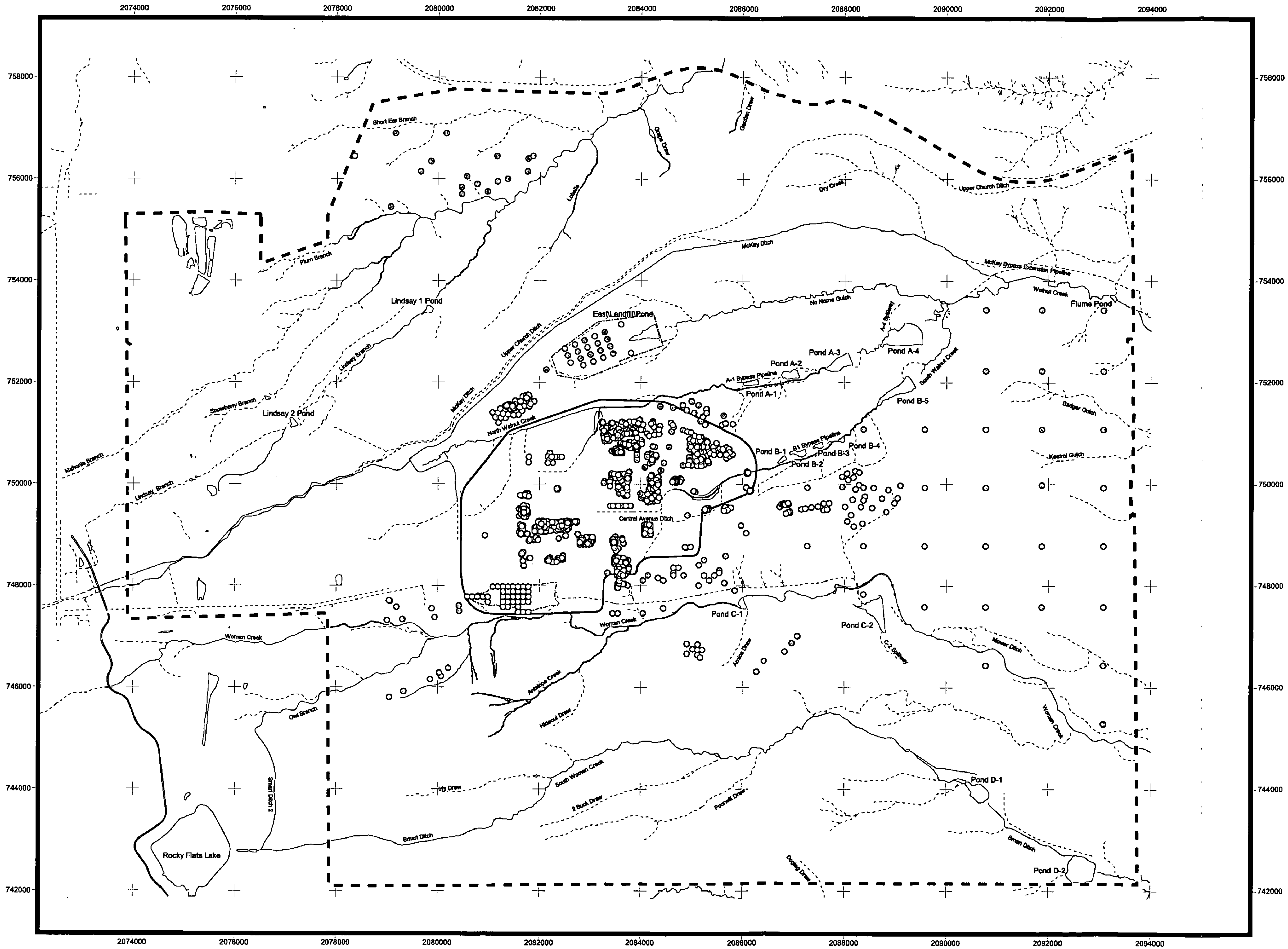

Figure 3.14

Dibenz(a,h)anthracene Concentrations in Surface Soil

Key

- Constituent > OR = PRG
- Constituent > OR = Detection Limit AND < PRG
- Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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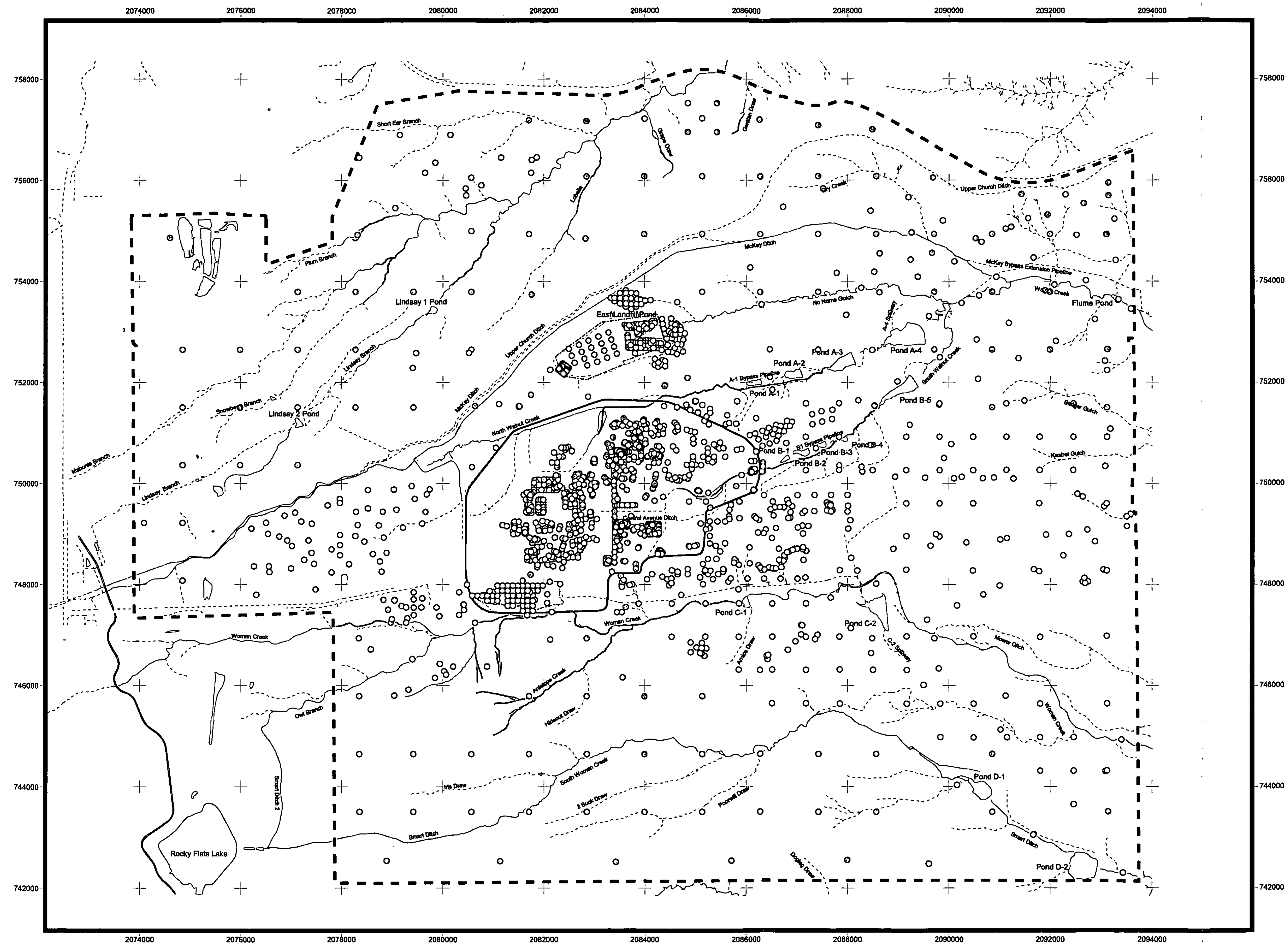

Figure 3.15

Americium-241 Activity in Surface Soil

Key

- Constituent > OR = PRG
- Constituent > Background AND < PRG
- Constituent > Detection Limit AND < OR = Background
- Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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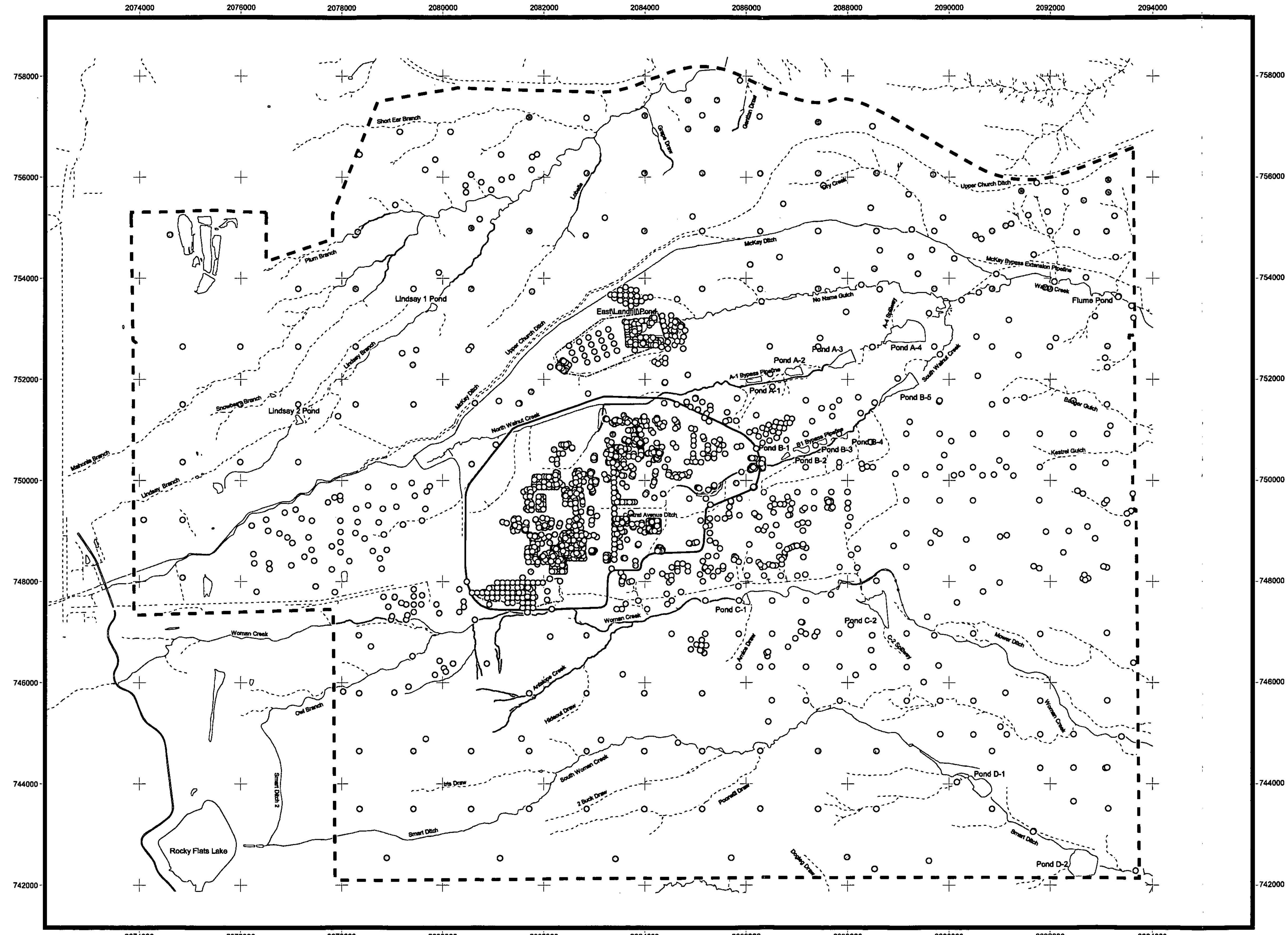

Figure 3.16

Plutonium-239/240 Activity in Surface Soil

Key

- Constituent > OR = PRG
- Constituent > Background AND < PRG
- Constituent > Detection Limit AND < OR = Background
- Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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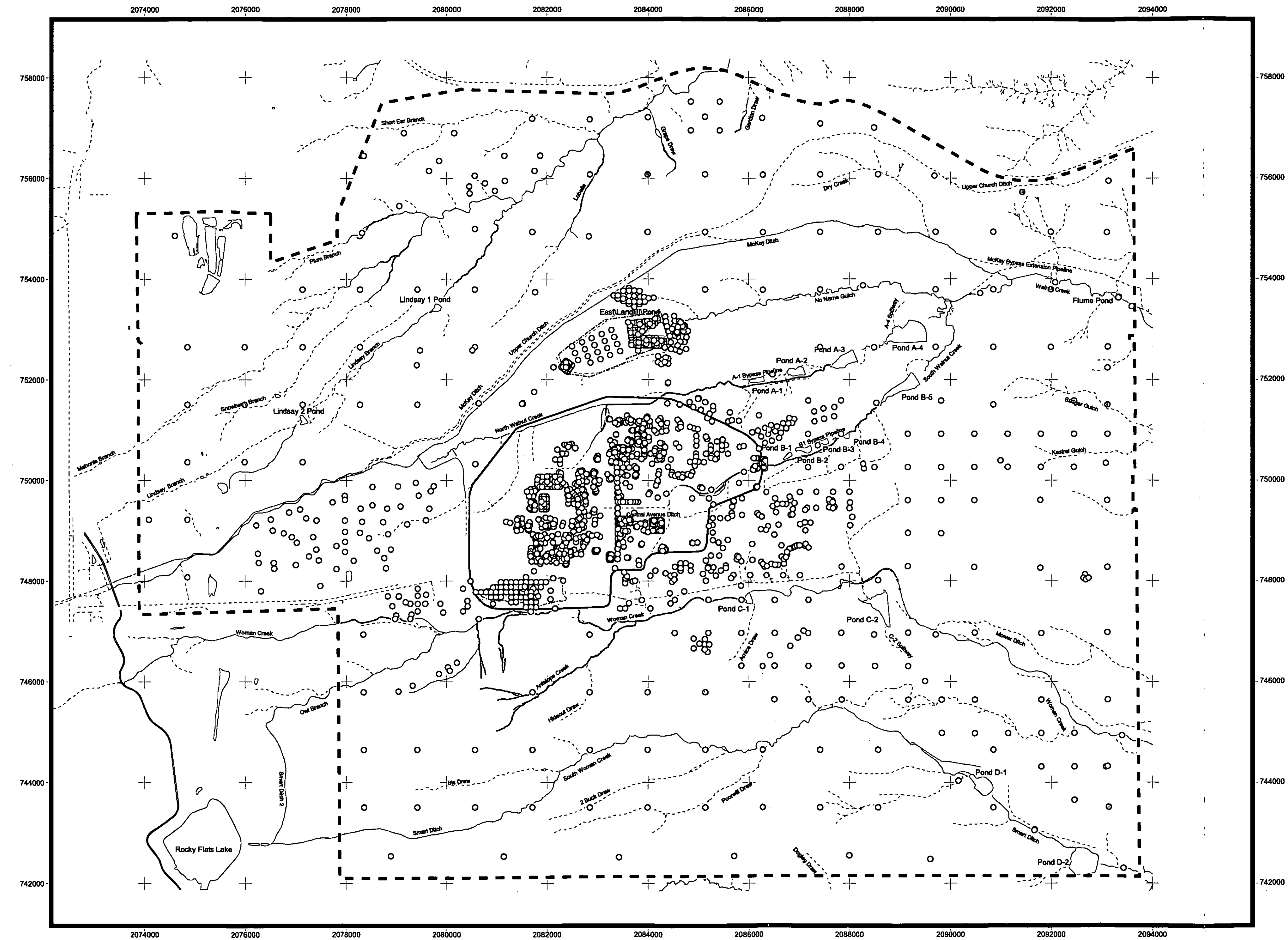

Figure 3.17

Uranium-233/234 Activity in Surface Soil

Key

- Constituent > OR = PRG
- Constituent > Background AND < PRG
- Constituent > Detection Limit AND < OR = Background
- Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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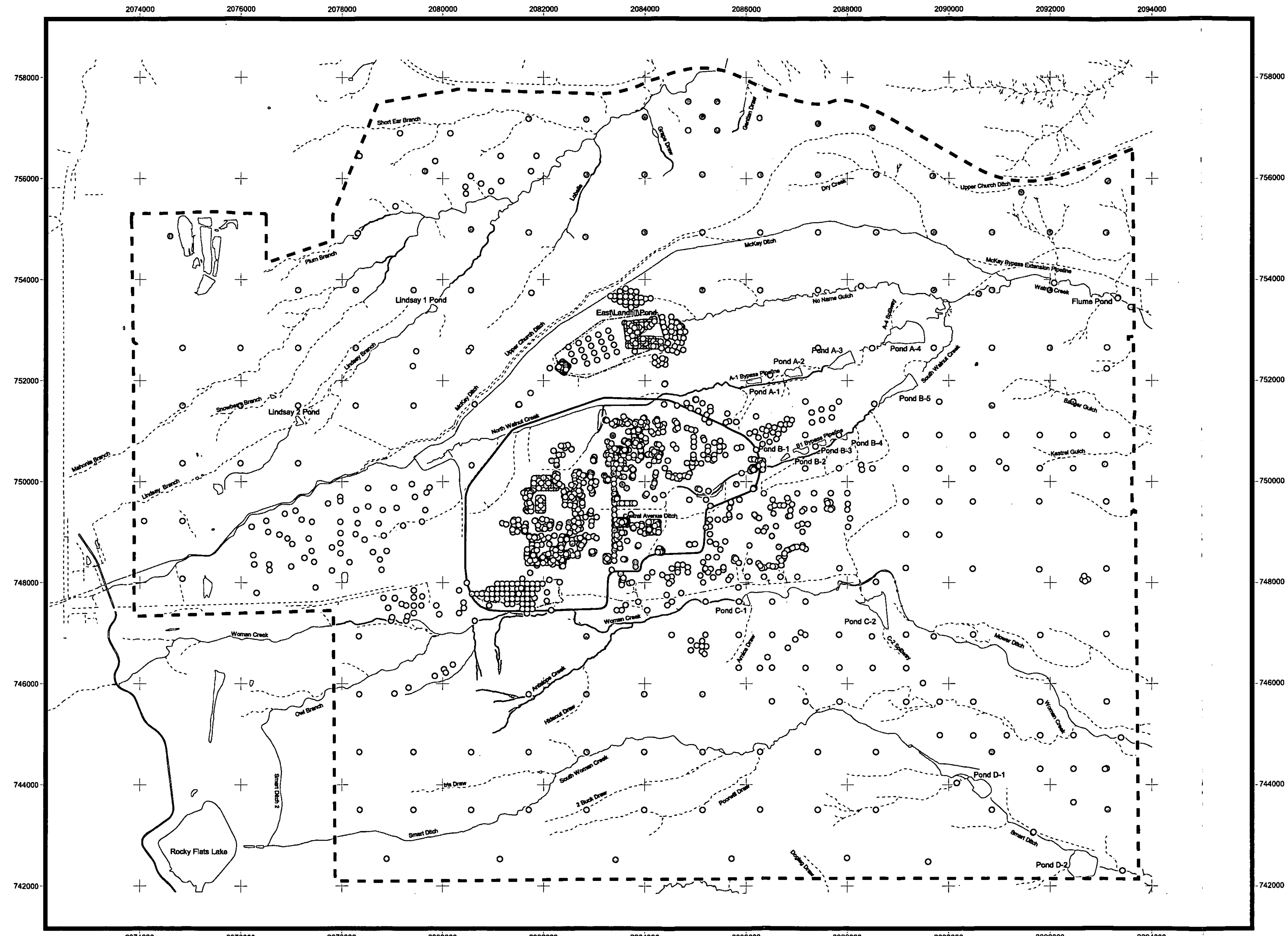

Figure 3.18

Uranium-235 Activity in Surface Soil

Key

- Constituent > OR = PRG
- Constituent > Background AND < PRG
- Constituent > Detection Limit AND < OR = Background
- Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N W E S

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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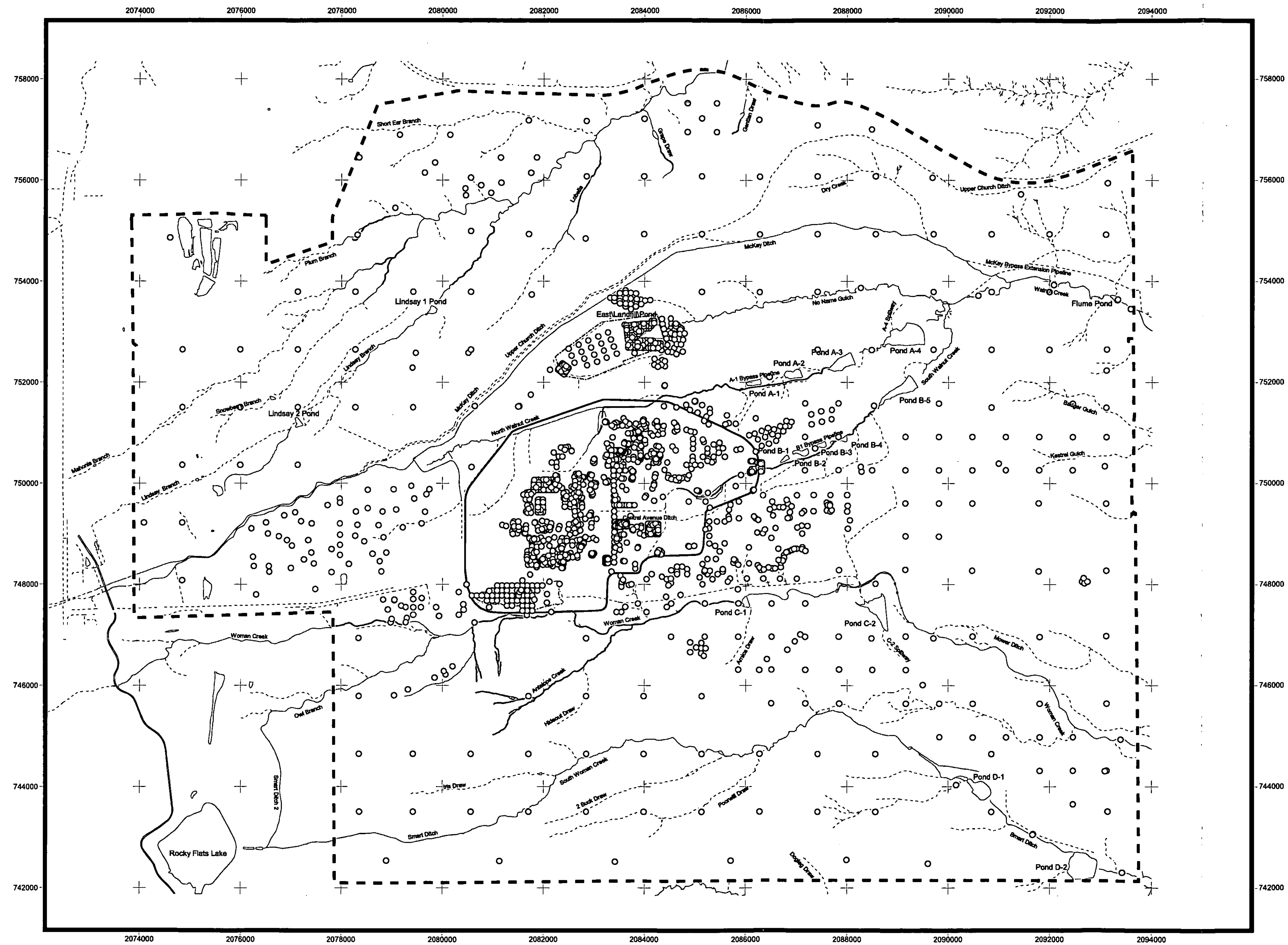

Figure 3.19

Uranium-238 Activity in Surface Soil

Key

- Constituent > OR = PRG
- Constituent > Background AND < PRG
- Constituent > Detection Limit AND < OR = Background
- Constituent not detected

Note:
Data presented are the results from soil samples collected from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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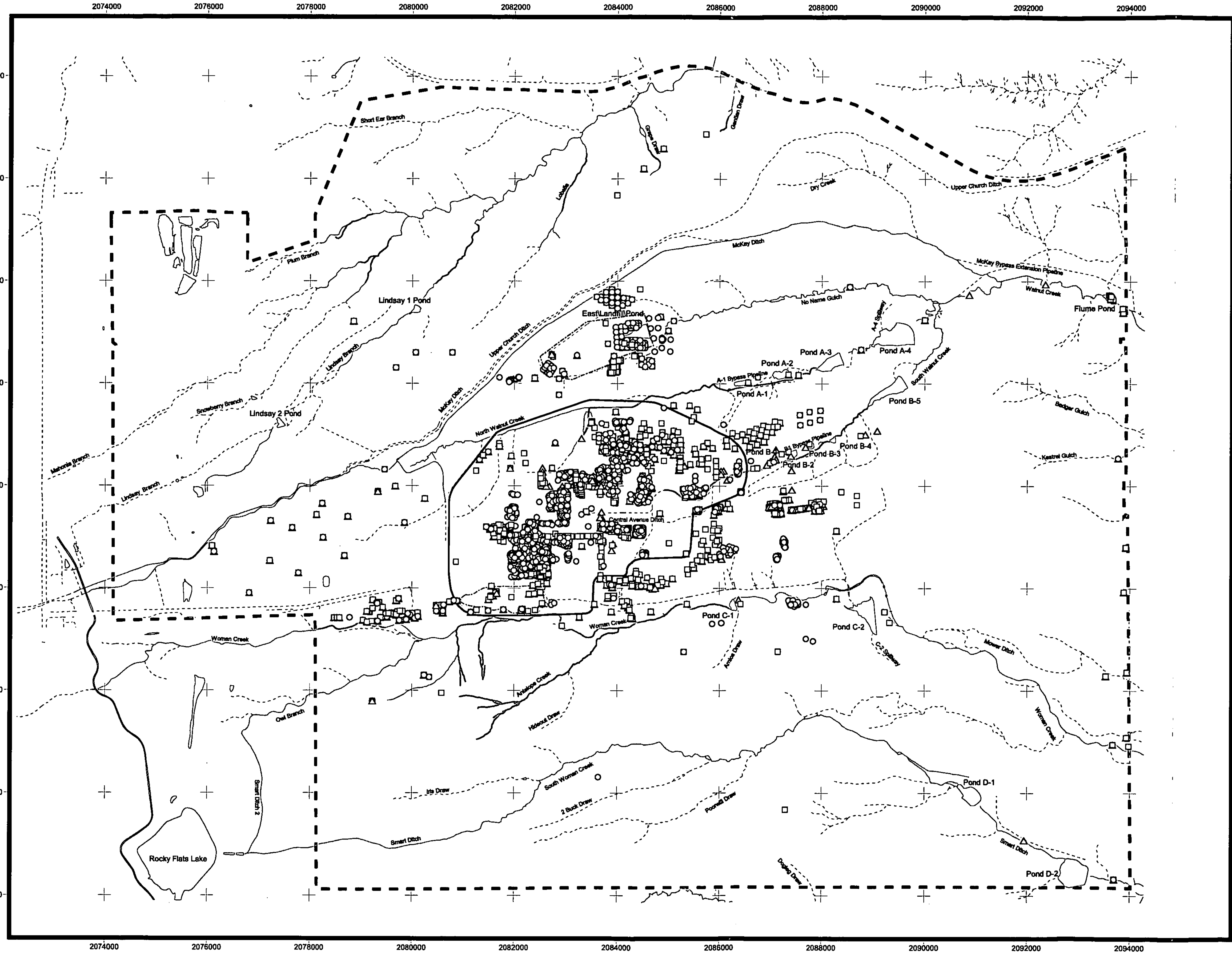

Figure 3.20

Chromium, total Concentrations in Subsurface Soil (0.5'-3', 3'-8', and 8'-12')

Key

- ○ Sample collected > 0.5' AND < OR = 3'
- □ Sample collected > 3' AND < OR = 8'
- △ Sample collected > 8' AND < OR = 12'
- ○ Constituent > OR = PRG
- ○ Constituent > Background AND < PRG
- ○ Constituent > Detection Limit AND < OR = Background
- ⊙ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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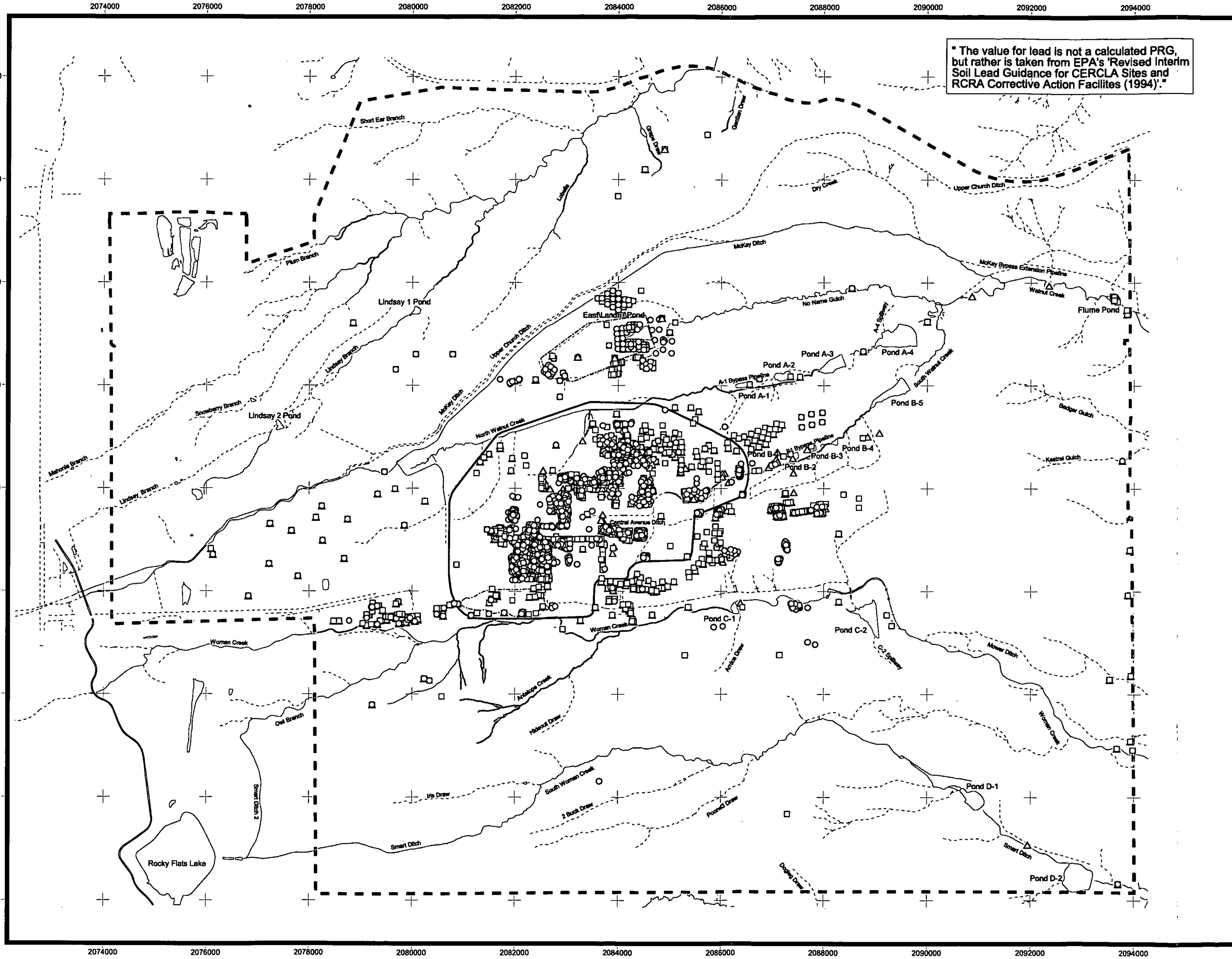

Figure 3.21

Lead Concentrations in Subsurface Soil (0.5'-3', 3'-8', and 8'-12')

Key

- ○ Sample collected > 0.5' AND < OR = 3'
- □ Sample collected > 3' AND < OR = 8'
- △ Sample collected > 8' AND < OR = 12'
- ○ Constituent > OR = PRG
- ○ Constituent > Background AND < PRG
- ○ Constituent > Detection Limit AND < OR = Background
- ⊙ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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State Plane Coordinate Projection
Colorado Central Zone
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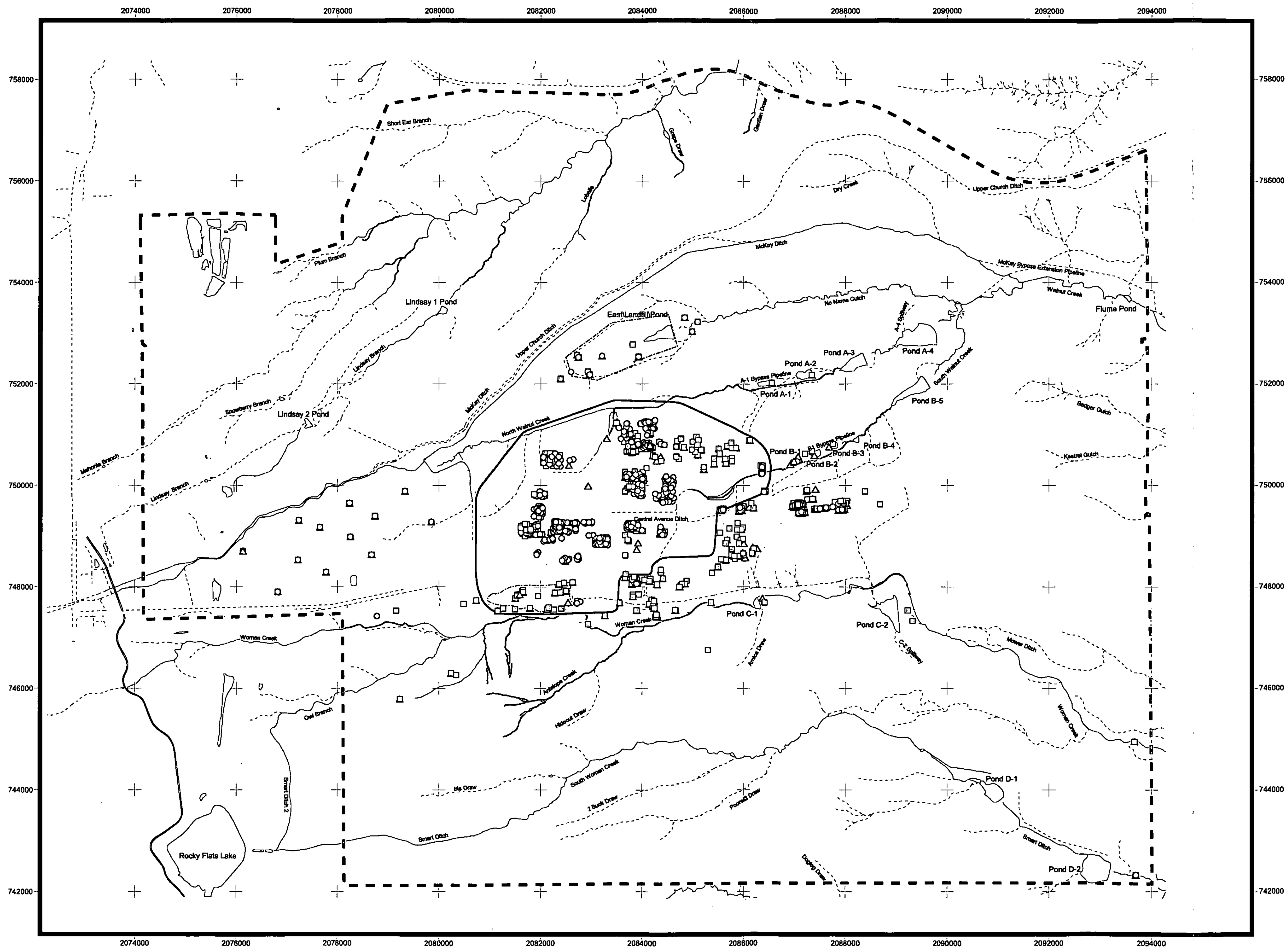

Figure 3.22

Benzo(a)pyrene Concentrations in Subsurface Soil (0.5'-3', 3'-8', and 8'-12')

Key

- ○ Sample collected > 0.5' AND < OR = 3'
- □ Sample collected > 3' AND < OR = 8'
- △ Sample collected > 8' AND < OR = 12'
- ○ Constituent > OR = PRG
- ○ Constituent > OR = Detection Limit AND < PRG
- ○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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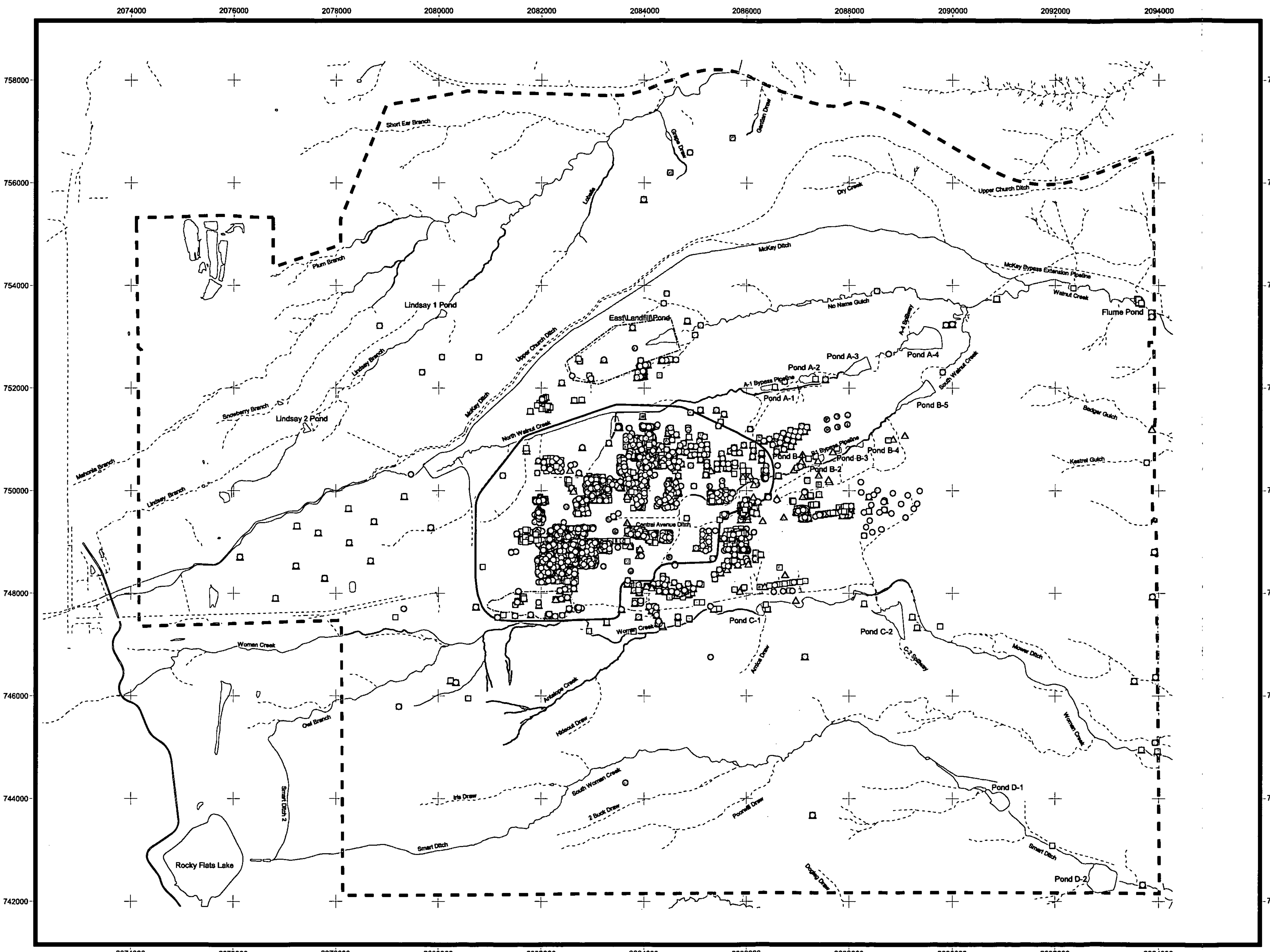

Figure 3.23

Tetrachloroethene Concentrations in Subsurface Soil (0.5'-3', 3'-8', and 8'-12')

Key

- ○ Sample collected > 0.5' AND < OR = 3'
- □ Sample collected > 3' AND < OR = 8'
- △ Sample collected > 8' AND < OR = 12'
- ○ Constituent > OR = PRG
- ○ Constituent > OR = Detection Limit AND < PRG
- ○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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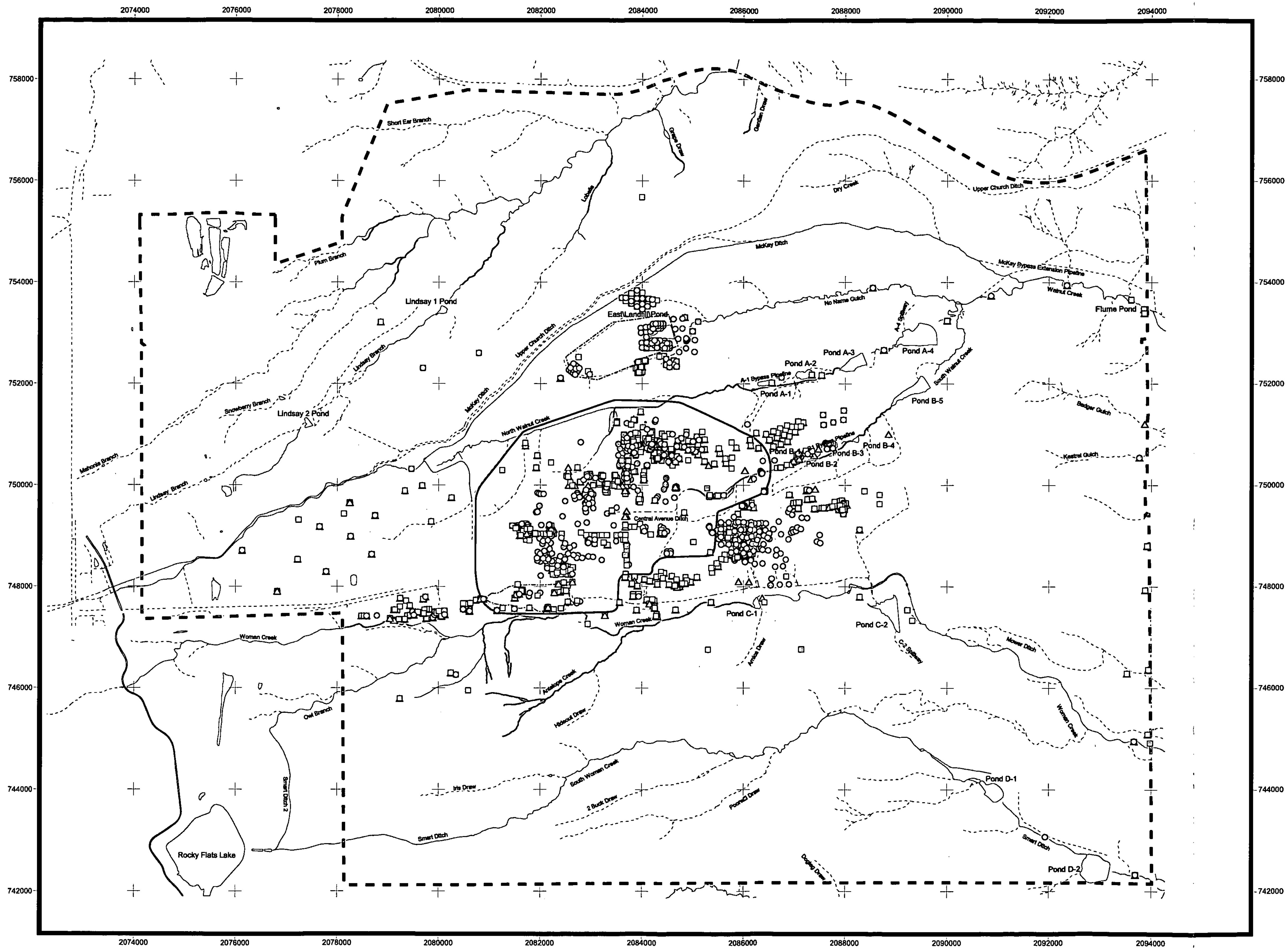

Figure 3.24

Americium-241 Activity in Subsurface Soil (0.5'-3', 3'-8', and 8'-12')

Key

- ○ Sample collected > 0.5' AND < OR = 3'
- □ Sample collected > 3' AND < OR = 8'
- △ Sample collected > 8' AND < OR = 12'
- ○ Constituent > OR = PRG
- ○ Constituent > Background AND < PRG
- ○ Constituent > Detection Limit AND < OR = Background
- ○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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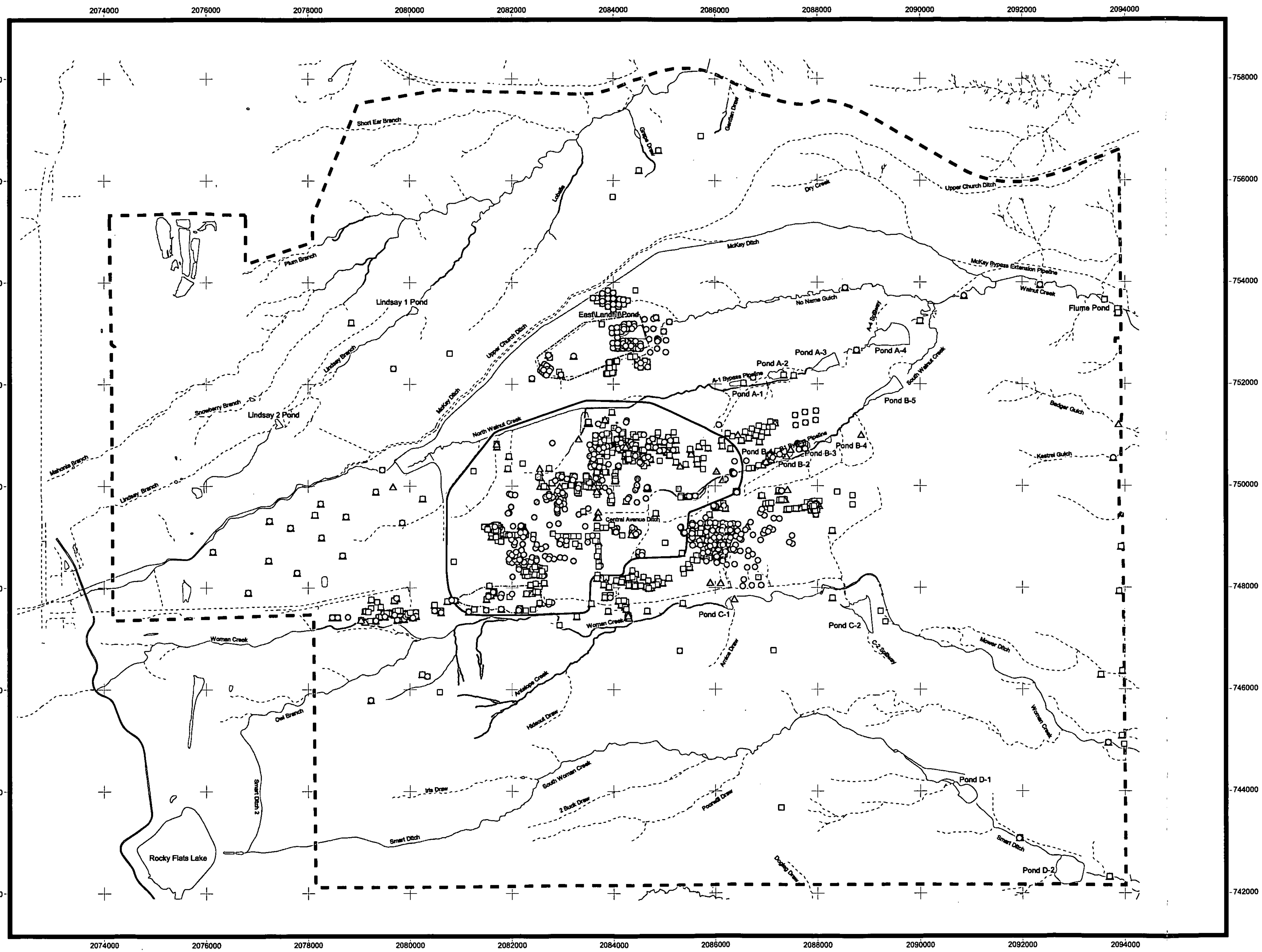

Figure 3.25

Plutonium-239/240 Activity in Subsurface Soil (0.5'-3', 3'-8', and 8'-12')

Key

- ○ Sample collected > 0.5' AND < OR = 3'
- □ Sample collected > 3' AND < OR = 8'
- △ Sample collected > 8' AND < OR = 12'
- ○ Constituent > OR = PRG
- ○ Constituent > Background AND < PRG
- ○ Constituent > Detection Limit AND < OR = Background
- ○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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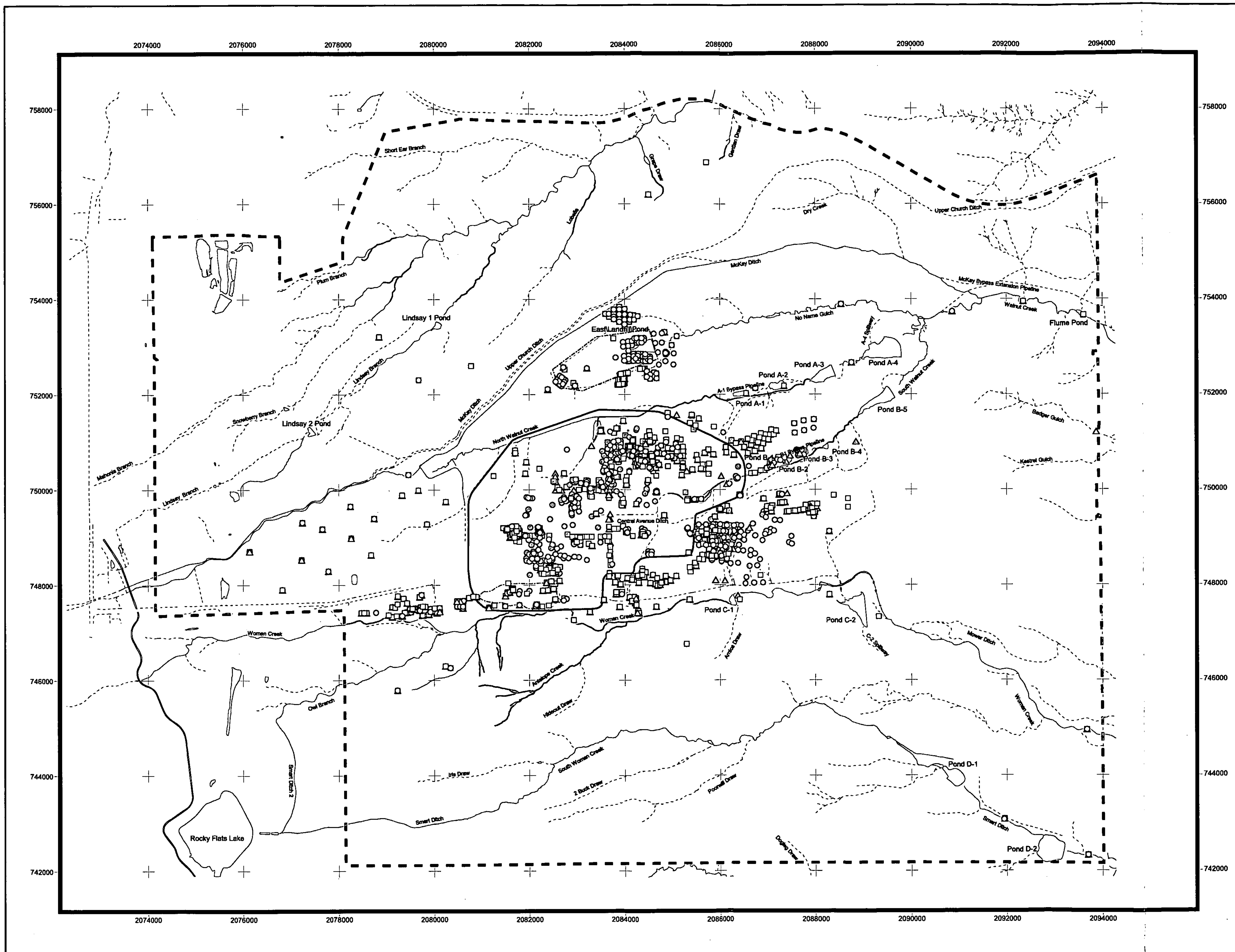

Figure 3.26

Uranium-235 Activity in Subsurface Soil (0.5'-3', 3'-8', and 8'-12')

Key

- ○ Sample collected > 0.5' AND < OR = 3'
- □ Sample collected > 3' AND < OR = 8'
- △ Sample collected > 8' AND < OR = 12'
- ○ Constituent > OR = PRG
- ○ Constituent > Background AND < PRG
- ○ Constituent > Detection Limit AND < OR = Background
- ○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
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295

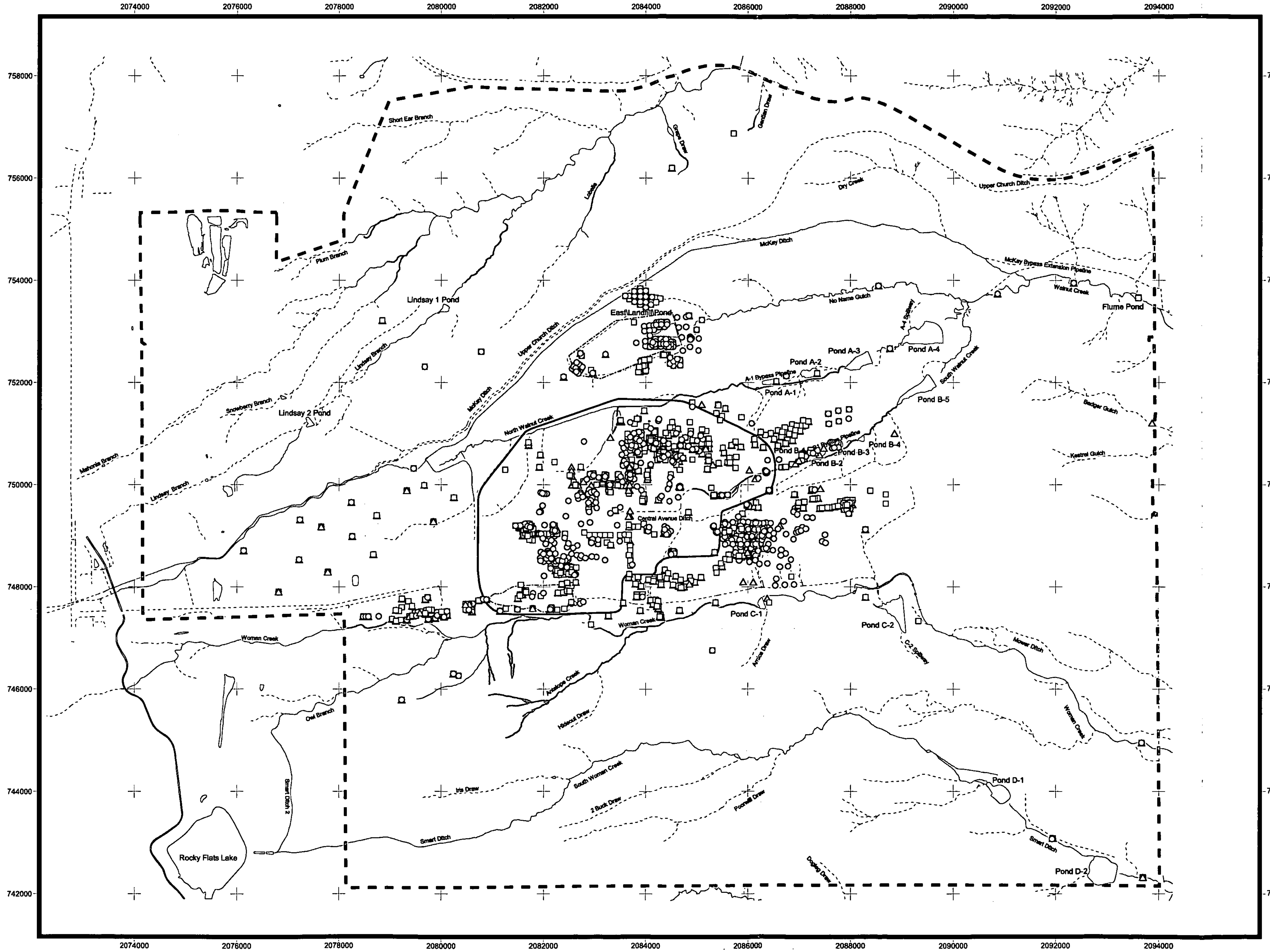

Figure 3.27

Uranium-238 Activity in Subsurface Soil (0.5'-3', 3'-8', and 8'-12')

Key

- ○ Sample collected > 0.5' AND < OR = 3'
- □ Sample collected > 3' AND < OR = 8'
- △ Sample collected > 8' AND < OR = 12'
- ○ Constituent > OR = PRG
- ○ Constituent > Background AND < PRG
- ○ Constituent > Detection Limit AND < OR = Background
- ⊗ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N
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0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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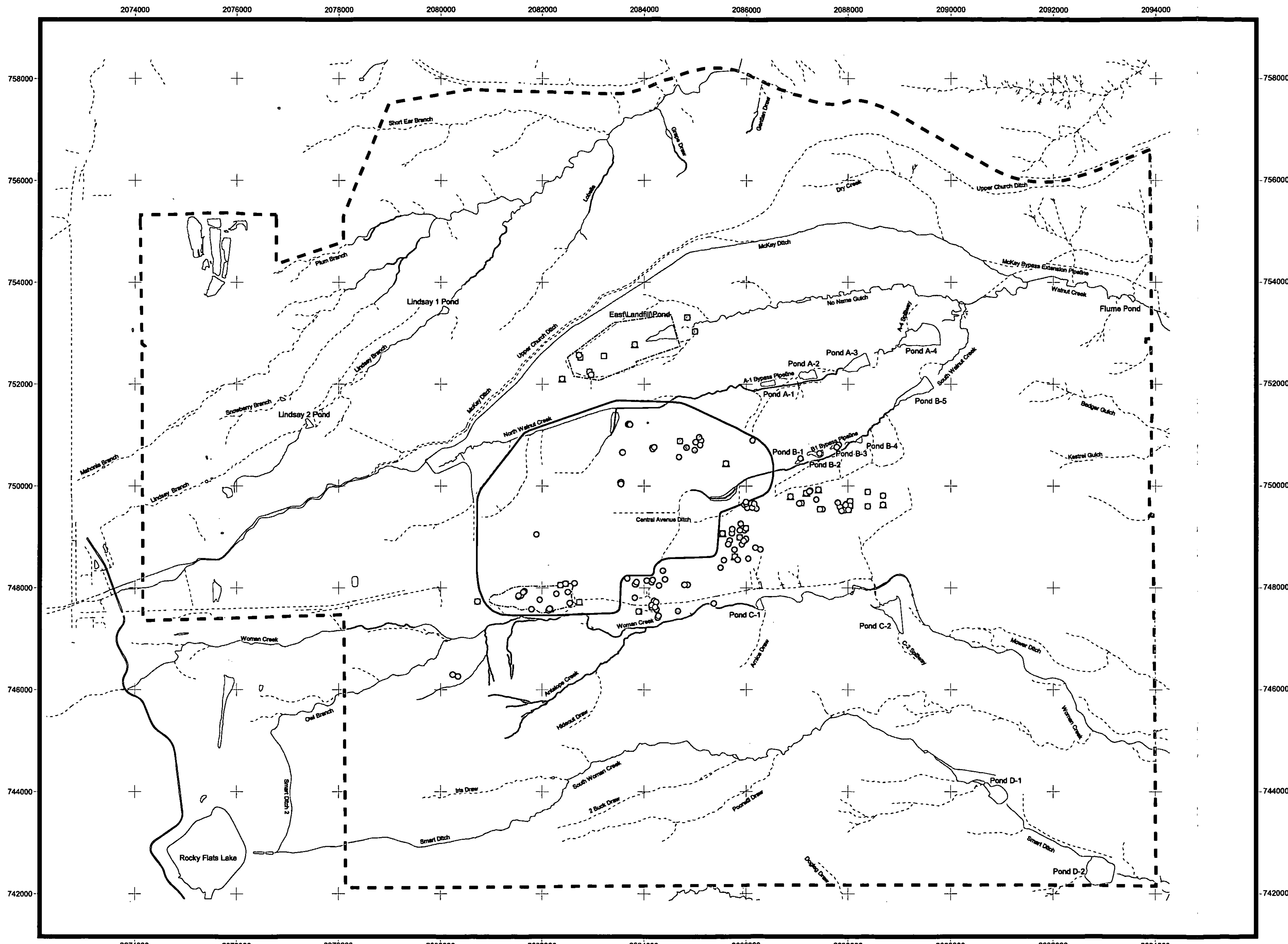

Figure 3.28

PCBs (Aroclor 1260) Concentrations in Subsurface Soil (12'-30', 30'-50', and >50')

Key

- ○ Sample collected > 12' AND < OR = 30'
- □ Sample collected > 30' AND < OR = 50'
- △ Sample collected > 50'
- ○ Constituent > OR = PRG
- ○ Constituent > OR = Detection Limit AND < PRG
- ○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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297

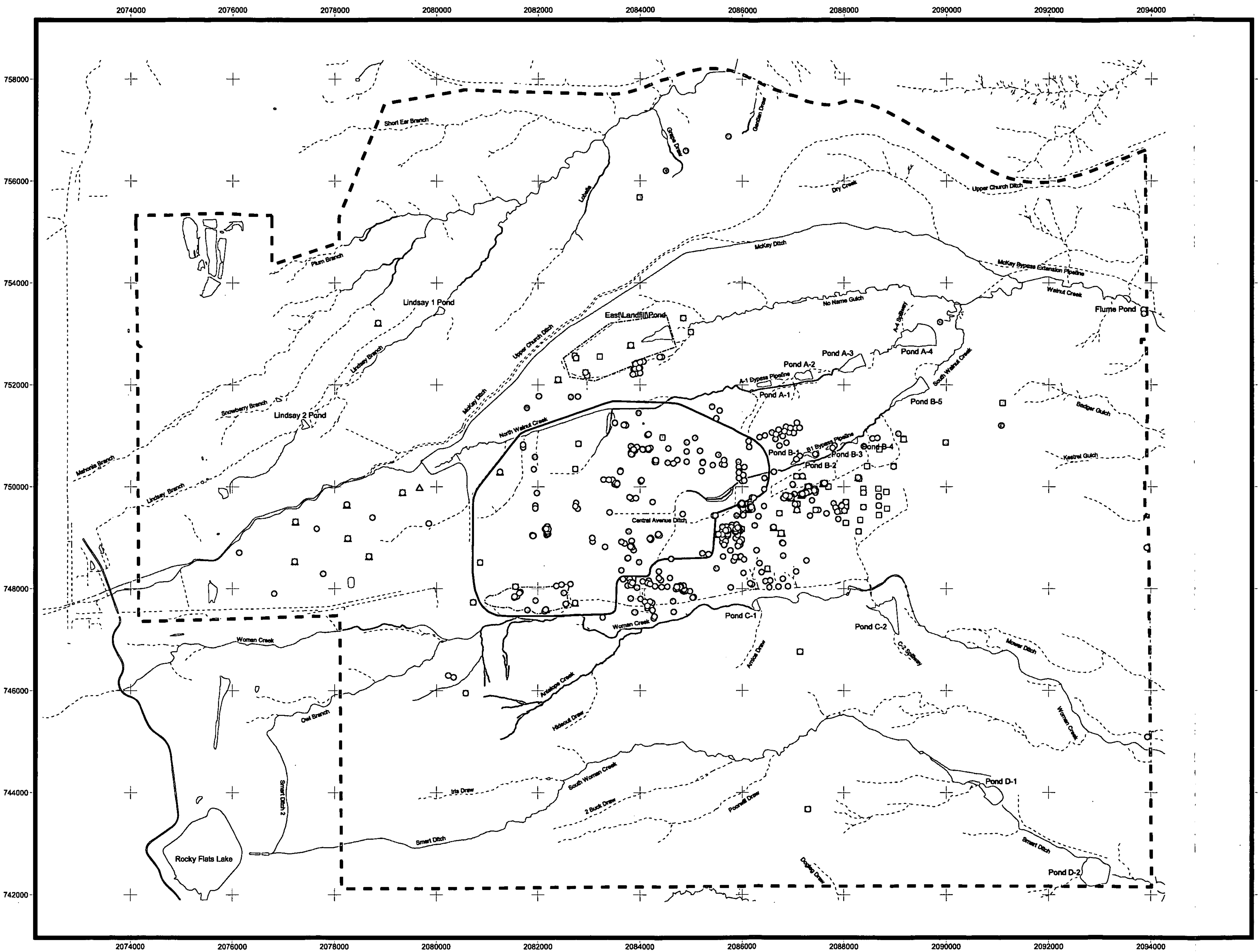

Figure 3.29

1,1,2,2-Tetrachloroethane Concentrations in Subsurface Soil (12'-30', 30'-50', and >50')

Key

○ Sample collected > 12' AND < OR = 30'

□ Sample collected > 30' AND < OR = 50'

△ Sample collected > 50'

○ Constituent > OR = PRG

○ Constituent > OR = Detection Limit AND < PRG

○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N / S / E / W

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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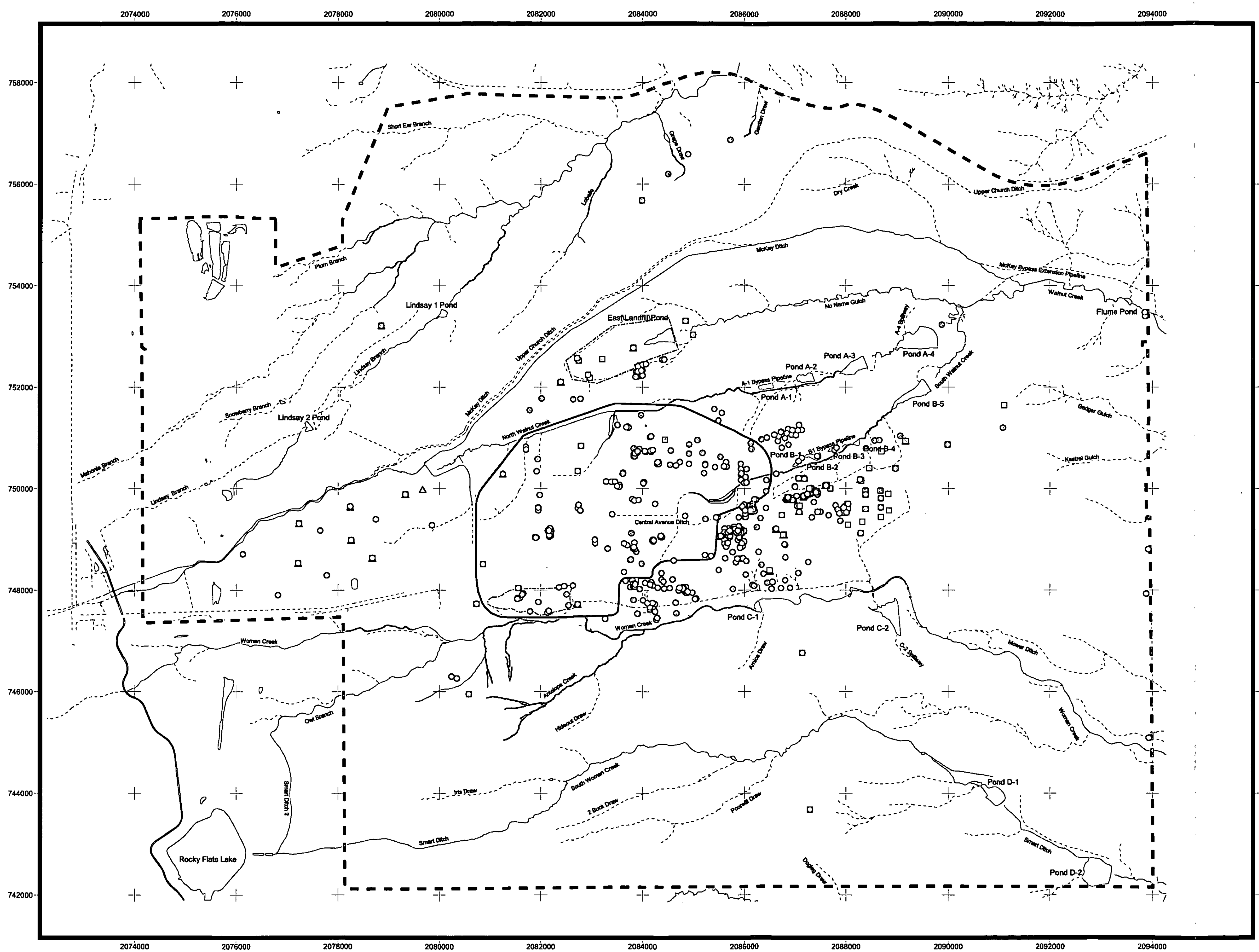

Figure 3.30

Carbon Tetrachloride Concentrations in Subsurface Soil (12'-30', 30'-50', and >50')

Key

- ○ Sample collected > 12' AND < OR = 30'
- □ Sample collected > 30' AND < OR = 50'
- △ Sample collected > 50'
- ○ Constituent > OR = PRG
- ○ Constituent > OR = Detection Limit AND < PRG
- ○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N S E W

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Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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Rocky Flats Environmental Technology Site

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299

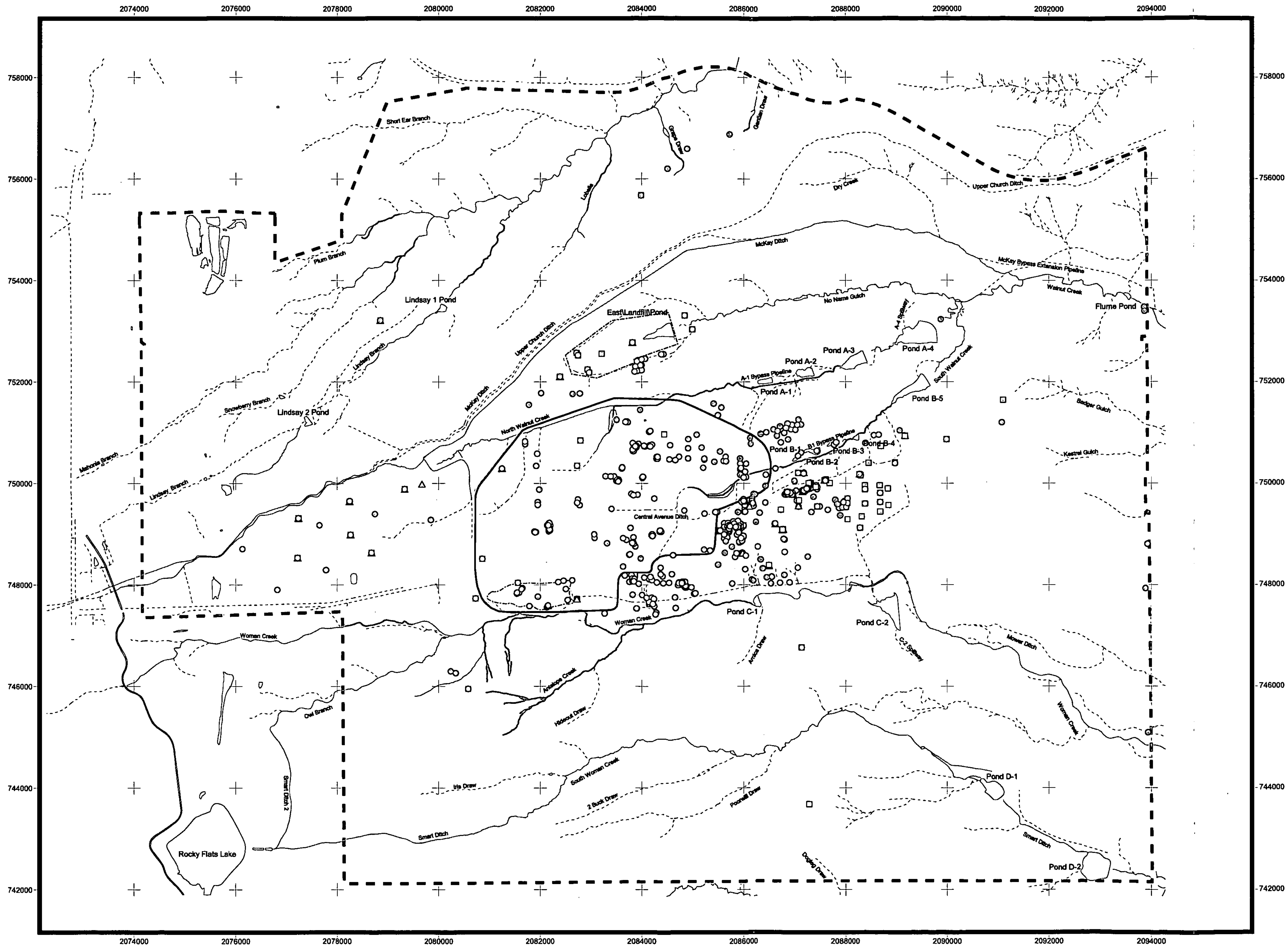

Figure 3.31

Chloroform Concentrations in Subsurface Soil (12'-30', 30'-50', and >50')

Key

- ○ Sample collected > 12' AND < OR = 30'
- □ Sample collected > 30' AND < OR = 50'
- △ Sample collected > 50'
- ○ Constituent > OR = PRG
- ○ Constituent > OR = Detection Limit AND < PRG
- ○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N W E S

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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Technology Site

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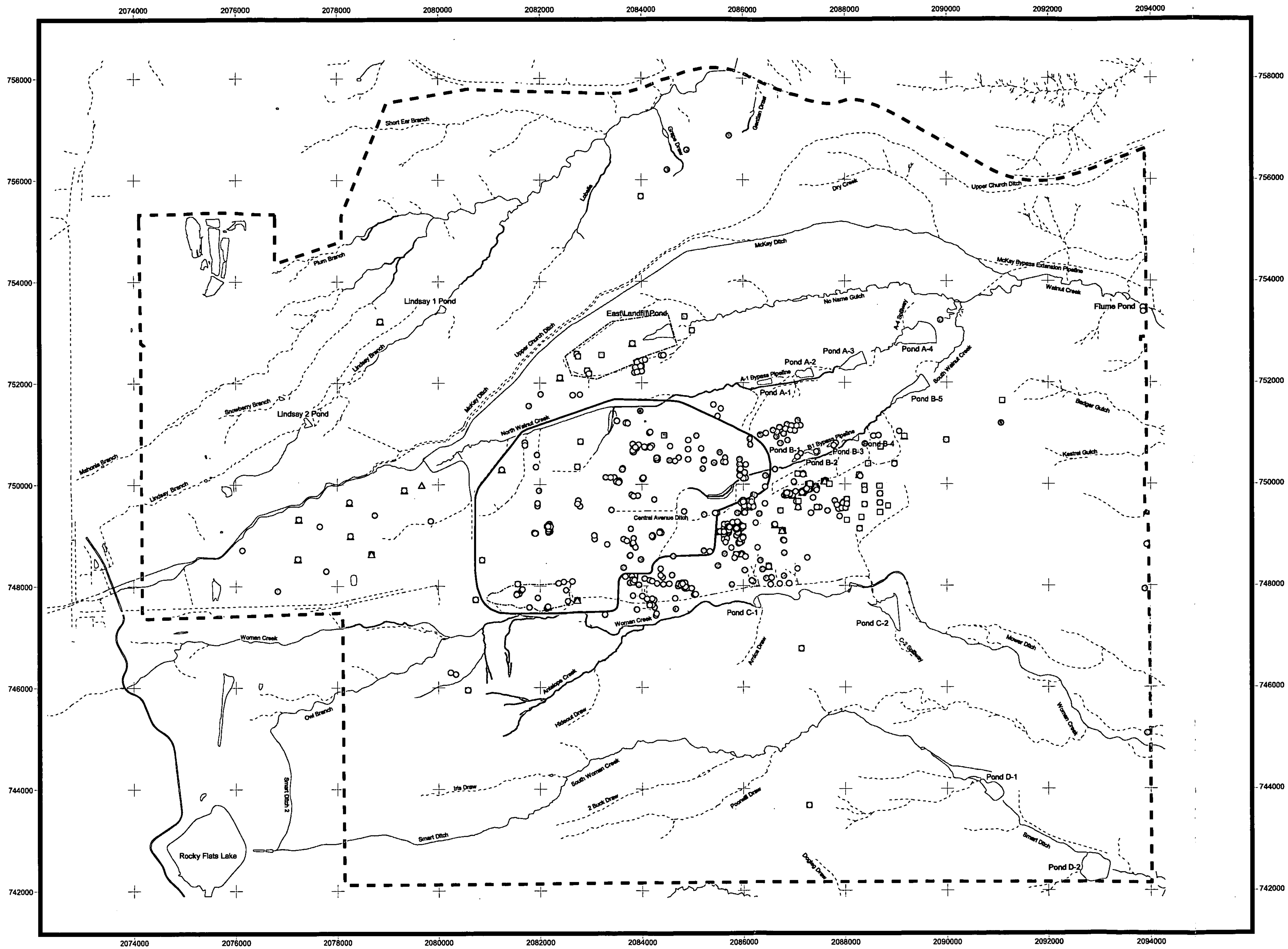

Figure 3.32

Methylene Chloride Concentrations in Subsurface Soil (12'-30', 30'-50', and >50')

Key

- ○ Sample collected > 12' AND < OR = 30'
- □ Sample collected > 30' AND < OR = 50'
- △ Sample collected > 50'
- ○ Constituent > OR = PRG
- ○ Constituent > OR = Detection Limit AND < PRG
- ○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

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Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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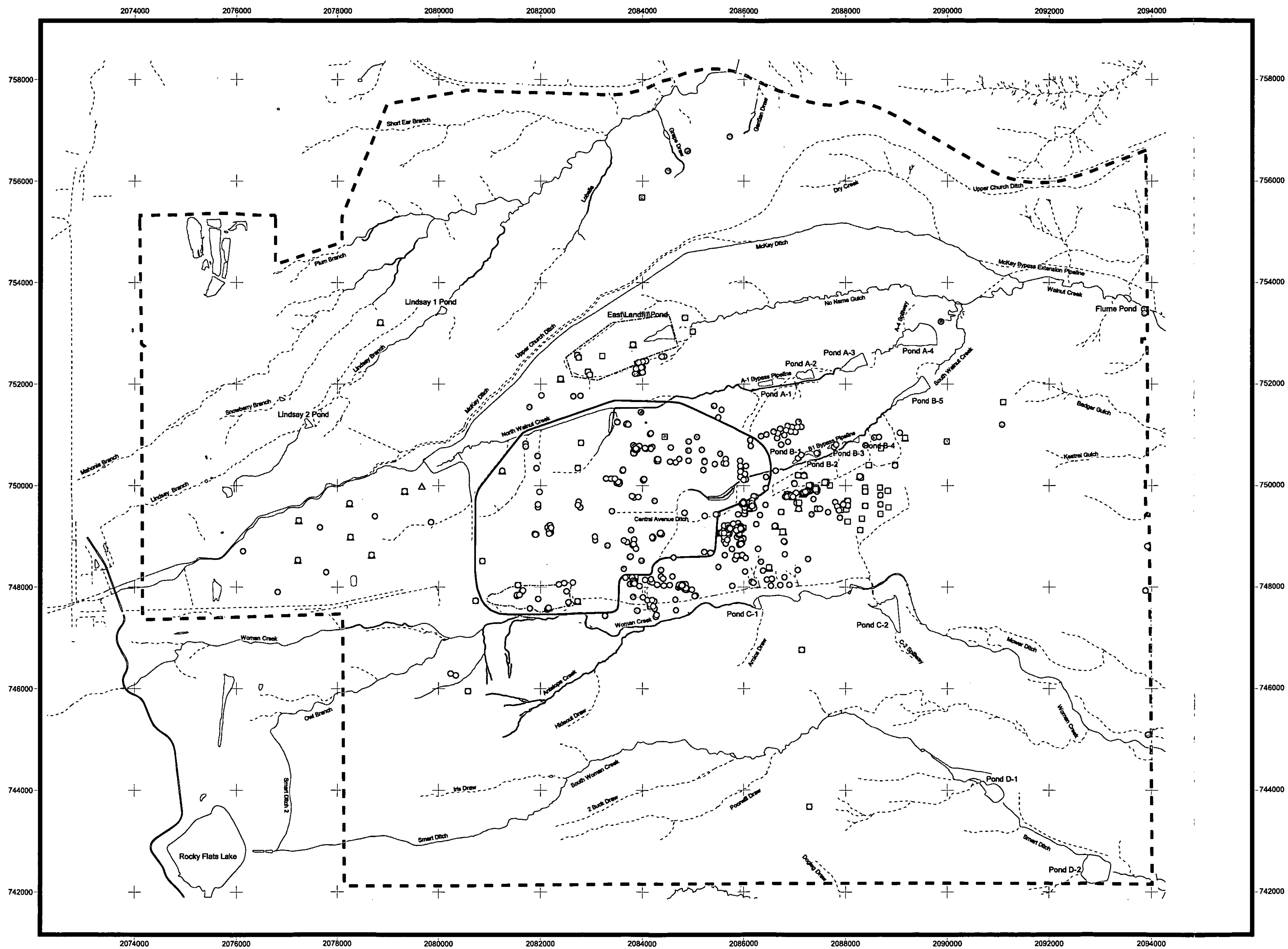

Figure 3.33

Tetrachloroethene Concentrations in Subsurface Soil (12'-30', 30'-50', and >50')

Key

- ○ Sample collected > 12' AND < OR = 30'
- □ Sample collected > 30' AND < OR = 50'
- △ Sample collected > 50'
- ○ Constituent > OR = PRG
- ○ Constituent > OR = Detection Limit AND < PRG
- ○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N
W E
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0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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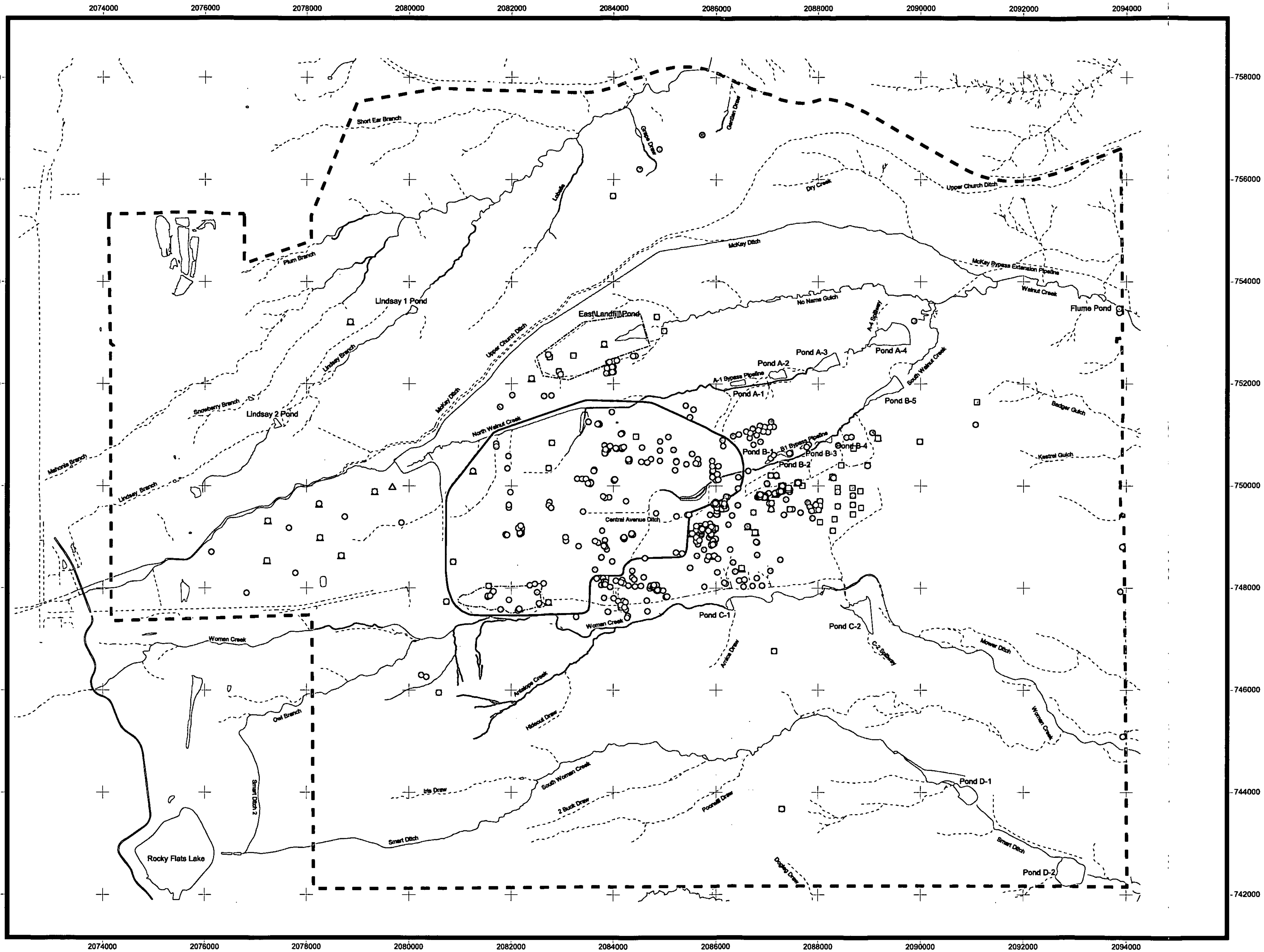

Figure 3.34

Trichloroethene Concentrations in Subsurface Soil (12'-30', 30'-50', and >50')

Key

- ○ Sample collected > 12' AND < OR = 30'
- □ Sample collected > 30' AND < OR = 50'
- △ Sample collected > 50'
- ○ Constituent > OR = PRG
- ○ Constituent > OR = Detection Limit AND < PRG
- ○ Constituent not detected

Note:
Data presented are the results from soil samples, collected at depths greater than 6 inches below the ground surface, from 6/28/91 through 8/22/2005.

Standard Map Features

- IAOU boundary
- Original Landfill
- Present Landfill
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary

N W E S

0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

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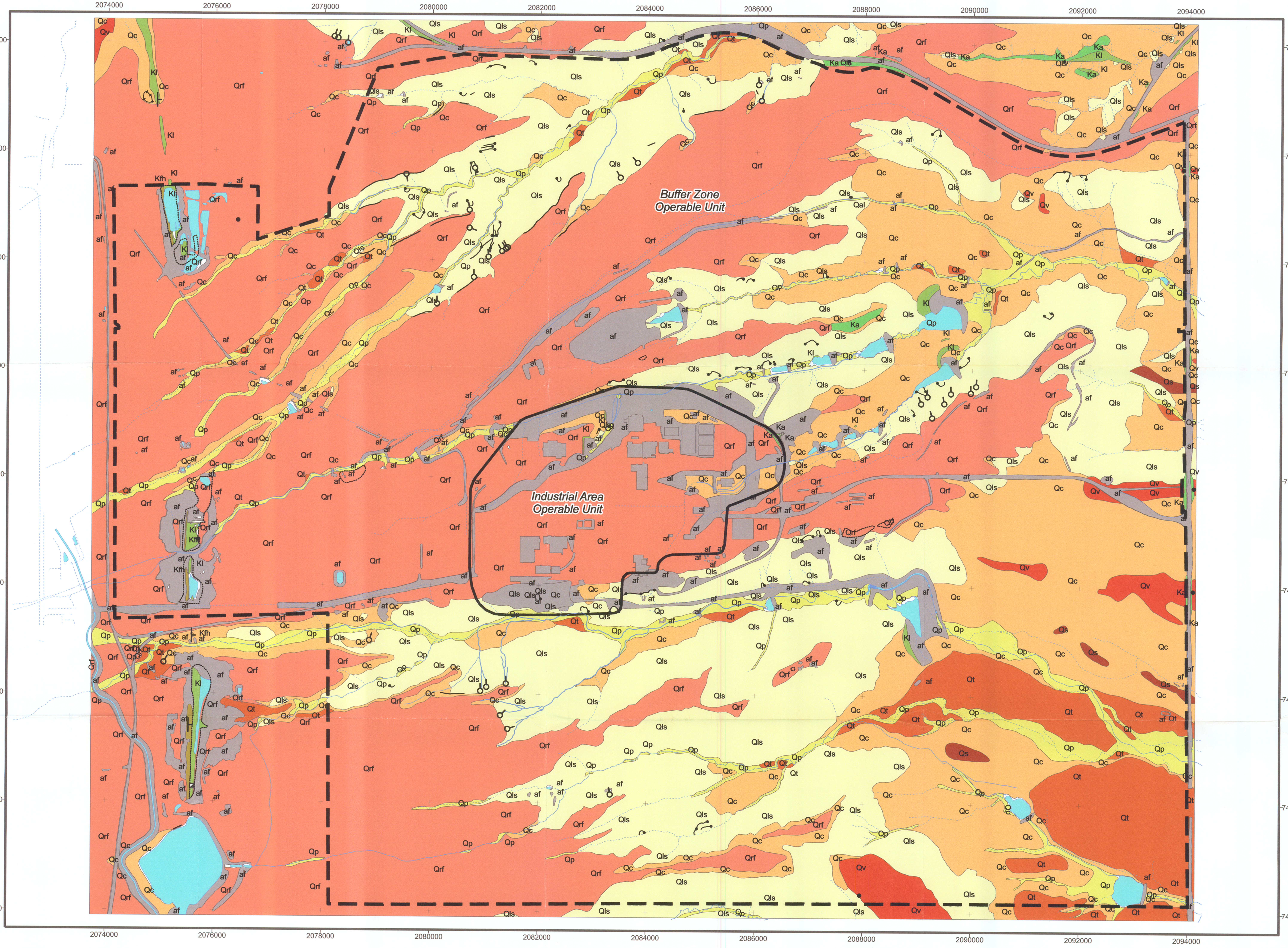

Figure 2.11
Geologic Units at Rocky Flats Environmental Technology Site
Produced in cooperation with the U.S. Geological Survey

KEY

Geologic Map Units

- af- Artificial fill or Disturbed area
- Qp - Post-Piney Creek/Piney Creek Alluvium
- Qt - Terrace Alluvium
- Qc - Colluvium
- Qls - Landslide deposits
- Qs - Slocum Alluvium
- Qv - Verdos Alluvium
- Qrf - Rocky Flats Alluvium
- Ka - Arapahoe Formation
- Kl - Laramie Formation
- Kfh - Fox Hill Sandstone

Geomorphology Line

- Areas of vegetation at and near springs
- Boundary of gravel and clay pit
- Scarp of young landslide
- Shallow closed depression

Geomorphology Point

- Spring
- Strike and dip of beds
- Clast identification site
- Capitol Mine (abandoned)

Data Source:

Geologic Mapping: Shroba, R.R., and Carrara, P.E. Preliminary Surficial Map of the Rocky Flats Plant and Vicinity, Jefferson and Boulder Counties, Colorado: U.S. Geological Survey Open-File Report (OFR) 94-162, Scale 1:6000. Site source of topo base; see OFR 94-162 (on map).

Standard Map Features

- IAOU Boundary
- Pond
- Site boundary
- Perennial stream
- Intermittent stream
- Ephemeral stream

N E S W

0 1,000 2,000 Feet

1:12,000 Scale

State Plane Coordinate Projection
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