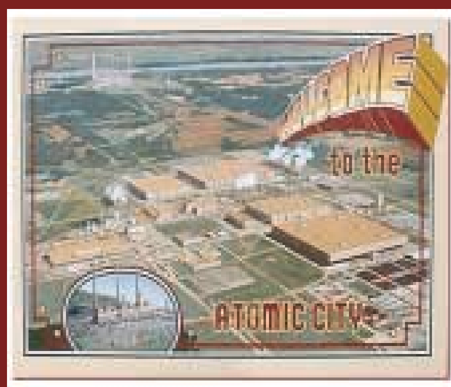
BJC/PAD-543/V1
Volume I

PADUCAH SITE

Annual Site Environmental Report



50TH
PGDP
ANNIVERSARY
TVA • EEI • Honeywell • USEC • DOE • BJC

2002

50 Years of Commitment

Fractions and Multiples of Units

Multiple	Decimal equivalent	Prefix	Symbol	Engineering Format
10^6	1,000,000	mega-	M	E+06
10^3	1,000	kilo-	k	E+03
10^2	100	hecto-	h	E+02
10	10	deka-	da	E+01
10^{-1}	0.1	deci-	d	E-01
10^{-2}	0.01	centi-	c	E-02
10^{-3}	0.001	milli-	m	E-03
10^{-6}	0.000001	micro-	μ	E-06
10^{-9}	0.000000001	nano-	n	E-09
10^{-12}	0.000000000001	pico-	p	E-12
10^{-15}	0.000000000000001	femto-	f	E-15
10^{-18}	0.000000000000000001	atto-	a	E-18

This report is intended to fulfill the requirements of U. S. Department of Energy (DOE) Order DOE O 231.1 Chg 2. The data and information contained in this report were collected in accordance with the Paducah Site Environmental Monitoring Plan (BJC 2001a) approved by DOE. This report is not intended to provide the results of all sampling conducted at the Paducah Site. Additional data collected for other site purposes, such as environmental restoration remedial investigation reports and waste management characterization sampling, are presented in other documents that have been prepared in accordance with applicable DOE guidance and/or laws.

Units of Radiation Measure

Current System	Système International	Conversion
curie (Ci)	becquerel (Bq)	1 Ci = 3.7 x 10^{10} Bq
rad (radiation absorbed dose)	gray (Gy)	1 rad = 0.01 Gy
rem (roentgen equivalent man)	sievert (Sv)	1 rem = 0.01 Sv

Conversions

Multiply	***by***	***to obtain***	***Multiply***	***by***	***to obtain***
in	2.54	centimeters	centimeters	0.394	in
ft	0.305	m	m	3.28	ft
mile	1.61	km	km	0.621	mile
lb	0.4538	kg	kg	2.205	lb
gal	3.785	L	L	0.264	gal
ft^2	0.093	m^2	m^2	10.764	ft^2
mi^2	2.59	km^2	km^2	0.386	mi^2
ft^3	0.028	m^3	m^3	35.31	ft^3
acres	0.40468	hectares	hectares	2.471	acres
dpm	0.45	pCi	pCi	2.22	dpm
pCi	10^{-6}	μCi	μCi	10^{6}	pCi
pCi/L (water)	10^{-9}	μCi/mL (water)	μCi/mL (water)	10^{9}	pCi/L (water)
pCi/m^3 (air)	10^{-12}	μCi/mL (air)	μCi/mL (air)	10^{12}	pCi/m^3 (air)

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Paducah Annual Site Environmental Report 2002

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Paducah Site

Annual Site Environmental Report for Calendar Year 2002

September 2003

Prepared for Bechtel Jacobs Company LLC
and the U.S. Department of Energy
under Subcontract No. 23900-SC-RM056

by

CDM Federal Services Inc.
325 Kentucky Avenue
Kevil, Kentucky 42053

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Acronyms and Abbreviations

ACO	Administrative Consent Order
AIP	KDEP Agreement in Principle
^{241}Am	americium-241
AOC	area of concern
ASER	Annual Site Environmental Report
ASTM	American Society of Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
BJC	Bechtel Jacobs Company LLC
CAA	Clean Air Act
CAB	Paducah Citizens Advisory Board
CEDE	committed effective dose equivalent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Ci	Curies
^{60}Co	cobalt-60
COE	U.S. Army Corps of Engineers
^{134}Cs	cesium-134
^{137}Cs	cesium-137
CSOU	comprehensive site-wide operable unit
CSTP	Conceptual Site Treatment Plan
CWA	Clean Water Act
CX	categorical exclusion
CY	calendar year
D&D	decontamination and decommissioning
DCG	derived concentration guide
DMSA	DOE Material Storage Area
DNAPL	dense nonaqueous phase liquid

DOE	U.S. Department of Energy
DOD	U. S. Department of Defense
DQO	data quality objective
DSTP	Draft Site Treatment Plan
DUF_6	depleted uranium hexafluoride
EA	environmental assessment
EDD	electronic data deliverable
EIC	DOE Environmental Information Center
EIS	environmental impact statement
EM	Environmental Management
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EPT	Ephemeroptera, Plecoptra, and Trichoptera
EQADMP	Environmental Services Quality Assurance and Data Management Plan
FDA	Food and Drug Administration
FFA	Federal Facility Agreement
FFC Act	Federal Facility Compliance Act
FFCA	Federal Facility Compliance Agreement
FS	feasibility study
ft	foot (feet)
ha	hectare(s)
HAP	hazardous air pollutant
HSWA	Hazardous and Solid Waste Amendments
ICRP	International Commission on Radiological Protection
IRA	interim remedial action
^{40}K	potassium-40
KAR	Kentucky Administrative Regulation
KCHS	Kentucky Cabinet for Health Services
KDAQ	Kentucky Division for Air Quality
KDEP	Kentucky Department for Environmental Protection

KDOW	Kentucky Division of Water
KDWM	Kentucky Division of Waste Management
kg	kilogram(s)
km	kilometer(s)
KOW	Kentucky Ordnance Works
KPDES	Kentucky Pollutant Discharge Elimination System
L	liter(s)
LRGA	Lower Regional Gravel Aquifer
m	meter(s)
MCL	maximum contaminant level
MHBI	Modified Hilsenhoff Biotic Index
µg	microgram
mg	milligrams
mR	milliRoentgen
mrem	millirem(s)
MSDS	material safety data sheet
mt	metric ton(s)
MW	monitoring well
NBIC	National Board Inspection Code
NCS	Nuclear Criticality Safety
ND	non detect
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NOV	notice of violation
^{237}Np	neptunium-237
NPL	National Priorities List
NSDD	North-South Diversion Ditch
OREIS	Oak Ridge Environmental Information System
OU	operable unit

^{234m}Pa	protactinium-234m
^{210}Pb	lead-210
PCB	polychlorinated biphenyl
pCi	picoCurie(s)
PEMS	Project Environmental Measurement Systems
PGDP	Paducah Gaseous Diffusion Plant
pH	hydrogen-ion concentration
PHA	public health assessment
POE	point of exposure
ppb	parts per billion
PP/WM	Pollution Prevention/Waste Minimization
PRAP	Proposed Remedial Action Plan
PSTP	Proposed Site Treatment Plan
^{238}Pu	plutonium-238
^{239}Pu	plutonium-239
P-wave	seismic reflection survey
QA	Quality Assurance
QC	Quality Control
^{226}Ra	radium-226
RAWP	remedial action work plan
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RFI	RCRA facility investigation
RGA	Regional Gravel Aquifer
RI	remedial investigation
ROD	Record of Decision
S	shear
SAR	SWMU Assessment Report
SDWA	Safe Drinking Water Act
SCPTs	Seismic Cone Penetrometer Tests

SHPO	State Historic Preservation Officer
SMO	Sample Management Office
SMP	Site Management Plan
SOW	statement of work
^{90}Sr	strontium-90
SWMU	solid waste management unit
SWOU	Surface Water Operable Unit
^{99}Tc	technetium-99
TCE	trichloroethylene (also called trichloroethene)
TCLP	Toxicity Characteristic Leaching Procedure
^{228}Th	thorium-228
^{230}Th	thorium-230
^{232}Th	thorium-232
^{234}Th	thorium-234
TLD	thermoluminescent dosimeter
TRE	Toxicity Reduction Evaluation
TSCA	Toxic Substances Control Act
TUa	acute toxicity unit
TUc	chronic toxicity unit
^{234}U	uranium-234
^{235}U	uranium-235
^{238}U	uranium-238
UCRS	Upper Continental Recharge System
UE	uranium enrichment
UF_4	uranium tetrafluoride
UF_6	uranium hexafluoride
URGA	Upper Regional Gravel Aquifer
USEC	United States Enrichment Corporation
UST	underground storage tank
WAG	waste area group
WKWMA	West Kentucky Wildlife Management Area

Request for Comments

The U. S. Department of Energy (DOE) requires an annual site environmental report from each of the sites operating under its authority. This report presents the results from the various environmental monitoring programs and activities carried out during the year. This *Paducah Site Annual Site Environmental Report for Calendar Year 2002* was prepared to fulfill DOE requirements. This report is a public document, distributed to government regulators, business persons, special interest groups, and members of the public at large.

This report is based on thousands of environmental samples collected at or near the Paducah Site. Significant efforts were made to provide the data collected and details of the site environmental management programs in a clear and concise manner, while presenting summary information. The editors of this report encourage comments in order to better address the needs of our readers in future site environmental reports. Please send your comments to the following address:

Paducah Site Office

U. S. Department of Energy

P. O. Box 1410

Paducah, Kentucky 42002

1 Site Operation and Overview

Abstract

The Paducah Gaseous Diffusion Plant (PGDP), located in McCracken County, Kentucky, has been producing enriched uranium since 1952. In July 1993, the U.S. Department of Energy (DOE) leased the production areas of the site to the United States Enrichment Corporation (USEC), a private company. Responsibility for the environmental restoration, legacy waste management, facilities management, uranium hexafluoride (UF_6) cylinder management, and decontamination and decommissioning (D&D)/ DOE Material Storage Areas (DMSA) programs is maintained by DOE. DOE also oversees an environmental monitoring and management program to ensure protection of human health and the environment and compliance with all applicable regulatory requirements. This document summarizes calendar year (CY) 2002 environmental management activities, including effluent monitoring, environmental surveillance, and environmental compliance status. It also highlights significant site program efforts conducted by DOE and its contractors and subcontractors at the Paducah Site. ***This report does not include USEC environmental monitoring activities.***

Introduction

DOE requires that environmental monitoring be conducted and documented for all of its facilities under the purview of DOE Order 231.1 Chg 2, *Environment, Safety and Health Reporting* (DOE 1996a). Several other laws, regulations, and DOE directives require compliance with environmental standards. The purpose of this Annual Site Environmental Report (ASER) is to summarize CY 2002 environmental management activities at the Paducah Site, including effluent monitoring, environmental surveillance, and environmental compliance status, and to highlight significant site program efforts. Since April 1, 1998, Paducah Site programs have been coordinated by DOE's managing and integrating contractor, Bechtel Jacobs Company LLC (BJC). References in this report to the Paducah Site generally mean the property, programs, and facilities at or near the PGDP for which DOE has ultimate responsibility.

Environmental monitoring consists of the following two major activities: effluent monitoring and environmental surveillance. Effluent monitoring is the direct measurement or the collection and analysis of samples of liquid and gaseous discharges to the environment. Environmental surveillance is the direct measurement or the collection and analysis of samples consisting of air, water, soil, biota, and other media. Environmental monitoring is performed to characterize and quantify contaminants, assess radiation exposure, demonstrate compliance with applicable standards and permit requirements, and detect and assess the effects (if any) on the local population and environment. Multiple samples are collected throughout the year and are analyzed for radioactivity, chemical content, and various physical attributes.

The overall goal for environmental management is to protect site personnel, the environment, and the Paducah Site's neighbors, and to maintain full compliance with all current environmental regulations. The current environmental strategy is to prevent future compliance problems, to identify any current compliance problems, and to develop a system to resolve them. The long-range goal of environmental management is to reduce exposures of the public, workers, and biota to harmful chemicals and radiation.

Background

Before World War II, the area now occupied by the PGDP was used for agricultural purposes. Numerous small farms produced various grain crops and provided pasture for livestock. Early in the war, a 6526-hectare (ha) (16,126-acre) tract was assembled for construction of the Kentucky Ordnance Works (KOW), which was subsequently operated by the Atlas Powder Company until the end of the war. At that time, it was turned over to the Federal Farm Mortgage Corporation, and then to the General Services Administration.

In 1950, the U. S. Department of Defense (DOD) and DOE's predecessor, the Atomic Energy Commission, began efforts to expand fissionable material production capacity. As part of this effort, the National Security Resources Board was instructed to designate power areas within a strategically safe area of the United States. Eight government-owned sites were initially selected as candidate areas, one of which was the KOW site. In October 1950, as a result of joint recommendations from the DOD, Department of State, and the Atomic Energy Commission, President Truman directed the Atomic Energy Commission to further expand production of atomic weapons. One of the principal facets of this expansion program was the provision for a new gaseous diffusion plant. On October 18, 1950, the Atomic Energy Commission approved the Paducah Site for uranium enrichment operations and formally requested the Department of the Army to transfer the site from the General Services Administration to the Atomic Energy Commission.

Although construction of PGDP was not completed until 1954 (Figure 1.1), production of enriched uranium began in 1952. The plant's mission, uranium enrichment, has continued unchanged and the original facilities are still in operation, albeit with substantial upgrading and refurbishment. Of the 3062 ha (7566 acres) acquired by the Atomic Energy Commission in 1950, 551 ha (1361 acres) were subsequently transferred to the Tennessee Valley Authority (Shawnee Steam Plant site) and 1125 ha (2781 acres) were conveyed to the Commonwealth of Kentucky for use in wildlife conservation and for

Figure 1.1 Construction of the Paducah Gaseous Diffusion Plant.

recreational purposes [West Kentucky Wildlife Management Area (WKWMA)]. DOE's current holdings at the Paducah Site total 1386 ha (3423 acres).

At Paducah's uranium enrichment plant, recycled uranium from nuclear reactors was introduced into the PGDP enrichment "cascade" in 1953 and continued through 1964. In 1964, cascade feed material was switched solely to virgin-mined uranium. Use of recycled uranium was resumed in 1969 and continued through 1976. In 1976, the practice of recycling uranium feed material from nuclear reactors was halted and never resumed. During the recycling time periods, Paducah received approximately 100,000 tons (90,000 metric tons) of recycled uranium containing an estimated 328 grams of plutonium-239 (^{239}Pu), 18,400 grams of neptunium-237 (^{237}Np), and 661,000 grams of technetium-99 (^{99}Tc). The majority of the ^{239}Pu and ^{237}Np was separated out as waste during the initial chemical conversion to UF_6. Concentrations of transuranics (e.g., ^{239}Pu and ^{237}Np) and ^{99}Tc are believed to have been deposited on internal surfaces of process equipment, with concentrations also being deposited in waste products.

In October 1992, congressional passage of the National Energy Policy Act established USEC. Effective July 1, 1993, DOE leased the plant production operation facilities to USEC. Under the terms of the lease, USEC assumed responsibility for environmental compliance activities directly associated with uranium enrichment operations.

Under the lease agreement with USEC, DOE retained responsibility for the site Environmental Restoration Program; the Enrichment Facilities Program; and the Legacy Waste Management Program, including all waste inventories predating July 1, 1993, and wastes generated by subsequent DOE activities. DOE is responsible for Kentucky Pollutant Discharge Elimination System (KPDES) compliance at outfalls not leased to USEC. DOE has also retained manager and cooperator status of facilities not leased to USEC. DOE and USEC have negotiated the lease of specific plant site facilities, written memoranda of agreement to define their respective roles and responsibilities under the lease, and developed organizations and budgets to support their respective functions. DOE is the owner and BJC with DOE are operators for Resource Conservation and Recovery Act (RCRA) permitted facilities and are responsible for compliance with the RCRA permit.

Figure 1.2 depicts a timeline of activities and events associated with the Paducah Gaseous Diffusion Plant.

Description of Site Locale

Location

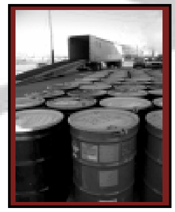
The Paducah Site is located in a generally rural area of McCracken County, Kentucky. The center of PGDP is about 16 kilometers (km) (10 miles) west of Paducah, Kentucky, and 5 km (3 miles) south of the Ohio River (Figure 1.3). The industrial portion of the PGDP is situated within a fenced security area and constitutes about 303 ha (748 acres). Within this area, which is designated as secured industrial land use, are numerous active and inactive production buildings, offices, equipment and material storage areas, active and inactive waste management units, and other support facilities (Figure 1.4 is the C-340 building). The additional DOE-owned land at the Paducah Site is 1083 ha (2675 acres). Of this land, 279 ha (689 acres) is a "buffer zone" that surrounds PGDP and is designated as unsecured industrial land. There are no residences on DOE property at the Paducah Site. DOE has also acquired approximately 133 acres in easements.

The following three small communities are located within 5 km (3 miles) of the DOE property boundary at PGDP: Heath and Grahamville to the east, and Kevil to the southwest. The closest commercial airport is Barkley Field approximately 8 km (5 miles) to the southeast. The population within an 80-km (50-mile) radius of PGDP is about 500,000, of which about 66,000 residents are located within a 16-km (10-mile) radius of PGDP (DOC 1994).

1951-1954
Construction of PGDP as the second gaseous diffusion plant in the United States. Oak Ridge, Tennessee, was first and Portsmouth, Ohio, third.

1952
Enriched uranium hexafluoride production begins. First cylinders of depleted uranium hexafluoride generated and stored inside the PGDP security fence.

1952-1984
Union Carbide Corporation manages and operates the Paducah and Oak Ridge gaseous diffusion plants under federal contract.



1979
Waste Management function established at Paducah.

1984
Martin Marietta Energy Systems Inc. becomes management and operating contractor for DOE facilities at Paducah and Oak Ridge (Portsmouth added in 1986).

1988
Contaminated groundwater was discovered outside the DOE Property Boundary. DOE policy of extending water lines to homes in area begins.

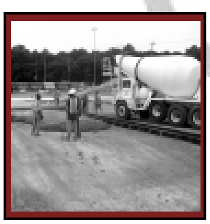
1989-1990
Creeks and ditches near the plant are posted to restrict public access. Expanded network of groundwater monitoring wells begins. First major site investigation begins to determine nature and extent of contamination outside the PGDP security fence.

1990
Second phase of sitewide investigation begins to further determine nature and extent of contamination outside the PGDP security fence.

1993
DOE leases enrichment production facilities to USEC. Plant ends use of the degreasor trichloroethene, the primary groundwater contaminant. DOE opens the Environmental Information Center in the West Kentucky Technology Park at Kevil.

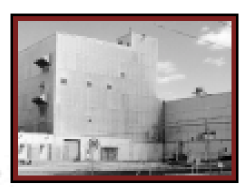
1995
Groundwater treatment begins to remove trichloroethene and technetium-99. The Environmental Protection Agency adds PGDP to its Superfund National Priorities List. Re-routing the treatment of flow in the plant's North South Diversion Ditch begins.

1997
Concrete cylinder yards built; tons of contaminated concrete, soil and gravel removed; cleanup actions completed around closed landfill; new solid waste contained landfill constructed. Paducah Area Community Reuse Organization chartered.



1998
Completed Federal Facility Agreement with state and federal regulators for long-term cleanup plan; made major strides in waste treatment and disposal. DOE awards Management and Integration contract to BJC. USEC privatizes.

2000
Continued operation of the Lasagna™ technology. Removal of Drum Mountain. Initiation of the Rubble Pile Removal project.



2002
Implementation of Six-Phase Heat Treatability Study for Groundwater and Soil Remediation near the C-400 Building. Succesfully completed Lasagna™ treatment. Continued progress toward C-410 D&D, initiated Scrap Metal and NSDD Removal/Remedial activities.

Figure 1.2 Timeline of events at the Paducah Gaseous Diffusion Plant.

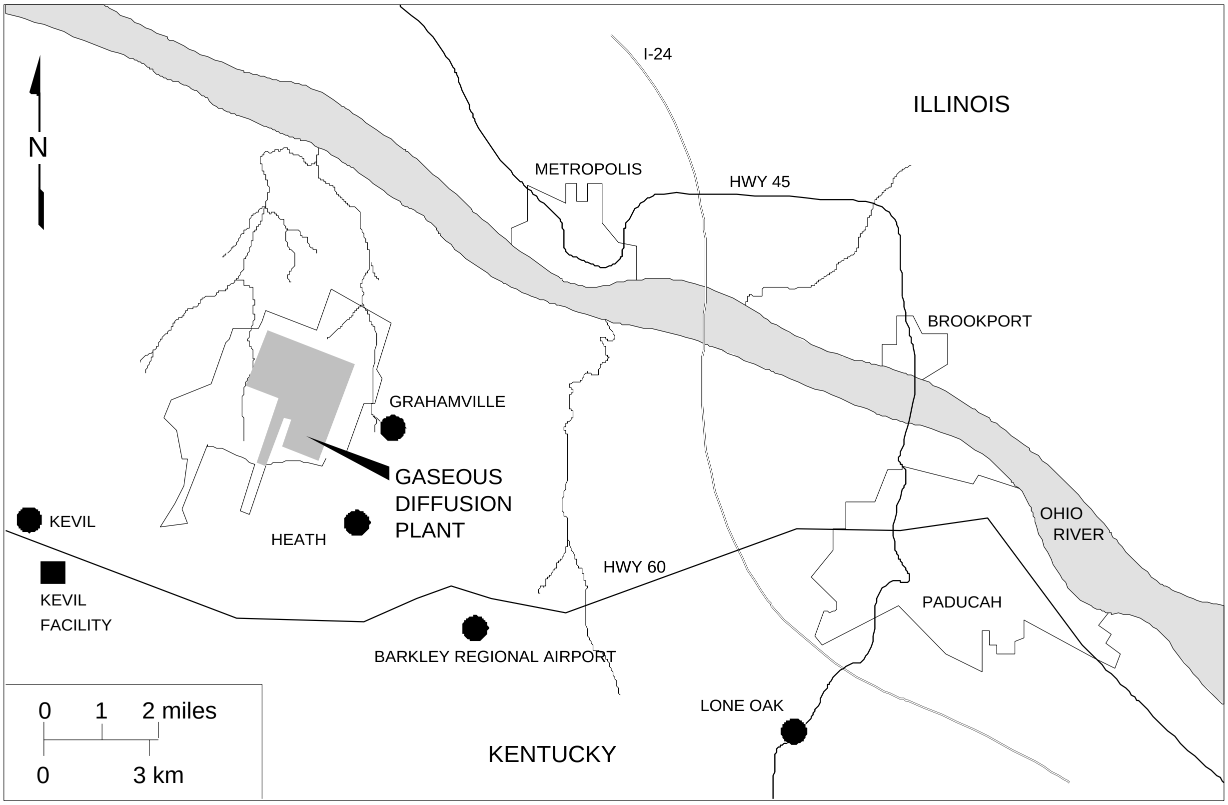


Figure 1.3 Location of the Paducah Site.

Figure 1.4 C-340 at the Paducah Gaseous Diffusion Plant.

Climate

The Paducah Site is located in the humid continental zone where summers are warm [July averages 26°C (79°F)] and winters are moderately cold [January averages 1.7°C (35°F)]. Yearly precipitation averages about 125 centimeters (49 inches). The prevailing wind is from the south-southwest at approximately 16 km (10 miles) per hour.

Surface Water Drainage

The Paducah Site is situated in the western part of the Ohio River basin. The confluence of the Ohio River with the Tennessee River is about 24 km (15 miles) upstream of the site, and the confluence of the Ohio River with the Mississippi River is about 56 km (35 miles) downstream. The plant is located on a local drainage divide; surface water from the east side of the plan flows east-northeast toward Little Bayou Creek and surface water from the west side of the plant flows west-northwest toward Bayou Creek (commonly referred to as "Big Bayou Creek" in previous ASERs). Bayou Creek is a perennial stream that flows toward the Ohio River along a 14-km (9-mile) course. Little Bayou Creek is an intermittent stream that flows north toward the Ohio River along a 11-km (7-mile) course. The two creeks converge 5 km (3 miles) north of the plant before emptying into the Ohio River.

Flooding in the area is associated with Bayou and Little Bayou creeks and the Ohio River. Maps of the calculated 100-year flood elevations show that all three drainage systems have 100-year floodplains located within the DOE boundary at PGDP. These 100-year floodplains range from approximately 340 to 380 feet (ft) above mean sea level. Plant elevations range from about 370 to 385 ft above mean sea level. (COE 1994).

Wetlands

More than 1100 separate wetlands, totaling over 648 ha (1600 acres), were found in a study area of about 4860 ha (12,000 acres) in and around the Paducah Site (COE 1994 and CDM 1994). These wetlands have been classified into 16 cover types. More than 60% of the total wetland area is forested.

Soils and Hydrogeology

Soils of the area are predominantly silt loams that are poorly drained, acidic, and have little organic content. Of the six primary soil types associated with the Paducah Site, five commonly have the characteristics necessary to be considered prime farmland by the Natural Resources Conservation Service, formerly the Soil Conservation Service (Humphrey 1976).

The local groundwater flow system at the Paducah Site contains the following four major components (listed from shallowest to deepest): (1) the terrace gravels, (2) the Upper Continental Recharge System (UCRS), (3) the Regional Gravel Aquifer (RGA), and (4) the McNairy flow system. The terrace gravels consist of shallow Pliocene gravel deposits in the southern portion of the plant site. These deposits usually lack sufficient thickness and saturation to constitute an aquifer, but may be an important source of groundwater recharge to the RGA.

The UCRS consists mainly of clay silt with interbedded sand and gravel in the upper continental deposits. The system is so named because of its characteristic recharge to the RGA.

The RGA consists of coarse-grained sediments at the base of the upper continental deposits, sand and gravel facies in the lower continental deposits, gravel and coarse sand portions of the upper McNairy that are directly adjacent to the lower continental deposits, and alluvium adjacent to the Ohio River. These deposits have an average thickness of 9 meters (m) (30 ft) and can be more than 21 m (70 ft) thick along an axis that trends east-west through the site. The RGA is the uppermost and primary aquifer, formerly used by private residences north of the Paducah Site.

The McNairy flow system is composed of interbedded and interlensing sand, silt accessory, and clay. Near PGDP, the McNairy Formation can be subdivided into three members: (1) an 18 m (60 ft)-thick sand-dominant lower member; (2) a 30-to 40 m (100- to 130-ft)-thick middle member composed predominately of silty and clayey fine sand; and (3) a 9-to 15 m (30-to 50-ft)-thick upper member consisting of interbedded sands, silts, clays, and occasional gravel. Sand facies account for 40 to 50% of the total formation thickness of approximately 69 m (225 ft).

Groundwater flow originates south of the Paducah Site within Eocene sands and the terrace gravels. Groundwater within the terrace gravels either discharges to local streams or recharges the RGA, although the flow regime of the terrace gravels is not fully understood. Groundwater flow through the UCRS is predominantly downward, also recharging the RGA. From the plant site, groundwater flows generally northward in the RGA toward the Ohio River, which is the local base level for the system.

Ecological Resources

Vegetation

Much of the Paducah Site has been impacted by human activity. Vegetation communities on the reservation are indicative of old field succession (e.g., grassy fields, field scrub-shrub, and upland mixed hardwoods). The open grassland areas, most of which are managed by WKWMA personnel, are periodically mowed or burned to maintain early successional vegetation, which is dominated by members of the Compositae family and various grasses. Management practices on the WKWMA encourage reestablishment of once common native grasses such as eastern gama grass and Indian grass. Other species commonly cultivated for wildlife forage are corn, millet, milo, and soybean (CH2M Hill 1992a).

Field scrub-shrub communities consist of sun-tolerant wooded species such as persimmon, maples, black locust, sumac, and oaks (CH2M Hill 1991a). The undergrowth may vary depending on the location of the woodlands. Wooded areas near maintained grasslands may have an undergrowth dominated by grasses; other communities may contain a thick undergrowth of shrubs, including sumac, pokeweed, honeysuckle, blackberry, and grape.

Upland mixed hardwoods contain a variety of upland and transitional species. Dominant species include oaks, shagbark and shellbark hickory, and sugarberry (CH2M Hill 1991a). Undergrowth may vary from open, with limited vegetation for more mature stands of trees, to dense undergrowth similar to that described for a scrub-shrub community.

Wildlife

Wildlife species indigenous to hardwood forests, scrub-shrub, and open grassland communities are present at the Paducah Site. Grassy fields are frequented by rabbits, mice, songbirds, and a variety of other small mammals and birds. Redwing blackbirds, killdeer, cardinals, mourning doves, bobwhite quail, meadowlarks, warblers, sparrows, and red-tailed hawks have been observed in such areas. Scrub-shrub communities support a variety of wildlife including opossums, voles, moles, raccoons, gray squirrels, killdeer, bluejays, redwing blackbirds, bluebirds, cardinals, mourning doves, shrike, warblers, turkeys, and meadowlarks. Deer, squirrels, raccoons, turkeys, songbirds, and great horned owls are found within the mature woodlands of the DOE reservation (CH2M Hill 1991a). In addition, the Ohio River serves as a major flyway for migratory birds, which are occasionally seen on the Paducah Site (DOE 1995).

Amphibians and reptiles are common throughout the Paducah Site. Amphibians likely to inhabit the area include the American and Woodhouse's toads. Reptiles include the Eastern box turtle and several species of snakes. Also, fish populations in Bayou and Little Bayou creeks are numerically dominated by various species of sunfish (DOE 1995).

Threatened and Endangered Species

A threatened and endangered species investigation identified federally listed, proposed, or candidate species potentially occurring at or near the Paducah Site (COE 1994). Updated information is obtained on a regular basis from federal and state sources. Currently, potential habitat for seven species of federal concern exists in the study area (Section 2, Table 2.3). Six of these species are listed as endangered under the Endangered Species Act of 1973 and one is listed as threatened. Of note, significant potential summer habitat exists at the Paducah Site for the Indiana bat, a federally listed endangered species. However, neither the Indiana bat nor any other federally listed or candidate species have been found on DOE property at the Paducah Site. Also, no property at the Paducah Site has been designated as critical habitat in accordance with the Endangered Species Act of 1973.

Cultural Resources

In a study area of about 4860 ha (12,000 acres) in and around the Paducah Site, there are 35 sites of cultural significance recorded with the State Historic Preservation Officer (SHPO) and several more unrecorded sites (COE 1994). Most of these sites are prehistoric and located in the Ohio River floodplain. Six of the sites are on DOE property at PGDP. None of the sites are included in, or have been nominated to, the National Register of Historic Places, although some are potentially eligible. Additional discussion is included in Section 2.

Site Program Missions

The following two major programs are operated by the DOE at the Paducah Site: (1) Environmental Management and (2) Uranium Programs. Environmental Restoration, Wasge Management, D&D are projects under the Enviromental Management Program. (Figure 1.5). The mission of the Environmental Restoration Program is to ensure that releases from past operations and waste management at the Paducah Site are investigated and that appropriate remedial action is taken for protection of human health and the environment in accordance with the Federal Facility Agreement (FFA) (DOE 1998a). The mission of the Waste Operations Program is to characterize and dispose of the legacy waste stored on-site in compliance with various Federal Facility Compliance Agreements (FFCAs). This includes DMSA. The primary mission of the D&D program is to manage and characterize the areas or facilities in the programs and prepare materials or waste for disposition. The primary mission of the Uranium Program is to maintain safe, compliant storage of the DOE depleted UF_6 inventory, pending final disposition of the material, and to manage facilities and grounds not leased to USEC. The environmental monitoring summarized in this report supports all four programs/projects.

Figure 1.5 Paducah Site programs/projects.

2 Environmental Compliance

Abstract

The policy of DOE and its contractors and subcontractors at the Paducah Site is to conduct operations safely and minimize the impact of operations on the environment. Protection of the environment is considered a responsibility of paramount importance. The Paducah Site maintains an environmental compliance program aimed at meeting all applicable requirements and minimizing impacts.

Introduction

Local, state, and federal agencies, including DOE, are responsible for enforcing environmental regulations at the Paducah Site. Principal regulating agencies are the U.S. Environmental Protection Agency (EPA) Region IV and the Kentucky Department for Environmental Protection (KDEP). These agencies issue permits, review compliance reports, participate in joint monitoring programs, inspect facilities and operations, and oversee compliance with applicable laws and regulations.

The EPA develops, promulgates, and enforces environmental protection regulations and technology-based standards as directed by statutes passed by the U.S. Congress. In some instances, the EPA has delegated regulatory authority to KDEP when the Kentucky program meets or exceeds EPA requirements. Where regulatory authority is not delegated, EPA Region IV is responsible for reviewing and evaluating compliance with EPA regulations which pertain to the Paducah Site. Table 2.1 provides a summary of the Paducah Site environmental permits maintained by DOE in 2002. Figure 2.1 shows the major environmental laws and requirements applicable to the Paducah Site. Each is discussed in this section.

Table 2.1 Environmental permit and compliance agreement summary

Permit Type	Issued By	Expiration Date	Permit Number	Issued To
Water				
KPDES	KDOW	3/31/2003	KY0004049	DOE
Solid Waste				
Residential Landfill (closed)	KDWM	11/1/2003	073-00014	DOE
Inert Landfill (closed)	KDWM	6/11/2003	073-00015	DOE
Solid Waste Contained Landfill (construction/operation)	KDWM	11/4/2006	073-00045	DOE
RCRA/TSCA				
State Hazardous Waste Management Permit	KDWM	8/19/2001*	KY8890008982	DOE/BJC
EPA Hazardous & Solid Waste Amendments Permit	EPA	8/19/2001*	KY8890008982	DOE/BJC
Toxicity Characteristic Leaching Procedure, Federal Facility Compliance Agreement	EPA	NA	NA	DOE
Federal Facility Compliance Act Site Treatment Plan: Agreed Order	EPA	NA	NA	DOE
Federal Facility Agreement	EPA KDWM	NA	NA	DOE
TSCA FFCA	EPA		NA	DOE

NA - Not Applicable
KDOW – Kentucky Division of Water
KDWM – Kentucky Division of Waste Management
* - New permits have been applied for.

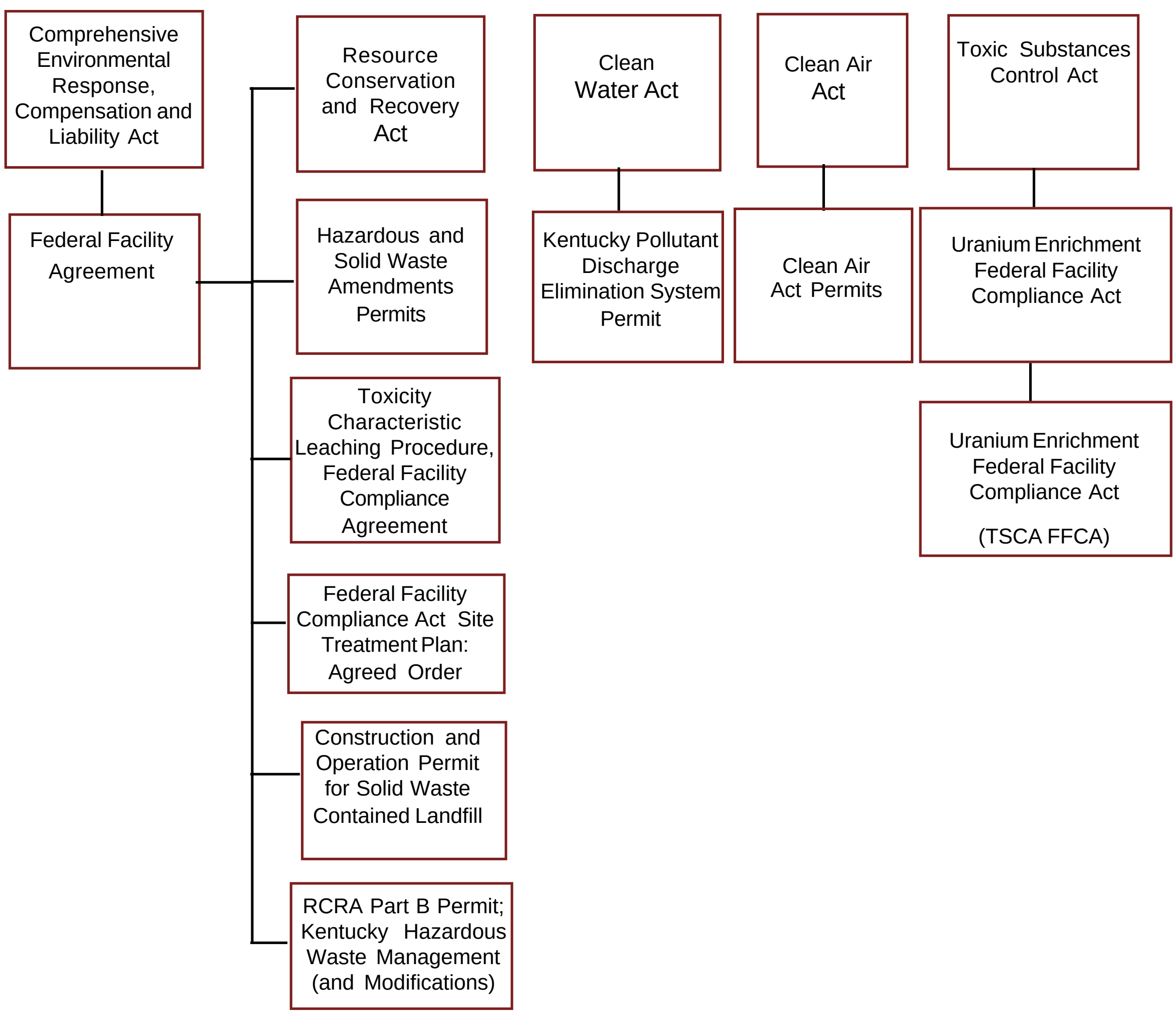


Figure 2.1 Regulatory drivers at the Paducah Site.

Compliance Activities

Resource Conservation and Recovery Act

Regulatory standards for the identification, treatment, storage, and disposal of solid and hazardous waste are established by RCRA. Waste generators must follow specific requirements outlined in RCRA regulations for handling solid and hazardous wastes. Owners and operators of solid and hazardous waste treatment, storage, disposal, and recycling facilities are required to obtain operating and closure permits for waste treatment, storage, disposal, and recycling activities. The Paducah Site generates solid, hazardous waste, and mixed waste (i.e., hazardous waste mixed with radionuclides) and operates four permitted hazardous waste storage and treatment facilities.

Resource Conservation and Recovery Act Hazardous Waste Permit

Part A and Part B permit applications of RCRA for storage and treatment of hazardous wastes were initially submitted for the Paducah Site in the late 1980s. At that time, the EPA had authorized the Commonwealth of Kentucky to exclusively administer the RCRA-based program for treatment, storage, and disposal units, but had not given the authorization to administer the 1984 Hazardous and Solid Waste Amendments (HSWA) provisions. Therefore, a permit application was submitted to the EPA and the Kentucky Division of Waste Management (KDWM) for treatment and storage of hazardous wastes.

On July 16, 1991, KDWM and EPA issued a 10-year RCRA permit (No. KY8890008982) to DOE as owner and operator and DOE's prime contractor (currently BJC) as cooperator. This RCRA permit consists of the following two individual permits: (1) a hazardous waste management permit administered by the Commonwealth of Kentucky and (2) a HSWA permit administered by the EPA. The hazardous waste management permit contains regulatory provisions for treatment, storage, and disposal activities at PGDP, authorized under the RCRA-base program (pre-HSWA), as well as HSWA provisions. The HSWA permit addresses only the provisions of the HSWA, which include corrective actions for solid waste management units (SWMUs), air emissions, and the land disposal restrictions. In 1996, Kentucky received authorization to administer the HSWA provisions in lieu of EPA. Even though the state is authorized, the EPA's portion of the RCRA permit will remain in effect until a new permit is issued. Therefore, the Paducah Site still has dual requirements for corrective actions under state and federal authority.

On February 21, 2001, DOE submitted a renewal application of the RCRA Permit to KDWM. On September 28, 2001, KDWM requested additional information. DOE submitted a revised permit application in February 2002. DOE is awaiting the issuance of a new permit and continues to operate under the expired permit.

As part of the corrective action requirements, the RCRA permit's schedule of compliance requires DOE to develop and implement a RCRA facility investigation (RFI) work plan for SWMUs and areas of concern (AOCs). DOE has submitted RFI work plans to the EPA and the KDWM in accordance with the time frames specified in the schedule of compliance. These RFI work plans are described in further detail in the section on Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) activities.

Modifications to the Resource Conservation and Recovery Act Hazardous Waste Permit

Since issuance of the KDWM Hazardous Waste Management portion of the RCRA permit in1991, 15 permit modifications have been approved. There were no modifications to this permit in 2002.

Resource Conservation and Recovery Act Hazardous Waste Facilities Closure Activities

In 2002, DOE has submitted closure plans to KDWM for the following DMSAs: C-400-04, C-331-10, C-335-05, C-331-10, C-331-15, OS-11, OS-9, OS-3, C-400-05, C-331-14, C-333-31, C-409-01, OS-12, OS-5, and C-409-02.

Resource Conservation and Recovery Act Notices of Violation

DOE received five notices alleging violations during 2002 from the KDWM. On January18, 2002, KDWM issued a Notice of Violation (NOV) alleging that hazardous waste that had been stored for more than 90 days without a permit. Actions taken in response to this NOV included submittal of amended SWMU Assessment Reports (SARs), revision of the Part A application, and submittal of closure plans to address SWMUs 464, 159, 206, 241, 216, 220, 222, 223, 249, 287, 351, 354, 355, and 464.

An NOV dated February 28, 2002 was received from KDWM alleging that hazardous waste has been stored for more than 90 days without a permit. The following actions were taken as a result of the NOV: amendment of SARs for SWMUs 248, 287, 351, and 355; revision of the Part A Application; and submittal of closure plans to address the aforementioned DMSA SWMUs.

On March 11, 2002, KDWM issued an NOV as a result of DOE's identification of hazardous waste stored in DMSAs. The violation alleged that there was hazardous waste stored for more than 90 days without a permit. Actions taken in response to this NOV included submittal of amended SARs, revision of the Part A Application, and submittal of closure plans for DMSAs C-333-31 (SWMU 287) and C-409-02 (SWMU 355). See Section 3 page 17 for more information about DMSAs.

An NOV dated November 12, 2002, was received from KDWM for storing hazardous waste for more than 90 days without a permit. Actions taken were amending the SARs, revising the Part A Application, and completing closure plans for each DMSA/SWMU cited in the NOV.

On November 12, 2002, KDWM issued an NOV alleging deficiencies in the RCRA Operating Records. Actions included reconciliation of hazardous waste manifests and annual reports for 1999-2001, documentation that a sequential numbering system is being used for hazardous waste manifests, correction of Land Disposal Restrictions associated with manifest #380, correction of manifests #379 and #380, and reinforcement of the performance of weekly inspections.

Land Disposal Restrictions

Hazardous waste is subject to land disposal restrictions storage prohibitions, which permits storage only for accumulation of sufficient quantities of hazardous waste to facilitate proper treatment, recycling, or disposal. Typically, hazardous wastes are not to be stored for more than one year. The Paducah Site generates mostly mixed waste, which is a combination of hazardous waste and radioactive waste. Nationally, there are limited opportunities for treatment and disposal of mixed waste. Therefore, the Paducah Site stores most of the mixed waste that is generated for longer than one year. If not for the radioactive constituents, this waste would not pose a compliance problem for the site, as there would be treatment and disposal options readily available. On June 30, 1992, DOE entered into an FFCA with EPA Region IV to regulate the treatment and storage of land disposal restriction mixed waste at the Paducah Site. On April 13, 1998, EPA Region IV released DOE from the FFCA, and allowed KDWM to regulate mixed waste under the Federal Facilities Compliance (FFC) Act.

Federal Facilities Compliance Act

The FFC Act was enacted in October 1992. This Act waived the immunity from fines and penalties that had existed for federal facilities for violations of hazardous waste management as defined by RCRA. As a result of the complex issues and problems associated with mixed chemical hazardous and radioactive waste (mixed waste), as well as the lack of treatment and disposal capacity, the FFC Act allowed a three-year extension for DOE facilities to prepare schedules and plans. These addressed how the facilities would manage their mixed waste in compliance with applicable RCRA regulations. The three-year waiver can be extended under the following conditions: (1) a mixed waste treatment plan and compliance schedule are approved by the appropriate agency, (2) an implementing order with that agency is signed, and (3) adherence to the plan and implementing order are maintained by the facility.

To facilitate compliance with the FFC Act and address the myriad of complex issues involved, the Paducah Site, along with 48 other DOE sites, began a four-phase approach. The first phase consisted of gathering required information and submitting to the EPA and state agencies an inventory of mixed wastes (mixed waste inventory report), including information pertaining to characterization and waste generation volumes.

The second phase of the approach involved the development of a Conceptual Site Treatment Plan (CSTP). The plan included investigation of the existing treatment capacity for facility wastes and, where there was no existing capacity, procurement of information on potential treatment technologies or options that could be employed to meet operation requirements. The Paducah Site submitted the CSTP in October 1993.

The third phase of the approach expanded on the information in the CSTP to identify treatment options that are preferred both environmentally and economically. The information gathered by the ongoing waste characterization program and the technology evaluation and development program outlined in the CSTP formed the basis for the Draft Site Treatment Plan (DSTP), which was submitted to the regulators in August 1994.

The fourth phase of the approach combined the preferred treatment options from the DSTP with regulator and stakeholder comments and the overall DOE complex picture to formulate a Proposed Site Treatment Plan (PSTP). This PSTP was submitted to the regulators March 31, 1995, and provides details on how and where Paducah Site mixed waste is to be treated. On October 5, 1995, KDWM issued a Unilateral Order and the Site Treatment Plan for the Paducah Site. DOE requested a hearing, which resulted in the Agreed Order dated September 10, 1997. The Paducah Site has complied since issuance of the Agreed Order.

Toxicity Characteristic Leaching Procedure Federal Facility Compliance Agreement

The Paducah Site has generated a significant volume of waste materials that are stored on-site. A large quantity of this waste was generated, characterized, and placed in storage before September 25, 1990. Prior to that date, characterization required utilizing the Extraction Procedure for toxicity. On September 25, 1990, a new regulation became effective replacing the Extraction Procedure for toxicity with the Toxicity Characteristic Leaching Procedure (TCLP). Since the accumulated wastes had not been characterized under the new toxicity characteristic regulations, DOE needed revised characterization data for these wastes using the new protocol.

On March 26, 1992, EPA Region IV and DOE entered into a TCLP FFCA concerning the regulatory status of these wastes. The TCLP FFCA requires the Paducah Site to identify those solid wastes that are not being managed in RCRA-regulated units and that have not been characterized under the TCLP test method. Additionally, the FFCA requires the Paducah Site to provide a schedule for TCLP characterization of the identified waste.

In response to the FFCA, the Paducah Site submitted an implementation plan that established a general framework for compliance with the requirements of the FFCA. The implementation plan established priorities for the characterization program and the nature of the data to be collected, and included a schedule for TCLP characterization of the identified waste. The primary characterization objective was the acquisition of sufficient data to safely handle the waste and provide for determination of its status under RCRA. Characterization of the waste with respect to polychlorinated biphenyls (PCB) and radionuclide concentrations was the second objective. The final characterization objective was the collection of data related to treatment and/or disposal of the waste.

A three-phase program for accomplishing the goals of the plan was developed. Phase I activities consisted of data compilation and waste prioritization. Phase II involved identification of discrete waste streams and development of characterization plans. The final phase of the program included the development of sampling and analysis plans, field sampling, and data reporting. All three phases of the program have been completed. Characterization was completed by December 2000. DOE continues to manage the program.

RCRA Solid Waste Management

The Paducah Site disposes of a portion of its solid waste at its on-site contained landfill facility, C-746-U. Construction of the C-746-U Landfill began in 1995 and was completed in 1996. The operation permit was received from KDWM in November 1996. Disposal of waste at the landfill began in February 1997. The C-746-U Landfill operated from February 1997 through October 1999 and received approximately 16,000 tons of solid waste. In November 1999, KDWM suspended waste acceptance activities at the C-746-U Landfill for all waste streams with the exception of wastes classified as "no rad added." DOE began preparation of an Environmental Assessment for the Implementation of the Authorized Limits Process for Waste Acceptance at the C-746-U Landfill, Paducah Kentucky DOE/EA-1414 in September 2000. Disposal operations were suspended while the environmental assessment was prepared. DOE issued a Finding of No Significant Impacts on August 6, 2002.

In late 2000 potential corrosion problems were discovered in the monitoring wells (MWs) surrounding the C-746-U Landfill. On August 10, 2001, KDWM issued a letter ordering DOE to cease the placement of waste in the landfill until such time as the MW network could be replaced. In addition, KDWM required the completion of two sampling events, at an interval of no less than thirty days, prior to re-opening the landfill. Activities were initiated to replace MWs at the landfill in late 2001 and completed in 2002. After completion of the environmental assessment (EA) in August 2002 and installation and sampling of the new MWs, the landfill resumed disposal operations in November 2002.

In lieu of disposing of office waste at the C-746-U Landfill, office waste generated by DOE and its contractors at the plant site is taken off-site for disposal. Commercial Waste Incorporated in Mayfield, Kentucky, provides off-site disposal of the office waste. A recycling program exists for office waste that is generated off the plant site. Section 3 provides more detail concerning this program.

DOE received two NOVs dated November 12, 2002 for the active C-746-U and inactive C-746-S and C-746-T landfills. The NOVs alleged unpermitted storage of hazardous waste. DOE responded to the NOVs and is conducting discussions with KDWM on the appropriate corrective actions.

Underground Storage Tanks

Underground storage tank (UST) systems at the Paducah Site have been used to store petroleum products, such as gasoline, diesel fuel, and waste oil. These USTs are regulated under RCRA Subtitle I [40 Code of Federal Regulations (CFR) Part 280] and Kentucky UST regulations (401 Kentucky Administrative Regulations [KAR] Chapter 42), or are exempt from specific UST regulations.

In April 2002 a previously unknown UST was discovered during refurbishment of cylinder storage yard C-745-K. KDWM was notified of the discovery. The UST was removed and clean closure for this tank was obtained.

DOE is responsible for 16 of the 18 site USTs that have been reported to KDWM in accordance with regulatory notification requirements. Of DOE's 16 USTs, none are currently in use. Five have been removed from the ground, eight have been filled in place with inert material, one (C-611-1) was "clean closed in place", and two were determined not to exist. At the end of 2002, one DOE UST (UST #5) had not met all regulatory requirements necessary to achieve permanent "clean" closure. Closure activities for this UST continued into 2003. Table 2.2 provides a current listing of the USTs at the Paducah Site and their status.

Comprehensive Environmental Response, Compensation, and Liability Act

DOE and EPA Region IV eneterd into an Administrative Consent Order (ACO) in August 1988 under Section 104 and 106 of CERCLA. The ACO was in response to the off-site groundwater contamination detected in July 1988.

On May 31, 1994, the Paducah Site was placed on the EPA National Priorities List (NPL), which is a list of sites across the nation designated by EPA as a high priority for site remediation. The EPA uses the Hazard Ranking System to determine which sites should be included on the NPL. A site is eligible for the NPL if it ranks 28.5 on the system; the Paducah Site ranked 56.9. Being placed on the NPL means DOE must follow the cleanup requirements of CERCLA.

Section 120 of CERCLA requires federal facilities on the NPL to enter into a FFA, also referred to as an interagency agreement, with the appropriate regulatory agencies. The FFA, which was signed February 13, 1998, establishes a process for decision making for remediation of the Paducah Site and coordinates CERCLA remedial action requirements with RCRA corrective action requirements specified in the RCRA permits. Upon signature of the FFA, the parties agreed to terminate the CERCLA ACO because those activities can be continued under the FFA. According to the FFA, DOE is required to submit an annual Site Management Plan (SMP) to EPA and KDEP. The plan summarizes the remediation work completed to date, outlines remedial priorities, and contains schedules for completing future work. The SMP is submitted to the regulators annually in November to update the enforceable milestones and to include any new strategic approaches.

The Agency for Toxic Substances and Disease Registry (ATSDR), based in Atlanta, Georgia, is part of the U.S. Public Health Service. As required by CERCLA, this agency conducts public health assessments (PHA) of hazardous waste sites listed or proposed for listing on the NPL. Representatives from the ATSDR made their initial site visit to Paducah in May 1994 to assign a ranking to the site for priority in scheduling the health assessment. A "B" ranking was assigned to Paducah, which is the second highest priority. The ranking was based on groundwater contamination associated with the plant that had affected several off-site wells. The ATSDR is aware of the actions the site has taken since 1988 to address the risks from the potential use of contaminated water. In 1995, the ATSDR visited the Paducah Site to initiate a PHA. The PHA report was issued in March 2001 for public comment. This document is available on-line at http://www.atsdr.cdc.gov/HAC/PHA/paducah/pad_toc.html

Comprehensive Environmental Response, Compensation, and Liability Act Reportable Quantities

There were no spills of materials above a CERCLA reportable quantity at the Paducah Site in 2002.

Table 2.2 Summary of USTs

UST	State ID	Date Installed	Operational Status	Regulatory Status
C-750-A	0001	1955	Removed from ground 3/91	Closure complete per KDWM letter of 3/25/99
C-750-B	0002	1955	Removed from ground 3/91	Closure complete per KDWM letter of 3/25/99
C-750-C	0003	1957 (Estimated)	Removed from ground 10/93	Clean closed under RCRA Subtitle C
C-750-D	0004	1957	Rinsed with TCE and emptied 6/79; filled with cement 10/97	Closure complete per KDWM letter of 11/23/99
C-746-A1	0005	1960	Emptied 9/88; filled with cement 10/97	Final closure awaits remediation of contaminated soils
C-710-B	0006	1956 (Estimated)	Emptied 7/85; filled with cement 10/97	Closure complete per KDWM letter of 2/19/02
C-200-A	0007	1956 (Estimated)	Filled with grout in 1977	Closure complete per KDWM letter of 11/23/99
C-746-A2	0008	- -	Determined during WAG 15 site investigation not to exist	Documented during WAG 15 site investigation not to exist
C-751-W	0009	1992	In use by USEC	In use by USEC
C-751-E	0010	1992	In use by USEC	In use by USEC
C-611-1	0011	1943 (Estimated)	Last used before 1975	Clean closed in place per KDWM letter of 12/6/96
C-611-3	0012	1953	Last used before 1975; filled with cement 9/97	Clean closed in place per KDWM letter of 12/6/96
C-611-2	0013	- -	Determined not to exist	No further action required per state correspondence of 12/6/96
C-611-4	0014	1943 (Estimated)	Last used before 1975; filled with sand	Clean closed in place per KDWM letter of 12/6/96
C-611-5	0015	Unknown	Filled with grout before 1975	Clean closed in place per KDWM letter of 12/6/96
C-200-B	0016	1967	Filled with concrete in 1981	Closure complete per KDWM letter of 2/19/02
C-745-K	0017	1951 (Estimated)	Removed from ground 2/02	Closure complete per KDWM letter of 12/4/02
C-746-K	0018	1951 (Estimated)	Removed from ground 4/02	Closure complete per KDWM letter of 12/4/02

National Environmental Policy Act

An evaluation of the potential environmental impact of proposed federal activities is required by the National Environmental Policy Act (NEPA), as is an examination of alternatives to those actions. Compliance with NEPA, as administered by DOE's NEPA Implementing Procedures (10 CFR 1021) and Council on Environmental Quality Regulations (40 CFR 1500–1508), ensures that consideration is given to environmental values and factors in federal planning and decision-making. In accordance with 10 CFR 1021, the Paducah Site conducts NEPA reviews for proposed actions and determines if any proposal requires preparation of an environmental impact statement (EIS), an EA, or is categorically excluded (CX) from preparation of either an EIS or an EA. The Paducah Site maintains records of all NEPA reviews.

In 2002, DOE completed preparation of two EAs. The *Environmental Assessment for the Implementation of the Authorized Limits Process for Waste Acceptance at the C-746-U Landfill, Paducah, Kentucky*, DOE/EA-1414, was completed when DOE issued a Finding of No Significant Impacts on August 6, 2002. This EA addressed the criteria that DOE will use to determine what waste may be disposed in the landfill.

The second EA completed was Waste Disposition Activities at the Paducah Site, DOE/EA-1339. A Finding of No Significant Impacts was issued on November 5, 2002. This EA addressed waste management activities and the impacts of shipping the waste to disposal facilities.

In addition, numerous minor activities for routine maintenance, small-scale facility modifications, and site characterization were within the scope of previously approved proposals that were determined to be a CX. The Paducah DOE Site Office and the DOE Oak Ridge Operations Office NEPA compliance officer approve and monitor the internal applications of previously approved CX determinations.

In accordance with the 1994 DOE Secretarial Policy Statement on NEPA, preparation of separate NEPA documents for environmental restoration activities conducted under CERCLA is no longer required. Instead, DOE CERCLA documents incorporate a consideration of environmental impacts resulting from the activity, or “NEPA values,” to the extent practical. NEPA values are environmental issues that affect the quality of the human environment. Incorporation of NEPA values into CERCLA documents ensures that the decision makers consider the potential effects of proposed actions on the human environment. Actions conducted under CERCLA are discussed in Section 3 of this report.

National Historic Preservation Act

The National Historic Preservation Act of 1966 is the primary law governing federal agencies' responsibility for identifying and protecting historic properties (cultural resources included in, or eligible for inclusion in, the National Register of Historic Places). There are currently no historic properties at the Paducah Site in the National Register of Historic Places, although there is a potential for eligible historic properties. Therefore, each proposed project is assessed to determine if there are any historic properties present and whether they may be affected. In making these determinations, DOE consults with the SHPO as required by Section 106 of the NHPA.

In accordance with 36 CFR 800.13, DOE is in the process of developing an optional NHPA compliance strategy based on a programmatic agreement between DOE, the Advisory Council on Historic Preservation, and the SHPO. In April 1997, a draft programmatic agreement was submitted to the SHPO for approval. The draft programmatic agreement provides for a more comprehensive cultural resources program and requires a survey to identify significant historical properties and development of a Cultural Resources Management Plan. The draft programmatic agreement is still in the process of being finalized. In 2002, additional revisions to the draft programmatic agreement were made based on discussions between DOE and the SHPO.

Endangered Species Act

The Endangered Species Act of 1973, as amended, provides for the designation and protection of endangered and threatened animals and plants. The act also serves to protect ecosystems on which such species depend. At the Paducah Site, proposed projects are reviewed, in conjunction with NEPA project reviews, to determine if activities have the potential to impact these species. If necessary, project-specific field surveys are performed to identify threatened and endangered species and their habitats, and mitigating measures are designed as needed. When appropriate, DOE initiates consultation with the U.S. Fish and Wildlife Service prior to implementing a proposed project.

Table 2.3 includes seven federally-listed, proposed, or candidate species that have been identified as potentially occurring at or near the Paducah Site. Project NEPA reviews and associated field surveys indicated that in 2002, DOE projects at the Paducah Site did not directly impact any of these seven species. Potential habitats of these species also were not significantly impacted.

Table 2.3 Federally listed, proposed, and candidate species potentially occurring within the Paducah Site Study Area in 2002[a]

Common Name	Scientific Name	Endangered Species Act Status
Indiana Bat[b]	*Myotis sodalis*	Listed Endangered
Interior Least Tern	*Sterna antillarum athalassos*	Listed Endangered
Pink Mucket	*Lampsilis abrupta*	Listed Endangered
Ring Pink	*Obovaria retusa*	Listed Endangered
Orangefoot Pimpleback	*Plethobasus cooperianus*	Listed Endangered
Fat Pocketbook	*Potamilus capax*	Listed Endangered
Bald Eagle	*Haliaeetus leucocephalus*	Listed Threatened

[a] All of the above species are discussed in *Environmental Investigations at the Paducah Gaseous Diffusion Plant and Surrounding Area, McCracken County, Kentucky, Volume III*, U. S. Army Corps of Engineers Nashville District, May 1994. Note that the study area encompasses 11,719 acres and extends to include the Ohio River, which is over three miles north of the DOE reservation. None of these species have been reported as sighted on the DOE reservation although potential summer habitat exists there for the Indiana bat. No critical habitat for any of these species has been designated anywhere in the study area.

[b] Specimens of the Indiana bat were collected from WKWMA property in 1991 and 1999.

Floodplain/Wetlands Environmental Review Requirements

Title 10 CFR, Part 1022, establishes procedures for compliance with Executive Order 11988, "Floodplain Management," and Executive Order 11990, "Protection of Wetlands." Activities, other than routine maintenance, proposed within 100-year floodplains or in wetlands first require that a notice of involvement be published in the Federal Register. A floodplain or wetlands assessment must then be prepared by DOE that evaluates potential impacts on the floodplains or wetlands and considers alternatives to avoid or lessen impacts. For floodplains, a floodplain statement of findings summarizing the floodplain assessment must be published in the Federal Register for public comment at least 15 days before beginning the project. Activities of DOE in "waters of the United States," which include wetlands, are likely to be subject to additional Clean Water Act (CWA) permit requirements administered by the U.S. Army Corps of Engineers (COE) and may require water quality certification from KDEP.

In 2002, no floodplain or wetlands assessments were prepared or approved. Also, no floodplain or wetlands notices of involvement were published in the Federal Register for the Paducah Site. In addition, DOE did not apply for any individual permits from COE or for any water quality certifications from the state. Some DOE projects were authorized through the COE nationwide permit program for activities involving waters of the United States.

DOE activities did not result in significant impacts to floodplains or wetlands at the Paducah Site in 2002.

Clean Water Act

The CWA was established primarily through the passage of the Federal Water Pollution Control Act Amendments of 1972. The CWA established the following four major programs for control of water pollution: (1) a permit program regulating point-source discharges into waters of the United States, (2) a program to control and prevent spills of oil and hazardous substances, (3) a program to regulate discharges of dredge and fill materials into "waters of the U.S.," and (4) a program to provide financial assistance for construction of publicly owned sewage treatment works. The Paducah Site is primarily affected by the regulations for discharges of dredge and fill materials (see previous subsection on Floodplain/Wetlands Environmental Review Requirements) and for point-source discharges regulated under the KPDES Permit.

Clean Water Act NOVs

No NOVs were received in 2002.

Kentucky Pollutant Discharge Elimination System Permits

The CWA applies to all nonradiological DOE discharges to waters of the United States. At the Paducah Site, the regulations are applied through issuance of a KPDES permit for effluent discharges to Bayou and Little Bayou creeks. The Kentucky Division of Water (KDOW) issued KPDES Permit No. KY0004049 to the Paducah Site. This permit became effective April 1, 1998, and is enforced by the KDOW. The KPDES permit calls for chemical and biological monitoring as an indicator of discharge-related effects in the receiving streams. As the permit is due to expire at the end of March 2003, a permit renewal application was submitted to KDOW in September of 2002. As of the end of 2002, KDOW had not approved the application.

KPDES Permit No. KY0004049 applies to the following four DOE outfalls: 001, 015, 017, and 019. Outfall 001 had three permit exceedences during 2002 for chronic toxicity. These toxicity exceedences were reported to KDOW on December 11, 2002. Efforts to determine the cause will continue in 2003.

No exceedences of effluent permit limits occurred at outfalls 015, 017, or 019 in 2002.

Toxic Substances Control Act

In 1976, the Toxic Substances Control Act (TSCA) was enacted with a twofold purpose: (1) to ensure that information on the production, use, and environmental and health effects of chemical substances or mixtures are obtained by the EPA, and (2) to provide the means by which the EPA regulates chemical substances/mixtures.

Polychlorinated Biphenyls

The Paducah Site undertakes activities to comply with PCB regulations (40 CFR 761) and the Uranium Enrichment (UE) TSCA FFCA promulgated under TSCA. The major activities performed in 2002 to ensure compliance included the following: maintaining compliant storage of PCB waste and PCB-contaminated wastewater, shipping PCB waste for treatment and disposal, treatment and discharge of PCB-contaminated wastewater, maintenance to the troughing system, and reporting and record keeping.

The UE TSCA FFCA between EPA and DOE was signed in February 1992. To meet the compliance goals at the Paducah Site, the UE TSCA FFCA is frequently revised and updated. Under this agreement, action plans have been developed and implemented for removal and disposal of large volumes of PCB material at the Paducah Site. As part of this program during 2002, ninety-seven capacitors were removed from service. Table 2.4 shows progress of removal of capacitors as well as a summary of PCB items in service at the Paducah Site at the end of 2002.

Nineteen transformers were shipped off-site for disposal in 2002. DOE shipped the transformers on November 13, 15, and 18-22, 2002, to an offsite disposal facility.

The annual PCB document, due July 1, provides details of facility activities associated with the management of PCB materials. The annual report provides details from the previous year on all PCB items that are in use, stored for reuse, generated as waste, stored for disposal, or shipped off-site for disposal. All Paducah Site UE TSCA FFCA milestones for 2002 were completed.

The facilities operated by USEC utilize equipment that contains PCB capacitors as well as transformers, electrical equipment, and other miscellaneous PCB equipment. Both radioactive and nonradioactive PCB wastes are stored on-site in storage units that meet TSCA and/or UE TSCA FFCA compliance requirements. Upon approval, nonradioactive PCBs are transported off-site to EPA-approved facilities for disposal.

Radioactive contaminated PCB wastes are authorized by the UE TSCA FFCA for on-site storage at Paducah beyond two years. Technology for the treatment and/or disposal of radioactively contaminated PCB wastes is being evaluated.

Table 2.4 Summary of PCBs and PCB items in service at the end of 2002

Type	Number in Service	Volume (gal)	PCBs (kg)
PCB Transformers	66	95,256	277,152
PCB Contaminated Transformers	9	2,299	0.95
PCB Contaminated Electrical Equipment	7	2,094	1.13
PCB Capacitors	682		
PCB Open Systems	3	235	10.90

Removed from service for disposal during CY 2002

Type	Number Removed	Volume (gal)	PCBs (kg)
PCB Capacitors	97	298.8*	952.30

* assumed 540,000 ppm PCB, 13 lbs/gal

Emergency Planning and Community Right-To-Know Act

Also referred to as Title III of the Superfund Amendments and Reauthorization Act, Emergency Planning and Community Right-to-Know Act (EPCRA) requires reporting of emergency planning information, hazardous chemical inventories, and releases to the environment. Reports under EPCRA are submitted to federal, state, and local authorities. Executive Order 12856, signed in August 1993, subjects all federal agencies to EPCRA. The applicable requirements of EPCRA are contained in Sections 304, 311, 312, and 313.

- Section 304 requires reporting of off-site reportable quantity releases to state and local authorities. Reportable quantities for various chemical releases are defined in regulations implemented by EPA.

- Section 311 requires that either material safety data sheets (MSDSs) or lists of the hazardous chemicals for which an MSDS is required be provided to state and local authorities for emergency planning purposes.

- Section 312 requires that a hazardous chemical inventory for chemicals stored at a site be submitted to state and local authorities for emergency planning.

- Section 313 requires annual reporting of releases of toxic chemicals to the EPA and the state.

The Paducah Site did not have any releases that were subject to Section 304 notification requirements during 2002. No Section 311 notifications were required in 2002. The Section 312 Tier II report of inventories for 2002 included UF_6, uranium tetrafluoride (UF_4), iron filings, diesel fuel, activated carbon pellets, magnesium fluoride, and PCBs associated with DOE activities. The Paducah Site reported PCBs on the Section 313 report. This is reported because DOE accepts legacy PCB material from USEC when disposal of electrical equipment is needed.

Clean Air Act

Authority for enforcing compliance with the Clean Air Act (CAA) and subsequent amendments resides with EPA Region IV and the Kentucky Division for Air Quality (KDAQ). The Paducah Site maintains compliance with federal and state rules implementing the CAA and its amendments.

Clean Air Act Compliance Status

The Paducah Site had two air emissions point sources in 2002. The Northwest Plume Groundwater System and the Northeast Plume Containment System are interim remedial actions (IRAs) under CERCLA for the containment of groundwater contamination at the Paducah Site. These separate facilities remove trichloroethene (TCE) contamination from the groundwater by air stripping. At the Northwest Plume Groundwater System, the TCE-laden air passes through carbon filtration which removes much of the TCE. At the Northeast Plume Containment System, a cooling tower system acts as an air stripper for TCE. The air streams for both systems are then released to the atmosphere where the remaining TCE naturally breaks down.

Asbestos Program

Numerous facilities at the Paducah Site contain asbestos materials. Compliance programs for asbestos management include identification of asbestos materials, monitoring, abatement, and disposal. Procedures and program plans are maintained that delineate scope, roles, and responsibilities for maintaining compliance with EPA Region IV, Occupational Safety and Health Administration, and Kentucky regulatory requirements. Noncompliances with environmental protection standards were not identified in 2002.

Radionuclide National Emissions Standards for Hazardous Air Pollutants Program

Kentucky and EPA Region IV regulate airborne emissions of radionuclides from DOE facilities under 40 CFR 61 Subpart H, the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations. Potential radionuclide sources at the Paducah Site in 2002 resulted from the handling of scrap metal, the Northwest Plume Groundwater System, and from fugitive source emissions. The fugitive source emissions include piles of contaminated scrap metal, roads, and building roofs. DOE utilized ambient air monitoring data to verify insignificant levels of radionuclides in off-site ambient air. The Radiation/Environmental Monitoring Section of the Radiation Health and Toxic Agents Branch of the Department for Public Health of the Kentucky Cabinet for Health Services conducted ambient air monitoring during 2002. Ambient air data were collected at eleven sites surrounding the plant in order to measure radionuclides emitted from Paducah Site sources, including fugitive emissions. Results are discussed in Section 4 of this document.

Pollutants and Sources Subject to Regulation

Any stationary source emitting more than 10 tons/year of any hazardous air pollutant (HAP) or 25 tons/year of any combination of HAPs is considered a major source and is subject to regulation. EPA Region IV must examine other sources for regulation under an “area source” program. The Paducah Site is not a major source by virtue of its individual or total hazardous air pollutant emissions.

Stratospheric Ozone Protection

DOE refrigeration units contain less than 50 pounds of ozone depleting substances; therefore, the only part of Title VI of the CAA that applies to the Paducah Site is the requirement to control refrigerants from leaking systems. DOE has implemented leakage controls for refrigerants and has an established record keeping system.

Clean Air Act NOVs

There were no violations of the CAA during 2002 and no NOVs were received for CAA violations.

Kentucky/Department of Energy Agreement in Principle

The Kentucky/DOE Agreement in Principle (AIP) reflects the understanding and commitments between DOE and the Commonwealth of Kentucky regarding DOE's provision of technical and financial support to Kentucky for environmental oversight, surveillance, remediation, and emergency response activities. The goal of the AIP is to maintain an independent, impartial, and qualified assessment of the potential environmental impacts from present and future DOE activities at the Paducah Site. The AIP is intended to support non-regulatory activities whereas the FFA covers regulatory authority. The AIP includes a grant to support the Commonwealth of Kentucky in conducting independent monitoring and sampling, both on-site and off-site, and to provide support in a number of emergency response planning initiatives including cooperative planning, conducting joint training exercises, and developing public information regarding preparedness activities.

Regulatory Inspections

Paducah Site environmental management programs are overseen by several organizations, both inside and outside the DOE complex. Each year, numerous appraisals, audits, and surveillances of various aspects of the environmental compliance program are conducted. Table 2.5 summarizes the state and federal regulatory inspections conducted in 2002.

Table 2.5 State and federal regulatory inspections at the Paducah Site in 2002

Date	Agency	Description
January 2002	KDWM	Inspection of DMSA's
February 2002	KDWM	C-746-U Landfill Inspection
	KDWM	C-746-K UST removal
March 2002	KDWM	RCRA Inspection
April 2002	KDWM	C-746-U Landfill Inspection
	KDWM	C-746-K UST removal
May 2002	KDWM	Annual RCRA Inspection
June 2002	KDOW	Outfall Inspection
	KDWM	RCRA Inspection
July 2002	KDAQ	6 Phase Project
	KDWM	C-746-U Landfill Inspection
October 2002	KDAQ	Scrap Metal Project Inspection
	KDAQ	Scrap Metal Project Inspection
	KDWM	RCRA Inspection
	KDWM	C-746-U Landfill Inspection
November 2002	KDOW	Scrap Metal Project Inspection
	KDWM	C-746-U Landfill Inspection

3 Environmental Program Information

Abstract

Environmental monitoring, environmental restoration, waste operations, facilities management, UF_6 cylinder management activities, and D&D/DMSA management occur at the Paducah Site. Several programs are conducted; therefore, they are presented in this section to inform the public about these activities.

Environmental Monitoring Program

The Environmental Monitoring Program at the Paducah Site consists of effluent monitoring and environmental surveillance. Requirements for routine environmental monitoring programs were established to measure and monitor effluents from DOE operations and maintain surveillance on the effects of those operations on the environment and public health through measurement, monitoring, and calculation. This program is intended to demonstrate that DOE operations at the Paducah Site comply with DOE orders and applicable federal, state, and local regulations. The Environmental Monitoring Program is documented in the *Environmental Monitoring Plan Calendar Year 2002* (BJC 2001a) in accordance with DOE Order 5400.1, General Environmental Protection Program. The results of this program are discussed in detail in subsequent sections of this ASER.

Before the DOE/USEC transition (described in Section 1), DOE's primary mission at the Paducah Site consisted of enriching uranium. However, since the transition on July 1, 1993, DOE's mission at the site has been focused on environmental restoration, Depleted UF_6 (DUF_6) cylinder management, waste management, and D&D/DMSA management. This change in mission also has changed the direction and emphasis of the Environmental Monitoring Program. In November 1995, the site Environmental Monitoring Plan was reissued to address DOE operations exclusively. The Environmental Monitoring Plan is reviewed annually and updated at least every three years. The October 2001 version of the Paducah Site Environmental Monitoring Plan (BJC 2001a) addresses the sampling events in 2002 that are reported in this ASER. Data Quality Objective (DQO) sessions were held during June and August of 2000 in order to determine if additional monitoring or changes to the environmental monitoring program were needed. As a result, locations and parameters were added for surface water, sediment, and groundwater monitoring in 2002.

Environmental Restoration Program

The goal of the Environmental Restoration Program is to ensure that releases from past operations and waste management activities are investigated and that appropriate remedial action is taken for the protection of human health and the environment. In May 1994, the PGDP was added to EPA's NPL of hazardous waste sites that require the most cleanup. Two federal laws, RCRA and CERCLA, are the dominant regulatory drivers for environmental restoration activities at the Paducah Site. RCRA sets the standards for managing hazardous waste and requires permits to be obtained for DOE facilities that treat, store, or dispose of hazardous waste and requires assessment and cleanup of hazardous waste releases at facilities. CERCLA addresses uncontrolled releases of hazardous substances and requires cleanup of inactive waste sites. As a result of being placed on the NPL and having RCRA permits, the DOE, USEPA and KDEP entered into a Federal Facility Agreement in 1998. The FFA delineates the relationship between the active regulatory requirements and prescribes the requirements necessary to facilitate compliance with both laws.

The Environmental Restoration Program supports remedial investigations (RIs) and environmental response actions, D&D of facilities no longer in use, projects designed to demonstrate or test advancements in remedial technologies, and other projects related to remedial action for the protection of human health and the environment.

Background

In July 1988, the Kentucky Radiation Control Branch, in conjunction with the Purchase District Health Department, sampled several residential groundwater wells north of the plant in response to concerns from a local citizen regarding the quality of water in a private well. Subsequent analyses of these samples revealed elevated gross beta levels, indicative of possible radionuclide contamination. On August 9, 1988, these results were reported to the Paducah Site, which responded by sampling several private groundwater wells adjacent to the site on August 10, 1988. Upon analysis, some of the samples collected contained elevated levels of both TCE and ^{99}Tc. In response, DOE immediately instituted the following actions:

- provided a temporary alternate water supply to affected residences,
- sampled surrounding residential wells to assess the extent of contamination,
- began extension of a municipal water line to affected residences as a long-term source of water, and;
- began routine sampling of residential wells around the Paducah Site.

Following the initial response actions, DOE and EPA entered into an ACO in August 1988 under sections 104 and 106 of CERCLA. The major requirements of the ACO include monitoring of residential wells potentially affected by contamination, providing alternative drinking water supplies to residents with contaminated wells, and investigation of the nature and extent of off-site contamination.

Pursuant to the ACO, DOE continued routine sampling of residential wells and initiated a two-phase site investigation to identify the nature and extent of off-site contamination at the Paducah Site. Phase I of the site investigation, from summer 1989 to March 1991, evaluated the extent of off-site contamination at the Paducah Site through extensive groundwater monitoring and surface-water sampling. Results of these activities are reported in *Results of the Site Investigation, Phase I, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CH2M Hill 1991b). Phase II of the site investigation, from November 1990 to October 1991, focused on identification and characterization of on-site sources contributing to off-site contamination, determined the level of risk to human health and the environment from exposure to contaminated media and biota, and developed an initial list of remedial alternatives. Results are reported in *Results of the Site Investigation, Phase II, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CH2M Hill

1992a). The principal findings of the site investigation are as follows:

• TCE and ^{99}Tc were identified as the primary contaminants in off-site groundwater at the Paducah Site.

• A northwest and a northeast groundwater plume extending off-site were delineated.

• PCBs and radionuclides were identified as the primary contaminants detected in surface water and sediment in outfalls, ditches, and creeks around the Paducah Site.

• Several on-site sources were identified as potential contributors to off-site contamination.

Risks to human health and the environment from exposure to contamination originating at the Paducah Site were reported in *Results of the Public Health and Ecological Assessment, Phase II at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CH2M Hill 1992b). This report used data collected during the site investigation to quantitatively assess risks to human health and to qualitatively assess risks to the environment.

A range of preliminary alternatives that could be used to address the contamination was also developed as part of the ACO activities. This information was presented in *Summary of Alternatives for Remediation of Off-Site Contamination at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (Draft) (SAIC 1991). Upon completion of the Phase II activities and in response to the risks identified in the public health and ecological assessment, the Paducah Site developed and implemented several IRAs designed to prevent further migration of contaminants and reduce risks to human health and the environment. The actions targeted certain on-site sources and the off-site contamination associated with groundwater and surface water.

As part of the residential well sampling program that began when off-site contamination was discovered, DOE established a water policy. This policy states that in the event contamination originating from the Paducah Site is detected above plant-action levels, which are established at the analytical laboratory detection limits of 25 picoCuries per liter (pCi/L) for ^{99}Tc and 1 part per billion (ppb) for TCE, a response would be initiated by the Paducah Site. Accordingly, residents would be notified immediately as would state and EPA officials. Alternative water supplies would be provided through connection to the municipal water system, or in the event of a time lapse between discovery and the ability to complete connections, bottled water would be made available. DOE pays the cost of installation of water systems and the monthly charges for water service to residents with contaminated wells.

DOE modified this water policy in 1994 to include provisions to extend a municipal water line to the entire area potentially affected by groundwater contamination originating from the Paducah Site. All residents within a defined area, regardless of whether or not their wells were contaminated, were given the option to receive municipal water at DOE's expense. DOE also provides municipal water to new residents and some new businesses. A five-year review of the water policy was issued in 1999.

Because of the extension of the municipal water line, the water policy allows reduction in the number of residential wells sampled. This modification provides for a more cost-effective allocation of well-sampling resources. Through the strategic placement of additional MWs, the modification also allows more accurate data on location and movement of contaminated groundwater.

The most significant interim action taken under the ACO, documented in *Technical Memorandum for Interim Remedial Action of the Northwest Plume* (DOE/OR/1031&D2), included groundwater extraction and treatment to reduce the spread of contamination from the source and high concentration areas of the Northwest Plume. The *Proposed Plan for Interim Remedial Action of the Northwest Plume* (DOE/OR/06-1127&D2), which summarizes the interim alternatives, was approved and the *Decision for Interim Remedial Action of the Northwest Plume* (DOE/OR/06-1143&D2) was signed by DOE on July 15, 1993, and by EPA on July 22, 1993. Construction of the interim action (the C-612 Northwest Plume Groundwater System) was completed and operational on August 28, 1995.

A second groundwater remediation action, the *Record of Decision (ROD) for Interim Remedial Action at the Northeast Plume* (DOE/OR/06-1356&D2), was signed by DOE on June 13, 1995, and the EPA on June 1, 1995. The ROD called for the hydraulic containment and treatment of high concentrations of off-site TCE contamination in the Northeast Plume. Pursuant to this ROD the Northwest Plume Containment System was constructed and began operation in February 1997.

Other previous interim actions include the NSDD, institutional controls for surface water/ ditches and scrapyards, enhancement of the existing cap for Waste Area Group (WAG) 7 (C-746-K Landfill), a removal action at WAG 17 (AOC 124) , and a PCB removal action for surface soils at WAG 23 sites. The North-South Diversion Ditch Interim Action called for treating certain plant effluents and controlling the migration of contaminated sediment associated with the ditch. The installation of fencing/posting restricted recreational use of surface water, outfalls, and lagoons. The installation of sediment controls to mitigate surface-water/ sediment runoff from scrapyards has been completed and is inspected on a monthly basis. The existing cap for the C-746-K Landfill was enhanced to reduce leachate production from surface infiltration.

On September 25, 2002, a second Interim Remedial Action ROD was signed for the NSDD. This interim action will address those portions of the NSDD located inside the plant security fence and is scheduled for implementation in 2003.

Operable Units

PGDP has numerous SWMUs and AOCs that require further investigation and potential remediation. Complex sites with multiple environmental releases, such as PGDP, may choose to divide the site into smaller areas and conduct separate RI feasibility studies (FSs), as opposed to conducting a single, site-wide RI/FS. These smaller, individual study areas, referred to as operable units (OUs) and implying an area for action to be taken or WAGs under the FFA, typically contain a limited number of SWMUs/AOCs grouped together based on certain criteria.

The SWMUs and AOCs requiring an RI/FS were initially segregated into 30 WAGs based on the following characteristics, and then prioritized for cleanup according to their contributions to off-site contamination:

- Common Remedial Technologies,
- Common Contaminant Sites,
- Common Geographic Locations,
- Common Operational Processes,
- Common Release Mechanisms,
- Common Surface-Water Drainage,
- Common Media Type,
- Hydraulically-Connected Areas,
- Operating Units, and
- Suspected Sources of Off-site Contamination.

As a better understanding of site conditions was gained through the various WAG investigations, the DOE, EPA, and the Commonwealth of Kentucky concluded it would be more effective if the existing WAGs were grouped more broadly, thereby providing the framework to more effectively integrate, focus, and prioritize response actions across the site. These data and other process knowledge were used to develop site conceptual models for each of the source areas to support the further consolidation of the WAGs into larger operable units. Source areas that were suspected as primary contributors of contamination to a specific environmental media and/or exposure pathway were grouped under the same OU. This effort resulted in identification of the following five potential OUs:

(1) Groundwater OU,

(2) Surface Water OU,

(3) Burial Grounds OU,

(4) Soils OU, and

(5) D&D OU.

The OUs include a number of SWMUs and AOCs that may require an RI/FS, proposed plan, record of decision, or remedial action. The scopes of these OUs are intended to include both the contributing source area and the affected media, which is a significant change from the previous WAG strategy where sources were addressed separately from the contamination that had already migrated to groundwater and surface water. Combining the source areas and affected media under the OU approach is intended to enhance the agencies' ability to develop integrated remedial solutions that will account for interactions between source areas and affected media.

While the source areas have been grouped into OUs based on suspected releases to a common media and/or exposure pathway, this does not mean the strategies or response actions for a given OU will not evaluate impacts to other media or exposure pathways. For example, the intent of the Soils OU is to help focus data collection and decision-making on a group of source areas where the probable site conditions, based on existing data and process knowledge, suggest the contamination may primarily be limited to the shallow soil horizons, thereby providing a primary route of exposure to plant workers through direct contact. This will further allow the selection of remedial actions to be more efficient allowing the action to be applied to as many sites as feasible. However, it is not unrealistic for some sources within this OU to also be a contributor to surface water or groundwater via contaminant transport. In comparison, sources in the groundwater and surface water OUs also may contain contamination at locations where plant workers could experience direct contact exposure with contaminated soils or sediments. Therefore, the strategies and corresponding response actions will contain adequate flexibility to manage uncertainties and address impacts to other media and secondary routes of exposure when appropriate.

Also, it should be noted that some OUs contain operating SWMUs. Since some of these units may not be able to be fully characterized or remediated until they cease operation, the scope of the RI/FS may be focused in nature, with emphasis on the migration pathways to determine whether there is an on-going release that poses a current risk, which warrants an immediate action. However, the extent of investigation and remedial action for OUs will be determined on a case-by-case basis after consideration of site-specific conditions. In some cases, if the investigation determines there is no immediate risk or potential for off-site migration, additional characterization and/or remediation may be deferred to the D&D OU when these units cease operation.

Once the five OU actions are complete, a Comprehensive Site-Wide OU (CSOU) will be conducted. The scope of the CSOU will include a comprehensive site-wide baseline risk assessment to evaluate any residual risk remaining at the site after completion of the five OUs, and the cumulative effects from all media. If the CSOU risk assessment concludes the actions taken to date collectively provide adequate protection to human health and the environment, a final CSOU Proposed Plan and ROD will be issued. The ROD will be followed by a final remediation report declaring site remediation complete. In the event the CSOU risk assessment determines additional actions are needed, an FS will be developed with the preferred alternative documented in a proposed plan and ROD, followed by the necessary remedial actions prior to issuing the final remediation report.

In February 2002, the Paducah DOE Site Office, in conjunction with other Site Offices within the DOE Environmental Management (EM) Program, performed, at the direction of the Assistant Secretary for Environmental Management, a Top-to-Bottom Review of the EM Program. The project team was tasked with performing a programmatic review of the EM program and its management systems with the goal of quickly and markedly improving program performance. The findings of this review were documented in *A Review of the Environmental Management Program, United States Department of Energy***,** February 4, 2002. In order to improve the program, a number of recommendations were suggested. These recommendations were designed to focus the EM Program on reducing risk to the public health, workers, and the environment in an accelerated manner. The DOE Paducah Site management also worked in 2002 with the Commonwealth of Kentucky, the EPA, and other stakeholders to implement these recommendations.

Site Priorities

The prioritization process for implementing the OU strategy incorporates the general principles of the CERCLA National Contingency Plan, which emphasizes the use of early actions to address and reduce further migration of imminent threats (both on- and off-site) and contamination (Figure 3.1). Consistent with those principles, a series of interim actions were implemented under the ACO during the earlier phases of the cleanup program. These actions focused exclusively on mitigating current threats, including alternate drinking supplies to affected residents, construction and operation of groundwater treatment systems for the northwest and northeast plumes, and surface water actions in the NSDD and Bayou and Little Bayou creeks. With regard to

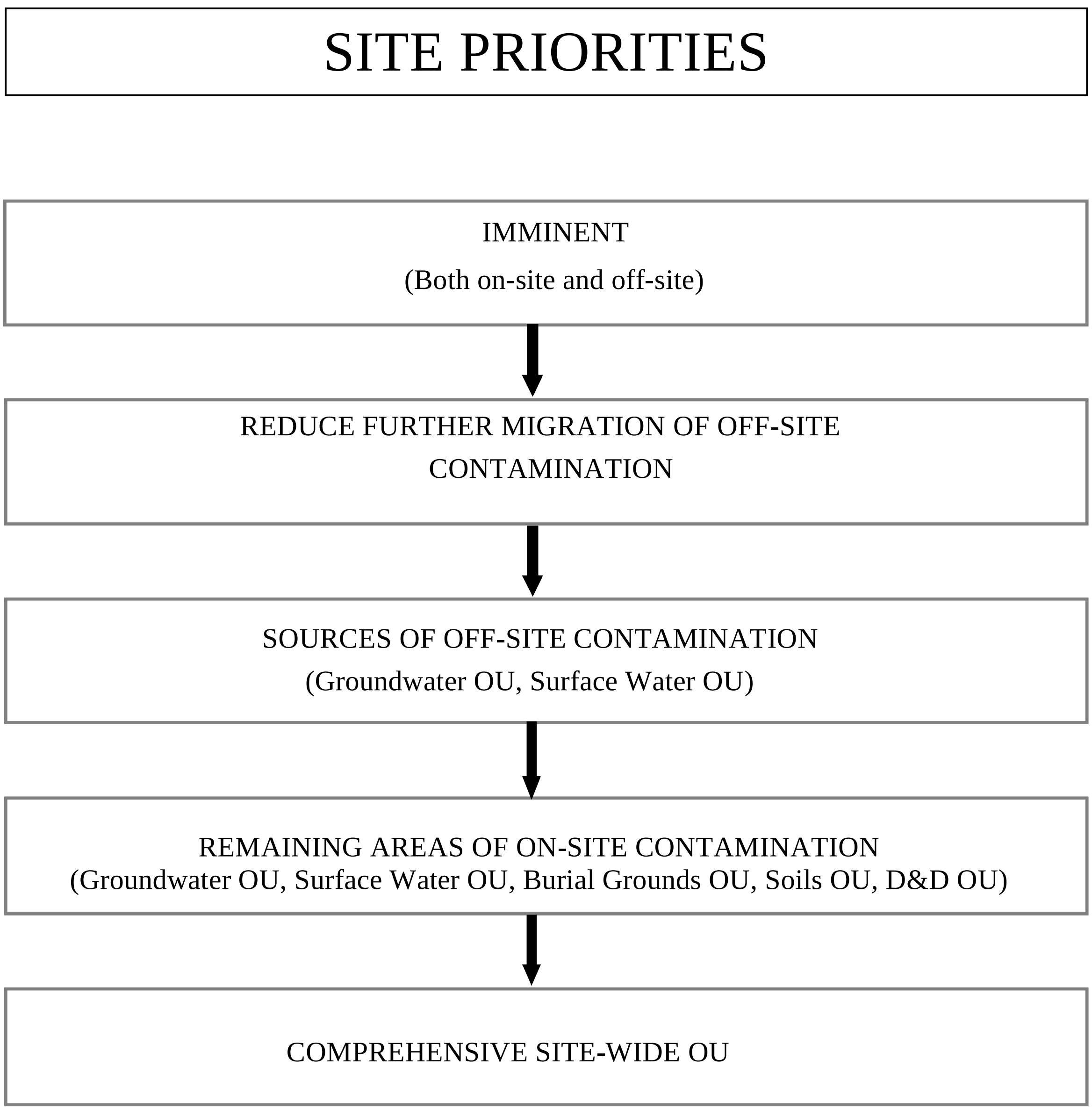


Figure 3.1 Site management plan priorities and corresponding projects.

potential on-site exposure, current threats, in general, have been mitigated through access restrictions and institutional controls. However, data generated from implementation of the OU strategy will be continuously reviewed to identify the need, should current threats be discovered, for additional expedited action.

Assuming imminent threats have been adequately addressed through previous actions, groundwater and surface water have been identified as the highest priority since those media serve as migration pathways to off-site receptors. The soils and burial grounds OUs are the next priority followed by the D&D facilities. However, it should be noted that while the RI/FSs for the five OUs have been sequenced in accordance with the previous priorities, a key strategy of implementing the OU approach is early evaluation of existing data to help identify opportunities to implement early actions prior to, or in conjunction with, the RI/FSs for each OU. While a series of early actions have already been identified for several of the OUs (e.g., Scrap Metal, North-South Diversion Ditch, C-340/C-410 D&D, etc.), this revised strategy formalizes a process to further facilitate identification and implementation of early actions.

2002 Remedial Activities

The significant accomplishments for the environmental restoration program conducted in 2002 include the following:

- Successfully completed the implementation of Lasagna™ technology as the selected remedial alternative for reducing the concentration of TCE in SWMU 91.
- Initiated Six Phase Heating treatability study adjacent to the C-400 Cleaning Building.
- Continued operation of the Northwest and Northeast Plume Groundwater treatment systems.
- Installed 35 new groundwater monitoring wells at the C-746-S, T, and U Landfills to upgrade the existing monitoring systems. Also, abandoned 10 monitoring wells from the old network at the C-746-U landfill.
- Completed initial site assessment for a possible CERCLA Waste Disposal Cell.
- Completed construction of the Storm Water Control Facility for the Scrap Yards.
- Completed soil removal action at petroleum spill site.

Lasagna™

In July 1998, DOE issued the *Record of Decision for Remedial Action at Solid Waste Management Unit 91 of Waste Area Group 27 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1998b). The ROD designated Lasagna™ as the selected remedial alternative for reducing the concentration of TCE in SWMU 91 to levels that would decrease the potential groundwater risk to human health and the environment at the point-of-exposure.

Lasagna™ uses an applied direct current electric field to drive TCE-contaminated groundwater through treatment zones installed in the contaminated soil. This induced groundwater flow is called electro-osmosis. The groundwater flow induced by the direct current travels from the anode electrodes to the cathode electrode. Groundwater containing TCE is driven away from anode electrodes toward the cathode electrode and passes through a series of iron particle treatment zones installed between them. The TCE is broken down into nonhazardous compounds as it comes in contact with the iron particles in the treatment zones. Figure 3.2 shows a cross section of the treatment process. Additional information about the Lasagna™ technology and its development can be found in the *Final Soil Characterization Work Plan for the Paducah Gaseous Diffusion Plant Lasagna Pilot Test in the Cylinder Drop Test Area* and the *DNAPL Site Characterization And Lasagna™ Technology Demonstration at Solid Waste Management Unit 91 of the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*.

Installation of the Lasagna™ technology was completed in September 1999. The system was in operation from December 1999 until December 2001. During that time two interim sampling projects were performed in August of 2000 and 2001. During the two years of operation the concentration of TCE in SWMU 91 soil was reduced from an average of 84 milligrams/kilogram (mg/kg) to an average of less than 5.6 mg/kg. The summary of operations and results is detailed in the *Final Remedial Action Report for Lasagna Phase IIb In-Situ Remediation of Solid Waste Management Unit 91 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07—2037&D1 (DOE 2002). The Commonwealth of Kentucky and the EPA approved the final report on October 31, 2002.

The Lasagna™ site was demobilized beginning in September 2002 and has been returned to its original surface condition. The total cost of the project implementation, including post-ROD activities, was $3.96 million (DOE 2002).

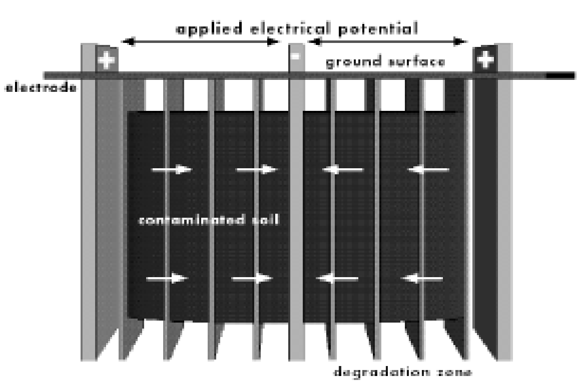


Figure 3.2 Lasagna™ Treatment System cross section.

Six-Phase Heating Treatability Study

The Six-Phase Heating Treatability Study began in 2002 with the objective to evaluate the performance of the Six-Phase Heating technology to remove TCE from the source area near the C-400 building. The area around the C-400 building is the primary source of TCE contamination in groundwater at the PGDP. The project plan was documented in an approved treatability study work plan and engineering designs were also approved prior to beginning field implementation on April 5, 2002. Figure 3.3 is a picture of system installation activities.

Figure 3.3 Six-Phase Treatability Study system installation.

Six-Phase Heating is a type of electrical resistance heating technology that uses a ring of six electrodes surrounding a central neutral electrode. The electrodes extend from a few feet below the ground surface down to the bottom of the RGA. Power is applied to the six electrodes, creating a flow of electricity to the neutral electrode. The natural resistance of the soil to the flow of electricity causes the soil to heat up. As the soil heats past the boiling point of TCE, the TCE is vaporized. These vapors are captured by a soil vapor extraction system, which creates a vacuum in the soil to pull the vapors out of the soil. The extracted vapors are cooled to allow separation of TCE and any entrained water and condensing water vapor. This separation occurs because TCE has a lower boiling point (87ºC) than water. After removal of the water, the extracted vapor is passed through a series of granular activated carbon filters that absorb the TCE.

The treatability study is being performed to determine the technology's effectiveness in the PGDP geology. The technology will be evaluated by comparing before and after soil and groundwater TCE concentrations and by measuring the volume of TCE vapor removed. The test will also provide a determination of the cost for implementing the technology at the site on a larger scale. The cost determination will provide data for use in further evaluation of competing technologies on a cost basis.

In 2002, the electrodes and monitoring points for the Six-Phase Heating System were installed as was the vapor extraction and treatment system. The Six-Phase System startup is expected in early 2003 with completion of the study by the end of 2003.

Northwest Plume Groundwater System

The IRA of the Northwest Plume Groundwater System is documented in a ROD signed by DOE and EPA in July 1993. KDEP also concurred with the ROD. The IRA began operation on August 28, 1995. The IRA consists of two extraction well fields with two extraction wells each, transfer pipelines, a treatment system, and appurtenant equipment. The interim action is designed to contain the migration of the high-concentration zone of the groundwater contaminant plume. Plume contaminants are TCE and ^{99}Tc.

TCE is removed by an air stripping process. The TCE is volatilized by a large volume of air that comes into contact with the contaminated groundwater during the treatment process. Activated carbon filtration beds are then used to remove the TCE, which is entrained in the air stream, before the air is released to the atmosphere. ^{99}Tc is removed by an ion-exchange process. Figure 3.4 is a picture of the facility.

The treatment system has extracted and treated approximately 744 million gallons of contaminated groundwater from start up through the end of 2002. The treatment system has exceeded the on-line goal of 85% since its start-up in 1995. The IRA has consistently met the treatment goals documented in the ROD of 5 ppb TCE and 900 pCi/L of ^{99}Tc. The groundwater, after treatment, is released through KPDES permitted Outfall 001. Radiological emissions from this facility are discussed in Section 4.

Figure 3.4 Northwest Plume Groundwater System Facility.

Northeast Plume Containment System

The IRA of the Northeast Plume was documented in a ROD signed by DOE and the EPA in June 1995. The KDEP accepted the ROD with the issuance of Hazardous Waste Permit Modification 8 dated June 26, 1995. The IRA system consists of two well extraction field, equalization tank, transfer pump, transfer piping and instrumentation, electrical power and accessories. Characterization and construction activities were completed during December 1996. System startup and operational testing were conducted in February 1997 with the system beginning full operation by February 28, 1997.

System operation includes pumping groundwater contaminated with TCE from two extraction wells to an equalization tank. A transfer pump is used to pump the contaminated water from the equalization tank through a transfer line (approximately 6,000 linear feet) to the top of the C-637-2A or C-637-2B Cooling Tower. C-637-2A is the primary destination; however, if it is off-line, flow is transferred to the C-637-2B tower. The cooling tower acts as an air stripper and removes the TCE from the groundwater as it moves through the tower.

Through 2002, approximately 446 million gallons of contaminated groundwater have been extracted and treated. The system has been operational approximately 95% of the time since startup with the exception of July through September 1999 when the facility was taken off-line due to cooling tower maintenance.

C-746-S, T, and U Landfills Monitoring Well Network Upgrade

During 2002, the monitoring networks for the C-746-S, T, and U Landfills were upgraded by installing 35 new MWs. These new wells monitor the UCRS, and the upper and lower portions of the RGA around the landfills. The new network includes 21 MWs at the C-746-U landfill and 14 new MWs at the C-746-S and T landfills along with 5 existing wells. The old monitoring network consisted of 11 MWs at the C-746-U landfill and 10 MWs at the C-746-S and T landfills.

The monitoring network upgrade was prompted by concerns over corrosion observed in some of the older stainless steel MWs and by more stringent monitoring requirements from the Commonwealth of Kentucky. The new MWs were constructed using polyvinyl chloride casing and well screen, which will not corrode like the stainless steel material used on the older wells.

Following completion of the new monitoring wells, two baseline groundwater sampling events were performed consistent with KDEP permit requirements. Also, all of the new wells have been incorporated into the quarterly groundwater monitoring programs for the landfills.

The final phase of the monitoring network upgrade involves abandonment of many of the older MWs. In 2000 two of the existing MWs in the C-746-U Landfill network and one of the MWs in the C-746-S and T network were abandoned as part of the corrosion analysis studies. In 2002 the remaining 8 old MWs at the C-746-U Landfill were abandoned. In 2003 it is expected that regulatory approval will be granted for the removal of the 5 of the older MWs around the C-746-S and T Landfills.

Time-Critical Removal Action at Petroleum Spill Site

A Time-Critical Removal Action of petroleum contaminated soil was performed in 2002. The site was a former service station and car wash during the early 1950s. The site was discovered during cylinder yard construction activities. The removal action resulted in the excavation for disposal of 375 cubic yards of soil. Final disposal of the excavated soil will occur at an approved facility in the future.

Regulatory Document Preparation

During 2002, regulatory documents were prepared for several projects to allow implementation of cleanup. A summary of these documents is listed below. Approval of these decision documents will allow field work to be performed in CY 2003.

- Prepared major regulatory documents for NSDD, which will allow field construction projects to proceed in 2003. This included the ROD and the Remedial Design for the Phase I construction. The project will clean-up a one-quarter-mile long section of the contaminated ditch located inside the security fence at PGDP.

- Completed the *Seismic Investigation Report for Siting of CERCLA Waste Disposal Facilities*.

North- South Diversion Ditch

On August 21, 2002, the *Record of Decision for Interim Remedial Action at the North-South Diversion Ditch at the Paducah Gaseous Diffusion Plan, Paducah, Kentucky* (DOE/OR/07-1948&D2) was approved by EPA and concurred with by the Commonwealth of Kentucky. DOE signed the ROD on September 25, 2002. Although this response action is being selected as an interim action with respect to the NSDD inside the security fence, a subsequent ROD for the SWOU will document the final action for the entire NSDD and/or SWOU. The portion of the NSDD addressed by the remedial action is comprised of Sections 1 and 2 [i.e., solid waste management unit (SWMU) 59]. This portion of the NSDD is located inside the main security fence surrounding the industrialized portion of the PGDP.

The remedial action objectives developed by the Project Team for sections of the NSDD located inside the security-fenced area at PGDP (i.e., Sections 1 and 2) and documented in the ROD are as follows:

• prevent future discharge of process water to the NSDD;

• reduce the risk to industrial workers and ecological receptors from exposure to contaminated surface soil, sediment, and surface water; and

• prevent future on-site runoff from being transported off-site (i.e., outside the existing security fence) via the NSDD.

The major components of the selected remedy include a two-phased approach. Phase I of the selected remedy includes the following components:

• Installation of piping to route process discharges, which currently go to the NSDD, directly to the C-616 Water Treatment Facility (See Figure 3.5);

• Installation of storm-water runoff controls in the NSDD downstream of Section 2 prior to excavation of a surge basin during Phase I (existing culverts at the downgradient end of Section 2 will be plugged and filled with controlled low-strength material as an initial step in surge basin construction and existing sediment controls inside the security fence will remain in place to control runoff);

• Excavation of a surge basin to contain storm-water runoff until it can be treated through the C-616 facility; and

• Installation of a plug in the NSDD at the PGDP security fence and in three other ditches within the watershed to prevent discharge of storm-water runoff to sections of the NSDD outside the PGDP security fence.

Phase II of the selected remedy includes the following components.

• Complete excavation of contaminated soils/sediments along Sections 1 and 2 of the NSDD to achieve specified cleanup levels. Sections of the NSDD located inside the PGDP security-fenced area (Sections 1 and 2) will be excavated to remove contaminated soils/sediments, and a clay cover will be installed at the base of the excavation. The clay cover will provide an extra layer of protection in the elimination of the surface exposure pathway.

Figure 3.5 Installation of piping at the North-South Diversion Ditch.

• Appropriate staging and disposal of contaminated materials excavated during Phases I and II. Nonhazardous waste generated as a result of the NSDD remedial action will be disposed of in the C-746-U Landfill.

• Restoration of Sections 1 and 2 of the NSDD to grade with 2 ft of clay cover, approximately 2 ft of clean soil, and vegetation following completion of excavation activities. The clay cover will provide an extra layer of protection in the elimination of the surface exposure pathway. If excavation achieves or exceeds the specified cleanup levels for Sections 1 and 2, long-term maintenance of the clay cover would not be required. However, since the extent of contamination is not characterized fully and the remediation focuses on the ditch only, it is possible that some residual contamination would remain at depth. Any residual contamination would be addressed by the GWOU.

On September 26, 2002, DOE issued the *Remedial Design/Remedial Action Work Plan* (RD/RAWP) *for the North-South Diversion Ditch Piping and Pump Modifications at the Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/OR/07-1967&D2.) The Commonwealth of Kentucky and EPA approved the Remedial Design//Remedial Action Work Plan for the Piping and Pump Modifications on October 15, 2002. On October 21, 2002 field activities bagan on Phase I construction activities. The Phase I field activities will be completed in 2003. Phase II construction activities are expected to begin in 2003.

CERCLA Waste Disposition

The field investigation to evaluate seismic conditions at the Paducah Site for the siting of a potential on-site CERCLA waste disposal facility was completed in March 2002. DOE worked with KDWM to plan the investigation, which began in late August 2001. The investigation consisted of four parts: 1) a Paleoliquefaction Study 2) a Site-Specific Fault Study 3) a Regional Fault Study; and 4) a Site-Specific Geotechnical Study. The Paleoliquefaction Study included visual surveys of several regional streams and the Ohio River to identify possible paleoliquefaction features in the area surrounding the Paducah Site. The Site-Specific Fault Study included a seismic reflection survey (P-wave), a horizontal shear (S) wave survey, direct push technology (DPT) sampling, and Carbon-14 dating of organic samples. The Regional Fault Study included similar activities at an off-site location in southern Illinois plus a detailed study of exposed faults in a large creek system. The Site-Specific Geotechnical Study included several seismic cone penetrometer tests (SCPTs) and shallow boreholes covering the potential disposal site, two deep boreholes that were drilled to bedrock (approximately 400 ft deep), and analyses of samples for geotechnical properties. Nationally-recognized experts were consulted on this important project. The results were presented to the EPA and KDWM in August 2002 in the *Seismic Investigation Report for Siting of a Potential On-Site CERCLA Waste Disposal Facility at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/OR/07-2038&D1* (DOE 2002).

Scrap Metal Removal

The Paducah Site has approximately 53,000 tons of scrap metal in ten scrap yards located on the northwestern portion of the fenced area of the plant, most of which are located adjacent to each other. An *Engineering Evaluation/Cost Analysis for Scrap Metal Disposition at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/OR/07-1880&D2/R1) which analyzed alternatives for handling the scrap was approved by EPA and the Commonwealth of Kentucky in March 2001. A public comment period followed, and the alternative known as "Scrap Removal and Disposition with Nickel Ingot Storage and Enhanced Sediment Control Measures" was selected. All documents leading to this selections including those addressing public comments' can be found at the DOE Environmental Information Center (EIC). The proposed activities which will be included in the removal action are:

• Construct staging areas to provide the scrap metal disposition with water, septic systems, electricity and communications;

• Control surface water and sediment runoff by constructing a storm water control basin;

• Remove all of the scrap materials down to the level of surface soil;

• Characterize, process, and package scrap materials to meet RCRA, TSCA, appropriate disposal facility waste acceptance criteria, and U.S. Department of Transportation shipping requirements; and

• Transport and dispose of the materials removed.

During 2002, DOE completed construction of a storm water control basin to support the removal action for safely removing and disposing of more that 50,000 tons of scrap metal. The facility is designed to limit the migration of contaminated sediments from the work site during the action. The basin (Figure 3.6) will control flow from a 61 acre watershed which contains the work site. The system will reduce total suspended solids through gravity settling. The storm water will be tested to ensure the water will meet the KPDES requirements prior to release to Outfall 001. Actual handling of the scrap metal is expected to begin in 2003 and to be completed in 2006.

Figure 3.6 Scrap yard storm water control basin.

Waste Operations Program

The Paducah Site Waste Operations Program directs the safe treatment, storage, and disposal of waste generated before July 1, 1993 (i.e., legacy wastes), and waste from current DOE activities. The primary objective of the program is to ensure that waste materials do not migrate into the environment. Waste managed under the program is divided into the following seven categories:

• *Low-level radioactive waste* - radioactive waste not classified as high-level or transuranic and that does not contain any components regulated by RCRA or TSCA.

• *Hazardous waste* - waste that contains one or more of the wastes listed as hazardous under RCRA or that exhibits one or more of the four RCRA hazardous characteristics: ignitability, corrosivity, reactivity, and toxicity.

• *Mixed waste* - waste containing both hazardous and radioactive components. Mixed waste is subject to RCRA, which governs the hazardous components, and is subject to additional regulations that govern the radioactive components.

• *Transuranic waste* - waste that contains more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years.

• *PCB and PCB-contaminated waste* - waste containing or contaminated with PCBs, a class of synthetic organic chemicals including 209 known isomers, each with 1 to 10 chlorine atoms on a biphenyl ring. Under TSCA regulations, PCB manufacturing was prohibited after 1978; however, continued use of PCBs is allowed provided that the use does not pose a risk to human health or the environment. Disposal of all PCB materials is regulated.

• *Asbestos waste* - asbestos-containing materials from renovation and demolition activities.

• *Solid* - waste that is neither radioactive nor hazardous. Solid sanitary/industrial waste is basically refuse or industrial/construction debris and is disposed in landfills.

• *PCB/Radioactive Waste* - PCB waste or PCB items mixed with radioactive materials and managed as radioactive waste. PCB/radioactive/

RCRA shall mean PCB/radioactive waste that may also be hazardous waste under RCRA.

Requirements for meeting waste management regulatory objectives are varied and complex because of the variety of waste streams generated by DOE activities. The goal, however, is to comply with all current regulations while planning actions to comply with anticipated future regulations.

Compliance for waste management activities involves meeting EPA and state regulations and DOE orders. In addition to compliance with these regulations, supplemental policies are enacted for management of radioactive, hazardous, PCB, PCB/radioactive, and mixed wastes. These policies include reducing the amount of wastes generated; characterizing and certifying waste before it is stored, processed, treated, or disposed; and pursuing volume reduction and use of on-site storage, when safe and cost effective, until a final disposal option is identified. Table 3.1 summarizes the waste shipments during 2002.

Additional developments in Waste Management that occurred in 2002 include the following:

- DOE signed the final NEPA determination regarding disposal in the C-746-U of wastes having negligible but detectable levels of residual radiation. A finding of No Significant Impact was included in the determination which was documented in the *Environmental Assessment on the Implementation of Authorized Limits Process for Waste Acceptance at the C-746-U Landfill* (DOE/EA-1414).

- The waste classification under RCRA for groundwater and soils associated with historical TCE disposal was re-evaluated, and in February, the determination was made that those materials which are waste would be considered a listed waste (F001 and U228) under the RCRA regulations. This determination altered the waste classification for waste materials that were previously managed or disposed. As a result, an evaluation was initiated and continued through the end of 2002 to evaluate impacts from historical waste management activities. DOE suspended off-site shipments that had the potential to be reclassified as RCRA-listed waste.

Table 3.1 Waste shipments during 2002

- February - Shipped 232,246 pounds of low-level waste to Nevada Test Site
- April – Shipped 9,848 pounds of RCRA mixed waste to Perma-Fix
- May – Shipped 64,427 pounds of recyclable material
- June – Shipped 40,412 pounds of RCRA waste to ONYX
- May – Shipped 251 pounds of RCRA waste to ONYX and Safety Kleen
- August – Shipped 21,647 pounds of TSCA mixed waste to the TSCA Incinerator
- September – Shipped 19,061 pounds of PCB mixed waste to the TSCA Incinerator
- October – Shipped 154 pounds of RCRA waste to Chem Waste Management
- November – Shipped 132,907 pounds of RCRA mixed waste to Perma-Fix facilities
- November – Shipped 163,264 pounds of PCB mixed waste to Waste Control Specialists
- December – Shipped 268,473 pounds of low-level waste to Nevada Test Site

Pollution Prevention / Waste Minimization

The Pollution Prevention/Waste Minimization (PP/WM) Program at the Paducah Site provides guidance and objectives for minimizing waste generation. Guidance for the program comes from regulations promulgated under RCRA and the Pollution Prevention Act, as well as applicable state and EPA rules, DOE Orders, and Executive Orders.

The program is striving to meet its goals with the following strategies:

- source reduction,
- segregation,
- reuse of materials,
- recycling, and
- procurement of recycled-content products.

The PP/WM Program has the following objectives:

- identify waste reduction opportunities,
- establish site-specific goals,
- establish employee awareness of PP/WM principles,
- integrate PP/WM technologies into ongoing projects,
- coordinate recycling programs, identify PP/WM responsibilities and resource requirements, and
- track and report results.

Recycling efforts in 2002 included 11.5 metric tons (mt) (25,346 pounds) of office paper; 0.5 mt (1102 pounds) of aluminum cans; 0.91 mt (2000 pounds) of telephone books; 0.26 mt (573 pounds) of printer and fax toner cartridges; 0.71 mt (1560 pounds) used motor oil; carbon used in the Northwest Plume Groundwater Treatment Facility; used computer equipment; and reuse of gravel generated from reconstruction of cylinder storage yards. Additional accomplishments of the PP/WM Program included continued use of micropurging techniques in groundwater sampling to reduce wastewater volume and transferring unused chemicals and materials to other programs for re-use. The recycling of nickel cadmium batteries and fluorescent light bulbs continues to reduce the volume of hazardous wastes generated at the site. The site also has converted to Philips Greens™ fluorescent bulbs that are not hazardous when disposed.

Also, the Lasagna project that was completed in 2002 received the 2002 Pollution Prevention Waste Minimization Award for DOE-Oak Ridge Operations. The project resulted in the in situ treatment of more than of 10,000 cubic yards of soil that otherwise would have required excavation and disposal.

Depleted Uranium Hexafluoride Cylinder Program

DUF_6 is a product of the uranium enrichment process. A solid at ambient temperatures, DUF_6 is stored in large metal cylinders. At the end of 2002, the Paducah Site managed an inventory of 38,133 cylinders containing approximately 454,000 metric tons of UF_6 (most containing DUF_6) stored in outdoor facilities commonly referred to as cylinder storage yards. Additional cylinders are added to the DOE inventory annually as a result of formal agreements with the United States Enrichment Corporation.

DUF_6 is stored as a crystalline solid at less than atmospheric pressure. When DUF_6 is exposed to the atmosphere, hydrogen fluoride and uranium reaction products form. The uranium by-products form a hard crystalline solid, which acts as a self-sealant within the storage cylinder. The hazard potential of DUF_6 is primarily chemical toxicity from any released hydrogen fluoride, rather than a radiological hazard.

The mission of the DUF_6 Cylinder Program is to safely store the DOE-owned DUF_6 inventory until its ultimate disposition. DOE has an active cylinder management program that includes cylinder and cylinder yard maintenance, routine inspections, cylinder yard construction and improvement, and other programmatic activities such as cylinder corrosion studies. The Program maintains a cylinder inventory database, which serves as a systematic repository for all cylinder inspection data.

Pursuant to Recommendation 95.1 from the Defense Nuclear Facilities Safety Board (DNFSB) in 1995 addressing the improved safety of storage of cylinders containing DUF_6 at Paducah, Portsmouth, and K-25 (currently identified as East Tennessee Technology Park), DOE identified the following five areas for response at PGDP:

- removal of cylinders from ground contact during storage;
- relocation of stored cylinders and placement of new cylinders into an adequate inspection configuration;
- completion of an analysis of alternative chemical forms for storage of the material;
- repainting of cylinders as needed due to excessive corrosion; and
- update of handling and inspection procedures and site-specific safety analysis reports.

In 1996 DOE began implementation of measures to improve the safety of DUF_6 cylinder storage at PGDP. The status of this implementation through 2002 is summarized in the following paragraphs.

Since 1996 DOE has upgraded the quality of the cylinder yards to maintain the integrity of the stored cylinders (Figure 3.7). Cylinders have been removed from ground contact and fewer cylinders are stored in each yard, resulting in easier access for inspections to detect cylinder corrosion or leaks. As the number of cylinders stored in each yard has decreased, the construction of new cylinder yards has been required to accommodate existing cylinders and to plan for the storage of newly generated cylinders. Since 1998 DOE has completed construction of five new cylinder yards (Table 3.2).

Due to the projected operation of a DUF_6 conversion facility at PGDP (please see following paragraph), currently there are no plans to build additional cylinder storage yards at the site.

Figure 3.7 DUF_6 cylinder storage yard construction.

On April 15, 1999, DOE issued the *Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride*, in response to the DNFSB's request to analyze alternative chemical forms for the storage of DUF_6. As a result of this study, in 2002 DOE selected Uranium Disposition Services, LLC, to design, build, and operate facilities at Paducah and Portsmouth, Ohio, that will convert the inventory of DUF_6 to triuranium octoxide (U_3O_8), a more stable form of uranium that is suitable for disposal or reuse. It is anticipated that conversion facilities will be operational by 2006.

Repainting of corroded DUF_6 storage cylinders was initiated in 1996 and from that time through the end of 1998, a total of 3368 cylinders were repainted. Cylinder painting activities at Paducah were terminated after 1998 in light of DOE's near-term plans to begin conversion of the depleted UF_6. If conversion begins by 2006, it will allow the DUF_6 in the remaining worst-case corroded cylinders to be converted by 2010. If conversion facilities do not become operational in 2006, alternative actions to mitigate further corrosion of these worst-case cylinders, such as a restart of cylinder painting operations, will need to be implemented.

In December 1998, toxicity test results at KPDES Outfall 017 exceeded the KPDES limit for toxicity (see Section 2). Subsequent tests confirmed the toxicity exceedance and a TRE Plan was established. Zinc from cylinder painting operations was suspected as the primary cause of the toxicity. Required TRE Plan sampling was conducted in 2002 and a report was filed with Kentucky in July 2002. In September 2002 correspondence from Kentucky indicated that Outfall 017 had successfully passed at least 5 of 6 of the required monthly TRE Plan sampling events and the TRE was rescinded.

Decontamination and Decommissioning/DOE Material Storage Areas

D&D is conducted for facilities and other structures contaminated with radiological and hazardous material. Facilities are accepted for D&D when they are no longer required to fulfill a site mission. Legacy contamination on the floors, walls, and ceiling of a structure and on equipment constitutes a potential for release to the environment if not appropriately managed in the near term and ultimately removed. Two major facilities comprising approximately 46,450 m^2 (500,000 ft^2) have been accepted for D&D at PGDP. These facilities are the C-340 Metal Reduction Plant complex, where UF_6 was converted to uranium metal and hydrogen fluoride, and the C-410 Feed Plant complex, where uranium trioxide was converted to UF_6. Contaminants at these facilities include depleted uranium, natural uranium and transuranic radionuclides, UF_4, PCBs, asbestos, and lead paint.

Table 3.2 Cylinder yards constructed at PGDP since 1996.

Cylinder Yard	Size	Year of Completion
C-745-T	470,000 ft^2	1998
C-745-L (South)	108,000 ft^2	2000
C-745-K (North)	120,945 ft^2	2002
C-745-K (South)	63,152 ft^2	2002
C-745-M	118,531 ft^2	2002

Development of CERCLA documentation for a non-time critical removal action for removal and disposal of piping, process equipment, and stored materials from the C-410/C-420 Feed Plant complex was initiated in 2001 and was completed in 2002. An engineering evaluation/cost estimate was developed and approved by the regulatory agencies in 2001 and a public meeting to discuss the project was held in January 2002. The Action Memorandum was approved by the regulators in June 2002. The Removal Action Work Plan was submitted to the regulators in 2002 and regulatory comments on the D2 version of the document are currently being addressed.

D&D accomplishments in 2002 at the C-410/C-420 complex included the following.

- Completion of isolation of water lines entering the C-410/C-420 complex.
- Continued building maintenance, general building cleanup, and decontamination in preparation for initiation of D&D,
- Removal and staging of equipment and material and decontamination of areas of the C-410/C-420 complex that will be used as staging areas or work areas during D&D operations.
- Began preparations for transfer of surplus fluorine generating cells and equipment to a private company for reuse, avoiding waste disposal costs. The Paducah Area Community Reuse Organization, a DOE-community economic development organization, served as a broker for the arrangement.
- Completion of removal and packaging of a sulfuric acid tank (Figure 3.8) at an outside DMSA as part of a Time-Critical Removal Action.

Activities performed during the year at the C-340 complex were limited to surveillance and maintenance of the structures to ensure containment of residual materials.

Figure 3.8 Sulfuric acid tank removal

DMSAs are areas at PGDP containing material and equipment that are undergoing a characterization process to comply with potential Nuclear Criticality Safety, RCRA, TSCA, and solid waste concerns. Originally included with the PGDP facilities leased to USEC, DOE accepted the return of the DMSAs from USEC on December 31, 1996, to facilitate Nuclear Regulatory Commission certification of PGDP. The 160 DMSAs are now nonleased areas located inside buildings leased to USEC or are located in outdoor areas.

In April 2001 DOE issued a DMSA work plan, *PGDP Department of Energy Material Storage Area Characterization / Remediation Plan* (BJC/PAD-186/R4) that presented a 5-year project schedule commencing January 1, 2001, to complete characterization of material in the 160 DMSAs. As of the end of 2002, characterization reports were completed on 26 DMSAs, field characterization was completed on 39 DMSAs, and field characterization was underway on 24 DMSAs. DMSA fieldwork gives priority to DMSAs located outside or those that may contain hazardous waste. Lower priority DMSAs are addressed while sampling and analysis results from higher priority locations are prepared in order to achieve maximum efficiency in field operations. The characterization reports completed as of the end of 2002 determined that less than one-tenth of one percent by volume of the material and equipment characterized could be classified as hazardous waste. DOE notifies the Commonwealth of Kentucky when hazardous waste is identified during the DMSA project.

The Kentucky Natural Resources and Environmental Protection Cabinet filed an administrative complaint in October 2001 regarding the enforcement of NOVs alleging violations of Kentucky's delegated hazardous waste management program regulations. Most of these NOVs alleged the failure to characterize materials in DMSAs at PGDP or the unpermitted storage of hazardous waste in DMSAs. Resolution on the administrative complaint issue was still pending as of the end of 2002. See Section 2 for more information on NOVs at DMSAs.

Public Awareness Program

A comprehensive community relations and public participation program on DOE activities exists at the Paducah Site. The purpose of the program is to provide the public with opportunities to become involved in decisions affecting environmental issues at the site. The program uses proactive public involvement to foster a spirit of openness and credibility among local citizens and various segments of the public.

Community/Educational Outreach

DOE and BJC Public Affairs supported several educational and community outreach activities during 2002. The DOE Site Manager spoke with civic groups, business leaders, and residents at pre-arranged events.

Site Specific Advisory Board

The PGDP Citizens Advisory Board (CAB), a Site Specific Advisory Board chartered by DOE under the Federal Advisory Committees Act, completed its sixth full year of operation in September 2002. During the year, the CAB held 11 regular Board meetings and one retreat. The Board also includes three task forces and three subcommittees which meet as necessary.

The task forces review issues for:

- Groundwater and Surface Water,
- Waste Operations,
- Long Range Strategy and Stewardship.

The subcommittees handle topics concerning:

- Community Concerns
- Nominations and Memberships
- Public Involvement.

All meetings were open to the public and all regular Board meetings are publicly advertised.

In 2002, the CAB had 18 voting members, four ***ex-officio*** members, a Deputy Designated Federal Official, and a Federal Coordinator. The Paducah CAB consists of individuals with diverse backgrounds and interests. It meets monthly to focus on early citizen participation in environmental cleanup priorities and related issues at the DOE facility. The Paducah CAB participates only in activities that are governed by DOE. Additional information concerning the Site Specific Advisory Board may be obtained at www.oakridge.doe.gov/pgdpssab.

Environmental Information Center

The public has access to Administrative Records and programmatic documents at the DOE EIC in the Barkley Centre, 115 Memorial Drive, Paducah, Kentucky. The EIC is open Monday through Friday from 9 a.m. to 5 p.m. and by appointment. The phone number is (270) 554-6979.

Documents for public comment are also placed in the McCracken County Public Library (formerly the Paducah Public Library), 555 Washington Street, Paducah, Kentucky. The library is open Monday through Friday from 9 a.m. to 5 p.m.

The EIC, and other public web pages related to DOE work at the Paducah Site, can be accessed at www.bechteljacobs.com/p_eic/p_eic8.htm.

4 Radiological Effluent Monitoring

Abstract

Environmental Monitoring at the Paducah Site, as required by DOE Order 5400.1, consists of two components: 1) effluent monitoring and 2) environmental surveillance monitoring. Effluent monitoring is initiated to demonstrate compliance with one or more federal or state regulations. Radiological liquid effluent monitoring was performed at the four outfalls under the jurisdiction of DOE at the Paducah Site during 2002. Three of the four outfalls retained by DOE contain only rainfall runoff. A fourth outfall is a continuous flow outfall. The outfalls were monitored for radionuclides historically present at the site. Surface water runoff from landfills at the Paducah Site was also monitored. Concentrations of the radionuclides measured (uranium and ^{99}Tc) for DOE outfalls were within acceptable limits set by DOE and by state and federal standards. The DOE-operated point sources for radionuclides in airborne effluents during 2002 were the Northwest Plume Groundwater System and the Scrap Yards Removal Project.

Introduction

Effluents are monitored for radionuclides known to be emitted or to have been present at the site. Monitoring of radioactivity in liquid and airborne effluents is described fully in the *Paducah Site Environmental Monitoring Plan* (BJC 2001a). Dose calculations are provided in Section 6.

Airborne Effluents

Effluent monitoring is to be conducted to meet the requirements of DOE Order 5400.1, *General Environmental Protection Program*, at all DOE sites. DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, sets annual dose standards for members of the public at 10 millirems (mrem) per year from airborne releases and at 100 mrem/year through all exposure pathways resulting from routine DOE operations.

Radiological airborne releases are also regulated by EPA and KDAQ under 40 CFR 61, Subpart H, which covers radionuclide emissions, other than radon, from DOE facilities. This regulation was amended in 1989 to include specific sampling requirements for each emission point with the potential to emit radionuclides resulting in an effective dose equivalent of 0.1 mrem to the most affected off-site resident. When determining potential emissions, it is assumed that air pollution abatement devices do not exist, but that the facility is otherwise operating normally.

Per 40 CFR 61 Subpart H, DOE must report annual radionuclide emissions, covering emissions during the previous calendar year, by June 30 of each year to EPA via a NESHAP report. The EPA-approved methodologies for sampling and calculating must be used to address emissions. DOE had two sources of airborne radionuclides in 2002. These sources were the Northwest Plume Groundwater System and the Scrap Yards Removal Project.

Northwest Plume Groundwater System

The CERCLA ROD signed July 22, 1993, established the Northwest Plume Groundwater System. Although administrative requirements of environmental regulations do not apply to projects conducted under CERCLA, DOE has continued to supply all permit-related documentation to regulators. The Operations and Maintenance Plan approved by the EPA in March 1995 (and since revised), describes sampling and methodologies to be used at the Northwest Plume Groundwater System. The air emissions methodology is to sample the water stream before and after the air stripper. The change in contaminant concentration is used to calculate air emissions. The analysis of the water before and after the air stripper stack provides a much more accurate measure of airborne discharges than actual stack measurements due to the low, practically immeasurable radionuclide airborne effluents associated with the facility.

On August 28, 1995, DOE began operation of the Northwest Plume Groundwater System. The facility is located just outside of the northwest corner of the PGDP security area. The facility consists of an air stripper to remove volatile organics from water and an ion-exchange unit for the removal of ^{99}Tc. The air stripper is located upstream of the ion-exchange unit. The ^{99}Tc concentration in the influent and effluent of the air stripper and the quantity of the water passing through the air stripper were used to calculate the total quantity of ^{99}Tc emitted from the facility in 2002. This calculation is used to calculate dose as a result of these operations.

Scrap Yards Removal Project

During 2002, construction was underway to complete roads and gravel pads, install administrative trailers, and clear vegetation around the area in preparation for the Scrap Yards Removal Project. In addition, some scrap metal was sampled and pallets were relocated to allow for the infrastructure activities. This project will sort and characterize materials contained within the scrap yards. If possible, contamination will be reduced through cleaning. The scrap will then be packaged for shipment to a disposal facility. There are about 54,000 tons of materials in the yards. Most of the metal is iron, nickel or aluminum. The most common contaminant is uranium.

Based on emission factors, the amount of airborne radionuclides was less than EPA standards (Appendix E, Table 2 of 40 CFR 61). Figure 4.1 shows the removal operation.

Figure 4.1 Scrap Yards Removal Project.

Airborne Effluent Results

In 2002, releases to the atmosphere from the Northwest Plume Groundwater System were calculated to be 1.59 x 10^{-2} curies of ^{99}Tc. Estimates of airborne radionuclide emissions from the Scrap Yards Removal Project were made based on emission factors. The estimated emissions from the project were 2.8 x 10^{-4} curies of various radionuclides. The calculated emissions were less than state and EPA standards (Appendix E, Table 2 of 40 CFR 61). Dose to the public from airborne radionuclides is discussed in Section 6.

Liquid Effluents

The CWA for the Paducah site is administered by KDOW through the KPDES Wastewater Discharge Permitting Program. The site-wide KPDES permit (KY0004049) became effective April 1, 1998, and expired March 31, 2003. This permit contains discharge limits based on water quality criteria for a zero-flow receiving stream.

In addition to nonradiological parameters on the KPDES permit, specific radionuclide analyses and indicator gross activity analyses are conducted on liquid effluent samples. Grab samples and composite samples at various frequencies are used to measure discharges.

The EPA safe drinking water limits for groundwater do not apply to Paducah Site surface water sampling as effluent ditches and Bayou and Little Bayou creeks are not drinking water supply sources for public or private use. However, DOE orders 5400.1 and 5400.5 establish effluent monitoring requirements to provide confidence that radiation exposure limits are not exceeded. Although no specific effluent limits for radiological parameters are included on the KPDES permit, DOE Order 5400.5 sets guidelines for allowable concentrations of radionuclides in various effluents and requires radiological monitoring to protect public health. This protection is achieved at the Paducah Site by meeting the DOE Order 5400.5 derived concentration guidelines (DCGs), which are the concentrations of given radionuclides that would result in an effective dose equivalent of 100 mrem/year. The DCGs are based on the assumption that a member of the public has continuous, direct access to the liquid effluents, which is a conservative exposure scenario not likely to exist. Since exposure is not continuous, this results in conservatively low concentration for the DCGs. Further information on DCGs is provided in Appendix B.

For monitoring purposes, the Paducah Site uses estimates of DCG levels and outfall flow characteristics (rainfall dependent) to determine sampling frequencies. Neither continuous monitoring nor continuous sampling are required by DOE Order 5400.5. Uranium and ^{99}Tc are the primary radionuclides of concern. Analyses are also routinely performed for dissolved alpha, suspended alpha, dissolved beta, suspended beta. The KPDES Permit also intermittently requires additional sampling for priority pollutants at the DOE outfalls. This sampling was conducted in 2002, which adds a larger list of analyses to the data set.

Other effluent monitoring is required by KDWM landfill permits 073-00014, 073-00015, and 073-00045. Surface runoff is to be analyzed to ensure that landfill constituents are not discharging into nearby receiving streams.

DOE Outfalls

DOE was responsible for a total of four outfalls in 2002 (Figure 4.2). Under KPDES permit number KY0004049, Outfall 001 is a continuous flow outfall that received discharges from USEC's Phosphate Reduction Facility, USEC's once-through cooling water, and DOE's Northwest Plume Groundwater System. DOE's Northeast Plume Containment System is treated through the C-637 cooling tower system at PGDP. The cooling tower basin water is then transferred to C-616 through a process known as blowdown. The water is transferred by an underground pipeline to C-616, a water treatment facility, and then ultimately discharges to Outfall

001. In addition, surface water runoff from the northeast side of the plant also is collected is a sedimentation basin and then discharged into Outfall 001. Outfall 015 receives surface water runoff from the east central sections of the plant. Outfall 017 receives surface water runoff from the southeast section of the plant (primarily the cylinder storage yards). Outfall 019 receives surface water runoff from C-746-U (DOE's operational landfill). Data are presented in Section 1 of the *Environmental Monitoring Results Annual Site Environmental Report for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (BJC/PAD-543 Volume II).

Landfill Surface Runoff

Surface runoff from the closed C-746-S Residential Landfill and the C-746-T Inert Landfill is monitored quarterly. Due to their close proximity, they are monitored as one landfill ("L" locations shown in Figure 4.2). Also, surface runoff is monitored from the Operating C-746-U Contained Landfill. Surface runoff from these landfills is monitored for gross alpha and gross beta. Grab samples are taken from the landfill runoff, the receiving ditch upstream of the runoff discharge point, and the receiving ditch downstream of the runoff discharge point. Sampling is performed to comply with KDWM permit requirements for landfill operations. Data are presented in Section 1 of the *Environmental Monitoring Results Annual Site Environmental Report for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (BJC/PAD-543 Volume II).

Liquid Effluent Monitoring Results

Tables 4.1 and 4.2 include the yearly minimum, maximum, and average concentrations of uranium and ^{99}Tc, respectively, at each outfall monitoring location. Each radionuclide is compared with the corresponding DCG and is presented as a percentage. The average concentrations at all outfalls were small percentages of the corresponding DCG. The average concentration of uranium being discharged to Outfall 015 was 7% of the DCG. The average concentration of uranium being discharged to Outfalls 001, 017, and 019 was less than 1% of the DCG. Outfall 015 received runoff from the uranium burial ground with small quantities of surface contamination from uranium compounds. Runoff from the burial ground is suspected as responsible for the elevated uranium concentrations associated with Outfall 015. ^{99}Tc averages for 2002 for all four outfalls were well below 0.1% of the DCG.

Data for 2002 do not show a significant change in relation to DCG levels for any radionuclide compared to data for the past five years. Figures 4.3 and 4.4 show a five-year summary of average concentrations of uranium and ^{99}Tc concentrations.

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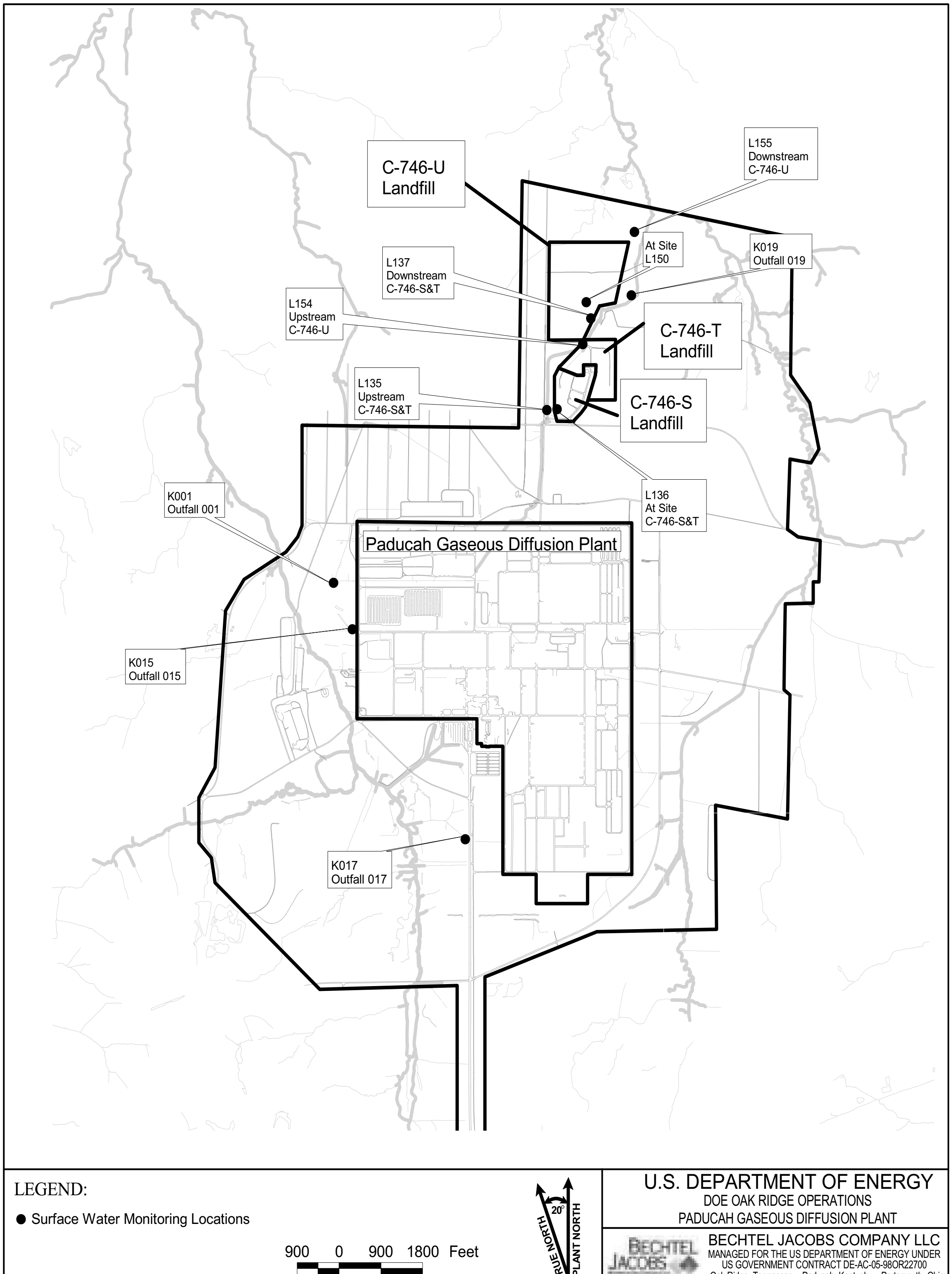

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

Figure 4.2 KPDES Outfalls and Landfill surface-water monitoring locations.

FIGURE No. c5ac90002sk110.apr
DATE 05-01-03

Table 4.1 Total uranium concentration in DOE outfalls for 2002.

Outfall	Number of Samples	Minimum (mg/L)	Maximum (mg/L)	Average (mg/L)	Average (pCi/L)	% ^{235}U	%of DCG[a]
001	6	0.003	0.018	0.008	4.5	0.53	0.74
015	4	0.016	0.17	0.1	42	0.28	7.0
017	4	<0.001	0.006	<0.002	1.2	0.60[b]	0.20
019	3	<0.001	<0.001	<0.001	0.7	0.76[c]	0.12

[a] Derived Concentration Guide (DCG) for uranium is 600 pCi/L

[b] Insufficient uranium quantities to analyze for assay, assay based on past data

[c] Insufficient uranium quantities to analyze for assay, natural uranium used as assay

Table 4.2 Technetium-99 concentration in DOE outfalls for 2002.

Outfall	Number of Samples	Minimum (pCi/L)[a]	Maximum (pCi/L)[a]	Average (pCi/L)	%of DCG[a]
001	6	0.24	30	15	0.015
015	4	0.49	34	18	0.018
017	4	-5.4	20	4.7	.0047
019	3	-7.31	3.25	-2.7	0.0027

[a] DCG for ^{99}Tc is 100,000 pCi/L.

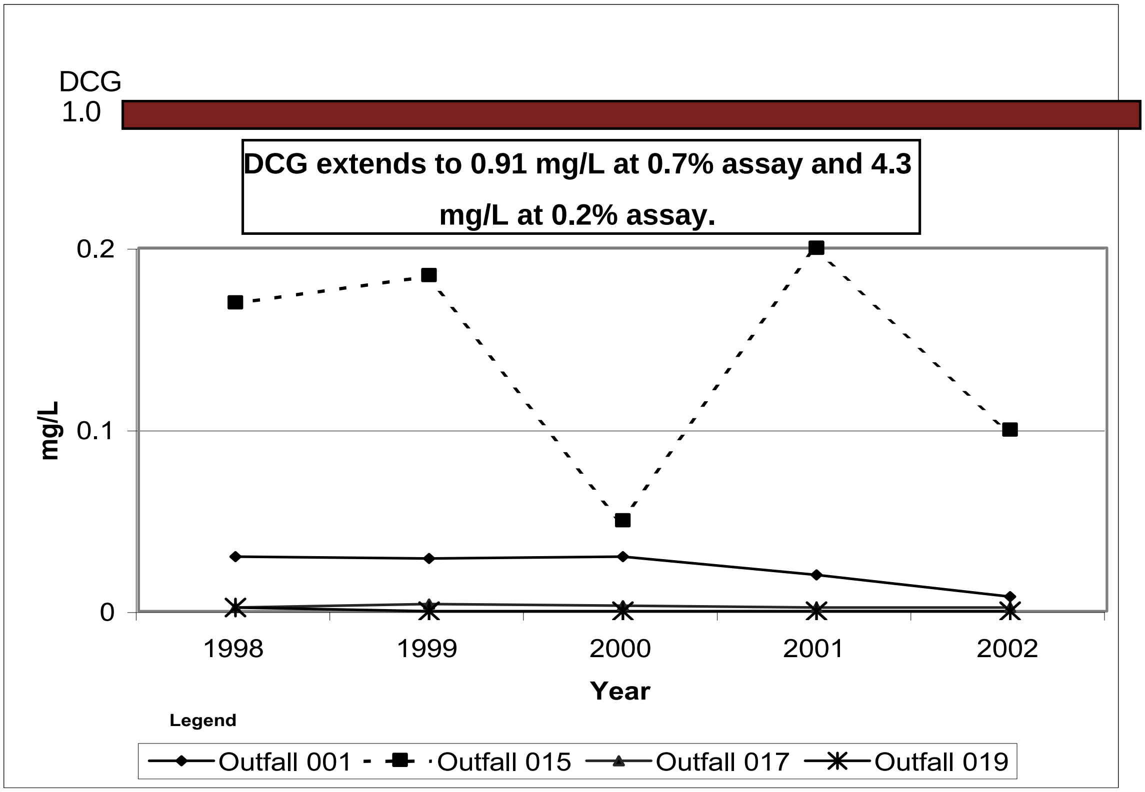

Figure 4.3 Uranium Concentrations discharged to surface water, 1997-2002.

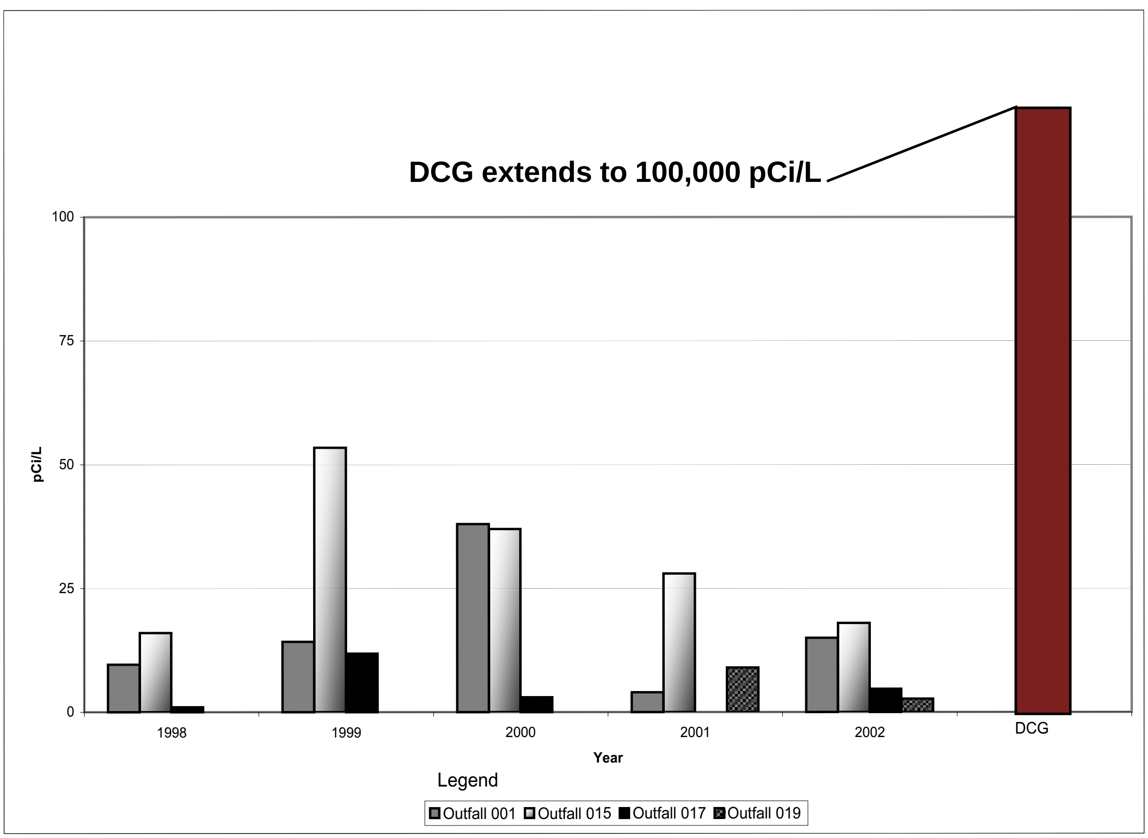

Figure 4.4 Technetium-99 concentrations discharged to surface water, 1997-2002.

5 Radiological Environmental Surveillance

Abstract

The radiological environmental surveillance program assesses the effects of DOE activities on the surrounding population and environment. Surveillance includes analyses of surface water, groundwater (Section 9), sediment, terrestrial wildlife, direct radiation, and ambient air. Surveillance results indicate that radionuclide concentrations in sampled media were within applicable DOE standards in 2002.

Introduction

The Radiological Environmental Surveillance Program at the Paducah Site is based on DOE Orders 5400.1, *General Environmental Protection Program*, and 5400.5, *Radiation Protection of the Public and the Environment*, which require that an environmental surveillance program be established at all DOE sites to monitor the radiological effects, if any, of DOE activities on the surrounding population and environment. Surveillance includes analyses of surface water, groundwater (Section 9), sediment, terrestrial wildlife, direct radiation, and ambient air.

Ambient Air

Per the 1993 DOE/USEC agreement, USEC is responsible for the existing radionuclide airborne point-source discharges at PGDP, with the exception of DOE's Northwest Plume Groundwater System. DOE monitors fugitive emission sources including building roof tops, piles of contaminated scrap metal, roads, and concrete rubble piles. A potential fugitive or diffuse source of radionuclides also results from the decontamination of machinery and equipment used in remediation activities, such as well drilling. The equipment is washed with high-power sprayers to remove any contaminants picked up from soil and groundwater. The concentrations of radionuclides on the equipment are so small that, under most circumstances, contamination cannot be distinguished from background.

DOE utilized ambient air monitoring data to verify insignificant levels of radionuclides in off-site ambient air. Ambient air data are collected at ten sites surrounding the plant (See Figure 5.1) in order to measure radionuclides emitted from Paducah Site sources including fugitive emissions. The Radiation/Environmental Monitoring Section of the Radiation Health and Toxic Agents Branch of the Department for Public Health of the Kentucky Cabinet for

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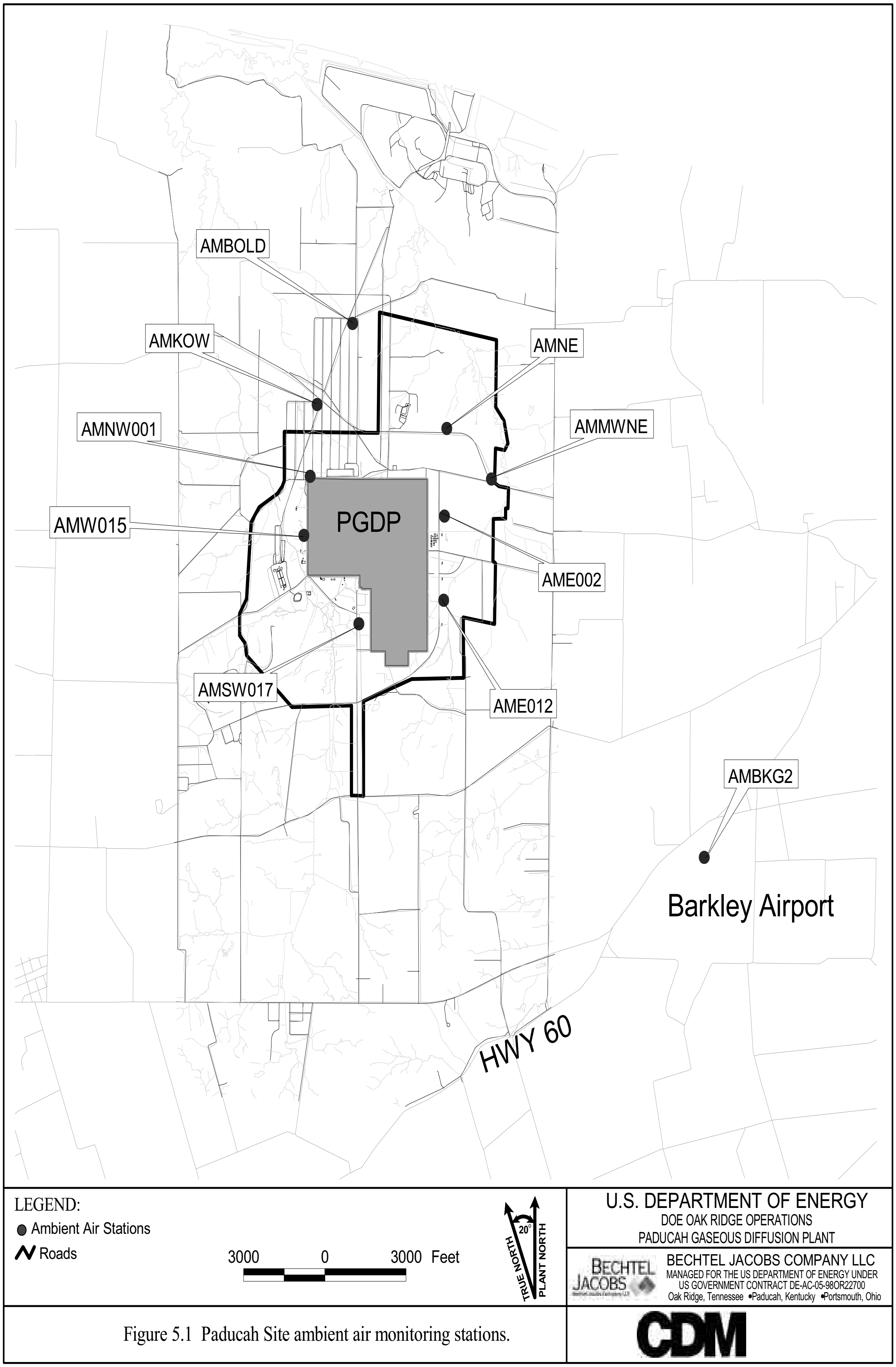

Figure 5.1 Paducah Site ambient air monitoring stations.

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DATE 05-01-03

Health Services (KCHS) conducted the ambient air monitoring during 2002. Based on observations for CY 2002, plant derived radionuclides were not detected by the Radiation Health and Toxic Agents Branch's air monitoring network. The monitoring results for 2002 are listed in Section 2 of the *Environmental Monitoring Results Annual Site Environmental Report for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (BJC/PAD-543 Volume II). Based on these results, airborne radionuclides emitted from the Paducah Site (including both DOE and USEC emissions) were at or below background at the ambient air monitors (KCHS 2003).

Meteorological Monitoring

DOE Order 5400.1 requires that DOE facilities collect representative meteorological data in support of environmental monitoring activities. This information is essential to characterize atmospheric transport and diffusion conditions in the vicinity of the Paducah Site.

Historic on-site meteorological data is used as input to calculate radiation dose to the public (see Section 6). Additional meteorological data from Barkley Regional Airport are used by some groups for inputs into reporting. For example, the Environmental Restoration Program uses these data to correlate precipitation with groundwater flow.

Computer-aided atmospheric dispersion modeling uses emission and meteorological data to determine the impacts of plant operations. Modeling is used to simulate the transport of air contaminants and predict the effects of abnormal airborne emissions from a given source. In addition, a multitude of emergency scenarios can be developed to estimate the effects of unplanned releases on employees and population centers downwind of the source.

Surface Water

All Paducah Site surface water runoff is released via plant outfalls either to the west to Bayou Creek or to the east to Little Bayou Creek. Bayou and Little Bayou Creeks merge north of the site and discharge into the Ohio River. The net impact of the Paducah Site on surface waters can be evaluated by comparing data from samples collected upstream of the site with data from samples collected downstream of the site or from background waterways. Bayou and Little Bayou Creeks are considered to be waters of the Commonwealth of Kentucky and designated for all uses by the Commonwealth. However, because these creeks are not used as drinking water supplies, EPA safe drinking water standards do not apply. Radioactive effluents are managed in accordance with DOE Order 5400.5.

Figure 5.2 shows surveillance surface-water sampling locations. Table 5.1 shows the radiological analytical parameters. Radiological sampling is conducted at upstream Bayou Creek (L1), downstream Bayou Creek (L5 and L6), downstream Little Bayou Creek (L12, L11, L241, and LBCN1), the convergence of both creeks (L8), upstream Ohio River (L29), downstream Ohio River (L30), downstream in the Ohio River at the confluence with the Mississippi River (L306) which is the closest public drinking water supply source downstream of the plant, and background stream Massac Creek (L64). Samples were also collected near the plant on Bayou Creek (C612, C616, K004, K006, K008, K009, K016, and L291), Little Bayou Creek (K002, K010, K011, K012, K013, L10, L55, L56, and L194) and at the C-746-K Landfill (C746KUP, C746TB1, C746TB2). No sample point exists for upstream Little Bayou Creek, as the watershed is insufficient to develop adequate flow to monitor. Nearly all water in Little Bayou Creek is comprised of discharges from plant outfalls. Therefore, background water quality for Little Bayou Creek is based on L1 (upstream Bayou Creek). L29 and L64 are background waterways also used for comparison with data from Little Bayou Creek.

In 2002 additional locations in Little Bayou Creek were added to the sampling program. These

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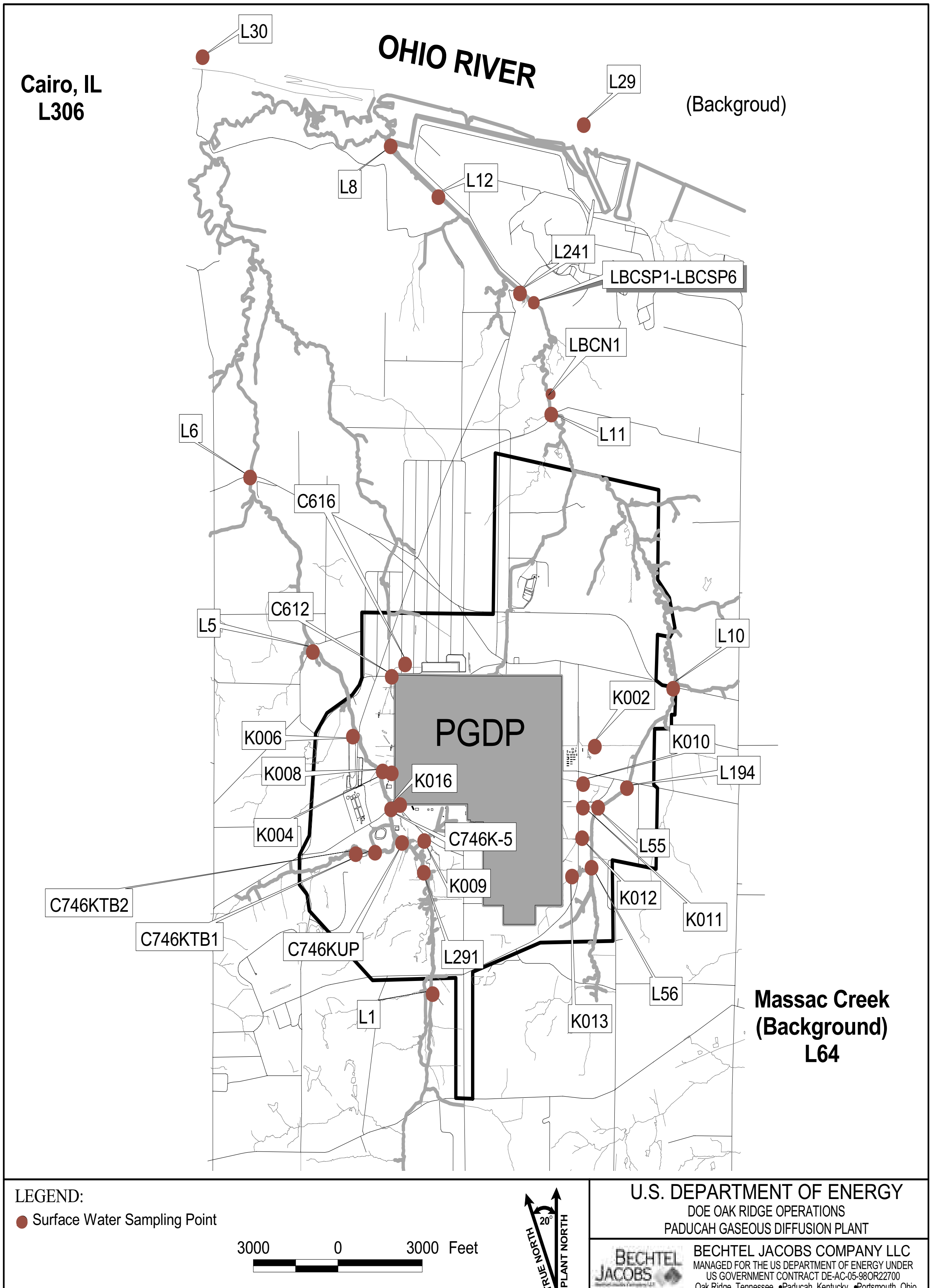


Figure 5.2 Surface-water monitoring locations.

FIGURE No. c5ac90002sk111.apr
DATE 05-01-03

Table 5.1 Radiological parameters for surface-water samples.

Parameter
Americium-241
Cesium-134
Cesium-137
Cobalt-60
Dissolved Alpha
Dissolved Beta
Neptunium-237
Plutonium-238
Plutonium-239/240
Potassium-40
Suspended Alpha
Suspended Beta
Technetium-99
Thorium-228
Thorium-230
Thorium-232
Uranium-234
Uranium-235
Uranium-238

locations, known as seeps, are upwellings of groundwater in the Little Bayou Creek bed. Six locations were chosen to sample each quarter to trend and observe changes in data. These locations are located downstream of the plant site approximately half-way between the site and the Ohio River. (Figure 5.2).

Surface Water Surveillance Results

Table 5.2 provides the average concentrations of radionuclides upstream and downstream of plant effluents in Bayou Creek and downstream of plant effluents in Little Bayou Creek. Comparisons of downstream data with upstream data and background waterways can be made to determine the influence of plant effluents on these waterways.

^{99}Tc concentrations were elevated in downstream creek locations with the highest concentrations found downstream at the convergence of Little Bayou Creek and Bayou Creek (L8) on figure figure 5.2. The locations with elevated results are downstream of the seep sites. However, these concentrations are well below the plant release criteria of 900 pCi/L. Cesium-137 (^{137}Cs), Cobalt-60 (^{60}Co), ^{237}Np, $^{238/239}$Pu, Potassium-40 (^{40}K), Thorium-228 (^{228}Th), Thorium-230, (^{230}Th), Thorium-232 (^{232}Th), and Uranium-235 (^{235}U), were not found in significant concentrations at any sampled location in 2002 when compared with DCGs. DCGs are provided in Appendix B.

Americium-241 (^{241}Am) was only found above the DCG upstream of the PGDP discharges in the Ohio River, which is unaffected by plant operations. Uranium-234 (^{234}U), Uranium-238 (^{238}U), were elevated compared to 10% DCGs near the plant site on both Bayou Creek and Little Bayou Creek. These were also elevated downstream in both creeks and at the C-746-K Landfill. All other concentrations of radionuclides in effluents at the Paducah Site were far below DCGs and do not pose a health risk.

Additional surface water data are presented in Tables 2.2 through 2.40 of Section 2 of the *Environmental Monitoring Results Annual Site Environmental Report for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (BJC/PAD-543 Volume II).

Table 5.2 Average radiological parameter concentrations for surface-water surveillance samples.

Paramter	Upstream Bayou[1]	Bayou Near Site[2]	Downstream Bayou[3]	Little Bayou Near Site[4]	Downstream Little Bayou[5]	Creek Convergence[6]	C-746-K Landfill Area[7]	Upstream Ohio River[8]	Downstream Ohio River[9]	Massac Creek[10]	Cairo[11]
^{241}Am (pCi/L)	-3.4	-6.5	-21	-8.4	-20	-23	-9	**3.8**	-8.9	-26	-28
^{134}Cs (pCi/L)	-1.4	-5.5	-6.3	-4.3	-4.8	-8.8	-2.1	-3.4	-4.5	-6.3	-2
^{137}Cs (pCi/L)	-2.7	0.1	0.41	-2	2.2	4	-0.75	1.3	-1.8	0.63	0.62
^{60}Co (pCi/L)	-2.2	-0.81	2.5	1.3	2	5.4	-1	-4.9	0.88	2.8	-1.8
Dissolved Alpha	0.094	5.7	10	12	2.7	3.6	0.47	1.5	0.89	0.59	2.2
Dissolved Beta	3.7	14	24	9.5	14	16	4.4	3.6	3.6	5	7
Suspended Alpha	0.14	-0.069	1.1	0.069	0.49	1.5	0.77	0.4	0.21	0.5	0.49
Suspended Beta	1.2	9.4	4.4	1.5	1.8	4.6	0.34	2.7	3.8	4.6	1.3
^{237}Np (pCi/L)	0.27	0.027	-0.22	0.061	0.089	-0.15	0.22	-0.16	-0.33	-0.093	-0.19
^{238}Pu (pCi/L)	0.014	0.0056	-0.004	0.0051	0.022	0.0017	0.0024	-0.0086	-0.0048	0.041	0.014
^{239}Pu (pCi/L)	-0.007	-0.0023	-0.017	0.0021	-0.0046	-0.0034	0.011	0.0013	-0.0073	0.0046	0.011
^{40}K (pCi/L)	-160	-43	-34	-32	-2.2	-90	-14	-9.9	0.8	-80	8.7
^{99}Tc (pCi/L)	0.67	7.1	8.1	7.2	16	22	5.3	-3.2	8.2	6.6	30
^{228}Th (pCi/L)	0.0062	-0.0079	-0.007	-0.0027	0.0097	0.0091	0.0022	-0.02	-0.026	-0.028	-0.016
^{230}Th (pCi/L)	0.15	0.019	0.087	0.0089	0.13	0.33	-0.0052	0.073	-0.026	0.16	0.026
^{232}Th (pCi/L)	0.003	-0.0049	0.013	-0.0082	0.012	0.00035	0.0044	-0.0094	0.011	0.0026	0.013
^{234}Th (pCi/L)	150	-89	-140	40	-58	NS	27	-140	-81	NS	-76
^{234}U (pCi/L)	a	**570**	a	**600**	a	**580**	**570**	a	**380**	a	a
^{235}U (pCi/L)	-2.2	0	-0.81	1.1	3.2	19	14	0	12	0	0
^{238}U (pCi/L)	0	**230**	**83**	**190**	**76**	**980**	**190**	0	**140**	0	0

a = Quantities of total uranium were found to be quite small or not detected; individual isotopes of uranium were not analyzed.
NS = Not Sampled
[**Bold**] = Exceeds DCGs
The following footnotes correspond with column titles in the above table. These are grouping of sample locations in the area described in the title.

1 = L1
2 = C612, C616, K004, K006, K008, K009, K016, and L291
3 = L5, L6
4 = K002, K010, K011, K012, K013, L10, L55, L56, L194
5 = L11, L12, L241, LBCN1
6 = L8
7 = C746KUP, C746KTB1, C746KTB2
8 = L29
9 = L30
10 = L64
11 = L306

Sediment

Sediment is an important constituent of the aquatic environment. If a pollutant is a suspended solid or attached to suspended sediment, it can either settle to the bottom (thus creating the need for sediment sampling), be taken up by certain organisms, or become attached to plant surfaces. Pollutants transported by water can adsorb on suspended organic and inorganic solids or be assimilated by plants and animals. Suspended solids, dead biota, and excreta settle to the bottom and become part of the organic substrata that support the bottom-dwelling community of organisms. Sediments play a significant role in aquatic ecology by serving as a repository for radioactive or chemical substances that pass via bottom-feeding biota to the higher trophic levels.

Sediment Surveillance Program

As a result of DOE's retaining responsibility for historic environmental issues and problems, ditch sediments are sampled semiannually through a radiological environmental surveillance program. Table 5.3 shows the radiological analytical parameters. Sediment samples were taken from 20 locations (Figure 5.3).

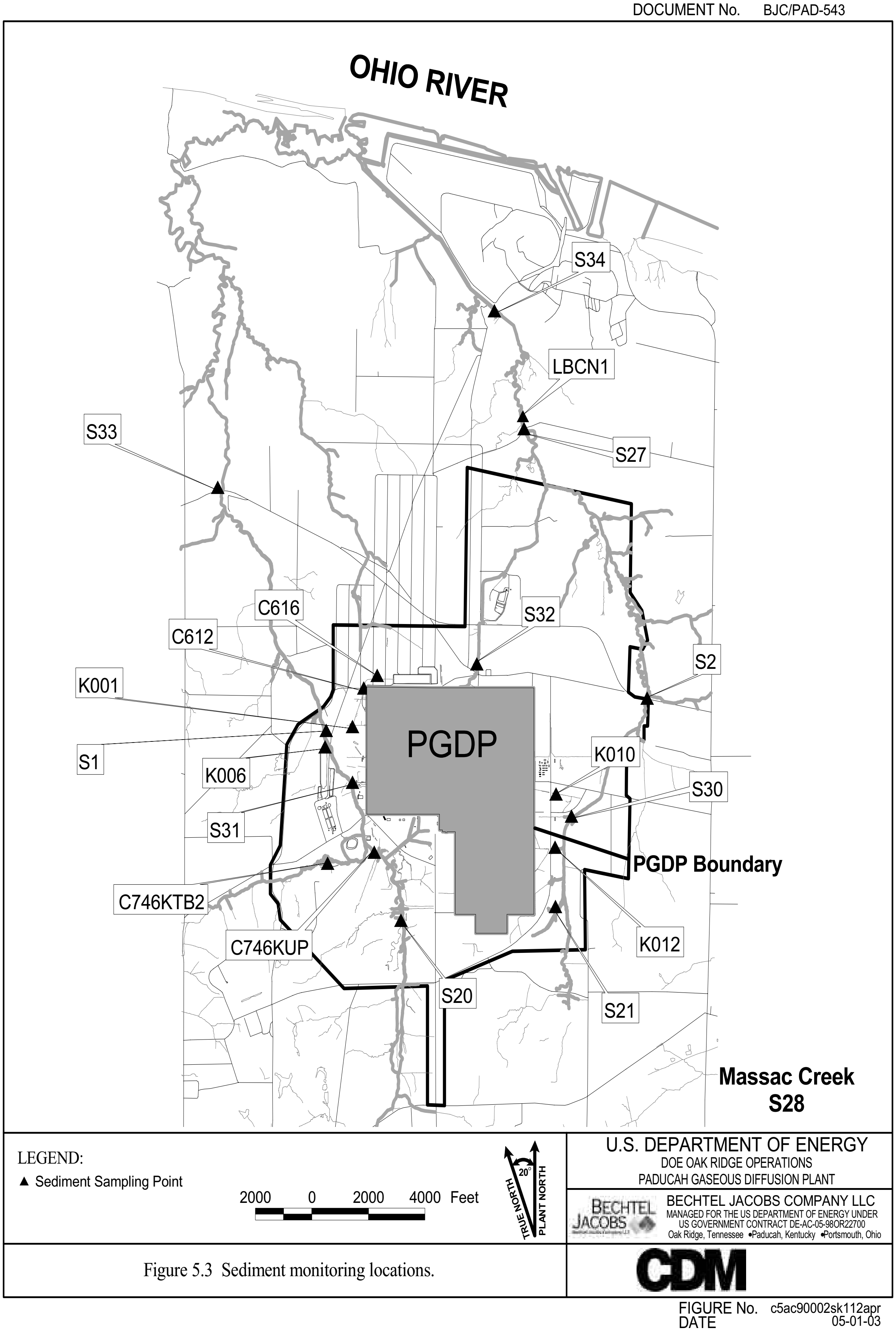


Figure 5.3 Sediment monitoring locations.

Table 5.3 Radiological parameters for sediment samples.

Parameter
Alpha activity
Americium-241
Beta activity
Cesium-137
Cobalt-60
Neptunium-237
Potassium-40
Pu-239/240
Technetium-99
Thorium-230
Uranium-234
Uranium-235
Uranium-238

Sediment Surveillance Results

Table 5.4 shows the upstream concentrations of radionuclides in the sediments compared with concentrations downstream of all DOE outfalls for 2002. Locations S27, S33, S34, and LBCN1 are downstream of plant effluents. Locations S20, S21, and S28 are considered reference, or background sites, and can be compared with downstream data. S20 and S21, located at Bayou and Little Bayou creeks, respectively, are upstream of plant discharges, whereas S28 is located in a similar, off-site stream (Massac Creek) providing a regional reference site. S30, S1, S2, S31, S32, K006, K001, C616, C612, K010, and K012 (Figure 5.3) are below certain discharges of the plant, but not below all discharges.

In general the location with the highest readings for all radionuclides is the NSDD. Remediation activities are underway due to the potential health risk. Access to this area is limited.

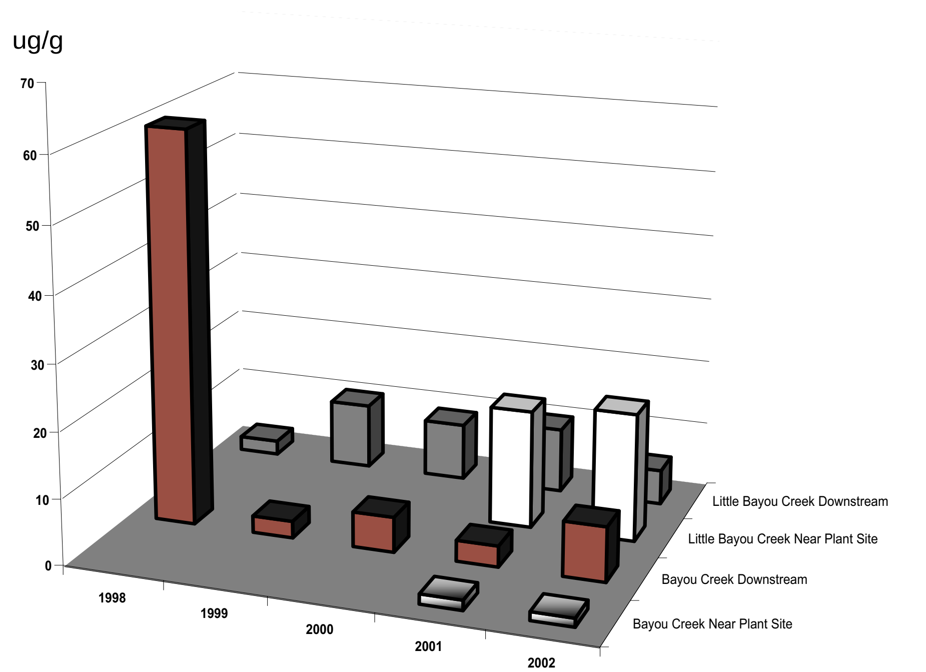
Uranium activity is elevated in Little Bayou Creek and Bayou Creek near the plant site and downstream. The levels are similar to those seen in 2001. ^{99}Tc levels are elevated on Bayou Creek near the plant site, and also downstream on Little Bayou Creek. The downstream location on Little Bayou Creek corresponds with the areas near the seep sites mentioned previously.

Figure 5.4 shows no significant change in uranium concentrations in sediment over the past five years; with the exception of the anomaly that was reported in 1998. New locations were added in 2001. No bars are present for the new locations for years 1998-2000. New locations sampled near plant

Table 5.4 Average[b] radiological parameter concentrations for sediment surveillance samples.

Parameter	Upstream Bayou[1]	Bayou Near Site[2]	Downstream Bayou[3]	Upstream Little Bayou[4]	Little Bayou Near Site[5]	Downstream Little Bayou[6]	C-746-K Area[7]	NSDD[8]	Massac Creek[9]
^{241}Am (pCi/g)	-0.0097	0.008	0.0076	-0.017	0.0071	0.029	0.006	0.76	-0.013
^{60}Co (pCi/g)	0.00350	-0.00087	0.0036	-0.0027	-0.0009	-0.00073	0.0044	0.00041	-0.0018
^{137}Cs (pCi/g)	0.0034	0.035	0.047	0.02	0.039	0.018	0.01	0.82	0.017
Alpha Activity (pCi/g)	1.7	9.7	4.1	3.6	12	8.5	2.1	94	2.4
Beta Activity (pCi/g)	1.8	20	4.8	2.9	17	20	2.3	120	2.3
^{237}Np (pCi/g)	-0.009	0.057	0.014	0.0024	0.016	0.039	0.01	0.85	-0.0063
^{40}K (pCi/g)	2.1	4.6	3.2	4.5	4	2	2.5	6.1	4.5
^{239}Pu (pCi/g)	0.00056	0.043	0.018	0.0034	0.0052	0.11	0.0013	2.9	0.00077
^{99}Tc (pCi/g)	0.16	7.9	1.5	0.17	0.38	17	0.26	52	0.31
^{230}Th (pCi/g)	0.12	.39	0.23	0.27	0.22	1.9	0.15	47	0.16
^{234}U (pCi/g)	a	3.2	0.65	a	0.83	0.73	a	6.4	a
^{235}U (pCi/g)	a	0.17	0.038	a	0.12	0.051	a	0.36	a
^{238}U (pCi/g)	a	4.9	1.1	a	9.3	2.3	a	10	a

NSDD – North-South Diversion Ditch
a = Quantities of total uranium were found to be quite small or not detected; individual isotopes of uranium were not analyzed.
b= The average within each group of locations.
The following footnotes correspond with column titles in the above table. These are grouping of sample locations in the area described in the title.
1 = S20
2 = S1, S31, K006, K001, C616, C612
3 = S33
4 = S21
5 = S30, S2, K010, K0126
6 = LBCN1, S27, S34
7 = C746KUP, C746KTB2
8 = S32
9 = S28



Note: Averages were calculated using only uranium data and analyzed by a radiochemical method.

Figure 5.4 Five year uranium concentration in sediment.

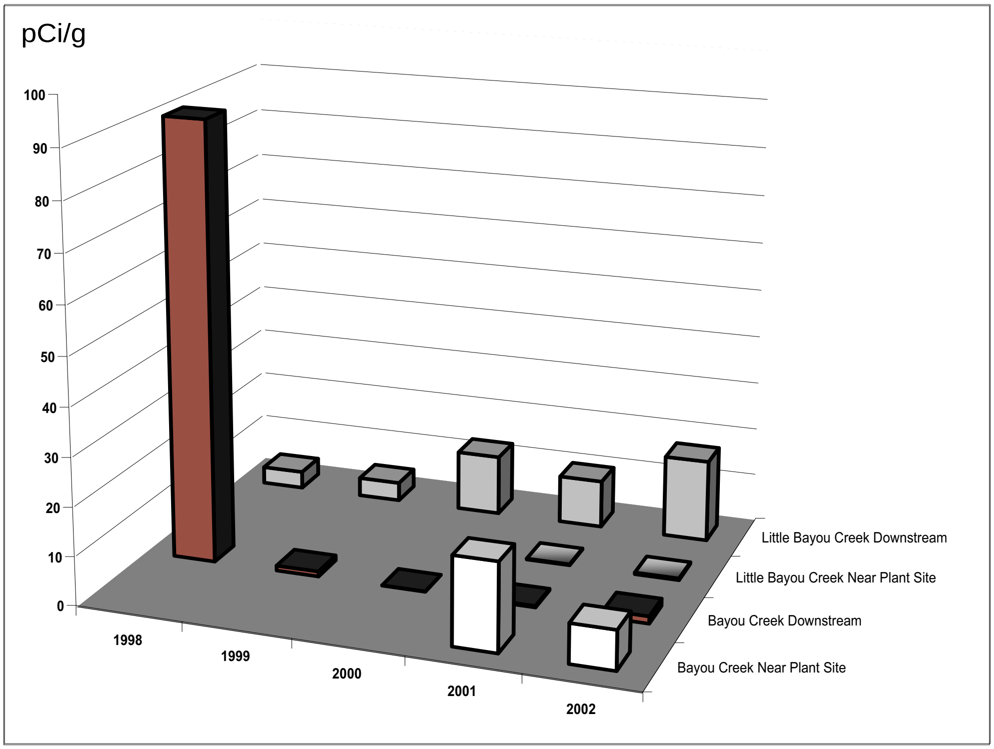


Figure 5.5 Five year technetium-99 concentration in sediment.

site on both Bayou and Little Bayou Creeks indicate higher amounts of uranium.

Figure 5.5 shows no significant change in ^{99}Tc concentrations in sediment over the past five years, with the possible exception downstream Little bayou Creek. In 1998, the increased result was reported as an anomaly and hasn't been detected at that level since then. These locations correspond with locations downstream of the seep locations as noted previously. New locations are also shown as previously noted, which do not contain bars for years 1998-2000. Other radionuclides, although present, are not significantly above background values. Additional sediment data are presented in Tables 2.35 through 2.54 of Section 2 of the *Environmental Monitoring Results.*

Terrestrial Wildlife

Annual Deer Harvest

In 2002, a total of five deer were harvested in the WKWMA as part of DOE's ongoing effort to monitor the effects of the Paducah Site on the ecology of the surrounding area. One deer obtained as background samples from the Stewart Island Habitat Restoration in Livingson County, Kentucky, was used for reference. Liver, muscle, and bone samples were analyzed for several radionuclides [^{137}Cs, ^{237}Np, ^{239}Pu, ^{99}Tc, ^{230}Th, ^{234}U, ^{235}U, ^{238}U, and Strontium-90 [^{90}Sr] (bone samples only)]. In addition, thyroid samples were analyzed for ^{99}Tc. Because the liver and muscle tissue are considered consumable by hunters, these tissues can be evaluated for radiological risks (dose) if analyses reveal detectable levels above background, or reference, deer. Bone and thyroid samples are used only as indicators of contamination.

In deer muscle, which is normally considered to be edible to humans, concentrations of ^{230}Th were detected at low levels in WKWMA deer. ^{234}Th was detected in WKWMA deer. In deer bone, ^{230}Th, ^{234}U, ^{235}U, and ^{238}U isotopes were found at or above detectable levels in WKWMA deer. In deer liver, ^{234}U was detected in WKWMA deer at a concentration of 0.25 pCi/g. No uranium was detected in background deer. Table 5.5 lists the radionuclides detected in deer tissue for 2002. Dose assessments indicate that deer are acceptable for consumption and levels are consistent with previous years' data.

The thyroid and bone are not considered edible portions of deer, but an indicator of the presence of target radionuclides. Specifically, ^{90}Sr accumulates in the bone and ^{99}Tc accumulates to some lesser degree in the thyroid. In 2002, all results were non-detect for ^{90}Sr in the bone and ^{99}Tc in the thyroid for both WKWMA deer and background deer.

Additional deer data are presented in Tables 2.62 through 2.69 of Section 2 of the *Environmental Monitoring Results Annual Site Environmental Report for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (BJC/PAD-543 Volume II). Chapter 6 discusses dose calculations associated with eating deer from WKWMA.

Table 5.5. Radiological parameters detected in deer tissue.

	Parameter	Deer 1	Deer 2	Deer 3	Deer 4	Deer 5	Deer (Background)
Rads* (pCi/g)	Thorium-230 (Bone)	0.11	ND	ND	0.12	ND	ND
	Thorium-230 (Liver)	ND	0.14	ND	ND	ND	ND
	Thorium-230 (Muscle)	0.11	ND	ND	ND	ND	ND
	Uranium-233/234 (Bone)	ND	ND	ND	0.18	ND	ND
	Uranium-234 (Bone)	ND	ND	ND	ND	3.4	ND
	Uranium-234 (Liver)	0.25	ND	ND	ND	ND	ND
	Uranium-235 (Bone)	ND	ND	ND	ND	0.16	ND
	Uranium-238 (Bone)	ND	ND	ND	ND	0.57	ND

ND - Non Detect
* - Other radionuclides were analyzed but not detected in any deer

Direct Radiation

A primary pathway of concern for DOE's operations at the Paducah Site is direct external radiation exposure. External radiation exposure is defined as exposure attributed to radioactive sources outside the body (e.g., cosmic gamma radiation). Sources of external radiation exposure from the Paducah Site include cylinder storage yards, the cascade system, and small sources such as instrument check locations. Cylinder storage yards have the largest potential for a dose to the public because of their proximity to the PGDP security fence.

The *Paducah Site Environmental Monitoring Plan* (BJC 2001) establishes DOE's program for monitoring external gamma radiation at areas accessible to members of the public. The External Radiation Exposure Monitoring Program has the following three objectives:

- to establish the potential radiation dose received by a member of the public from direct exposure to DOE operations at the boundary of the DOE perimeter fence,
- to establish the potential dose a member of the public may receive visiting or passing through accessible portions of the DOE reservation, and
- to calculate the radiation dose equivalent to the maximally exposed individual member of the public.

In 2002, monitoring consisted of quarterly placement, collection, and analysis of environmental thermoluminescent dosimeters (TLDs). TLD locations are shown in Figure 5.6. Monitoring results indicate that nine locations out of 46 were consistently above background levels (BJC 2003a). These locations were all at or near the PGDP security fence in the vicinity of UF_6 cylinder storage yards (Figure 5.6).

Annual dose rates for the background locations and the nine locations above background were calculated. The mean annual background exposure was determined to be 91 milliRoentgen (mR), based on the analysis of TLDs placed away from DOE property, see *Annual Report on External Gamma Radiation Monitoring for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky, (BJC/PAD-493)*. For each location, the mean background exposure was subtracted from the annualized total exposure to obtain a net annual exposure. The net annual exposure represents the total exposure at that location, for the entire calendar year 2002, attributed to the Paducah Site (Table 5.6). Exposure measured at these locations is assumed to result from DOE operations. Dose from direct radiation exposure is discussed in Section 6. Additional data are presented in Section 2 of the *Environmental Monitoring Results Annual Site Environmental Report for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky, (BJC/PAD-543 Volume II)*. Chapter 6 discusses dose calculations associated with direct radiation exposure.

Table 5.6 Net annual exposure from direct radiation attributed to the Paducah Site for 2002 (mR).

Location	TLD-1	TLD-2	TLD-3	TLD-47	TLD-48	TLD-50	TLD-51	TLD-52	TLD-53
total annual exposure	406	716	165	249	106	141	111	105	227
background[a]	91	91	91	91	91	91	91	91	91
net annual exposure	315	625	74	158	15	50	20	14	136

a based on the analysis of TLDs placed away from DOE property, see *Annual Report on External Gamma Radiation Monitoring for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky (BJC/PAD-493).*

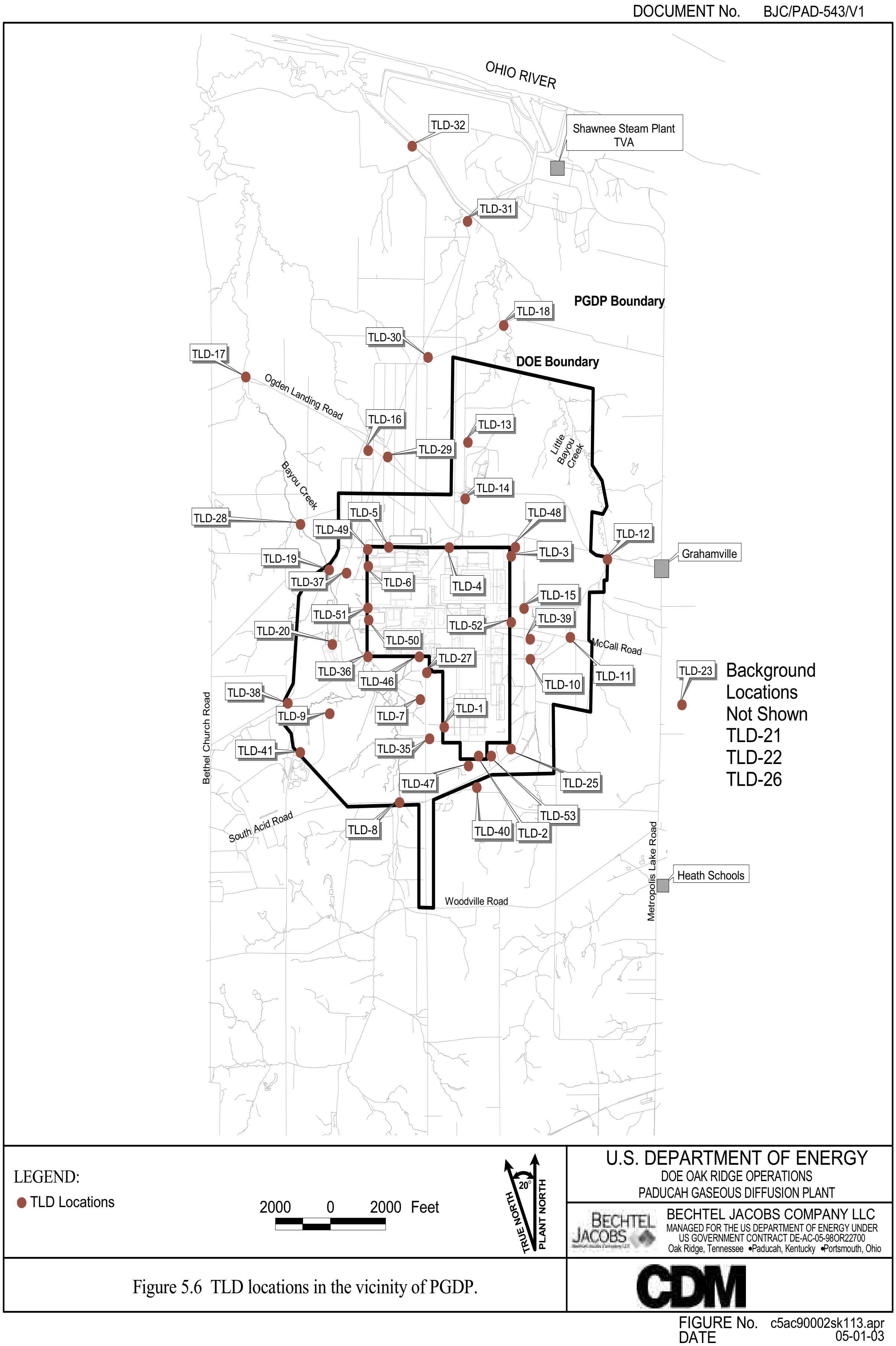


Figure 5.6 TLD locations in the vicinity of PGDP.

6 Dose

Abstract

For 2002, exposure pathways potentially contributing to dose were determined to include ingestion of surface water, ingestion of sediments, ingestion of deer meat, direct radiation, and atmospheric releases. The highest estimated dose a maximally exposed individual might have received from all combined DOE exposure pathways (worst-case scenario) was 4.47 mrem. This dose is less than 5% of the applicable federal standard of 100 mrem/year.

Introduction

This section presents the calculated doses to individuals and the surrounding population from atmospheric and liquid releases from the Paducah Site, as well as direct radiation (sections 4 and 5). In addition, potential doses from special case exposure scenarios, such as deer meat consumption, were calculated based upon deer sample analyses. Doses from naturally occurring sources are discussed in Appendix A.

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, limits the dose to members of the public to less than 100 mrem/year total effective dose equivalent from all pathways resulting from operation of a DOE facility. Information on the demography and land use of the area surrounding the plant and identification of on-site sources have indicated radionuclides and exposure pathways of concern.

For the Phase I Remedial Action Site Investigation, a preliminary assessment of risk to the health of the public from contaminants at the Paducah Site was conducted. This study identified the following four primary pathways that each could contribute greater than 1% to the total off-site dose: (1) groundwater ingestion, (2) sediment ingestion, (3) wildlife ingestion, and (4) exposure to direct radiation. Since that preliminary assessment, groundwater wells that supplied drinking water in the downgradient direction from the PGDP have been sealed to prevent use, resulting in a loss of that pathway. Surface water is now considered to be the primary pathway for water ingestion. In addition, the Northwest Plume Groundwater System began operation in 1995, resulting in an airborne pathway now included in the dose calculations. In 2002, the Scrap Yards Removal Project also added to the airborne dose. Furthermore, in 1999, a drinking water pathway was added for consumption of surface water at the nearest public drinking water source (Ohio River at Cairo, Illinois).

To fully assess the potential dose to the public, a hypothetical group of extreme characteristics was used to postulate an upper limit to the dose of any real group. This is referred to as the worst-case scenario. Actual dose received is likely to be considerably less than the dose calculated for the worst-case scenario.

Terminology and Internal Dose Factors

Most consequences associated with radionuclides released to the environment are caused by interactions between human tissue and various types of radiation emitted by the radionuclides. These interactions involve the transfer of energy from radiation to tissue, possibly resulting in tissue damage. Radiation may come from radionuclides outside the body or from radionuclides deposited inside the body (by inhalation, ingestion, and, in a few cases, absorption through the skin). Exposures to radiation from radionuclides outside the body are called external exposures; exposures to radiation from radionuclides inside the body are called internal exposures. This distinction is important because external exposure occurs only as long as a person is near the external radionuclide; simply leaving the area of the source will stop the exposure. Internal exposure continues as long as the radionuclide remains inside the body.

A number of specialized terms or quantities have been defined for characterizing exposures to radiation as defined in Appendix A. Because the damage associated with such exposures results primarily from the deposition of radiant energy in tissue, the units are defined in terms of the amount of incident radiant energy absorbed by tissue and of the biological consequences of that absorbed energy. These terms or quantities include the following:

- *Committed effective dose equivalent (CEDE)* — the total internal dose (measured in mrem) received over a 50-year period resulting from the intake of radionuclides in a one-year period. The CEDE is the product of the annual intake (pCi) and the dose conversion factor for each radionuclide (mrem/pCi).

- *Effective dose equivalent* — includes the CEDE from internal deposition of radionuclides and the dose from penetrating radiation from sources external to the body. This is a risk-equivalent value and can be used to estimate the health-effects risk to the exposed individual.

- *Total effective dose equivalent* — includes the sum of the effective dose equivalent (for external exposures) and the CEDE (for internal exposures). For purposes of compliance, dose equivalent to the whole body may be used as the effective dose equivalent for external exposures.

Internal dose factors for several radionuclides of interest at the Paducah Site are included in Appendix A.

Direct Radiation

In 2002, DOE conducted continuous monitoring for direct external radiation exposure (Section 5). Access to PGDP is limited due to the increased security boundary implemented in September 2001. The monitoring results indicate that, due to limited access of the public to radioactive source areas, the dose to the maximally exposed individual member of the public (i.e., the neighbor living closest to the PGDP security fence) from DOE operations did not vary statistically from background (i.e., essentially zero) (BJC 2003a).

For purposes of this ASER, an additional potential receptor was considered. In a conservative exposure scenario, this receptor is assumed to be exposed to the location at TLD-14 for 8.3 hours for the year. The 8.3 hours per year assumption is based on an individual driving past this location twice per day at 1 minute per trip, five days per week, 50 weeks per year. It is likely that actual exposure at this location is probably much less than assumed since any shielding from the receptor's vehicle is not considered. TLD-14 represents the closest location that would be accessible to the public in 2002, which is near Harmony Cemetery located north of the plant security fence and south of Ogden Landing Road (Figure 5.6). This location resulted in external radiation exposures below background. Based on results from this location and other data obtained from all locations, the dose to the maximally exposed individual member of the public from DOE operations was zero.

Surface Water

The most common surface-water pathway for exposure is through drinking water containing radionuclides. Surface-water pathway dose was calculated for an individual assumed to consume water from the public drinking water supply at Cairo, Illinois. Cairo is the closest drinking water system that uses water downstream of PGDP effluents. The average concentrations of radionuclides that were detected in Cairo were used to calculate the exposure resulting from consumption of surface water. The radionuclide that was detected in Cairo was ^{99}Tc. ^{99}Tc was only detected in one out of four sampling events. During the sampling event, ^{99}Tc was also detected in the background location in Massac Creek. The maximally exposed receptor was assumed to consume all of their daily required water, 8 glasses each containing 8 ounces (a total of approximately 2 L), 365 days a year from the public drinking water supply. The maximum dose to an individual, without subtracting the background dose, was determined to be 0.032 mrem in 2002. The background dose, taken at Massac Creek, was determined to be 0.0049 mrem in 2002. Therefore, the resulting net exposure to the maximally exposed receptor from the Paducah Site was 0.027 mrem.

Contaminated Sediment

Exposure to contaminated sediment in Bayou and Little Bayou creeks could occur during fishing, hunting, or other recreational activities. Exposure is possible through incidental ingestion of contaminated sediment. The worst-case ingestion assumption is that an individual would splash around in one of the creeks every other day during the hunting season and ingest a small amount of sediment each visit (50 mg/day). A dose is then calculated based on the radionuclide concentrations and amount of exposure via ingestion. Massac Creek samples are assumed to be background and are subtracted from downstream sample results to arrive at a dose associated with site releases. The downstream location with the maximum dose is assumed to represent the dose received from this pathway by the maximally exposed individual.

Doses are calculated for ingestion of sediments for both Bayou and Little Bayou creeks. The worst-case dose was calculated to be at S32, the north-south diversion ditch (Figure 5.3). The estimated worst-case dose above background from sediment ingestion was 0.24 mrem in 2002. Sediment sample locations are shown in Figure 5.4. Dose results are provided at the end of this section in Table 6.1.

Ingestion of Deer

The effect of an intake of a radionuclide by ingestion depends on the concentration of the radionuclide in food and drinking water and on the individual's consumption patterns. The estimated intake of a radionuclide is multiplied by the appropriate ingestion dose factor to provide the estimate of CEDE resulting from the intake.

Terrestrial wildlife, such as deer, can come into contact with contaminated soil, ingest plants that have taken up contaminants, or ingest contaminated water. Hunting is permitted in the WKWMA surrounding the Paducah Site, and the limit for deer harvest is two deer per person per season. Approximately 100 deer are harvested per year from WKWMA. The Paducah Site dose calculations assume that an individual kills two average-weight deer and consumes the edible portions of those deer during the year (approximately 100 pounds of meat and five pounds of liver). The dose is calculated for each deer sampled.

In 2002, five deer from the Paducah Site were sampled along with one reference deer. As a worst-case scenario for site dose contribution, it is assumed that a person kills and eats the two deer with the two highest dose estimates. The worst-case dose was calculated to be 7.4 mrem, which is 4.2 mrem above the dose from the background deer (Hampshire 2002). Therefore, 4.2 mrem is used in the worst case scenario calculations. The detection limits heavily influenced the statistics for the dose calculations again for calendar year 2002. Calculations were affected in 2001 due to lower detection limits in background deer than site deer.

Airborne Radionuclides

DOE's radionuclide airborne point-sources that contributed to the public dose in 2002 included two sources. These sources were the Northwest Plume Groundwater System and the Scrap Yards Removal Project. The two point sources are discussed in Section 4. These point-sources were reviewed or monitored to determine the extent to which the general public could be exposed and to demonstrate compliance with EPA regulations that are based on International Commission on Radiological Protection (ICRP) publications (ICRP 1980).

The 50-year CEDE (internal) from DOE air sources to the maximally exposed individual, who under most circumstances is the person living closest to the plant in the predominant wind direction, is calculated each year. EPA-supplied CAP-88 software was used to calculate the off-site dose from PGDP air emissions. CAP-88 provides a framework for developing dose and risk assessments for the purpose of demonstrating compliance with 40 CFR 61.93(a). CAP-88 assesses both collective populations and maximally-exposed individuals. The dose from the two projects to the maximally exposed individual from radioactive emissions was calculated to be 0.0032 mrem from the Northwest Plume Groundwater System and 0.00048 mrem from the Scrap Yard Removal Project. If an individual were to receive the maximum dose from each of these sources, it would add up to approximately 0.0037 mrem which is well below the 10 mrem limit of 40 CFR Part 61, Subpart H. The maximally exposed individual for both of the projects would be located 2350 m (7710 ft) north of the plant.

Conclusions

Table 6.2 provides a summary of the dose for 2002 from the Paducah Site that could be received by a member of the public assuming worst-case exposure from all major pathways. The largest contributor to the calculated dose is from ingestion of deer meat. The groundwater pathway from DOE sources is assumed to contribute no dose to the population because all residents have been supplied with public water by DOE. The worst-case combined (internal and external) dose to an individual member of the public was calculated at 4.47 mrem. This level is well below the DOE annual dose limit of 100 mrem/year to members of the public and below the EPA limit of 10 mrem airborne dose to the public.

Estimates of radiation doses presented in this report were calculated using the dose factors provided by DOE and EPA guidance documents. These dose factors are based on ICRP Publication 30 (ICRP 1980). Figure 6.1 shows the potential (worst-case) annual dose as calculated for the past five years.

Table 6.1 Annual dose estimates for 2002 incidental ingestion of sediment from Bayou Creek and Little Bayou Creek.

Location	Committed Effective Dose Equivalent (mrem)							Total (mrem)
	^{237}Np	$^{239/240}$Pu	^{99}Tc	^{230}Th	^{234}U	^{235}U	^{238}U	
S1	1.2E-03	3.1E-04	4.8E-05	7.9E-04	---	---	---	2.4E-03
S2	1.8E-04	1.1E-04	2.1E-06	5.3E-04	1.8E-03	2.3E-04	1.8E-02	2.0E-02
S20	---	1.3E-05	1.1E-06	3.5E-04	---	---	---	3.6E-04
S21	4.9E-05	7.8E-05	1.2E-06	7.6E-04	---	---	---	8.8E-04
S27	3.7E-04	3.4E-03	1.5E-05	8.2E-03	7.0E-04	4.8E-05	2.1E-03	1.5E-02
S28 (background)	---	1.8E-05	2.1E-04	4.4E-04	---	---	---	**6.7E-04**
S30	9.6E-05	5.2E-05	1.6E-06	7.6E-04	8.6E-04	1.9E-04	1.5E-02	1.6E-02
S31	2.1E-04	2.2E-04	4.6E-06	6.6E-04	7.2E-04	3.3E-05	5.6E-04	2.4E-03
S32 (maximum)	1.8E-02	6.6E-02	3.6E-04	1.3E-01	8.8E-03	4.8E-04	1.2E-02	**2.4E-01**
S33	2.9E-04	4.0E-04	1.0E-05	6.5E-04	8.9E-04	5.1E-05	1.3E-03	3.6E-03
S34	4.7E-04	1.6E-03	1.4E-05	3.2E-03	8.0E-04	5.6E-05	2.3E-03	8.4E-03
C612	6.3E-04	7.6E-04	2.5E-05	1.1E-03	2.8E-03	1.5E-04	4.8E-03	1.0E-02
C616	4.5E-03	4.1E-03	2.1E-04	2.8E-03	1.0E-02	5.4E-04	1.3E-02	3.6E-02
C746KTB2	4.4E-04	2.4E-05	2.1E-06	5.1E-04	---	---	---	9.7E-04
C746KUP	---	3.3E-05	1.4E-06	3.2E-04	---	---	---	3.6E-04
K001	4.7E-04	4.1E-04	4.1E-05	7.8E-04	1.8E-03	9.3E-05	2.5E-03	6.0E-03
K006	4.3E-05	7.1E-05	1.0E-06	4.3E-04	---	---	---	5.4E-04
K010	1.3E-04	6.4E-05	4.7E-06	5.8E-04	1.3E-03	7.9E-05	2.9E-03	5.1E-03
K012	1.0E-03	2.5E-04	2.4E-06	6.9E-04	3.9E-04	2.3E-05	7.7E-04	3.1E-03
LBCN1	1.6E-03	2.4E-03	3.2E-04	4.3E-03	1.7E-03	1.1E-04	4.5E-03	1.5E-02
Net exposure from Paducah Site to maximally exposed individual (S32-S28) =								**2.4E-01**

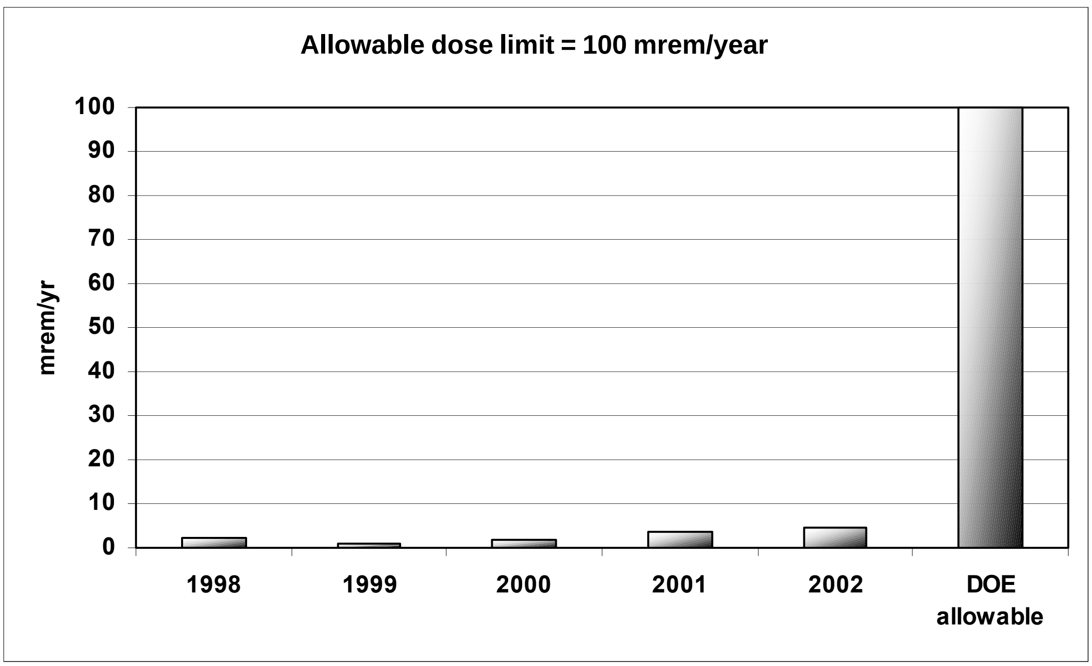


Figure 6.1 Potential radiological dose from DOE activities at the Paducah Site, 1998 through 2002.

Table 6.2 Summary of potential radiological dose from the Paducah Site for 2002. (worst-case combined exposure pathways)

	Dose[a] (mrem/year)	Percent of total
Ingestion of surface water	0.027	0.6
Ingestion of sediments	0.24	5.4
Ingestion of deer meat	4.2	94.0
Direct radiation	0	0
Atmospheric releases[1]	0.0043	0
Total annual dose above background (all pathways)	**4.47**	**100**

[a] = Maximum allowable exposure is 100 mrem/year (DOE Order 5400.5).
[1]DOE source emissions were from the Northwest Plume and Scrap Yards Removal

7 Nonradiological Effluent Monitoring

Abstract

In 2002, there was one KPDES outfall at the Paducah Site that experienced exceedences for toxicity. Outfall 001 exceeded reportable KPDES effluent discharge permit limits for chronic toxicity. No NOVs were issued in 2002 for exceedences.

In 2002, DOE had two point sources and several fugitive sources for nonradiological air emissions. The combined emissions from these DOE sources were small; therefore, the Paducah Site is considered a minor source in accordance with the CAA.

Introduction

Responsibility for nearly all nonradioactive airborne emission sources at the PGDP was turned over to USEC as a result of the 1993 lease agreement between USEC and DOE. Only a few fugitive sources such as gravel roads, spoil piles (resulting from construction excavation), metal scrap pile windage, and two point sources remained the responsibility of DOE in 2002. The small amount of emissions from DOE sources results in CAA classification of the Paducah Site as a minor air emissions source.

Monitoring of nonradiological parameters in liquid effluents is summarized in the *Paducah Site Environmental Monitoring Plan* (BJC 2001) and is based on KPDES Permit KY0004049, and KDWM landfill permits 073-00014, 073-00015, and 073-00045. Effluents are monitored for nonradiological parameters listed on the permit governing the discharge.

Airborne Effluents

Airborne Effluent Applicable Regulations

The CAA at the Paducah Site is administered by KDAQ. DOE has responsibility only for air emission sources under DOE program control; therefore, this report does not address emissions from the PGDP sources leased to USEC.

Airborne Effluent Monitoring Program

The point sources of air emissions other than radionuclides (Section 4) for the Paducah Site in 2002 were the Northwest Plume Groundwater System and the Northeast Plume Containment System. These systems combined removed 3559 pounds (1.8 tons) of TCE, which is a volatile organic compound and HAP, from 177,627,000 gallons of groundwater. These facilities remove TCE contamination from the groundwater by air stripping. At the Northwest Plume Groundwater System, TCE-laden air passes through carbon filtration removing TCE. The air stream is then released to the atmosphere where any remaining TCE naturally breaks down. The Northeast Plume Groundwater System uses the existing C-637-2A Cooling Tower at PGDP for stipping of TCE.

The CAA defines VOC emissions as criteria pollutants. A minor source is limited to 100 tons per year of each criteria pollutant. If greater quantities of criteria pollutants are emitted, then the source is classified as a major source. A minor source has less stringent permit requirements because of the reduced potential for health effects from the smaller amount of emissions.

The CAA also limits the emissions from a minor source of HAPs to 10 tons/year for each individual pollutant and 25 tons/year for all HAPs combined. TCE is a HAP.

Liquid Effluents

Liquid Effluent Applicable Regulations

The CWA for the Paducah site is administered by KDOW through the KPDES Wastewater Discharge Permitting Program. The sitewide KPDES permit (KY0004049) became effective April 1, 1998, and expired March 31, 2003. A renewal permit application has been submitted to KDOW. This permit contains discharge limits based on water quality criteria for a zero-flow receiving stream.

KDWM specifies in landfill permits 073-00014, 073-00015, and 073-00045 that surface runoff be analyzed to ensure that landfill constituents are not discharging into nearby receiving streams.

Liquid Effluent Monitoring Program

DOE conducts nonradiological effluent monitoring for outfalls under its jurisdiction (Section 4, Figure 4.2). Outfalls 001, 015, 017, and 019 were monitored for KPDES permit parameters. The specific sample collection, preservation, and analytical methods acceptable for the types of pollutants analyzed are listed in 40 CFR 136. Preservation in the field is conducted per 40 CFR 136, and chain-of-custody procedures are followed after collection and during transport to the analytical laboratory. The samples are then accepted by the laboratory and analyzed per 40 CFR 136 procedures for the parameters required by the KPDES permit. The KPDES permit also intermittently requires additional sampling (two events in five years) for priority pollutants at the DOE outfalls. This sampling was conducted in 2002, which adds a larger list of analyses to the data set.

Surface runoff from the closed C-746-S Residential Landfill, the closed C-746-T Inert Landfill, and the operating C-746-U Landfill was monitored quarterly. Grab samples were monitored for chemical oxygen demand, chloride, conductivity, dissolved oxygen, dissolved solids, flow rate, iron, pH, sodium, sulfate, suspended solids, temperature, total organic carbon, and total solids. The samples taken include landfill runoff, the receiving ditch upstream of the runoff discharge point, and the receiving ditch downstream of the runoff discharge point (Section 4, Figure 4.2). Sampling was performed to comply with KDWM requirements for operation of the contained landfill.

Liquid Effluent Monitoring Results

Analytical results are reported to KDOW in monthly and quarterly discharge monitoring reports. Three exceedences of permit limits were reported in 2002 for DOE Outfall 001 (Table 7.1 and Section 2). Table 7.2 summarizes the maximum detected nonradiological analyses for samples collected as part of the required KPDES permit sampling. During 2002, the priority pollutant monitoring results were also reported to KDOW. Table 7.3 summarizes the nonradiological detected analyses for this event. None of these detects resulted in KPDES permit violations.

Data for the KPDES samples and the surface runoff samples from the landfills are presented in Section 3 of the *Environmental Monitoring Results Annual Site Environmental Report for Calendar Year 2002*, *Paducah Gaseous Diffusion Plant, Paducah, Kentucky, (BJC/PAD-543 Volume II).*

Table 7.1 KPDES permit exceedence summary for 2002.

Noncompliance Parameter	Species	Month Sampled	Result	KPDES Limit
Chronic Toxicity	Fathead Minnows	October	1.008 TUc	1.0 TUc
Chronic Toxicity	*Ceriodaphnia Dubia*	November	2.7 TUc	1.0 TUc
Chronic Toxicity	Fathead Minnows	December	7.1 TUc	1.0 TUc

Table 7.2 KPDES permit sampling nonradiological maximum detected analyses.

Parameter	K001	K015	K017	K019
Chlorine, Total Residual (mg/L)	0.12	0.03	NR	NR
Hardness - Total as CaCO3 (mg/L)	400	210	150	73
Iron (mg/L)	0.95	2.1	1.2	1.4
Phosphorous (mg/L)	0.57	NR	NR	NR
Suspended Solids (mg/L)	NR	NR	NR	29
Zinc, Total (mg/L)	0.1	0.1	0.31	ND
Zinc, Dissolved (mg/L)	ND	ND	0.26	ND

ND - Non Detect

NR - Not Required

Table 7.3 KPDES Priority Pollutant sampling nonradiological detected analyses.

Parameter	K001[1]	K015	K017	K019
Aluminum (mg/L)	0.45	1	0.82	1
Barium (mg/L)	0.031	0.059	0.061	0.037
Chloride (mg/L)	97	6.6	3.3	7.4
Fecal Coliform (col/100ml)	20	130	61	ND
Fluoride (mg/L)	0.54	0.45	0.35	0.15
Iron (mg/L)	0.44	1.2	0.76	0.2
Magnesium (mg/L)	26	7.3	5.2	3.4
Manganese (mg/L)	0.052	0.21	0.062	ND
Nitrate/Nitrite as Nitrogen (mg/L)	4.4	0.04	0.62	0.03
Phosphorous (mg/L)	0.2	0.12	0.09	ND
Sulfate (mg/L)	410	46	28	11
Total Organic Nitrogen (mg/L)	7.6	9.6	5.3	1.8
Total Organic Carbon (mg/L)	1.1	0.64	ND	1.2

ND - Non Detect

1 - Duplicate sample collected at Outfall 001

8 Nonradiological Environmental Surveillance

Abstract

The nonradiological environmental surveillance program at the Paducah Site assesses the effects of DOE operations on the site and the surrounding environment. Surveillance includes analyses of air, surface water, groundwater (Section 9), sediment, soil, vegetation, terrestrial wildlife, and fish and other aquatic life. Surveillance results for 2002 were similar to results reported in previous ASERs.

Introduction

Nonradiological surveillance at the Paducah Site involves sampling and analysis of surface water, groundwater (see Section 9 for groundwater surveillance results), sediment, soil, terrestrial wildlife, and fish and other aquatic life. This section discusses the results of surveillance activities.

Ambient Air

As a result of the transfer of the production part of the plant to USEC in 1993, major air emission sources were transferred to USEC. Therefore, the DOE activities at the Paducah Site is not required to conduct ambient air monitoring for nonradiological parameters.

Surface Water

Surface-water monitoring downstream of KPDES outfalls is not required by the KPDES permit. However, it is performed at the Paducah Site as part of the Environmental Surveillance Program. Nonradiological sampling is conducted at upstream Bayou Creek (L1), downstream Bayou Creek (L5 and L6), downstream Little Bayou Creek (L12, L11, L241, and LBCN1), the convergence of both creeks (L8), upstream Ohio River (L29), downstream Ohio River (L30), downstream in the Ohio River at the confluence with the Mississippi River (L306), and background stream Massac Creek (L64). Locations were also collected near the plant on the Bayou Creek (C612, C616, K004, K006, K008, K009, K016, and L291) and Little Bayou Creek (K002, K010, K011, K012, K013, L10, L55, L56, and L194). Samples were also collected near the C-746-K Landfill (C746KUP, C746KTB1, C746KTB2, and C-746K-5). No sample point exists for upstream Little Bayou Creek, as the watershed is insufficient to develop adequate flow to monitor. Nearly all water in Little Bayou Creek is comprised of discharges from the plant outfalls. Therefore, background water quality for Little Bayou Creek is based on L1 (upstream Bayou Creek). L29 and L64 are background waterways also used for comparison with data from Little Bayou Creek. Figure 5.2 shows surveillance surface-water sampling locations. Table 8.1 shows the analytical parameters that are analyzed on a quarterly basis or semiannual basis.

Beginning in 2002, seep locations, as described in Chapter 5, identified in Little Bayou Creek were sampled.

Surface Water Surveillance Results

Table 8.2 shows a water chemistry comparison between upstream and downstream locations associated with the plant. The only results of significance compared to background data were TCE results identified near the plant site and downstream of Little Bayou Creek at an average concentration of 57.5 and 12.2 µg/L, respectively. Also included is the Little Bayou Creek seep data with the highest average 145 µg/L.

Although detected at very low levels, PCB aroclors were detected in 2002 near the plant site on both Bayou and Little Bayou Creeks. There were no detections of PCB in surface water in 2001.

Additional data are presented in Section 4 of the *Environmental Monitoring Results Annual Site Environmental Report for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (BJC/PAD-543 Volume II).

Table 8.1 Nonradiological parameters for surface-water samples.

Parameter
Chloride
Sulfate
Conductivity
Dissolved Oxygen
Flow Rate
pH
Temperature
Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Copper
Iron
Lead
Manganese
Mercury
Molybdenum
Nickel
Phosphorous
Selenium
Silver
Strontium
Thallium
Uranium
Vanadium
Zinc
Herbicides
Pesticides
PCB-1016
PCB-1221
PCB-1232
PCB-1242
PCB-1248
PCB-1254
PCB-1260
PCB-1268
Polychlorinated biphenyl
2-Propanol
Acetone
Trichloroethene
Ammonia as Nitrogen
Biochemical Oxygen Demand
CBOD
Cyanide
Hardness - Total as CaCO3
Nitrate/Nitrite as Nitrogen
Suspended Solids
Turbidity

Table 8.2 Selected routine nonradiological surface water surveillance results (average concentrations)

Parameter	Upstream Bayou[1]	Bayou Near Site[2]	Down-stream Bayou[3]	Little Bayou Near Site[4]	Down-stream Little Bayou[5]	Little Bayou Creek Seep Sites[6]	Creek Convergence[7]	C-746-K Landfill[8]	Upstream Ohio River[9]	Down-stream Ohio River[10]	Massac Creek[11]
Aluminum (mg/L)	0.319	0.458	0.244	0.863	0.806	1.75	0.54	2.07	1.79	1.38	0.311
Ammonia (mg/L)	ND	1.16	0.27	0.95	0.57	0.315	ND	ND	ND	ND	ND
Barium (mg/L)	ND	ND	0.047	0.132	0.0815	ND	0.065	ND	ND	ND	0.049
Chloride (mg/L)	20.6	50.2	49.1	81.1	29.5	36.2	ND	9.8	9.47	9.1	ND
Cadmium (mg/L)	ND	ND	ND	ND	ND	0.022	ND	0.025	ND	ND	ND
Copper (mg/L)	ND	ND	ND	ND	ND	0.317	ND	ND	ND	ND	ND
Hardness - Total as CaCO3 (mg/L)	61.5	121	156	118	69.6	96.5	ND	57.1	120	91	ND
Iron (mg/L)	0.337	0.49	0.329	0.79	0.966	1.24	0.936	1.93	1.11	1.17	0.928
Manganese (mg/L)	ND	ND	0.091	0.102	0.285	ND	0.397	ND	ND	ND	0.265
Phosphorous (mg/L)	0.0733	0.354	0.125	0.189	0.174	0.0964	ND	0.211	0.165	0.165	ND
Nitrate/Nitrite as Nitrogen (mg/L)	0.522	24.7	1.85	29	0.432	2.64	ND	0.566	0.647	0.685	ND
pH (std. units)	7.37	7.33	7.35	7.32	7.08	6.15	6.95	7.27	7.6	7.6	6.5
Strontium (mg/L)	ND	ND	0.264	0.699	0.245	ND	0.218	ND	ND	ND	0.0917
Sulfate (mg/L)	21.9	94.3	164	49.1	37.4	12.6	ND	25	23	22.7	ND
Suspended Solids (mg/L)	ND	19.4	ND	24.4	43	80.5	ND	321	37	40.5	ND
Trichloroethene (µg/L)	1.5	1.75	ND	57.7	12.2	145	2	ND	ND	ND	ND
Vanadium (mg/L)	ND	ND	0.031	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260 (µg/L)	ND	0.351	ND	0.344	ND	ND	ND	ND	ND	ND	ND
PCB-1268 (µg/L)	ND	ND	ND	ND	ND	ND	ND	0.173	ND	ND	ND

Note: The result presented in the table is the maximum average value for the locations within the area grouping. ND – Not Dete

The following footnotes correspond with column titles in the above table. These are grouping of sample locations in the area described in the title.

1 = L1
2 = C612, C616, K004, K006, K008, K009, K016, L291
3 = L5, L6
4 = K002, K010, K011, K012, K013, L10, L55, L56, L194
5 = L11, L12, L241, LBCN1
6 = L8
7 = LBCSP1, LBCSP2, LBCSP3, LBCSP4, LBCSP5, LBCSP6
8 = C746KUP, C746KTB1, C746KTB2, C746K-5
9 = L29
10 = L30
11 = L64
12 = L306

Sediment

Sediment is an important constituent of the aquatic environment. If a pollutant is a suspended solid or is attached to suspended sediment, it can either settle to the bottom (thus creating the need for sediment sampling), be taken up by certain organisms, or become attached to plant surfaces. Pollutants transported by water can either adsorb on organic and inorganic solids or be assimilated by plants and animals. Suspended solids, dead biota, and excreta settle to the bottom and become part of the organic substrata that support the bottom-dwelling community of organisms. Sediments play a significant role in aquatic ecology by serving as a repository for radioactive or chemical substances that pass via bottom-feeding biota to the higher trophic levels.

Sediment Surveillance Program

Ditch sediments are sampled semiannually as part of a nonradiological environmental surveillance program. Sediment samples were taken from twenty locations in 2002 (Figure 5.3). Sediments were sampled for the parameters listed in Table 8.3.

Table 8.3 Semiannual nonradiological parameters for sediment samples.

Parameter
Moisture
Percent Moisture
Total Organic Carbon
Grain Size Analysis
Metals
Semivolatiles
Pesticides
Herbicides
PCB

Sediment Surveillance Results

Table 8.4 shows an average value of detections for locations within the area group for specific parameters. Parameters selected to include are those that whose differences between upstream (or background) and downstream and have potential impacts on the receiving streams. Barium, beryllium, chromium, and nickel showed the most variation between sites for metals. Chromium was identified in the NSDD at 48.1 mg/kg and near the plant site on Little Bayou Creek at 51.2 mg/kg. Arsenic was found near the C-746-K Landfill and in Little Bayou Creek and Bayou Creek near the plant site. Zinc was found at all locations; however the highest was found in the NSDD.

A pesticide, 2,4-Dichlorodiphenyl-dichloroethylene, was found in Little Bayou Creek and the NSDD. PCBs were found in the NSDD, Little Bayou Creek near the plant site and downstream, and in Bayou Creek. This year they were also found in the C-746-K Landfill area. PCB-1254 and PCB-1260 were the most abundant aroclors.

Table 8.5 shows selected data for semivolatiles collected in sediment locations. An average value of detections for locations within the area group is presented.

Additional sediment data are presented in Tables 4.40 through 4.60 of Section 4 of the *Environmental Monitoring Results Annual Site Environmental Report for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (BJC/PAD-543 Volume II).

Table 8.4 Selected routine nonradiological sediment surveillance results (average concentrations).

Parameter (mg/kg)	Upstream Bayou[1]	Bayou Near Site[2]	Down-stream Bayou[3]	Upstream Little Bayou [4]	Little Bayou Near Site[5]	Down-stream Little Bayou[6]	C-746-K Landfill[7]	NS Ditch[8]	Massac Creek[9]
Arsenic (mg/kg)	ND	6.14	ND	ND	6.89	ND	ND	ND	ND
Barium (mg/kg)	30.8	43.8	33.3	68.4	54.4	24.5	37.7	50.2	40
Beryllium (mg/kg)	0.592	0.603	ND	0.547	0.57	ND	0.59	ND	ND
Chromium (mg/kg)	7.15	17	9.12	12.1	51.2	36.5	11	48.1	5.34
Nickel (mg/kg)	ND	8.65	ND	6.25	5.58	6.08	5.96	23.5	ND
Potassium (mg/kg)	ND	347	288	295	289	258	339	452	270
Vanadium (mg/kg)	13.5	16	12.2	23	18.7	9.65	16.7	15.6	11.2
Zinc (mg/kg)	12.8	27.9	21.1	26.7	55.2	25.2	24.4	84.8	16.9
2,4-DDE (µg/kg)	ND	ND	ND	ND	13.5	ND	ND	54	ND
PCB-1254 (µg/kg)	ND	115	ND	ND	568	160	100	555	ND
PCB-1260 (µg/kg)	ND	ND	ND	ND	240	ND	ND	370	ND

Note: The result presented in the table is the average value for the locations within the area grouping.
ND – Not Detected
NS Ditch – North-South Diversion Ditch
The following footnotes correspond with column titles in the above table. These are grouping of sample locations in the area described in the title.

1 = S20
2 = C612, C616, S1, S31, K001, K006
3 = S33
4 = S1
5 = S30, S2, K010, K012
6 = LBCN1, S27, S34
7 = C746KUP, C746KTB2
8 = S32
9 = S28

Table 8.5 Selected semivolatile sediment surveillance results (average concentrations)

Parameter (mg/kg)	Upstream Bayou[1]	Bayou Near Site[2]	Down-stream Bayou[3]	Upstream Little Bayou [4]	Little Bayou Near Site[5]	Down-stream Little Bayou[6]	C-746-K Landfill[7]	NS Ditch[8]	Massac Creek[9]
2-Methylnaphthalene	ND	65	ND	ND	ND	30	ND	30	ND
Acenaphthene	ND	300	ND	ND	30.5	170	ND	22	ND
Anthracene	ND	142	ND	ND	39	116	ND	55	ND
Benz(a)anthracene	38.5	249	26	ND	133	231	53	360	ND
Benzo(a)pyrene	42.5	250	24	ND	124	204	64.3	320	ND
Benzo(b)fluoranthene	67	324	52.5	ND	193	304	113	231	ND
Benzo(e)pyrene	29	175	23	ND	91.2	145	53.7	260	ND
Benzo(ghi)perylene	ND	170	ND	ND	61.8	76	20.3	130	ND
Benzo(k)fluoranthene	37.5	204	18	ND	111	209	60	340	ND
Chrysene	49.5	283	30	ND	133	240	74.7	320	ND
Chrysene C1	ND	257	ND	ND	78	134	35	240	ND
Di-n-butyl phthalate	ND	753	665	685	811	912	2700	ND	920
Dibenz(a,h)anthracene	ND	56	ND	ND	32	74	ND	49	ND
Dotriacontane	36	49	110	48.5	84	33	83.5	74.5	ND
Eicosane	ND	23	ND	ND	ND	ND	41	ND	ND
Fluoranthene	70	442	43.5	ND	250	413	121	467	ND
Fluoranthene C1	20	197	ND	ND	66.5	92.3	24.7	150	ND
Fluorene	ND	280	ND	ND	23	110	ND	20	ND
Henicosane	35	34	ND	ND	ND	26	ND	51.5	ND
heptacosane	430	301	225	283	134	293	312	365	91
Heptadecane	48	109	100	106	68	62.5	130	53.5	ND
Hexacosane	33	41.7	ND	34	41.5	30	35	59	ND
Indeno(1,2,3-cd)pyrene	24	156	ND	ND	76.4	110	29	170	ND
n-Hentriacontane	1150	748	1170	1700	699	643	655	1250	405
n-Octacosane	66	62.3	74	78.7	62.2	45.7	48	115	ND
n-Pentacosane	125	95	62.5	83	58.5	142	74.5	104	40.5
n-Tetracosane	ND	ND	ND	ND	ND	ND	27	36	ND
n-Triacontane	72	52.4	73	73.3	55	41	46.5	94.5	20
n-Tricosane	59	40	ND	52.3	38.3	54	34.5	70	21
n-Tritriacontane	240	175	344	273	158	134	195	300	159
Naphthalene	ND	140	ND	ND	ND	110	ND	23	ND
Naphthalene C1	ND	58	ND	ND	ND	26	ND	32	ND
Naphthalene C2	20	50.3	ND	ND	ND	26	ND	100	ND
Naphthalene C3	ND	31.5	ND	ND	ND	12	ND	120	ND
Nonacosane	1250	665	605	1600	603	595	588	1220	250
Pentadecane	ND	33	ND	53	52	ND	ND	40	ND
Perylene	ND	200	46	ND	50.8	173	84	73	ND
Phenanthrene	55.5	410	34	ND	132	432	74	363	ND
Phenanthrene C1	25	198	ND	ND	49.2	135	28	220	ND
Phenanthrene C2	ND	130	ND	ND	33	68	ND	88	ND
Pyrene	61	419	35	ND	171	329	96.7	419	ND
Pyrene C1	20	228	ND	ND	59.3	99	24.3	180	ND

See Table 8.4 for Footnotes

Soil

The major source of soil contamination is from air pathways. Because DOE no longer controls any major air emissions sources, routine soil surveillance is not performed. However, surface-soil contamination is being addressed by the Surface Soils Operable Unit (see Environmental Restoration Program discussion in Section 3).

Vegetation

Because DOE no longer operates any major air emissions sources, routine vegetation surveillance activities are not performed.

Terrestrial Wildlife

Annual Deer Harvest

The deer population in WKWMA is sampled annually to determine levels of radionuclides (Section 5), PCBs, and inorganic elements that might be attributed to past plant practices. There were five deer harvested from WKWMA and one deer harvested from the Stewart Island Habitat Restoration in Livingston County, Kentucky to serve as a reference sample.

PCBs tend to accumulate in fat tissue. PCB-1260 and PCB-1268 were present in deer. Table 8.6 shows the PCB results. All measurable PCBs were well below the Food and Drug Administration (FDA) standard of 3 ppm for red meat.

A risk assessment was conducted using the concentrations of PCB found in deer, assuming 20% fat content and that a hunter would eat the two deer with the highest quantities of PCBs found. The risk assessment concluded that the risk to the hunter who eats 100 pounds of the two worst-case deer (50 pounds/deer) would have an average increased cancer risk of 0.000018, or approximately eighteen chances of cancer development per one million people who eat the deer.

A comparison of the metals detected in the 2002 deer with the 2001 deer shows essentially no change. Antimony is the only metal detected in 2002 that was not detected in 2001. The maximum silver value is higher than the silver seen in 2001 deer. Mercury was identified at low levels in both 2001 and 2002. Most other metals results are comparable between the background and site deer, for example, the average cadmium result in liver is 2.09 mg/kg and the result in the background deer is 2.14 mg/kg.

Additional deer data are presented in Tables 4.61 through 4.68 of Section 4 of the *Environmental Monitoring Results Annual Site Environmental Report for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (BJC/PAD-543 Volume II).

Table 8.6. Summary of PCB detects in deer 2002

	Parameter	Deer 1	Deer 2	Deer 3	Deer 4	Deer 5	Deer (Background)
PCBs (ppb)	PCB-1260	ND	29	ND	20	18	34
	PCB-1268	46	ND	40	57	ND	ND

ND - Non Detect

(Result) - Detected at the result indicated

Fish and Other Aquatic Life

Watershed (biological) monitoring was conducted, as required, by DOE Order 5400.1 and KPDES Permit KY0004049. The KPDES permit also requires toxicity monitoring of one continuous outfall and of three intermediate outfalls on a quarterly basis. Watershed or biological monitoring of Bayou and Little Bayou creeks has been conducted since 1987.

The objectives of the Watershed Monitoring Program are as follows:

- determine whether discharges from the Paducah Site and its associated SWMUs associated with the Paducah Site are adversely affecting instream fauna;
- assess the ecological health of Bayou and Little Bayou creeks;
- assess the degree to which abatement actions ecologically benefit Bayou and Little Bayou creeks;
- provide guidance for remediation;
- provide an evaluation of changes in potential human health concerns; and
- provide data that could be used to assess the impact of inadvertent spills or fish kills.

The 2002 sampling effort was conducted in accordance with the *Bayou Creek and Little Bayou Creek Watershed Monitoring Plan* (BJC 2001b). The plan is required by the KPDES permit. This plan was revised in October 2001 to include recommended changes made by the Kentucky Division of Water.

Study Area and Methods

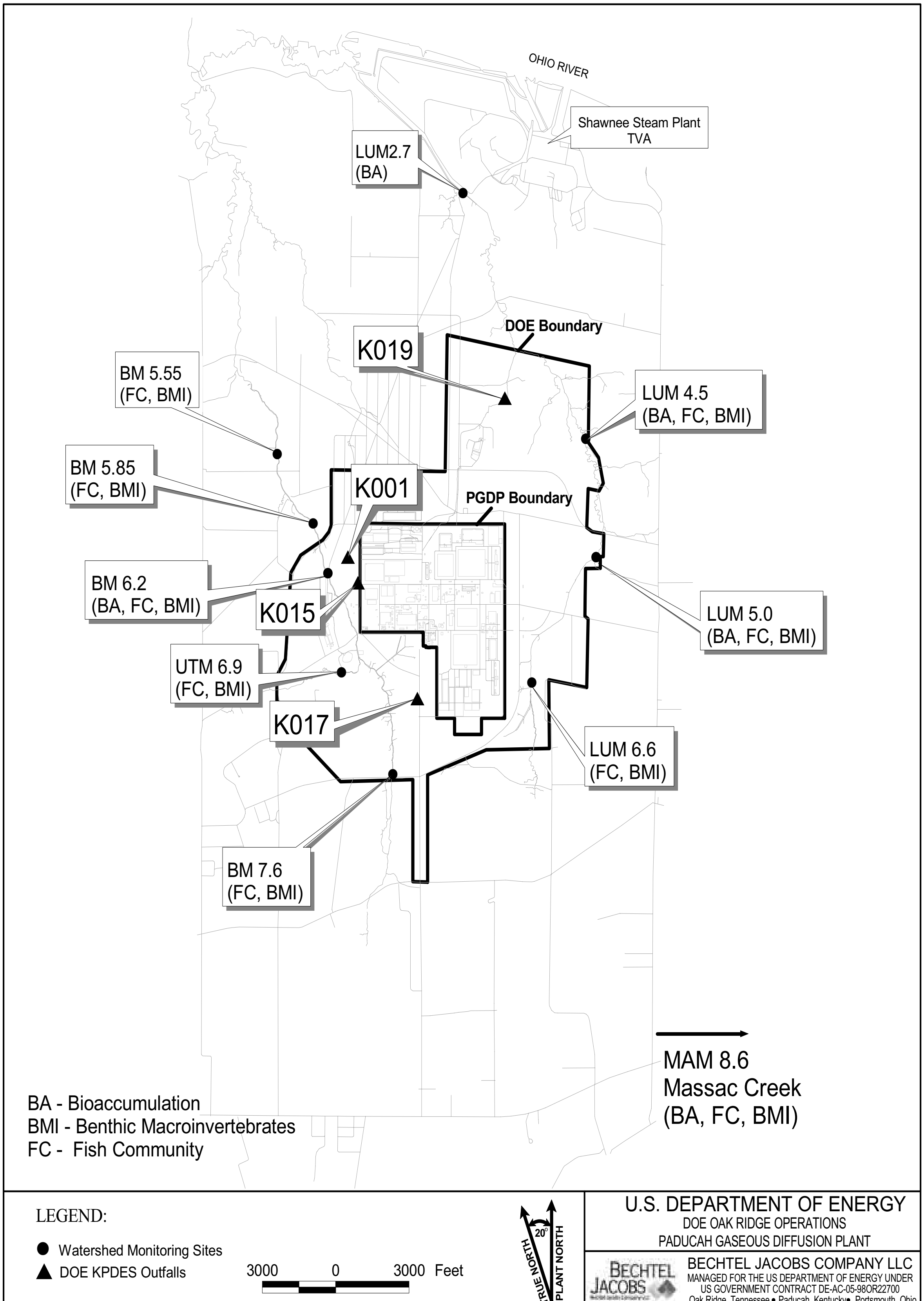
In June 2002, the fish and benthic macroinvertebrate communities were sampled at nine locations, including a location in Massac Creek, which serves as the source of background fish (MAK 13.8) and is not shown in Figure 8.1.

Benthic macroninvertebrate samples were collected with a square-foot bottom sampler from randomly selected locations within each of the five sites. Organisms were identified to the lowest practical classification. Instream habitats located on the bank of the watercourse, and water quality, were assessed at each site following standard procedures outlined by EPA. An analysis of the data includes general descriptive information to evaluate trends in sequential and spatial changes that could be associated with decreasing activities or remedial actions. Metrics of the benthic macroinvertebrate community, such as total density, total taxonomic richness, taxonomic richness of the pollution-sensitive Ephemeroptera, Plecoptera, and Trichoptera (EPT), percent community similarity index, and dominants in common, are included in the analysis of the data.

Quantitative samplings of the fish communities were conducted by electrofishing. Areas ranging from eight to 120 meters at individual sampling sites were sampled by electrofishing methods using a three-pass removal estimate. Block nets were placed surrounding each area prior to commencement of sampling. Data from these samples were used to estimate species richness, population size (numbers and biomass per unit area), and annual production. Data were adapted to create an Index of Biotic Integrity that is consistent with KDOW 1986 guidelines. All fish sampling sites overlap sites used in the benthic macroinvertebrate community task.

The concentration of PCBs in fish was determined in longear sunfish (*Lepomis megalotis*) from the Little Bayou Creek sites and spotted bass (*Micropterus punctulatus*) from Bayou Creek. Filets of individual sunfish and composite filet samples of the spotted bass were analyzed for PCBs and lipids. Fish from background reference sites were also used to establish background levels.

DOCUMENT No. BJC/PAD-543/V1



U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

Figure 8.1 Biological monitoring locations for 2002.

CDM

FIGURE No. c5ac90002sk114.apr
DATE 05-10-03

Watershed Monitoring

Results of watershed monitoring are reported annually. Reports for 2002 monitoring are reported in the *Watershed Monitoring Report for Calendar Year 2002, Paducah Gaseous Diffusion Plant, Paducah, Kentucky KPDES Permit No. KY0004049*, BJC/PAD-485 (BJC 2003b). Additional analysis of the data can be seen in this report. The report conclusions are presented as follows.

Benthic macroinvertebrate samples were collected, identified, and enumerated to the lowest practical taxon. Instream and riparian habitat, and water quality were assessed at each site. Metrics of the benthic macroinvertebrate community such as total density, total taxonomic richness, taxonomic richness of the pollution-sensitive EPT, percent community similarity index, and dominants in common are included in the analysis of the data. The Modified Hilsenhoff Biotic Index (mHBI) was used to evaluate the water quality of the sample sites. The taxa composition from 2001 to 2002 shifted, resulting in lower water quality ratings in 2002. The inclusion of taxa collected in multi-habitat samples provided a more complete picture of the taxa assemblage at these sites. The multi-habitat samples also affected the mHBI values because of the addition of more tolerant taxa such as Odonata (dragonflies and damselflies) and Coleoptera (beetles). This lower trend in water quality ratings was seen at all sites during 2002. It is difficult to assign a cause for the shift in taxa composition, but it could the result of high flows approximately three weeks prior to the sampling period. A sudden surge of high water will displace invertebrates as a result of the higher velocity of the water (BJC 2003b).

Quantitative samplings of the fish communities in the PGDP area were conducted. Data from these samples were used to estimate species richness, population size (numbers and biomass per unit area), and annual production. All fish sampling sites overlap sites used in the benthic macroinvertebrate community task. All fish observed in 2002 were found to be in good health. Fish communities examined in 2002 do show some changes in density, biomass, total numbers, and species richness. However, the changes noted are not indicative of contaminant impacts. The changes in the community are more aligned with ecological impacts such as and primarily, recent high water events and unstable substrates. (BJC 2003b)

The concentrations of PCBs in fish from Little Bayou Creek, Bayou Creek, and Massac Creek were determined. PCB concentrations were detected in fish tissue from Bayou Creek and Little Bayou Creek. PCBs have varied over the past five years and have consistently been elevated above the background level. All mean PCB concentrations of sites sampled in 2002 were under 0.2 ìg/g (part per million [ppm]). The FDA Action limit for fish consumption is 2 ppm. The 2002 average concentration has decreased from the 2001 concentration. Overall, there is a general down trend with a flattening profile for the locations monitored on Little Bayou Creek (Figure 8.2) (BJC 2003b).

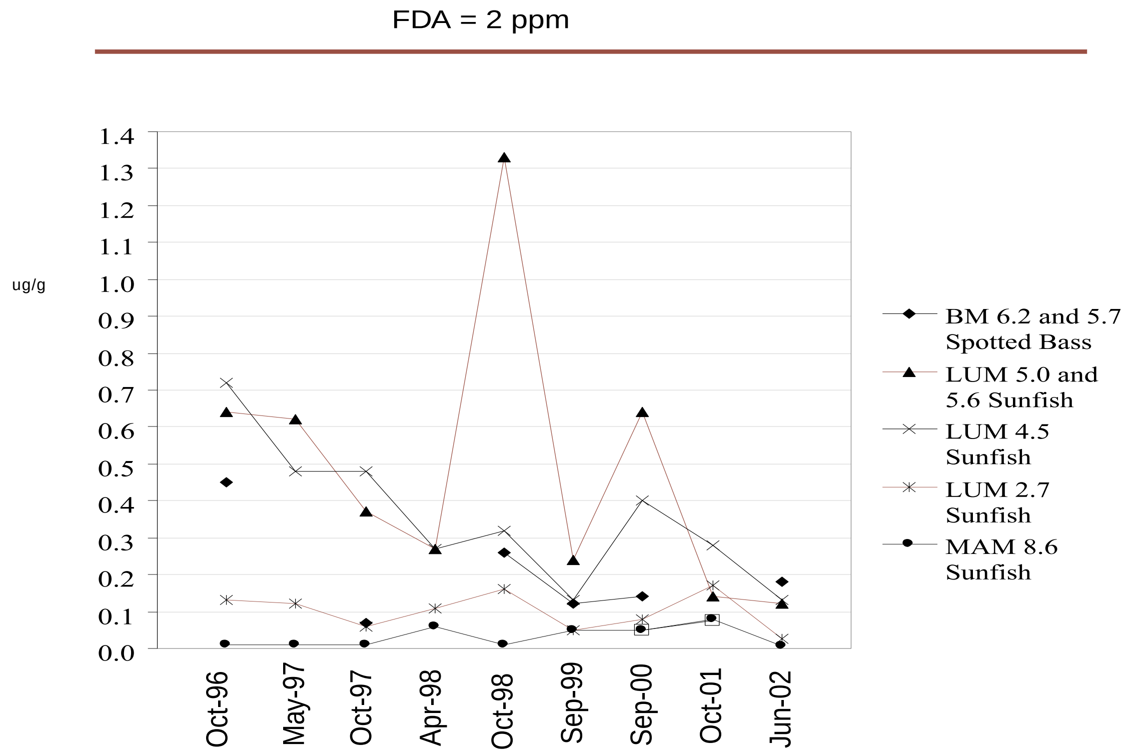


Figure 8.2 Average concentration of PCBs in fish tissue from 1996 through 2002.

9 Groundwater

Abstract

The primary objectives of groundwater monitoring at the Paducah Site are to detect contamination and provide the basis for groundwater quality assessments if contamination is detected. Monitoring includes the exit pathways at the perimeter of the plant and off-site water wells. Primary off-site contaminants continue to be TCE, an industrial degreasing solvent, and ^{99}Tc, a fission by-product. Evidence suggests the presence of TCE as a dense nonaqueous phase liquid (DNAPL) in groundwater beneath the site.

Introduction

Monitoring and protection of groundwater resources at the Paducah Site are required by federal and state regulations and by DOE orders. Federal groundwater regulations generally are enacted and enforced by EPA. The Paducah Site lies within EPA Region IV jurisdiction. EPA Region IV encompasses the southeastern United States and maintains headquarters in Atlanta, Georgia. Many state groundwater regulations are enacted and enforced by KDWM located in Frankfort, Kentucky. A KDWM field office for western Kentucky is located in Paducah.

When off-site contamination from the Paducah Site was discovered in 1988, the EPA Region IV and DOE entered into an ACO. DOE provided an alternate water supply to affected residences. Under CERCLA, DOE also is required to determine the nature and extent of off-site contamination through sampling of potentially affected wells and a comprehensive site investigation.

A CERCLA/ACO site investigation, completed in 1991, determined off-site contaminants in the RGA to be TCE, used as an industrial degreasing solvent, and ^{99}Tc, a fission byproduct contained in nuclear power reactor returns that were brought on-site several years ago for re-enrichment. Such reactor returns are no longer used in the enrichment process. Known or suspected sources of TCE and ^{99}Tc include burial grounds, former test areas and other facilities, spills, leaks, and leachate derived from contaminated scrap metal.

Investigations of the on-site source areas of TCE at the Paducah Site are ongoing. A common degreasing agent, TCE may act as a DNAPL due to its low solubility and higher density relative to water. DNAPLs either sink to the bottom of aquifers or come to rest on a less-permeable layer within an aquifer, forming pools. These DNAPL pools form a continuous source for the dissolved-phase contamination (plumes) that are migrating off-site toward the Ohio River (Figure 9.1). Pools of DNAPL are extremely difficult to clean up. Currently, only the highest concentrations of dissolved TCE are controlled by pump-and-treat systems at Paducah. The pump-and-treat system installed northwest of the plant also controls the highest concentrations of dissolved ^{99}Tc that would otherwise migrate off-site. Continued groundwater monitoring serves to identify the extent of contamination, predict the possible fate of the contaminants, and determine the movement of groundwater near the plant. This year's (CY 2002) plume map (Figure 9.1) continues the basic interpretation presented in the plume maps for CY 2001. Revisions for CY 2002 reflect the following: (1) increasing TCE trends in MWs at C-404 and C-720, (2) the consideration of surface water discharge to Little Bayou Creek, and (3) the installation of new MWs at the C-746-S&T and C-746-U Landfill areas (BJC 2003c).

Groundwater monitoring at Paducah complies with one or more federal or state regulations and permit conditions and includes perimeter exit pathway monitoring and off-site water well monitoring. (See Groundwater Monitoring Program.) Figures 9.2 and 9.3 show the locations of all wells sampled during 2002.

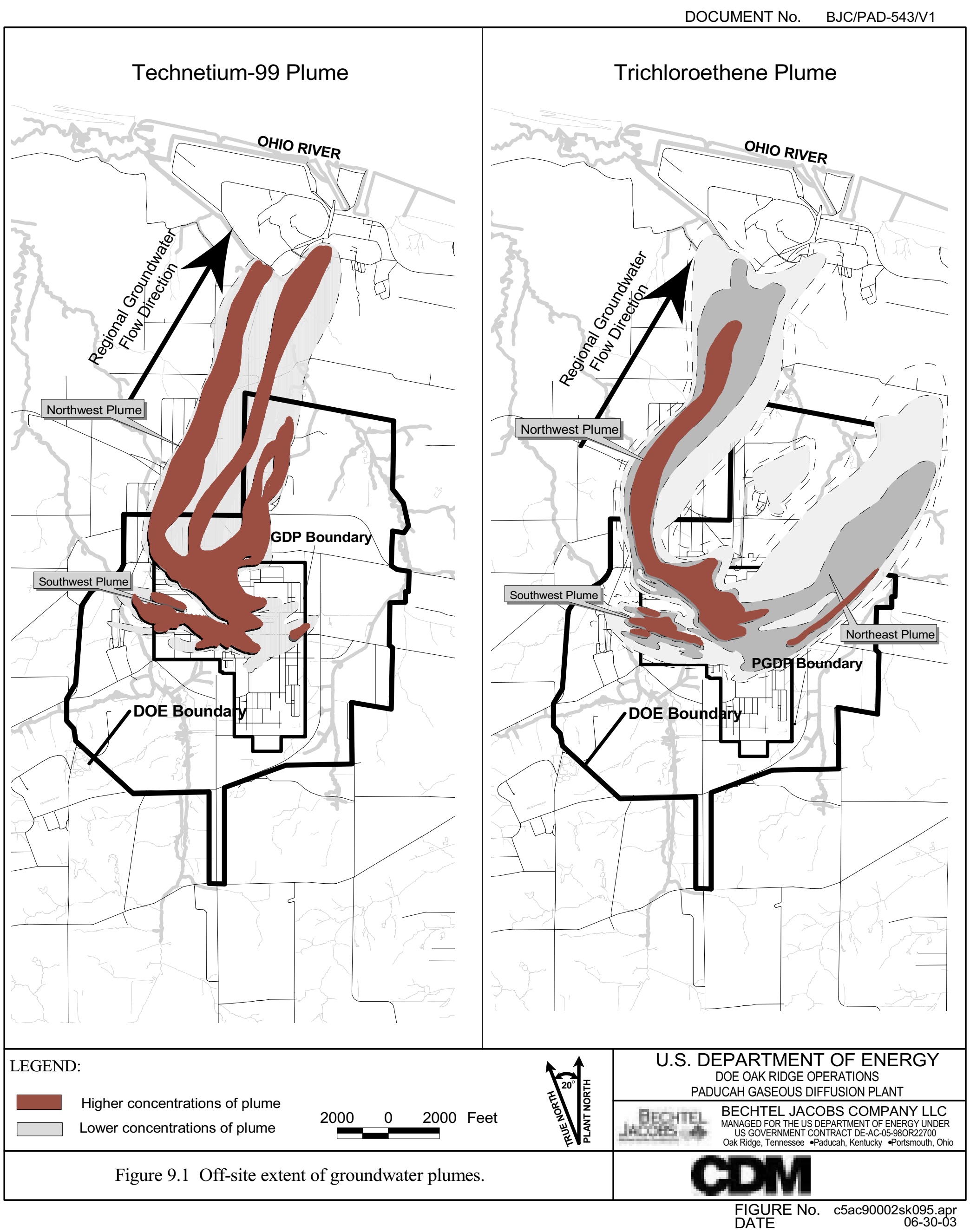


Figure 9.1 Off-site extent of groundwater plumes.

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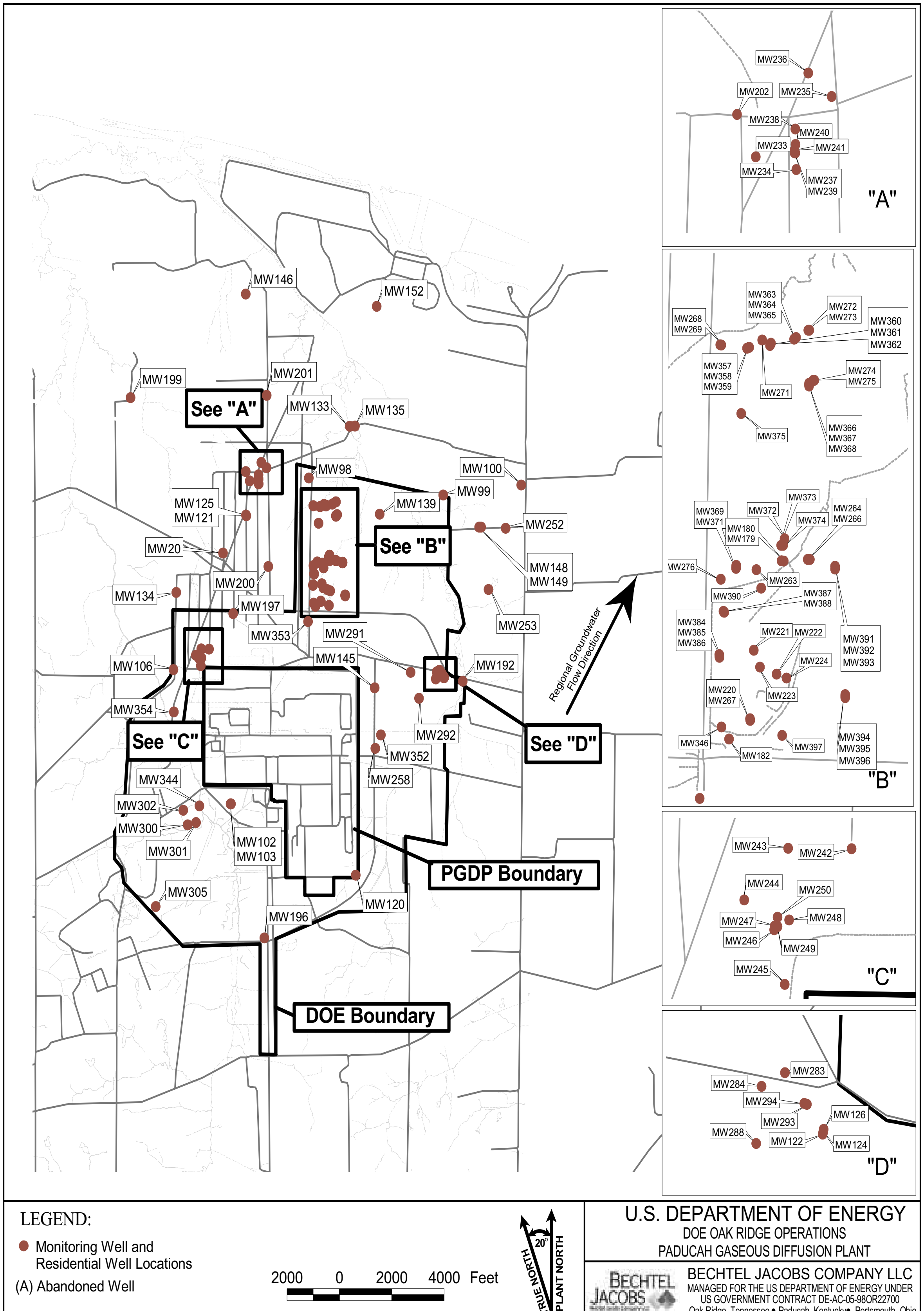

Figure 9.2 Wells sampled in the vicinity of the Paducah Site.

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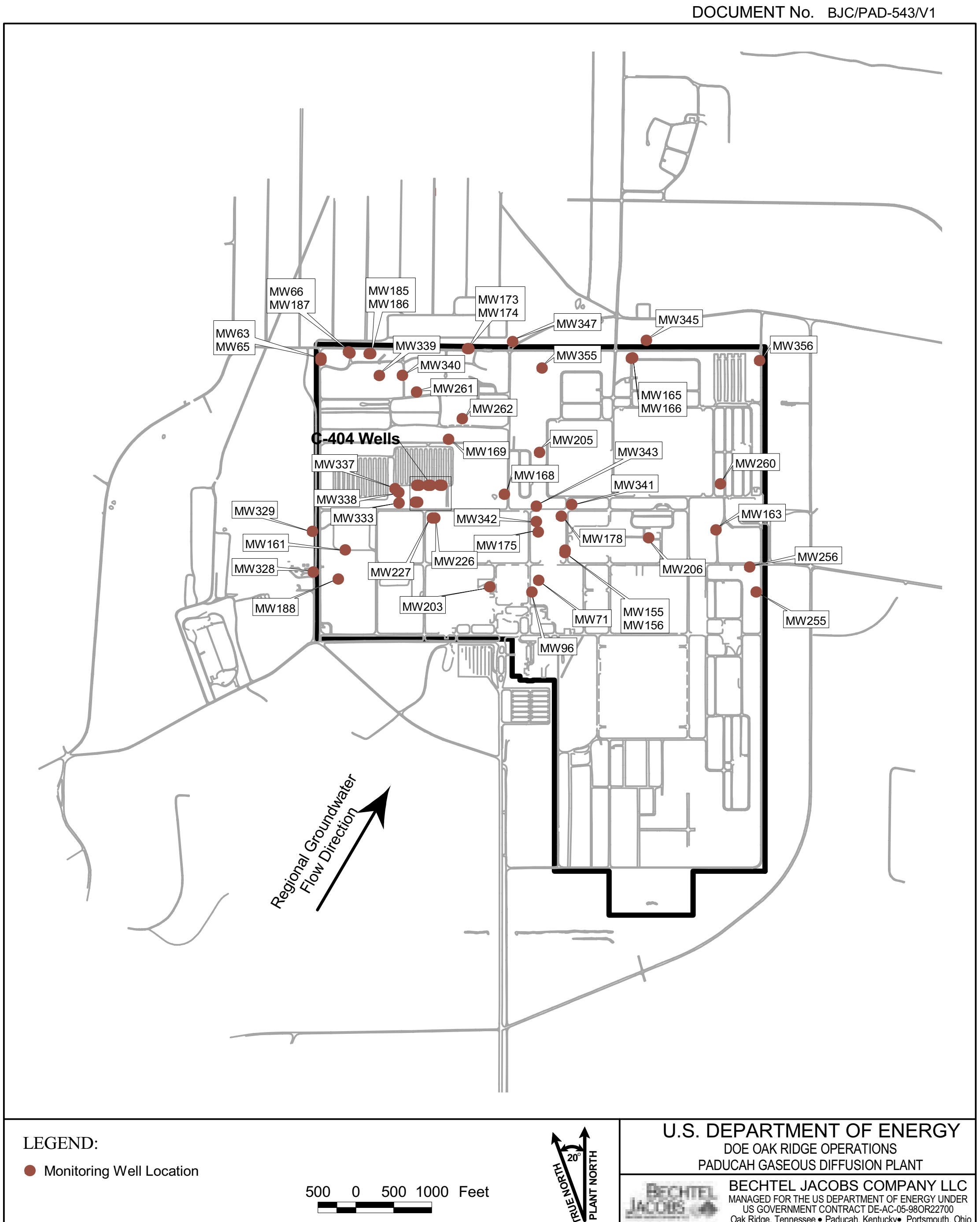

Figure 9.3 Wells sampled inside the perimeter fence.

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Groundwater Hydrology

When rain falls to the ground, the water does not stop moving. Some of it flows along the surface as streams or lakes, some of it is used by plants, some evaporates and returns to the atmosphere, and some sinks into the ground. The water that sinks into the ground moves into the spaces between the particles of soil and sand, infiltrating porous soil and rock. Groundwater is water that is found underground in cracks and spaces in soil, sand, and rock. Groundwater is stored in, and moves slowly through, an aquifer, which is a source of useable

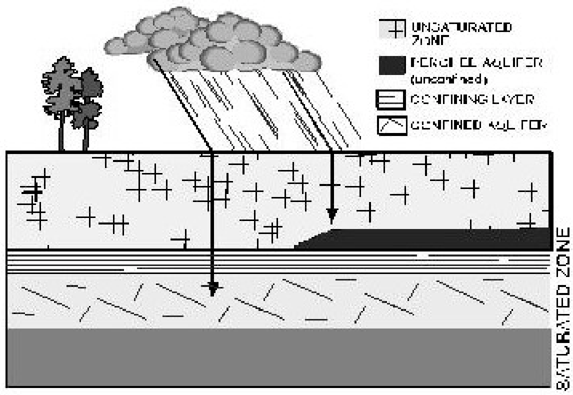

Figure 9.4 Typical path for rainwater accumulation as groundwater.

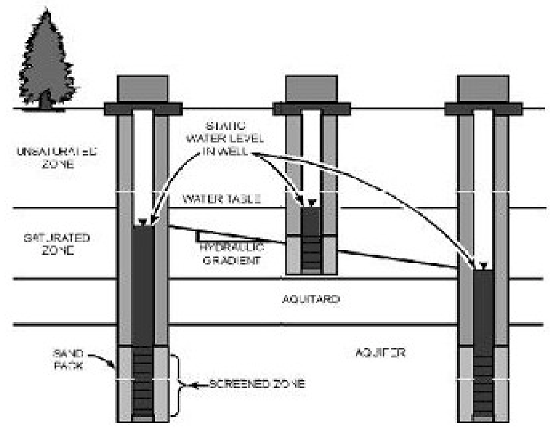

Figure 9.5 Monitoring well construction showing relationship between screened zone and water level in wells where limited flow in the aquifer is to the right.

water. Aquifers typically consist of layers of gravel, sand, sandstone, or fractured rock. The speed at which groundwater flows through the surface depends on the size of the spaces in the soil or rock and how well the spaces are connected. Permeability, or hydraulic conductivity, is the physical property that describes the ease with which water can move through the pore spaces and fractures in soil, gravel, sand, and rock.

The area in the subsurface where water fills these pore spaces is called the saturated zone (Figure 9.4). The top of the saturated zone is the water table, which is the boundary between the unsaturated and saturated zones. This boundary usually, but not always, gently mirrors the surface topography and is higher than natural exits such as springs, swamps, and beds of streams and rivers. Groundwater can be brought to the surface naturally, either through discharge as a spring or as flow into lakes and streams, or it can be extracted through a well drilled into the aquifer. A well is a pipe in the ground that fills with groundwater, which can then be brought to the surface by a pump.

Groundwater movement is determined by differences in the energy associated with the groundwater's elevation above sea level and the pressures exerted on it by surrounding water. This is called the hydraulic head. Hydraulic head is considered to be the total energy in any water mass resulting from three components: pressure, velocity, and elevation. Water will rise in a well casing in response to the pressure of the water surrounding the well's screened zone. The depth to water in the well is measured and the elevation calculated to determine the hydraulic head of the water in the monitored zone (Figure 9.5). The hydraulic gradient measures the difference in hydraulic head over a specified distance. By comparing the water levels in adjacent wells screened in the same zone, a horizontal hydraulic gradient can be determined and the lateral direction of groundwater flow can be predicted. Only wells screened in the same zones are considered when determining the horizontal gradient. Wells screened above and below an aquitard (a geologic unit which inhibits groundwater flow) can also have different hydraulic heads, thus defining a vertical gradient. If the water levels in deeper wells are lower than those in shallower wells, vertical flow is primarily downward.

Groundwater aquifers are one of the primary pathways by which potentially hazardous substances can spread through the environment. Substances placed in the soil may migrate downward due to gravity or be dissolved in rainwater, which moves them downward through the unsaturated zone into the aquifer. The contaminated water then flows laterally downgradient toward the discharge point. MWs are used extensively at the Paducah Site to assess the effect of plant operations on groundwater quality. Wells positioned to sample groundwater flowing away from a site are called downgradient wells, and wells placed to sample groundwater before it flows under a site are called upgradient wells. Any contamination of the downgradient wells that is not present in the upgradient wells at a site may be assumed to be a product of that site. Wells can be drilled to various depths in the saturated zone and be screened to monitor the recharge area above the aquifer, different horizons within the aquifer, or water-bearing zones below the aquifer. Vertical and horizontal groundwater flow directions are determined by the permeability and continuity of geologic strata, in addition to hydraulic head. To effectively monitor the movement of groundwater and any hazardous constituents it may contain, hydrogeologists at the Paducah Site have undertaken many detailed studies of the geology of strata beneath the site.

Geologic and Hydrogeologic Setting

The Paducah Site, located in the Jackson Purchase region of western Kentucky, lies within the northern tip of the Mississippi Embayment portion of the Gulf Coastal Plain Province (Figure 9.6). The Mississippi Embayment is a large sedimentary trough oriented nearly north-south that received sediments during the Cretaceous and Tertiary geologic time periods.

During the Cretaceous Period, sediments deposited in a coastal marine environment, creating the McNairy/Clayton Formation. For the most part, the McNairy/Clayton Formation is sandy at the bottom and silty at the top; However, variations in

Figure 9.6 The Mississippi embayment aquifer system. (source: USGS website, http://sr6capp.er.usgs.gov/aquiferBasics/ext_embay.html)

the geologic make-up of the McNairy/Clayton Formation do not occur and lenses of clay, and at least one fairly continuous string of gravel, are present within the formation.

The Clayton Formation overlies the McNairy. The Clayton Formation was deposited during the early Paleocene geologic epoch in an environment so similar to that of the McNairy that the Clayton and upper portion of the McNairy are indistinguishable in lithologic samples. Later in the Paleocene, the Porters Creek Clay was deposited in marine and brackish water environments in a sea that occupied most of the Mississippi Embayment. The McNairy/Clayton and the Porters Creek Clay formations, dip 9 to 10.5 m [30 to 35 ft] per mile to the south-southwest.

The next feature in the geologic history at the Paducah Site is a Pleistocene-age river valley occupying approximately the same position as the present-day Ohio and Tennessee river valleys. In forming the valley, braided stream channels of the ancestral Tennessee River, and possibly several "feeder" streams, eroded any sediments deposited after the Paleocene Porters Creek Clay and before the Pleistocene. The river system also eroded portions of the Porters Creek Clay and the McNairy formation and cut a prominent terrace in the Porters Creek Clay at the south end of the plant. The sediments deposited on this erosional surface are termed continental deposits. The lower portion of the continental deposits consists of approximately 9 m (30 ft) of stream gravel and sand.

Over time, sediments from the retreating glaciers dammed the river valley, causing the formation of a lake. Silts and clays with thin zones of sand and occasional gravel were deposited in the lake, forming the upper portion of the continental deposits. These deposits range from approximately 1.5 to 17 m (5 to 55 ft) thick.

Finally, loess, a wind-blown silt, overlies the continental deposits throughout the site. Thickness of loess deposits varies from approximately 1.5 to 8 m (5 to 25 ft), averaging 4.6 m (15 ft).

The local groundwater flow system at the Paducah Site contains the following four major components (listed from shallowest to deepest): (1) the terrace gravels, (2) UCRS, (3) RGA, and (4) the McNairy flow system. The Rubble Zone is the formation underlying the McNairy. The terrace gravels consist of shallow Pliocene gravel deposits in the southern portion of the plant site. These deposits usually lack sufficient thickness and saturation to constitute an aquifer, but may be an important source of groundwater recharge to the RGA.

The UCRS consists mainly of clay silt with interbedded sand and gravel in the upper continental deposits. The system is so named because of its characteristic recharge to the RGA.

The RGA consists of coarse-grained sediments at the base of the upper continental deposits, sand and gravel facies in the lower continental deposits, gravel and coarse sand portions of the upper McNairy that are directly adjacent to the lower continental deposits, and alluvium adjacent to the Ohio River. These deposits have an average thickness of 9 m (30 ft) and can be more than 21 m (70 ft) thick along an axis that trends east-west through the site. The RGA is the uppermost and primary aquifer, formerly used by private residences north of the Paducah Site.

The McNairy flow system consists of interbedded and interlensing sand, silt, and clay of the McNairy Formation. Sand facies account for 40 to 50% of the total formation thickness of approximately 69 m (225 ft).

Uses of Groundwater in the Vicinity

The WKWMA and some lightly populated farmlands are in the immediate vicinity of the Paducah Site. Homes are sparsely located along rural roads in the vicinity of the site. The following two communities lie within 3.2 km (2 miles) of the plant: Grahamville and Heath to the east.

Both groundwater and surface water (Cairo, Il. only) sources have been used for water supply to residents and industries in the plant area. Wells in the area are screened at depths ranging from 4.6 to 75 m (15 to 245 ft). The majority of these wells are believed to be screened in the RGA. The Paducah Site continues to provide municipal water to all residents within the area of groundwater contamination from the site. These residents' out-of-service wells are utilized by DOE for sampling as a result of written agreements. Residential wells that are no longer sampled have been capped and locked.

Groundwater Monitoring Program

The primary objectives of groundwater monitoring at the Paducah Site are early detection of any contamination resulting from past or and present land disposal of wastes and provision of the basis for developing groundwater quality assessments if contamination is detected. Additional objectives outlined in DOE Order 5400.1, *General Environmental Protection Program*, require that groundwater monitoring at all DOE facilities "...determine and document the effects of operations on groundwater quality and quantity." The order specifically requires groundwater monitoring to be conducted on-site and in the vicinity of DOE facilities to accomplish the following:

- obtain data to determine baseline conditions of groundwater quality and quantity;
- demonstrate compliance with, and implementation of, all applicable regulations and DOE orders;
- provide data to permit early detection of groundwater pollution or contamination;
- provide a reporting mechanism for detected groundwater pollution or contamination;
- identify existing and potential groundwater contamination sources and maintain surveillance of these sources; and
- provide data for making decisions about land disposal practices and the management and protection of groundwater resources.

These objectives are outlined in the following three documents related to groundwater monitoring: *Paducah Gaseous Diffusion Plant Groundwater Protection Program Management Plan* (BJC 2003d), *Groundwater Protection Plan* (BJC 2001c), and the *Paducah Site Environmental Monitoring Plan* (BJC 2001b). Scheduled sampling continues for more than 170 MWs and residential wells in accordance with DOE orders and federal, state, and local requirements. Well sampling is included in several different monitoring programs, which are described below.

Resource Conservation Recovery Act Permit Monitoring Programs

Presently, the only hazardous waste facility at the Paducah Site that requires groundwater monitoring is the C-404 Landfill (Figure 9.7). The C-404 Low-Level Radioactive Waste Burial Ground was used for the disposal of uranium-contaminated solid wastes until 1986 when it was determined that, of the wastes disposed there, gold dissolver precipitate was considered a hazardous waste under RCRA. The landfill was covered with a RCRA-compliant clay cap and was certified closed as a hazardous waste landfill in 1987. The landfill is now monitored under post-closure monitoring requirements. According to the Kentucky C-404 Post Closure Permit, 14 wells (MWs 84–95, 226, and 227) monitor groundwater quality of the UCRS (four wells) and the underlying RGA (ten wells) during the required post-closure care on a semiannual basis.

During 2002, MWs at the C-404 Landfill were sampled and analyzed for total and dissolved arsenic, total and dissolved chromium, TCE, and ^{99}Tc. TCE exceeded the Maximum Contaminant Level (MCL) in four upgradient RGA wells and two downgradient RGA wells. Total chromium also exceeded MCLs in two upgradient RGA wells. Results are reported to KDWM semiannually. A

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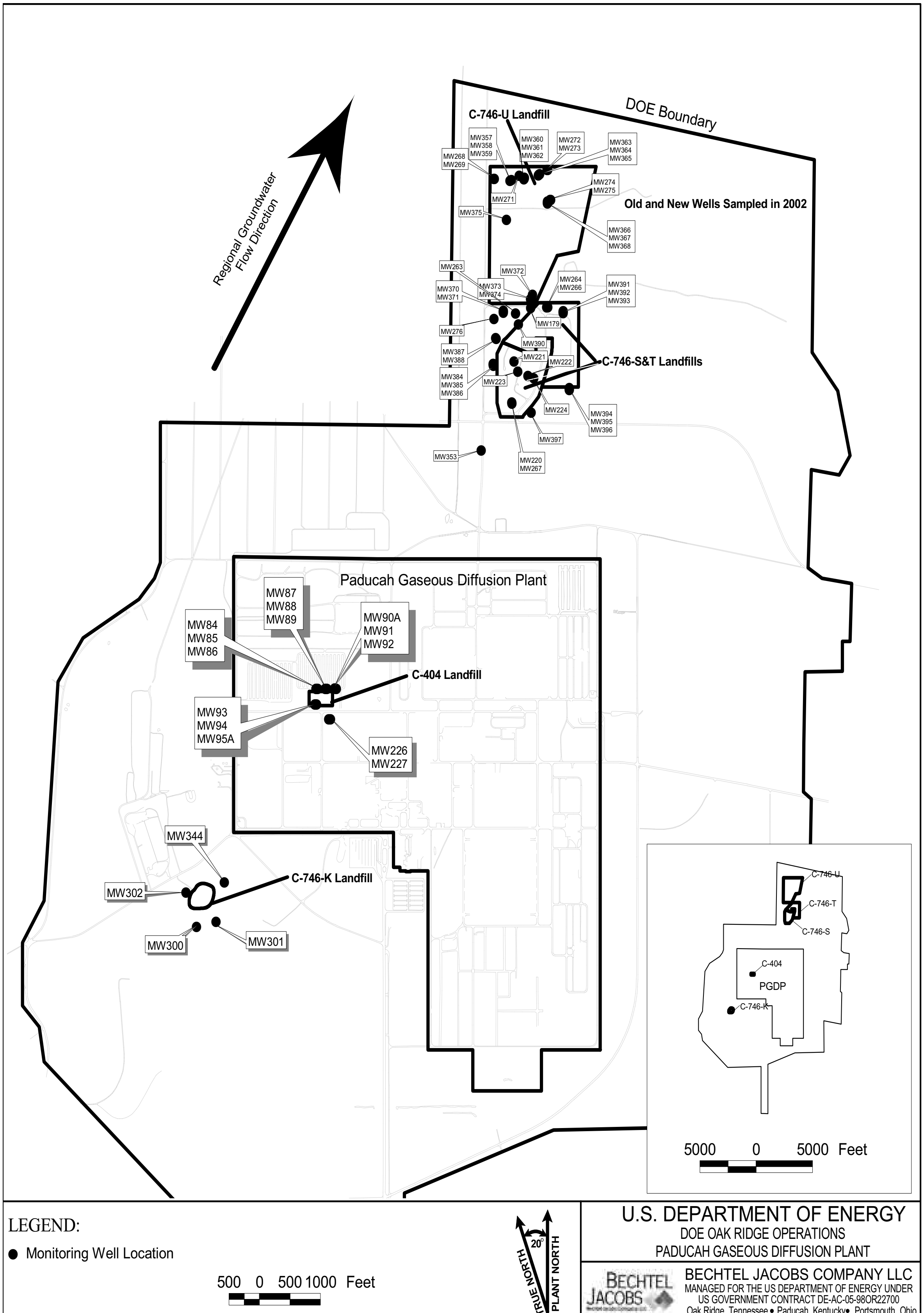

Figure 9.7 Monitoring well locations near the landfills.

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summary of the maximum results for each of the wells is provided in Table 9.1.

State Solid Waste Disposal Regulations

Post-closure groundwater monitoring continues for the C-746-S Residential Landfill. The landfill stopped receiving solid waste before July 1, 1995, and was certified closed on October 31, 1995, by an independent engineering firm. The groundwater monitoring system for the C-746-S Residential Landfill also encompasses the C-746-T Inert Landfill, which was certified closed in November 1992. The C-746-T Inert Landfill has fulfilled its two years of post-closure environmental monitoring and maintenance requirements and is awaiting final closure approval from KDWM.

The groundwater monitoring system for C-746-S and C-746-T consists of upgradient, sidegradient, and downgradient wells (Figure 9.7). The monitoring system is designed to monitor the UCRS, the upper portion of the RGA (URGA), and lower portion of the RGA (LRGA).

At the request of KDWM, six of elevent MWs at C-746-S and C-746-T are being abandoned due to questionable integrity. A revised groundwater monitoring plan for the landfills was submitted in late 2001. DOE revised the groundwater monitoring plan in response to comments received from KDWM and in 2002 fourteen new monitoring wells were installed around the C-746-S and C-746-T Landfills. One monitoring well was abandoned in 2002 and preparations are currently underway to abandon five additional monitoring wells in 2003. The remaining five MWs will become part of the new network, along with the newly installed fourteen wells.

Figure 9.8 Monitoring well installation.

The MWs at the C-746-S and C-746-T are sampled quarterly and in accordance with 401 KAR 48:300. The analytes are dictated by a KDWM approved solid waste landfill permit modification.

Table 9.1 Summary of maximum groundwater results from the RGA at C-404 Landfill.

	Upgradient Wells				Downgradient Wells						
Parameter	**MW 226**	**MW 227**	**MW 93**	**MW 95A**	**MW 84**	**MW 86**	**MW 87**	**MW 89**	**MW 90A**	**MW92**	**Criteria Reference**
Arsenic (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05 MCL
Arsenic, Dissolved (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Chromium, Total (mg/L)	**0.27**	**0.12**	ND	ND	ND	ND	ND	ND	ND	ND	0.1 MCL
Chromium, Dissolved (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
^{99}Tc (pCi/L)	166	33	18	20	ND	ND	ND	ND	ND	19	900 MCL
Trichloroethene (µg/L)	**140**	**23**	**76**	**39**	**58**	**33**	4	ND	ND	ND	5 MCL

ND - Non Detect
MCL - Maximum Contaminant Level
[Bold] = Exceeds Criteria

Evaluation of the groundwater monitoring data collected at the C-746-S and C-746-T landfills requires immediate reporting to KDWM of results exceeding Kentucky MCLs (401 KAR 47:030 Section 6) and statistical analysis of the results for constituents that do not have an MCL.

During 2002, aluminum, iron, and manganese exceeded contaminant levels in upgradient, sidegradient, and downgradient wells. Chromium, TCE, and alpha activity exceeded contaminant levels in upgradient and downgradient wells. Beta activity exceeded contaminant levels in sidegradient and downgradient wells. Dissolved solids and turbidity contaminant level exceedences were seen in upgradient, sidegradient, and downgradient wells and chloride levels exceeded contaminant levels in some sidegradient wells. PCB levels exceeded contaminant levels in some downgradient wells. KDWM was notified of the exceedences, as required by the permit. Results were reported to KDWM on a quarterly basis. A summary of the maximum results for upgradient, sidegradient, and downgradient wells in each of the monitored portions of the groundwater system is provided in Table 9.2.

The C-746-U Contained Landfill, a solid waste landfill at the Paducah Site, was completed in 1996 and operation was initiated in 1997. Solid waste regulations require groundwater monitoring of the landfill. Clusters of wells are installed which are made up of one well in the URGA and one well in the LRGA. (Figure 9.7).

At the request of KDWM, MWs were being abandoned and replaced due to questionable integrity. A revised groundwater monitoring plan for the landfill was submitted in late 2001. DOE revised the groundwater monitoring plan in response to comments received from KDWM and in 2002 ten monitoring wells in the C-746-U Landfill groundwater monitoring system were abandoned. The abandoned wells were replaced with 21 new MWs in 2002.

Evaluation of the groundwater monitoring data collected at the C-746-U Landfill included, for permitted wells, immediate reporting to KDWM of results exceeding Kentucky MCLs (401 KAR 47:030, Section 6) and statistical analysis of the results for constituents that do not have an MCL. During 2002, aluminum, iron, manganese, uranium, and turbidity exceeded contaminant levels in some upgradient, sidegradient, and downgradient wells. Chromium exceeded contaminant levels in some upgradient and downgradient wells. Beryllium levels and alpha activity exceeded contaminant levels in some downgradient wells, while beta activity exceeded contaminant levels in some sidegradient and some downgradient wells. TCE and dissolved solids exceeded contaminant levels in some upgradient wells and fluoride levels exceeded contaminant levels in some sidegradient wells. KDWM was notified of the exceedences and results were reported to KDWM on a quarterly basis. A summary of the maximum results for upgradient, sidegradient, and downgradient wells in each of the monitored portions of the groundwater system is provided in Table 9.3.

Table 9.2 Summary of maximum groundwater results at C-746-S&T Landfill.

		UCRS MWs			Upper RGA MWs			RGA MWs		Lower RGA MWs				
	Parameter	**Up-gradient**	**Side-gradient**	**Down-gradient**	**Up-gradient**	**Side-gradient**	**Down-gradient**	**Up-gradient**	**Down-gradient**	**Up-gradient**	**Side-gradient**	**Down-gradient**	**Criteria**	**Reference**
Metal	Aluminum	**0.39**	**15**	**0.87**	ND	**0.32**	**4.5**	**5.9**	**57**	**0.82**	**0.51**	**2.1**	0.2	SMCL
(mg/L)	Arsenic	ND	0.019	0.007	ND	0.016	ND	ND	ND	ND	ND	ND	0.05	MCL
	Arsenic, Dissolved	ND	0.016	0.006	ND	0.016	ND	ND	ND	ND	ND	ND	0.05	MCL
	Barium	0.21	0.4	0.04	0.24	0.25	0.29	0.24	0.94	0.25	0.16	0.35	2	MCL
	Barium, Dissolved	0.22	0.34	0.031	0.24	0.22	0.22	0.24	0.3	0.24	0.15	0.32	2	MCL
	Boron	ND	ND	ND	ND	ND	ND	ND	1.2	ND	ND	ND		
	Calcium	43	82	25	31	38	32	96	80	33	38	28		
	Chromium	ND	ND	ND	ND	ND	ND	**0.93**	**1.2**	ND	ND	ND	0.1	MCL
	Cobalt	ND	0.067	ND	ND	ND	ND	0.0041	0.1	ND	ND	ND		
	Copper	0.026	0.022	ND	ND	0.037	ND	0.05	0.08	0.028	ND	ND	1.3	SMCL
	Iron	**9.5**	**34**	**16**	**1.4**	**8.2**	**29**	**5.7**	**120**	**1.6**	**0.45**	**9.8**	0.3	SMCL
	Lead	ND	0.0063	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.015	SDWA
	Magnesium	18	31	6.7	12	13	13	16	25	13	8.1	11		
	Manganese	**0.88**	**1.4**	**0.22**	**0.54**	**3.7**	**0.5**	**0.36**	**6.4**	**0.47**	**0.076**	**2.7**	0.05	SMCL
	Molybdenum	ND	0.0014	ND	ND	ND	ND	0.085	0.089	ND	0.0027	ND		
	Nickel	ND	ND	ND	ND	ND	ND	0.68	1.1	0.007	ND	ND		
	Potassium	0.98	2.6	0.63	1	1.4	2.3	8.8	14	2	2.6	2.3		
	Selenium	0.01	0.019	ND	0.0068	0.0057	0.006	0.0068	0.0094	ND	ND	0.0072	0.05	MCL
	Selenium, Dissolved	0.007	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	MCL
	Sodium	120	140	180	33	140	46	91	66	35	37	63		
	Uranium	0.002	0.001	0.002	ND	0.0019	ND	0.001	0.002	ND	ND	ND	0.02	MCL
	Uranium, Dissolved	0.003	ND	0.002	ND	ND	ND	ND	ND	ND	ND	ND	0.02	MCL
	Vanadium	ND	0.038	ND	ND	ND	ND	0.037	0.098	ND	ND	ND		
	Zinc	ND	ND	ND	ND	ND	ND	ND	0.22	ND	ND	ND	5	SMCL
PCBs	PCB-1260	ND	ND	ND	ND	ND	ND	ND	0.092	ND	ND	ND		
(ug/L)	Polychlorinated biphenyl	ND	ND	ND	ND	ND	ND	ND	**0.092**	ND	ND	ND	0.5	MCL
Rads	Alpha activity	**17**	ND	**18**	8.3	ND	**17**	ND	11	6.1	ND	9.3	15	MCL
(pCi/L)	Beta activity	7.3	8.5	ND	13	**120**	**70**	**120**	**390**	11	**77**	19	50	MCL
	Iodine-131	ND	ND	ND	ND	ND	ND	160	ND	ND	ND	ND		
	Radium	ND	ND	ND	ND	ND	ND	ND	0.54	0.47	0.42	ND		
	Radium-226	0.69	0.74	0.57	0.58	ND	0.67	ND	5.8	0.66	ND	0.97	20	SDWA
	^{99}Tc	ND	ND	ND	ND	120	92	86	540	26	110	ND	900	MCL
SVOC	1,4-Dioxane	ND	ND	ND	ND	ND	0.6	ND	ND	0.5	ND	0.5		
(ug/L)	3-Methylphenol	6	45	280	ND	1400	ND	ND	ND	ND	ND	74		
	Bis(2-chloroethoxy)methane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2		
	Bis(2-ethylhexyl)phthalate	15	5	9	7	2	6	ND	ND	3	2	6		
	Butyl benzyl phthalate	6	ND	ND	ND	ND	6	ND	ND	ND	ND	ND		
	Di-n-butyl phthalate	5	12	3	38	4	37	ND	ND	5	10	5		
	Diethyl phthalate	ND	ND	ND	0.5	ND	0.5	ND	ND	ND	ND	0.6		
	Phenol	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	1000	SDWA
VOC	1,3-Dimethylbenzene	1	1	8	ND	5	ND	ND	ND	ND	ND	2		
(ug/L)	2-Butanone	12	ND	9	ND	4	ND	ND	ND	ND	ND	ND		
	Acetone	150	53	220	10	170	4	ND	ND	11	10	56		
	Carbon disulfide	ND	ND	ND	ND	2	ND	ND	ND	ND	ND	ND		
	Chloroform	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	4		
	Dimethylbenzene	1	1	8	ND	5	ND	ND	ND	ND	ND	2	10000	MCL
	Ethylbenzene	ND	ND	2	ND	1	ND	ND	ND	ND	ND		700	MCL
	Methylene chloride	13	3	3	2	ND	2	ND	ND	14	ND	4		
	Trichloroethene	2	ND	ND	**20**	2	**11**	2	**23**	**14**	ND	**9**	5	MCL
Other	Bromide (mg/L)	1.6	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND		
	Chloride (mg/L)	100	**310**	25	60	69	48	69	60	65	32	44	250	SMCL
	Fluoride (mg/L)	2.3	0.27	3.7	0.16	1.8	1.1	0.28	0.33	0.16	0.36	1.2	4	MCL
	Nitrate as Nitrogen (mg/L)	ND	ND	ND	1.1	ND	1.8	1.9	2	2.1	1.6	2	10	MCL
	Sulfate (mg/L)	42	22	9.1	11	20	27	54	210	14	28	15		
	Dissolved Solids (mg/L)	**540**	**890**	**680**	260	430	290	**540**	**560**	270	280	310	500	SMCL
	Bicarbonate as $CaCO_3$ (mg/L)	240	170	350	97	220	120	ND	ND	87	120	180		
	Chemical Oxygen Demand (COD) (mg/L)	37	ND	210	ND	49	ND	ND	ND	40	ND	36		
	Iodide (mg/L)	ND	3.1	ND	ND	3.6	ND	3	3.2	ND	ND	2.9		
	Sulfide (mg/L)	ND	1	4	ND	3.5	7	ND	ND	ND	ND	1.3		
	Total Organic Carbon (TOC) (mg/L)	19	9.2	95	1.3	31	1.8	1.7	2.2	1.6	5.1	18		
	Total Organic Halides (TOX) (ug/L)	220	140	1200	670	360	ND	ND	350	ND	ND	220		
	Turbidity (NTU)	**36**	**250**	**75**	**15**	**75**	**240**	**70**	**800**	**16**	**12**	**90**	5	MCL

SMCL - Secondary MCL

MCL - Maximum Contaminant Level

SDWA - Safe Drinking Water Act

ND - Non Detect

[Bold] = Exceeds Criteria

Table 9.3 Summary of maximum groundwater results at C-746-U Landfill.

		UCRS MWs			Upper RGA MWs			RGA MWs		Lower RGA MWs				
	Parameter	**Up-gradient**	**Side-gradient**	**Down-gradient**	**Up-gradient**	**Side-gradient**	**Down-gradient**	**Up-gradient**	**Down-gradient**	**Up-gradient**	**Side-gradient**	**Down-gradient**	**Criteria Reference**	
Metal	Aluminum	**21**	ND	**140**	**2.6**	**20**	**0.59**	**1.1**	ND	**23**	**0.33**	**1.9**	0.2	SMCL
(mg/L)	Arsenic	ND	ND	0.025	0.013	0.005	ND	ND	ND	0.007	ND	ND	0.05	MCL
	Arsenic, Dissolved	ND	ND	ND	0.013	ND	ND	ND	ND	ND	ND	ND	0.05	MCL
	Barium	0.26	0.037	0.42	0.38	0.54	0.25	0.27	0.2	0.3	0.18	0.33	2	MCL
	Barium, Dissolved	0.14	0.034	0.098	0.36	0.49	0.25	0.23	0.2	0.25	0.16	0.33	2	MCL
	Beryllium	ND	ND	**0.006**	ND	ND	ND	ND	ND	ND	ND	ND	0.004	MCL
	Boron	ND	ND	ND	0.49	ND	0.32	ND	ND	0.79	ND	ND		
	Calcium	67	20	55	44	57	39	30	39	62	31	44		
	Chromium	ND	ND	**0.16**	ND	ND	ND	**0.97**	**0.18**	0.025	ND	ND	0.1	MCL
	Cobalt	ND	ND	0.058	0.0094	0.025	0.039	ND	ND	0.034	0.0072	0.0058		
	Copper	ND	ND	0.066	ND	0.025	ND	0.026	ND	0.026	ND	ND	1.3	SMCL
	Iron	**23**	**23**	**120**	**22**	**15**	**15**	**7**	**1.7**	**38**	**16**	**4.3**	0.3	SMCL
	Lead	0.007	ND	ND	ND	ND	ND	ND	ND	0.013	ND	ND	0.015	SDWA
	Magnesium	20	5.8	24	17	19	15	12	16	25	12	16		
	Manganese	**0.6**	**0.4**	**2**	**0.87**	**4.3**	**1.8**	**0.079**	**0.79**	**2.2**	**0.66**	**2.1**	0.05	SMCL
	Molybdenum	0.0022	ND	0.0016	ND	ND	ND	0.066	ND	0.0011	ND	ND		
	Nickel	0.012	ND	0.11	ND	ND	ND	ND	ND	ND	ND	ND		
	Potassium	3	ND	8.5	2.2	2.4	2.2	ND	5.8	4.3	3	3.6		
	Selenium	0.0093	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0051	0.05	MCL
	Selenium, Dissolved	0.0095	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	MCL
	Sodium	340	67	110	67	97	72	37	52	88	54	54		
	Uranium	**0.044**	ND	0.008	0.0059	**0.022**	0.0044	ND	ND	0.004	0.012	**0.023**	0.02	MCL
	Uranium, Dissolved	0.0012	ND	0.001	ND	0.004	ND	ND	ND	ND	ND	ND	0.02	MCL
	Vanadium	ND	ND	0.27	0.039	0.046	0.033	ND	ND	0.048	0.027	0.037		
	Zinc	ND	ND	0.19	0.72	ND	ND	ND	ND	ND	ND	ND	5	SMCL
PCBs	4,4'-DDD	0.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
(ug/L)	alpha-BHC	0.34	ND	0.074	ND	ND	ND	ND	ND	ND	ND	ND		
	beta-BHC	0	ND	0.18	ND	ND	0.15	ND	ND	ND	0.06	ND		
	delta-BHC	0.096	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
	Dimethoate	ND	ND	ND	ND	ND	0.58	ND	ND	ND	ND	ND		
	Heptachlor	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.4	MCL
	Lindane	0.22	ND	0.064	ND	ND	ND	ND	ND	ND	ND	ND		
Rads	Alpha activity	ND	ND	**39**	ND	ND	8.6	ND	ND	11	ND	7	15	MCL
(pCi/L)	Beta activity	ND	ND	22	39	**62**	33	43	**150**	15	36	42	50	MCL
	^{40}Potassium	37	ND	ND	ND	ND	47	ND	130	ND	ND	43		
	Radium	ND	ND	ND	ND	0.77	1	ND	ND	0.47	ND	ND		
	^{226}Ra	ND	ND	ND	ND	ND	12	ND	ND	ND	ND	ND	20	SDWA
	^{99}Tc	ND	ND	ND	53	68	46	55	190	16	120	52	900	MCL
	^{234}Thorium	ND	ND	ND	ND	ND	ND	ND	ND	ND	44	ND		
SVOA	2-Methylnaphthalene	0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
(ug/L)	2-Methylphenol	0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
	3-Methylphenol	2	ND	ND	ND	2	ND	ND	ND	ND	ND	ND		
	Acetophenone	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
	Bis(2-ethylhexyl)phthalate	2	ND	5	2	2	4	ND	ND	2	2	4		
	Di-n-butyl phthalate	1	ND	3	ND	ND	0.6	ND	ND	ND	ND	1		
	Diethyl phthalate	ND	ND	1	ND	ND	ND	ND	ND	ND	ND	ND		
	Dimethyl phthalate	ND	ND	ND	1	1	2	ND	ND	2	ND	ND		
	Isophorone	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
	Phenanthrene	0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
	Phenol	4	ND	ND	ND	2	ND	ND	ND	ND	ND	ND	1000	SDWA
VOC	2-Butanone	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
(ug/L)	2-Hexanone	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
	Acetone	370	1500	40000	14	760	11000	ND	ND	560	29	180		
	Carbon disulfide	ND	ND	ND	ND	4	7	ND	ND	ND	ND	ND		
	Chloroform	ND	ND	10	1	1	ND	ND	ND	ND	ND	ND		
	Ethanol	ND	ND	ND	ND	ND	26	ND	ND	ND	ND	ND		
	Methylene chloride	2	ND	69	5	4	67	ND	ND	7	2	2		
	Trichloroethene	ND	ND	ND	**16**	ND	ND	**12**	4	**19**	ND	4	5	MCL
Other	Bromide (mg/L)	2.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
	Chloride (mg/L)	200	21	14	48	40	31	50	49	56	33	33	250	SMCL
	Fluoride (mg/L)	0.31	0.16	0.3	0.28	**6**	0.24	0.14	0.16	0.32	0.19	0.21	4	MCL
	Nitrate as Nitrogen (mg/L)	ND	ND	3	ND	ND	ND	1.2	1.3	ND	ND	1	10	MCL
	Sulfate (mg/L)	16	51	80	75	59	100	12	100	810	38	120		
	Sulfide (mg/L)	ND	ND	ND	ND	9	ND	ND	ND	ND	ND	ND		
	Dissolved Solids (mg/L)	**1100**	310	400	330	**560**	330	220	320	**510**	290	360	500	SMCL
	Bicarbonate as CaCO3 (mg/L)	360	ND	74	110	180	150	ND	ND	160	120	130		
	Chemical Oxygen Demand	260	76	140	50	110	91	ND	ND	130	69	ND		
	Total Organic Carbon (TOC)	90	31	34	18	47	26	ND	ND	49	11	3.1		
	Total Organic Halides (TOX)	900	87	140	200	510	58	ND	ND	280	160	62		
	Turbidity (NTU)	**140**	**11**	**650**	**60**	**130**	**45**	**30**	**20**	**550**	**9.1**	**80**	5	MCL

SMCL - Secondary MCL

MCL - Kentucky Maximum Contaminant Level

SDWA - Safe Drinking Water Act

ND - Non Detect

[Bold] = Exceeds Criteria

Table 9.4 Summary of maximum groundwater results at C-746-K Landfill.

	Parameter	MW300	MW301	MW302	MW344	Criteria Reference	
Metal (mg/L)	Aluminum	**13**	**0.32**	ND	**2.1**	0.2	SMCL
	Barium	0.025	0.039	0.076	0.069	2	MCL
	Barium, Dissolved	0.012	0.04	0.076	0.054	2	MCL
	Beryllium	**0.014**	ND	ND	ND	0.004	MCL
	Beryllium, Dissolved	**0.013**	ND	ND	ND	0.004	MCL
	Cadmium	0.002	ND	ND	ND	0.005	MCL
	Cadmium, Dissolved	0.0012	ND	ND	ND	0.005	MCL
	Iron	**381**	**186**	ND	**7.6**	0.3	SMCL
	Lead	**0.01**	ND	ND	ND	0.015	SDWA
	Magnesium	97	45	26	25		
	Manganese	**37**	**16**	**0.067**	**0.49**	0.05	SMCL
	Nickel	0.22	ND	ND	ND		
	Potassium	18	22	ND	ND		
	Sodium	26	21	83	34		
	Strontium	1.4	1	0.39	0.31		
	Uranium	0.004	0.0042	ND	ND	0.02	MCL
	Uranium, Dissolved	0.004	0.0059	ND	ND	0.02	MCL
Rads (pCi/L)	Beta activity	**62**	**52**	ND	6.2	50	MCL
	Alpha activity	ND	ND	9.5	10.2		
	Technetium-99	22	19	ND	19	900	MCL
VOC (µg/L)	1,1-Dichloroethene	**66**	ND	ND	ND	7	MCL
	cis-1,2-Dichloroethene	**620**	16	ND	ND	70	SMCL
	Trichloroethene	**34**	3	2	ND	5	MCL
Other (mg/L)	Silica	53	30	41	16		
	Suspended Solids	ND	228	ND	86		

SMCL - Secondary MCL
MCL - Kentucky Maximum Contaminant Level
SDWA - Safe Drinking Water Act
ND - Non Detect
[Bold] = Exceeds Criteria

C-746-K Sanitary Landfill Groundwater Monitoring

The C-746-K Sanitary Landfill was used at PGDP between 1951 and 1981 primarily for the disposal of fly ash. Post-closure groundwater monitoring continues for the C-746-K Landfill on a quarterly basis. The UCRS and RGA are not present at the C-746-K site. Wells at the landfill are installed to monitor groundwater in the terrace gravels (Figure 9.7). A summary of the maximum results for each of the wells is provided in Table 9.4. TCE and degradation compounds, at concentrations above their respective regulatory criterion, were identified in wells around the C-746-K site. Aluminum, beryllium, iron, lead, manganese, and beta activity were also found above regulatory criteria.

Residential (Federal Facility Agreement) Monitoring

The FFA requires sampling of residential wells potentially affected by the contaminant plume (DOE 1998a). Currently, only three residential wells (R2, R294, and R302) are sampled monthly. Eighteen other residential wells are monitored semiannually per the FFA. All residential wells that are sampled monthly were analyzed for alpha and beta activity, TCE, and ^{99}Tc. As stated previously, the hydrologic unit in which residential wells are screened is uncertain; however, most are believed to be RGA wells. Table 9.5 provides a summary of the maximum detected results for the residential well monthly monitoring program. The eighteen residential wells, sampled semiannually, showed no detections of alpha, beta, or TCE. Two wells showed ^{99}Tc at 18.6 and 24.6 pCi/L. These results are not listed in the Table 9.5.

For one residential well, R424, DOE has provided the residents with a carbon filtering system to allow them to have safe drinking water. These filters are replaced semiannually and sampled before and after filter replacement. The groundwater in the well contains TCE below levels established by the EPA Safe Drinking Water Act; however, its location makes it highly improbable that the contaminants migrated from the Paducah Site. All residents were notified by mail of the results.

Environmental Surveillance Monitoring

Environmental surveillance monitoring is defined as perimeter exit pathway (off-site exposure) monitoring and off-site water well monitoring. Environmental surveillance monitoring is conducted in support of DOE orders and other laws and regulations as addressed in the *Paducah Site Environmental Monitoring Plan* (BJC 2001a). Specific wells monitored for environmental surveillance are as follows:

- *Annual Monitoring Progra*m - UCRS MWs 96, 180, 182, 188, and 192; RGA MWs 71, 106, 134, 155, 156, 163, 168, 169, 175, 178, 188, 191, 193, 200, 201, 203, 205, and 206; McNairy MW 133;
- *Annual Background Monitoring Progra*m - Terrace Gravels MW196; Eocene Sand MW305; RGA MWs 103, 150, 194, and 199; McNairy MWs 102, 120, 121, and 122;
- *Quarterly Monitoring Progra*m - UCRS MWs 166, 174, 186, and 187; RGA MWs 20, 63, 65, 98, 99, 100, 125, 135, 139, 146, 152, 161, 165, 173, 185, 197, 202, 260, 261, 262, 328, 329, 333, 337, 338, 339, 340, 341, 342, 343, 352, 354, and 355; McNairy MW356; Rubble Zone MWs 345, 346, and 347.

During 2002, surveillance wells were sampled for VOCs, metals, radionuclides, alpha and beta activity, carbonaceous biochemical oxygen demand, hardness, and suspended solids. Table 9.6 provides a summary of the maximum detected results for each hydrogeologic unit sampled for the surveillance program. The maximum TCE value reported in the RGA is 160,000 µg/L from MW 156. The well is located at the southeast corner of C-400. This level of TCE is consistent with levels shown at this well in the past. TCE was also detected in the McNairy at 81 µg/L in MW 356. Two other wells completed in the McNairy (MW 99 and MW 133) showed TCE detections (19 and 1 µg/L).

During 2002 maximum ^{99}Tc activities in the RGA (9900 pCi/L-MW 343) exceeded contaminant levels in. Maximum ^{99}Tc activities of 18.9 pCi/L (MW 356) recorded in the McNairy during 2002 did not exceed MCLs.

Table 9.5 Summary of maximum groundwater results from residential monthly monitoring.

Well Number	Alpha activity pCi/L	Beta activity pCi/L	^{99}Tc pCi/L	TCE µg/L
R2	**29**	**116**	157	**450**
R294	ND	2.8	ND	ND
R302	ND	7.5	ND	ND
	MCL=15	MCL=50	MCL=900	MCL=5

ND - Non Detect

MCL - Kentucky Maximum Contaminant Level

[Bold] = Exceeds Criteria

Table 9.6 Summary of maximum groundwater results from environmental surveillance quarterly, annual, and background monitoring.

	Parameter	Eocene	McNairy	RGA	Rubble Zone	Terrace Gravel	UCRS	Criteria	Reference
VOC (µg/L)	1,1-Dichloroethane	ND	ND	13	ND	ND	ND		
	1,1-Dichloroethene	ND	ND	**26**	ND	ND	ND	7	MCL
	Carbon tetrachloride	ND	ND	**170**	ND	ND	ND	5	MCL
	cis-1,2-Dichloroethene	ND	ND	**400**	ND	ND	ND	70	SMCL
	Trichloroethene	ND	**81**	**160000**	1	ND	**7200**	5	MCL
	Vinyl chloride	ND	ND	**670**	ND	ND	ND	2	MCL
Metal (mg/L)	Aluminum	**4.1**	ND	**4**	ND	ND	**0.68**	0.2	SMCL
	Chromium	ND	ND	**1.4**	ND	ND	**2.3**	0.1	MCL
	Copper	ND	ND	0.031	ND	ND	0.037	1.3	SMCL
	Iron	**2.6**	ND	**30**	ND	**7.1**	**21**	0.3	SMCL
	Nickel	ND	ND	0.44	ND	ND	1		
	Phosphorous	2.1	ND	0.39	ND	0.28	0.47		
	Total Metals	6.7	ND	31	ND	7.2	21		
	Uranium	0.002	0.0016	0.017	0.0057	ND	**0.35**	0.02	MCL
Rads (pCi/L)	Alpha activity	ND	8.7	**160**	15	ND	**210**	15	MCL
	Beta activity	ND	8.2	**7700**	12	27	**630**	50	MCL
	Dissolved Alpha	ND	ND	230	13	ND	170		
	Dissolved Beta	ND	ND	5900	ND	26	380		
	Suspended Beta	ND	50	11	ND	ND	ND		
	^{99}Tc	ND	19	**9900**	26	ND	840	900	MCL
	Uranium	ND	ND	**1600**	ND	ND	**2200**		
	^{234}U	ND	ND	610	ND	ND	840		
	^{235}U	ND	ND	40	ND	ND	54		
	^{238}U	ND	ND	1000	ND	ND	1300		
Other (mg/L)	Carbonaceous Biochemical Oxygen Demand (CBOD)	ND	ND	23	ND	ND	ND		
	Hardness - Total as CaCO3	38	110	210	ND	100	570		
	Suspended Solids	140	ND	810	ND	11	120		

SMCL - Secondary MCL
MCL - Maximum Contaminant Level
ND - Non Detect
[Bold] = Exceeds Criteria

Three wells, MW 345, MW 346, and MW 347, have been installed penetrating the Rubble Zone, which is the formation underlying the McNairy. Initial sampling of the wells indicated no contamination; however, in 2000 TCE was detected at 1 µg/L. During 2001 no TCE was detected in these wells; in 2002 TCE was again detected at 1 ug/L. ^{99}Tc, which had not been detected in these wells in previous years, was detected in the Rubble Zone in 2002 at an activity of 26.1 pCi/L. However, this maximum activity is significantly lower than the ^{99}Tc MCL.

Environmental Restoration Activities

Northwest Plume Monitoring

The EPA approved an IRA ROD to hydraulically contain off-site migration of the northwest plume. This was the first phase of the high concentration portion of remedial action for groundwater at the Paducah Site. Two extraction wells near a source of the northwest plume and two additional extraction wells farther north, near the centroid of the plume, were installed. Each set of extraction wells is surrounded by a MW network (Figure 9.9). The network is used for monitoring groundwater quality and water levels to determine the effectiveness of the interim action. Collectively, the system is known as the Northwest Plume Groundwater System.

Long-term monitoring has been conducted at the Northwest Plume. Data gathered from 1995 through 2002 suggest that the overall concentration of TCE and ^{99}Tc in the majority of the wells is decreasing. This indicates that the well fields are beginning to achieve containment of the core of the plume. Dissolved TCE continues to migrate past the east side of the South well field. Beginning in 2002, monitoring data suggests that the North extraction well field may be failing to reduce the high-concentration core of the Northwest Plume (DOE 2003). Other analytical data are gathered to monitor the extraction system performance. A more detailed description of TCE and ^{99}Tc in the Northwest Plume is included in Appendix C. Summaries of the program's monitoring results are listed in Tables 9.7 and 9.8. The data for this program are reported in the FFA Semiannual Progress Report.

Northeast Plume Monitoring

EPA approved an Interim ROD for treatment of the Northeast Plume in June of 1995. Implementation of the ROD was completed in 1996 and operation began in 1997, which consisted of construction of two extraction wells, several MWs (Figure 9.10) and piezometers, and facilities required to transfer the TCE-contaminated water to the C-637 Cooling Tower for treatment. Groundwater quality and water level information obtained from the piezometers and MWs are used to evaluate the effectiveness of the remedial action. The upgradient MWs are used to detect possible ^{99}Tc contamination within the high-concentration area of the plume before it reaches the extraction wells.

Monitoring results from the Northeast Plume indicate TCE levels have dropped significantly since implementation of the remedial action (BJC 2003c). A recent review of the remedial action indicated that the system is functioning as intended (DOE 2003). Other analytical data is also gathered to monitor the extraction system performance. A more detailed description of TCE and ^{99}Tc in the Northeast Plume is included in Appendix C. A summary of the program's monitoring results is listed in Table 9.9. The data for this program are reported in the FFA Semiannual Progress Report.

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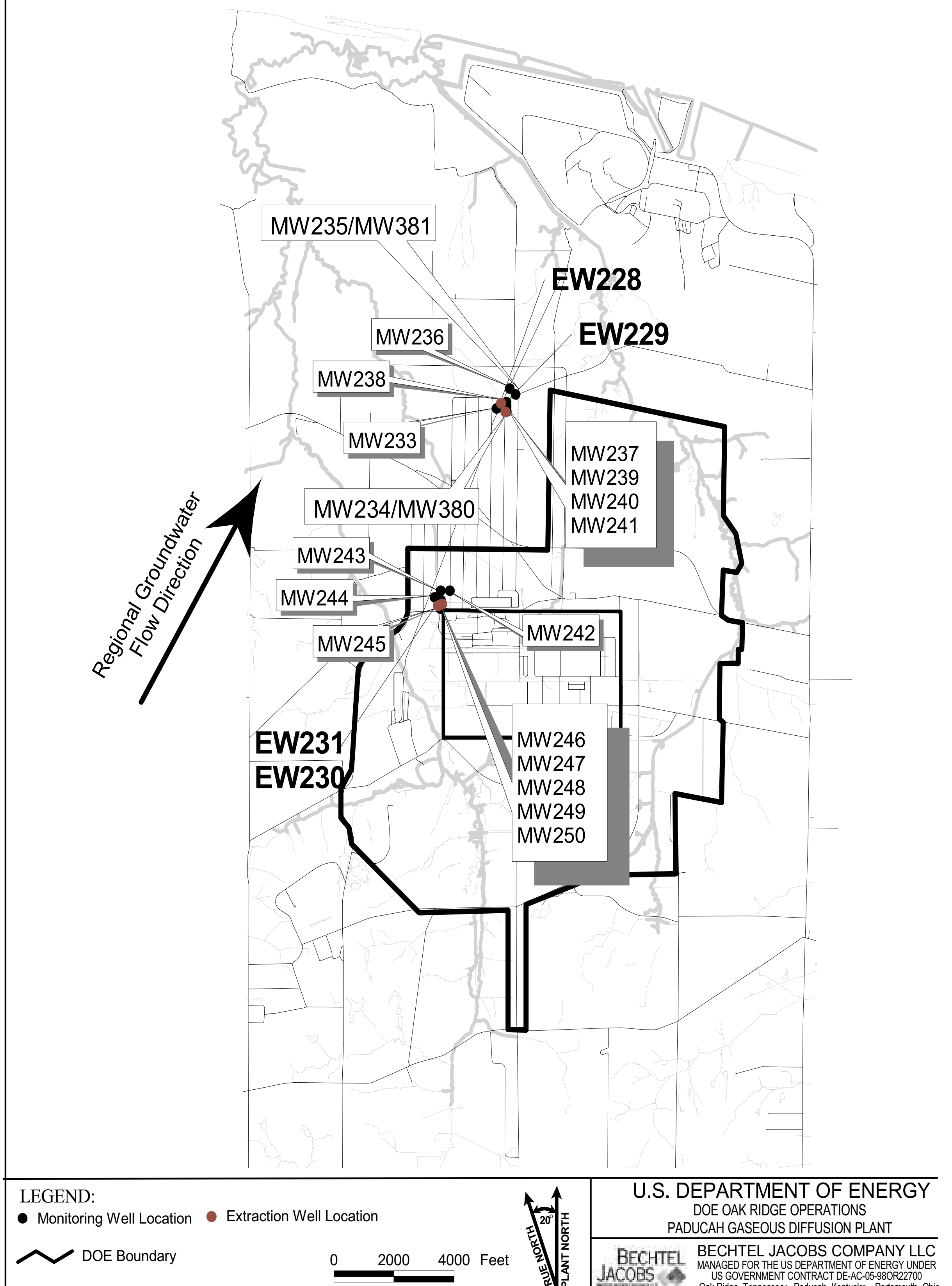


U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER
US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

Figure 9.9 Northwest plume monitoring wells.

CDM

FIGURE No. c5ac90002sk097.apr
DATE 05-01-03

Table 9.7 Summary of maximum groundwater results from the Northwest Plume north field groundwater monitoring.

	Analysis	MW 233	MW 234/380	MW 235/381	MW 236	MW 237	MW 238	MW 239	MW 240	MW 241	Criteria	Reference
Metals (mg/L)	Aluminum	ND	**5.2**	**0.64**	ND	ND	**1.8**	ND	ND	ND	0.2	SMCL
	Barium	0.13	0.16	0.16	0.14	0.12	0.13	0.039	0.13	0.13	2	MCL
	Barium, Dissolved	0.12	0.14	0.15	0.13	0.12	0.13	0.04	0.12	0.12	2	MCL
	Calcium	21	29	29	23	23	24	4.5	22	21		
	Calcium, Dissolved	21	27	28	24	25	22	4.5	22	21		
	Cobalt	ND	ND	ND	ND	ND	ND	0.011	ND	ND		
	Cobalt, Dissolved	ND	ND	ND	ND	ND	ND	0.012	ND	ND		
	Iron	ND	**11**	**1.7**	**0.78**	ND	**2.7**	**26**	ND	**0.46**	0.3	SMCL
	Iron, Dissolved	ND	ND	ND	ND	ND	ND	**24**	ND	ND	0.3	SMCL
	Magnesium	9.1	10	11	10	9.1	9.3	3	9.5	9		
	Magnesium, Dissolved	11	12	14	12	10	10	3.6	11	10		
	Manganese	0.0079	**0.4**	**0.49**	0.0091	ND	0.031	**0.81**	ND	0.0067	0.05	SMCL
	Manganese, Dissolved	ND	0.014	**0.5**	ND	ND	ND	**0.79**	ND	ND	0.05	SMCL
	Molybdenum	ND	0.0011	ND	0.0012	ND	ND	ND	ND	ND		
	Nickel	0.039	0.0072	ND	0.0053	ND	ND	ND	ND	0.0081		
	Nickel, Dissolved	0.013	ND	ND	ND	ND	ND	ND	ND	ND		
	Potassium	1.4	1.4	1.5	1.4	0.3	1.4	7.9	1.3	1.3		
	Potassium, Dissolved	1.4	1.3	1.5	1.4	0.3	1.2	7.9	1.4	1.3		
	Selenium	0.0053	ND	ND	ND	ND	ND	ND	0.0056	0.0057	0.05	MCL
	Sodium	32	35	45	32	87	32	17	34	32		
	Sodium, Dissolved	40	39	47	37	100	33	21	39	36		
Rads (pCi/L)	Alpha activity	ND	ND	12	10	ND	ND	5.6	ND	ND	15	MCL
	Beta activity	16	**260**	**350**	**170**	ND	**77**	18	35	**140**	50	MCL
	^{99}Tc	24	350	460	200	20	97	ND	35	21	900	MCL
VOC (µg/L)	Trichloroethene	**23**	**970**	**1100**	**710**	ND	**310**	1	**70**	**49**	5	MCL
Other	Dissolved Solids (mg/L)	180	190	210	180	310	180	160	170	170	500	SMCL
	Chloride (mg/L)	27	28	37	27	2.9	26	23	26	26	250	SMCL
	Fluoride (mg/L)	0.16	0.15	0.16	0.15	0.55	0.15	0.32	0.16	0.15	4	MCL
	Nitrate as Nitrogen (mg/L)	1.9	2.2	1.8	2	ND	1.8	ND	1.6	1.6	10	MCL
	Sulfate (mg/L)	14	22	22	22	90	18	18	17	16		
	Total Organic Carbon (mg/L)	ND	ND	ND	ND	1	1.2	ND	ND	ND		
	Alkalinity (mg/L)	95	98	110	92	170	92	63	92	92		
	Silica (mg/L)	18	16	16	19	40	17	51	16	16		
	Turbidity (NTU)	3	**160**	**30**	6.3	2.8	**13**	**28**	1.7	5	5	MCL

SMCL - Secondary MCL

MCL - Maximum Contaminant Level

ND - Non Detect

[Bold] = Exceeds Criteria

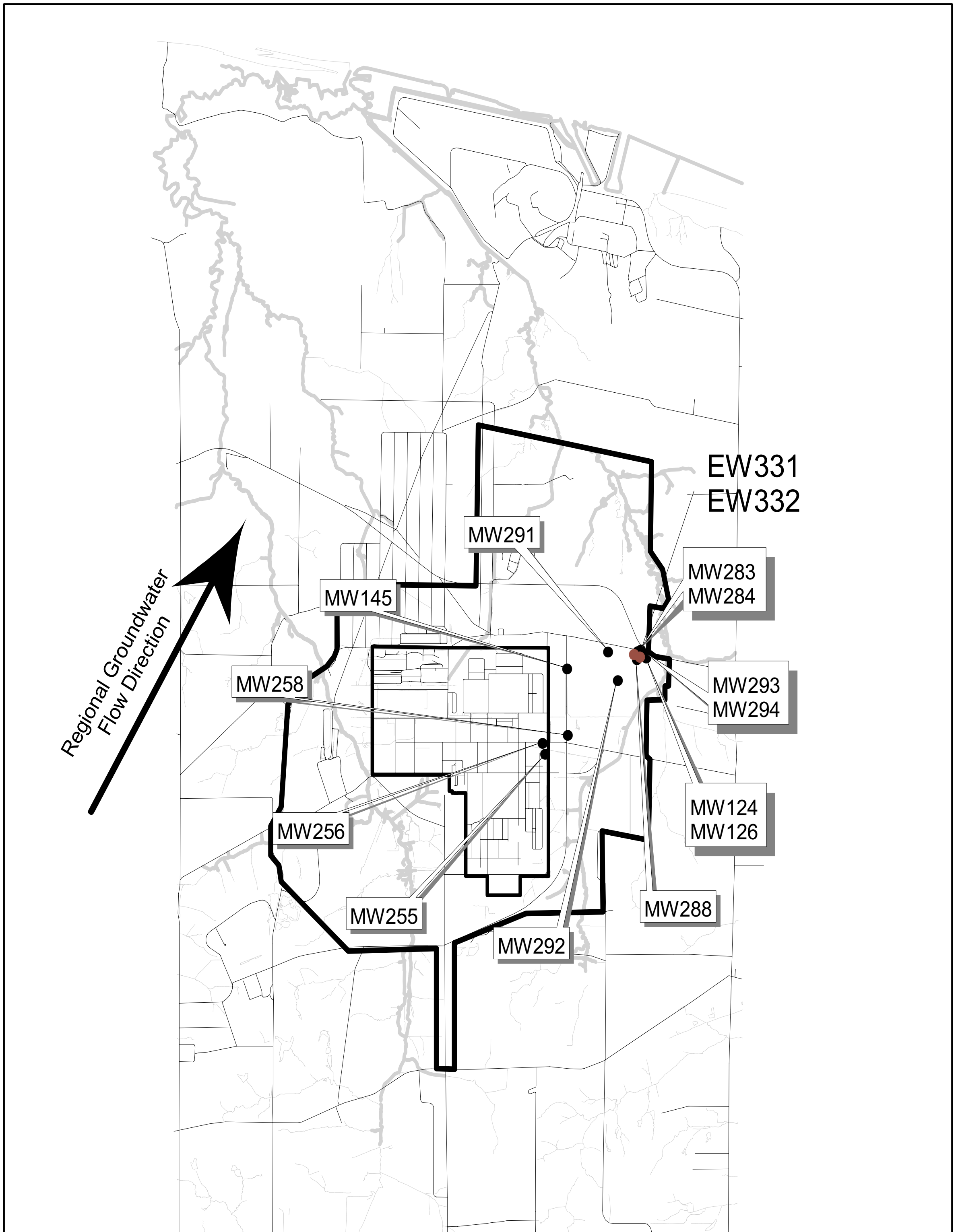
Table 9.8 Summary of maximum groundwater results from the Northwest Plume south field groundwater monitoring.

	Parameter	MW 242	MW 243	MW 244	MW 245	MW 246	MW 247	MW 248	MW 249	MW 250	Criteria Reference	
Metal (mg/L)	Aluminum	**0.36**	0.00032	ND	**3.5**	**1**	ND	ND	**0.23**	**1.4**	0.2	SMCL
	Aluminum, Dissolved	ND	ND	ND	**0.37**	ND	ND	ND	ND	ND	0.2	SMCL
	Barium	0.25	0.14	0.096	0.17	0.042	0.26	0.13	0.11	0.087	2	MCL
	Barium, Dissolved	0.25	0.15	0.096	0.16	0.036	0.23	0.13	0.11	0.087	2	MCL
	Calcium	30	24	20	24	26	23	23	24	22		
	Calcium, Dissolved	33	29	23	22	24	24	30	23	22		
	Chromium	**0.22**	**0.12**	ND	ND	ND	ND	ND	ND	ND	0.1	MCL
	Cobalt	0.0068	ND	ND	ND	ND	ND	ND	ND	ND		
	Iron	**1.8**	**0.92**	0.0003	**5**	**1.1**	**15**	**0.71**	**0.77**	**2.7**	0.3	SMCL
	Iron, Dissolved	ND	ND	ND	ND	ND	**9.7**	ND	ND	ND	0.3	SMCL
	Magnesium	14	9.8	8.4	9.2	11	14	9.6	7.5	8.8		
	Magnesium, Dissolved	17	14	12	9.8	10	16	16	9.1	11		
	Manganese	**0.095**	0.0089	ND	**1.2**	ND	**1.4**	**0.083**	0.033	ND	0.05	SMCL
	Manganese, Dissolved	**0.095**	0.0093	ND	**1.2**	ND	**1.6**	ND	ND	ND	0.05	SMCL
	Molybdenum	0.013	0.0026	ND	ND	ND	0.0018	0.0011	ND	ND		
	Molybdenum, Dissolved	0.0041	ND	ND	ND	ND	0.0017	ND	ND	ND		
	Nickel	0.75	0.018	0.036	ND	ND	ND	0.0071	ND	ND		
	Nickel, Dissolved	0.75	0.019	0.092	ND	ND	ND	ND	ND	ND		
	Potassium	1.2	0.0011	0.001	ND	9.8	6.5	0.001	4.4	0.0011		
	Potassium, Dissolved	1.3	1.2	1.1	0.85	8.4	6.6	1.1	4.1	1		
	Selenium	0.0083	0.0063	0.0054	ND	ND	ND	0.0069	ND	0.0052	0.05	MCL
	Selenium, Dissolved	0.0056	ND	ND	ND	ND	ND	ND	ND	ND	0.05	MCL
	Sodium	29	27	30	25	93	33	26	33	35		
	Sodium, Dissolved	36	34	34	27	110	35	34	32	34		
	Zinc	ND	ND	ND	0.021	ND	ND	ND	ND	ND	5	SMCL
Rads (pCi/L)	Alpha activity	6.5	7.8	ND	5	ND	13	**17**	ND	ND	15	MCL
	Beta activity	**130**	**340**	39	29	15	14	**730**	38	40	50	MCL
	^{226}Radium	ND	ND	ND	ND	ND	1.4	ND	ND	ND	20	SDWA
	Radon	ND	180	190	230	1100	ND	280	ND	ND		
	^{99}Tc	190	490	42	50	ND	ND	**1100**	78	73	900	MCL
VOC (ug/L)	Trichloroethene	**180**	**2400**	**35**	**290**	1	ND	**5600**	**130**	**150**	5	MCL
Other	Dissolved Solids (mg/L)	230	210	170	170	340	170	220	140	170	500	SMCL
	Chloride (mg/L)	59	54	26	12	3.3	5.3	56	18	23	250	SMCL
	Fluoride (mg/L)	ND	0.12	0.14	0.18	0.36	0.16	0.11	0.12	0.14	4	MCL
	Nitrate as Nitrogen (mg/L)	1.4	1.8	ND	ND	ND	ND	3.2	ND	ND	10	MCL
	Sulfate (mg/L)	10	12	12	10	110	ND	9.9	8.8	12		
	Alkalinity (mg/L)	88	80	100	96	150	170	80	78	94		
	Silica (mg/L)	16	15	18	26	36	6	18	20	18		
	Turbidity (NTU)	**12**	**8.1**	3.2	**77**	**22**	**290**	4.2	**6.6**	**29**	5	MCL

SMCL - Secondary MCL
MCL - Maximum Contaminant Level
SDWA - Safe Drinking Water Act

ND - Non Detect
[Bold] = Exceeds Criteria

DOCUMENT No. BJC/PAD-543/V1



LEGEND:
● Monitoring Well Location ● Extraction Well Location
DOE Boundary
2000 0 2000 Feet
TRUE NORTH 20° PLANT NORTH

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER
US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

Figure 9.10 Northeast plume monitoring wells.

CDM

FIGURE No. c5ac90002sk098.apr
DATE 05-01-03

Table 9.9 Summary of maximum groundwater results from the Northeast Plume groundwater monitoring.

	Parameter	Monitoring Wells													Reference	
		124	126	145	255	256	258	283	284	288	291	292	293	294		
Metal	Barium	0.22	0.2	0.065	0.17	0.29	0.19	0.29	0.28	0.27	0.24	0.24	0.18	0.24	2	MCL
(mg/L)	Barium, Dissolved	0.21	0.19	0.068	0.17	0.3	0.18	ND	0.29	0.25	0.24	0.23	0.17	0.24	2	MCL
	Calcium	28	26	56	34	32	31	34	31	33	25	33	28	28		
	Calcium, Dissolved	27	25	53	32	31	29	32	30	33	24	30	27	27		
	Chromium	**0.2**	0.069	ND	ND	ND	0.066	ND	0.061	0.047	0.1	0.036	0.05	**0.31**	0.1	MCL
	Cobalt	0.0021	ND	ND	ND	ND	0.0018	ND	ND	ND	ND	0.0023	ND	0.0014		
	Cobalt, Dissolved	ND	ND	ND	ND	ND	0.0015	ND	ND	ND	ND	0.0028	ND	0.0015		
	Iron	**3.4**	**1.4**	ND	**0.42**	ND	**2.2**	ND	**0.89**	**0.32**	**0.61**	**0.89**	**0.5**	**2.2**	0.3	SMCL
	Magnesium	9.9	9.4	21	12	12	12	12	12	12	9.5	12	9.1	10		
	Magnesium, Dissolved	11	10	24	14	13	12	14	13	14	10	13	10	12		
	Manganese	0.041	0.0057	ND	**0.064**	ND	0.013	ND	ND	ND	0.01	0.027	0.0096	0.018	0.05	SMCL
	Manganese, Dissolved	0.011	ND	ND	0.044	ND	0.0096	ND	ND	ND	ND	0.035	0.0082	0.021	0.05	SMCL
	Molybdenum	ND	0.0017	ND	0.0036	ND	0.0023	0.0018	0.0044	0.0023	0.0051	0.0047	0.039	0.02		
	Molybdenum, Dissolved	ND	ND	ND	0.0023	ND	ND	ND	0.0011	ND	ND	0.0023	0.042	0.004		
	Nickel	0.11	0.0088	0.0066	0.017	ND	0.057	ND	0.012	ND	0.025	0.19	0.079	0.082		
	Nickel, Dissolved	0.097	ND	ND	0.015	ND	0.054	ND	0.0096	ND	0.017	0.25	0.085	0.085		
	Potassium	1.8	1.4	5.7	2	2.1	2.1	1.6	1.7	1.7	1.5	1.8	1.8	1.8		
	Potassium, Dissolved	1.8	1.3	5.2	1.8	1.9	1.9	1.6	1.6	1.7	1.4	1.7	1.7	1.7		
	Selenium	0.016	0.013	0.0075	0.013	0.01	0.014	0.01	0.011	0.011	0.0094	0.014	0.012	0.014	0.05	MCL
	Selenium, Dissolved	0.012	0.0091	ND	0.009	0.0065	0.0096	0.0064	0.0069	0.0088	0.006	0.0095	0.0079	0.01	0.05	MCL
	Silver	ND	ND	ND	ND	ND	ND	ND	ND	0.0017	ND	ND	ND	ND	0.05	SDWA
	Sodium	49	46	72	91	70	75	42	39	49	41	58	35	41		
	Sodium, Dissolved	51	51	80	100	75	78	44	42	54	45	59	39	48		
Rads	Alpha activity	ND	ND	ND	ND	ND	8.4	ND	ND	ND	7.2	ND	ND	ND	15	MCL
(pCi/L)	Beta activity	6.4	ND	17	ND	**87**	8.2	6.9	8.9	26	6.4	15	ND	ND	50	MCL
	^{99}Tc	ND	ND	ND	17	130	20	ND	ND	59	ND	28	ND	18	900	MCL
VOC	1,1-Dichloroethene	ND	ND	ND	ND	**110**	ND	ND	ND	ND	ND	ND	ND	ND	7	MCL
(µg/L)	cis-1,2-Dichloroethene	ND	ND	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	70	SMCL
	Trichloroethene	**170**	**7**	**98**	**740**	**480**	**1000**	**200**	**210**	**650**	**180**	**850**	**770**	**1100**	5	MCL
Other	Dissolved Solids (mg/L)	230	220	440	340	290	300	250	240	260	210	270	220	240	500	SMCL
	Chloride (mg/L)	52	50	95	59	50	59	71	69	71	57	66	52	65	250	SMCL
	Fluoride (mg/L)	0.17	0.19	0.18	0.24	0.2	0.22	0.15	0.14	0.14	0.13	0.16	0.14	0.13	4	MCL
	Nitrate as Nitrogen (mg/L)	2.4	1.3	ND	ND	ND	1.4	1.3	1.2	1.4	1.3	1.5	2.8	2.1	10	MCL
	Sulfate (mg/L)	16	12	92	38	23	23	8.6	6.8	16	6.5	13	10	6		
	Alkalinity (mg/L)	100	100	150	190	160	160	96	90	120	86	130	88	85		
	Silica (mg/L)	14	16	16	14	15	15	16	15	14	15	14	14	14		
	Total Organic Carbon (mg/L)	1	1.1	1.3	1.5	1.4	1.5	1	ND	1.2	ND	1.2	1.6	1		
	Turbidity (NTU)	**21**	**9.9**	0.5	**9.2**	1	**27**	0.8	**6.2**	4.1	**8.4**	**9.1**	**5.2**	**20**	5	MCL

SMCL - Secondary MCL

MCL - Maximum Contaminant Level

SDWA - Safe Drinking Water Act

ND - Non Detect

[Bold] = Exceeds Criteria

Groundwater Monitoring Results

The primary objectives of groundwater monitoring at the Paducah Site are being met by the monitoring programs. Contamination has been detected in groundwater off-site. Through the monitoring program, in conjunction with RIs, a footprint of the groundwater contamination has been mapped and is regularly updated. The program continues to expand each year to further delineate the boundaries of the footprint over time and to identify source locations for contaminants. Monitoring wells upgradient and downgradient from individual underground waste disposal facilities are sampled and analyzed for contaminants of concern (COCs). Contaminants identified by the monitoring program are evaluated by technical assessment and statistical analysis to determine if the source of the contaminants could be the disposal site being monitored. Beta activity, TCE, and ^{99}Tc are found in the off-site and on-site contamination plumes. Chromium and dissolved solids are also present in some wells, although these contaminants are thought to be natural in origin and not a result of past practices. Groundwater monitoring results from all sampling efforts conducted by the Paducah Site are compiled in the Paducah Oak Ridge Environmental Information System (OREIS) database. A complete listing of analytical results is available upon request from the BJC Public Affairs Department.

Appendix C contains a more detailed interpretation of the TCE and ^{99}Tc groundwater contamination and plumes within the RGA based upon an annual update of the plumes. Detailed plume figures included in *Trichloroethene and Technetium-99 Groundwater Contamination in the Regional Gravel Aquifer for Calendar Year 2002 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2003c) have been omitted from this report due to space limitations. However, Figure 9.1 shows offsite groundwater plumes. The complete report is available from the DOE EIC.

10 Quality Assurance

Abstract

The Paducah Site maintains a Quality Assurance/Quality Control (QA/QC) Program to verify the integrity of data generated within the environmental monitoring program. Monitoring and sampling organizations at Paducah select sampling methods, instruments, locations, schedules, and other sampling and monitoring criteria based on applicable guidelines from various established authorities.

Introduction

The Paducah Site maintains a QA/QC Program to verify the integrity of data generated within the Environmental Monitoring Program. Each aspect of the monitoring program, from sample collection to data reporting, must address quality requirements and assessment standards. Requirements and guidelines for the QA/QC Program at the Paducah Site are established by DOE Order 414.1, *Quality Assurance*; state and federal regulations; and documentation from EPA, the American National Standards Institute, the American Society of Mechanical Engineers, the American Society of Testing and Materials (ASTM), and the American Society for Quality Control. The QA/QC Program specifies organizational and programmatic elements to control equipment, design, documents, data, nonconformances, and records. Emphasis is placed on planning, implementing, and assessing activities. QA/QC Program requirements are specified in project and subcontract documents to ensure that requirements are included in project specific QA plans and other planning documents.

The *Environmental Services Subcontract Quality Assurance and Data Management Plan* (BJC 2001a, Appendix D) [EQADMP] defines the relationship of each element of the Environmental Monitoring Program to key quality and data management requirements. Training requirements, sample custody, procedures, instrument calibration and maintenance, and data review are a few of the subjects discussed in the EQADMP. In 2002, a variety of functions were performed for the Environmental Monitoring Program, such as developing DQOs, conducting surveillances, reporting problems, reviewing data, reviewing procedures, and revising the EQADMP.

Field Sampling Quality Control

Data Quality Objectives and Sample Planning

From the point of conception of any sampling program, DQOs play an important role. The number of samples, location of sampling sites, sampling methods, sampling schedules, and coordination of sampling and analytical resources to meet critical completion times are part of a DQO process and are documented in the *Paducah Site Environmental Monitoring Plan* (BJC 2001).

Each sample location and sample collected is assigned a unique identification number, which consists of an alpha numeric sequence. Each segment of the sequence is used to designate information concerning the location from which a sample is collected. In order to progress from planning to implementing the DQOs, an analytical statement of work (SOW) for the analytical laboratory is generated from a system within the Paducah Integrated Data System. From this system, the Project Environmental Measurements System (PEMS), an electronic database used for managing and streamlining field-generated and laboratory-generated data, is populated with sample identification numbers, sampling locations, sampling methods, analytical parameters, analytical methods, and container and preservative requirements. This information is used to produce sample bottle labels and chain-of-custody forms for each sampling event.

Field Measurements

Field measurements for the groundwater and surface water monitoring program are collected in the field and include water level measurements, pH, conductivity, flow rate, turbidity, temperature, dissolved oxygen, total residual chlorine, and barometric pressure. Environmental conditions such as ambient temperature and weather are also recorded. Field measurements are collected and either downloaded electronically, recorded on appropriate field forms, or recorded in logbooks, and input into PEMS.

Sampling Procedures

Samples are collected using media-specific procedures, which are written according to EPA-approved sampling methods. Sample media consists of surface water, groundwater, sediment, and biota, such as fish or deer. Sample information recorded during a sample event consists of the following: sample identification number, station (or location), date collected, time collected, person who performed the sampling, etc. This information is documented in the logbooks and on the chain-of-custody form and sample container label, and input directly into PEMS on a weekly or other appropriate basis. Chain-of-custody forms are maintained from the point of sampling, and samples are properly protected until they are placed in the custody of an analytical laboratory.

Field Quality Control Samples

The QC program for both groundwater and environmental monitoring activities specifes a minimum target rate of 5%, or one per 20 environmental samples, for field QC samples. Table 10.1 shows the types of field QC samples collected and analyzed. Analytical results of field QC samples are evaluated to determine if the sampling event had, in some way, affected the sample results.

Analytical Laboratory Quality Control

Analytical Procedures

When available and appropriate for the sample matrix, EPA-approved SW-846 methods are used for sample analysis. When SW-846 methods are not available, other nationally recognized methods such as those developed by DOE and ASTM are used. Analytical methods are identified in an analytical SOW. Using guidance from EPA, the laboratories

Table 10.1 Types of Quality Control (QC) Samples.

Field QC Samples	Laboratory QC Samples
Field blanks[a]	Laboratory duplicates
Field duplicates	Reagent blanks
Trip blanks[a]	Matrix spikes[b]
Equipment rinseates	Matrix spike duplicates
	Surrogates
	Performance evaluations
	Laboratory control samples

a blank – samples of deionized water used to assess potential contamination from a source other than the media being sampled

b spikes – samples that have been mixed with a known quantity of a chemical to measure instrument effectiveness during the analysis process

document the steps in handling, analysis, and approval of results. Chain-of-custody procedures are followed until a sample is analyzed.

Laboratory Quality Control Samples

Laboratory QC samples are prepared and analyzed as required by the analytical methods used. Typical laboratory QC samples are identified in Table 10.1. If acceptance criteria are not met for the QC samples, then appropriate action, as denoted by the analytical method, is taken or appropriate qualification of the data occurs.

Independent Quality Control

The Paducah Site is directed by DOE and EPA to participate in independent QC programs. The site also participates in voluntary independent programs to improve analytical QC. These programs generate data that are readily recognizable as objective measures, allowing participating laboratories and government agencies a periodic review of their performance. Results that exceed acceptable limits are investigated and documented according to formal procedures. Although participation in certain programs is mandated, the degree of participation is voluntary so that each laboratory can select parameters of particular interest to that facility. These programs are conducted by EPA, DOE, and commercial laboratories.

Laboratory Audits/Sample Management Office

Laboratory audits are performed periodically by the BJC Oak Ridge Sample Management Office (SMO) to ensure the laboratory is in compliance with regulations, procedures, and the contract between the laboratory and the SMO. Findings are documented and addressed by the audited laboratory through corrective actions.

Data Management

Project Environmental Management System

The data generated from sampling events are stored in PEMS, a consolidated site data system for tracking and managing data. The system is used to manage field-generated data; import laboratory-generated data; input data qualifiers identified during the data review process; and transfer data to the Paducah OREIS for reporting. PEMS uses a variety of references and code lists to ensure consistency and standardize the presentation of data for users.

Paducah OREIS

Paducah OREIS is the database used to consolidate data generated by the Environmental Management Program. Data consolidation consists of the activities necessary to prepare the evaluated data for the users. The PEMS files containing the assessed data are transferred from PEMS to Paducah OREIS for future use. The data manager is responsible for notifying project team and other data users of the data availability. Data used in reports distributed to external agencies (e.g., the quarterly landfill reports, the ASER, and the biological monitoring program reports) are obtained from Paducah OREIS and have been through the data review process.

Electronic Data Deliverables

A "results only" Electronic Data Deliverable (EDD) is requested for all samples analyzed by each laboratory. The results and qualifier information from the EDD are checked in addition to the format of all fields provided. Discrepancies are immediately reported to the laboratory so corrections can be made or new EDDs can be issued. Approximately 10% of the EDDs are randomly checked to verify that the laboratory continues to provide adequate EDDs.

Data Packages

A "forms only" Level III data package is requested from the laboratory when data validation is to be performed on a specific sampling event or media. All data packages received from the fixed-base laboratory are tracked, reviewed, and maintained in a secure environment. The following information is tracked: sample delivery group number; date received; number of samples; sample analyses; receipt of the EDD, if applicable; and comments. The contents of the data package and the chain-of-custody forms are compared and discrepancies are identified. Discrepancies are immediately reported to the laboratory and data validators. All data packages are forwarded to the PGDP Environmental Management and Enrichment Facilities Document Management Center for permanent storage.

Laboratory Contractual Screening

Laboratory contractual screening is the process of evaluating a set of data against the requirements specified in the analytical SOW to ensure that all requested information is received. The contractual screening includes, but is not limited to, the chain-of-custody form, number of samples, analytes requested, total number of analyses, method used, QC samples analyzed, EDDs, units, holding times, and reporting limits achieved. The contractual screening is conducted electronically upon receipt of data from the analytical laboratory. Any exception to the SOW is identified and documented.

Data Verification, Validation, and Assessment

Data verification is the process for comparing a data set against a set standard or contractual requirement. Verification is performed electronically, manually, or by a combination of both. Data verification includes contractual screening and other criteria specific to the data. Data are flagged as necessary. Verification qualifiers are stored in PEMS and transferred with the data to Paducah OREIS.

Data validation is the process performed by a qualified individual for a data set, independent from sampling, laboratory, project management, or other decision-making personnel. Data validation evaluates the laboratory adherence to analytical method requirements. Validation qualifiers are stored in PEMS and transferred with the data to Paducah OREIS. Data from routine sampling events are validated programmatically at a frequency of 5% of the total data packages. Each of the selected data packages, which make up 5% of the total number of data packages, is validated 100%.

Data assessment is the process for assuring that the type, quality, and quantity of data are appropriate for their intended use. It allows for the determination that a decision (or estimate) can be made with the desired level of confidence, given the quality of the data set. Data assessment follows data verification and data validation (if applicable) and must be performed at a rate of 100% to ensure data are useable. The data assessment is conducted by trained technical personnel or their designee in conjunction with other project team members. Assessment qualifiers are stored in PEMS and transferred with the data to Paducah OREIS. Data are made available for reporting from Paducah OREIS upon completion of the data assessment, and associated documentation is filed with the project files.

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Glossary

absorption – The process by which the number and energy of particles or photons entering a body of matter is reduced by interaction with the matter.

activity – See radioactivity.

air stripping – The process of bubbling air through water to remove volatile organic compounds from the water.

alpha particle – A positively charged particle emitted from the nucleus of an atom having the same charge and mass as that of a helium nucleus (two protons and two neutrons).

ambient air – The atmosphere around people, plants, and structures.

analyte – A constituent or parameter being analyzed.

analytical detection limit – The lowest reasonably accurate concentration of an analyte that can be detected; this value varies depending on the method, instrument, and dilution used.

aquifer – A geologic formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs.

aquitard – A geologic unit that inhibits the flow of water.

assimilate – To take up or absorb.

atom – Smallest particle of an element capable of entering into a chemical reaction.

beta particle – A negatively charged particle emitted from the nucleus of an atom. It has a mass and charge equal to those of an electron.

biota – The animal and plant life of a particular region considered as a total ecological entity.

CERCLA-reportable release – A release to the environment that exceeds reportable quantities as defined by the Comprehensive Environmental Response, Compensation, and Liability Act.

chain of custody form – A form that documents sample collection, transport, analysis, and disposal.

closure – Formal shutdown of a hazardous waste management facility under Resource Conservation and Recovery Act requirements.

compliance – Fulfillment of applicable requirements of a plan or schedule ordered or approved by government authority.

concentration – The amount of a substance contained in a unit volume or mass of a sample.

conductivity – A measure of a material's capacity to convey an electric current. For water, this property is related to the total concentration of the ionized substances in water and the temperature at which the measurement is made.

confluence – The point at which two or more streams meet; the point where a tributary joins the main stream.

congener – Any particular member of a class of chemical substances. A specific congener is denoted by a unique chemical structure.

contained landfill – A solid waste site or facility that accepts disposal of solid waste. The technical requirements for contained landfills are found in 401 KAR 47:080, 48:050, and 48:070 to 48:090.

contamination – Deposition of unwanted material on the surfaces of dissolved into structures, areas, objects, or personnel.

cosmic radiation – Ionizing radiation with very high energies that originates outside the earth's atmosphere. Cosmic radiation is one contributor to natural background radiation.

curie (Ci) – A unit of radioactivity. One curie is defined as 3.7×10^{10} (37 billion) disintegrations per second. Several fractions and multiples of the curie are commonly used:

- **kilocurie (kCi)** – 10^{3} Ci, one thousand curies; 3.7×10^{13} disintegrations per second.
- **millicurie (mCi)** – 10^{-3} Ci, one-thousandth of a curie; 3.7×10^{7} disintegrations per second.
- **microcurie (μCi)** – 10^{-6} Ci, one-millionth of a curie; 3.7×10^{4} disintegrations per second.
- **picocurie (pCi)** – 10^{-12} Ci, one-trillionth of a curie; 3.7×10^{-2} disintegrations per second.

daughter – A nuclide formed by the radioactive decay of a parent nuclide.

decay, radioactive – The spontaneous transformation of one radionuclide into a different radioactive or nonradioactive nuclide or into a different energy state of the same radionuclide.

dense nonaqueous phase liquid (DNAPL) – The liquid phase of chlorinated organic solvents. These liquids are denser than water and include commonly used industrial compounds such as tetrachloroethylene and trichloroethylene.

derived concentration guide (DCG) – The concentration of a radionuclide in air or water that, under conditions of continuous exposure for one year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation), would result in either an effective dose equivalent of 0.1 rem (1 mSv) or a dose equivalent of 5 rem (50 mSv) to any tissue, including skin and the lens of the eye. The guidelines for radionuclides in air and water are given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment.*

disintegration, nuclear – A spontaneous nuclear transformation (radioactivity) characterized by the emission of energy and/or mass from the nucleus of an atom.

dose – The energy imparted to matter by ionizing radiation. The unit of absorbed dose is the rad, equal to 0.01 joules per kilogram in any medium.

- **absorbed dose** – The quantity of radiation energy absorbed by an organ divided by the organ's mass. Absorbed dose is expressed in units of rad (or gray) (1 rad = 0.01 Gy).
- **dose equivalent** – The product of the absorbed dose (rad) in tissue and a quality factor. Dose equivalent is expressed in units of rem (or sievert) (1 rem = 0.01 Sv).
- **committed dose equivalent** – The calculated total dose equivalent to a tissue or organ over a 50-year period after known intake of a radionuclide into the body. Contributions from external dose are not included. Committed dose equivalent is expressed in units of rem (or sievert).
- **committed effective dose equivalent** – The sum of the committed dose equivalents to various tissues in the body, each

multiplied by the appropriate weighting factor. Committed effective dose equivalent is expressed in units of rem (or sievert).

- **effective dose equivalent** – The sum of the dose equivalents received by all organs or tissues of the body after each one has been multiplied by an appropriate weighting factor. The effective dose equivalent includes the committed effective dose equivalent from internal deposition of radionuclides and the effective dose equivalent attributable to sources external to the body.
- **collective dose equivalent/collective effective dose equivalent** – The sums of the dose equivalents or effective dose equivalents of all individuals in an exposed population within a 50-mile (80-km) radius expressed in units of person-rem (or person-sievert). When the collective dose equivalent of interest is for a specific organ, the units would be organ-rem (or organ-sievert). The 50-mile distance is measured from a point located centrally with respect to major facilities or DOE program activities.

downgradient – In the direction of decreasing hydrostatic head.

downgradient well – A well that is installed hydraulically downgradient of a site and that may be capable of detecting migration of contaminants from a site.

drinking water standards (DWS) – Federal primary drinking water standards, both proposed and final, as set forth by the EPA in 40 CFR 141 and 40 CFR 143.

effluent – A liquid or gaseous waste discharge to the environment.

effluent monitoring – The collection and analysis of samples or measurements of liquid and gaseous effluents for purposes of characterizing and quantifying the release of contaminants, assessing radiation exposures to members of the public, and demonstrating compliance with applicable standards.

Environmental Restoration – A DOE program that directs the assessment and cleanup of its sites (remediation) and facilities (decontamination and decommissioning) contaminated with waste as a result of nuclear-related activities.

exposure (radiation) – The incidence of radiation on living or inanimate material by accident or intent. Background exposure is the exposure to natural background ionizing radiation. Occupational exposure is that exposure to ionizing radiation received at a person's workplace. Population exposure is the exposure to the total number of persons who inhabit an area.

external radiation – Exposure to ionizing radiation when the radiation source is located outside the body.

fauna – The population of animals in a given area, environment, formation, or time span.

flora – The population of plants in a given area, environment, formation, or time span.

formation – A mappable unit of consolidated or unconsolidated geologic material of a characteristic lithology or assemblage of lithologies.

gamma ray – High-energy, short-wavelength electromagnetic radiation emitted from the nucleus of an excited atom. Gamma rays are identical to X-rays except for the source of the emission.

Gaussian puff/plume model – A computer-simulated atmospheric dispersion of a release using a Gaussian (normal) statistical distribution to determine concentrations in air.

grab sample – A sample collected instantaneously with a glass or plastic bottle placed below the water surface to collect surface-water samples (also called dip samples).

groundwater, unconfined – Water that is in direct contact with the atmosphere through open spaces in permeable material.

half-life, radiological – The time required for half of a given number of atoms of a specific radionuclide to decay. Each nuclide has a unique half-life.

hardness – The amount of calcium carbonate dissolved in water, usually expressed as part of calcium carbonate per million parts of water.

hydrogeology – Hydraulic aspects of site geology.

hydrology – The science dealing with the properties, distribution, and circulation of natural water systems.

in situ – In its original place; field measurements taken without removing the sample from its origin; remediation performed while groundwater remains below the surface.

internal dose factor – A factor used to convert intakes of radionuclides to dose equivalents.

internal radiation – Occurs when natural radionuclides enter the body by ingestion of foods or liquids or by inhalation. Radon is the major contributor to the annual dose equivalent for internal radionuclides.

ion – An atom or compound that carries an electrical charge.

irradiation – Exposure to radiation.

isotopes – Forms of an element having the same number of protons but differing numbers of neutrons in their nuclei.

- **long-lived isotope** – A radionuclide that decays at such a slow rate that a quantity of it will exist for an extended period (half-life is greater than three years).
- **short-lived isotope** – A radionuclide that decays so rapidly that a given quantity is transformed almost completely into decay products within a short period (half-life is two days or less).

lower limit of detection – The smallest concentration or amount of analyte that can be reliably detected in a sample at a 95% confidence level.

maximally exposed individual – A hypothetical individual who remains in an uncontrolled area and would, when all potential routes of exposure from a facility's operations are considered, receive the greatest possible dose equivalent.

migration – The transfer or movement of a material through air, soil, or groundwater.

milliroentgen (mR) – A measure of X-ray or gamma radiation. The unit is one-thousandth of a roentgen.

minimum detectable concentration – The smallest amount or concentration of a radionuclide that can be distinguished in a sample by a given measurement system at a preselected counting time and at a given confidence level.

monitoring – Process whereby the quantity and quality of factors that can affect the environment or human health are measured periodically to regulate and control potential impacts.

mrem – The dose equivalent that is one-thousandth of a rem.

natural radiation – Radiation from cosmic and other naturally occurring radionuclide (such as radon) sources in the environment.

nuclide – An atom specified by its atomic weight, atomic number, and energy state. A radionuclide is a radioactive nuclide.

outfall – The point of conveyance (e.g., drain or pipe) of wastewater or other effluents into a ditch, pond, or river.

part per billion (ppb) – A unit measure of concentration equivalent to the weight/volume ratio expressed as µg/L or mg/mL.

part per million (ppm) – A unit measure of concentration equivalent to the weight/volume ratio expressed as mg/L.

pathogen – A disease-producing agent; usually refers to living organisms.

person-rem – Collective dose to a population group. For example, a dose of 1 rem to 10 individuals results in a collective dose of 10 person-rem.

pH – A measure of the hydrogen-ion concentration in an aqueous solution. Acidic solutions have a pH from 0 to 6, neutral solutions have a pH equal to 7, and basic solutions have a pH greater than 7.

piezometer - An instrument used to measure the hydraulic potential of groundwater at a given point; also, a well designed for this purpose.

polychlorinated biphenyl (PCB) - Any chemical substance that is limited to the biphenyl molecule and that has been chlorinated to varying degrees.

polynuclear aromatic hydrocarbon (PAH) - Any organic compound composed of more than one benzene ring.

process water - Water used within a system process.

purge - To remove water before sampling, generally by pumping or bailing.

quality assurance (QA) - Any action in environmental monitoring to ensure the reliability of monitoring and measurement data.

quality control (QC) - The routine application of procedures within environmental monitoring to obtain the required standards of performance in monitoring and measurement processes.

quality factor - The factor by which the absorbed dose (rad) is multiplied to obtain a quantity that expresses, on a common scale for all ionizing radiation, the biological damage to exposed persons. A quality factor is used because some types of radiation, such as alpha particles, are more biologically damaging than others.

rad - An acronym for Radiation Absorbed Dose. The rad is a basic unit of absorbed radiation dose. (This is being replaced by the 'gray,' which is equivalent to 100 rad.)

radiation detection instruments – Devices that detect and record the characteristics of ionizing radiation.

radioactivity – The spontaneous emission of radiation, generally alpha or beta particles or gamma rays, from the nucleus of an unstable isotope.

radioisotopes – Radioactive isotopes.

radionuclide – An unstable nuclide capable of spontaneous transformation into other nuclides by changing its nuclear configuration or energy level. This transformation is accompanied by the emission of photons or particles.

reference material – A material or substance with one or more properties that is sufficiently well established and used to calibrate an apparatus, to assess a measurement method, or to assign values to materials.

release – Any discharge to the environment. Environment is broadly defined as any water, land, or ambient air.

rem – The unit of dose equivalent (absorbed dose in rads multiplied by the radiation quality factor). Dose equivalent is frequently reported in units of millirem (mrem), which is one-thousandth of a rem.

remediation – The correction of a problem. See Environmental Restoration.

Resource Conservation and Recovery Act (RCRA) – Federal legislation that regulates the transport, treatment, and disposal of solid and hazardous wastes.

RFI Program – RCRA Facility Investigation Program; EPA-regulated investigation of a solid waste management unit with regard to its potential impact on the environment.

roentgen – A unit of exposure from X-rays or gamma rays. One roentgen equals 2.58 x 10^4 coulombs per kilogram of air.

screen zone – In well construction, the section of a formation that contains the screen, or perforated pipe, that allows water to enter the well.

semivolatile organic analyte (SVOA) – Any organic compound with a high boiling point which will volatilize upon heating.

sievert (Sv) – The SI (International System of Units) unit of dose equivalent; 1 Sv = 100 rem.

slurry – A suspension of solid particles (sludge) in water.

source – A point or object from which radiation or contamination emanates.

specific conductance – The ability of water to conduct electricity; this ability varies in proportion to the amount of ionized minerals in the water.

stable – Not radioactive or not easily decomposed or otherwise modified chemically.

storm water runoff – Surface streams that appear after precipitation.

strata – Beds, layers, or zones of rocks.

substrate – The substance, base, surface, or medium in which an organism lives and grows.

surface water – All water on the surface of the earth, as distinguished from groundwater.

suspended solids – Mixture of fine, nonsettling particles of any solid within a liquid or gas.

terrestrial radiation – Ionizing radiation emitted from radioactive materials, primarily ^{40}K, thorium, and uranium, in the earth's soils. Terrestrial radiation contributes to natural background radiation.

thermoluminescent dosimeter (TLD) – A device used to measure external gamma radiation.

total activity – The total quantity of radioactive decay particles that are emitted from a sample.

total solids – The sum of total dissolved solids and suspended solids.

total suspended particulates – Refers to the concentration of particulates in suspension in the air irrespective of the nature, source, or size of the particulates.

transuranic element (TRU) – An element above uranium in the Periodic Table, that is, with an atomic number greater than 92. All 11 TRUs are produced artificially and are radioactive. They are neptunium, plutonium, americium, curium, berkelium, californium, einsteinium, fermium, mendelevium, nobelium, and lawrencium.

troughing system – A collection and containment system designed to collect leaks of oil that have been contaminated with PCBs.

turbidity – A measure of the concentration of sediment or suspended particles in solution.

upgradient – In the direction of increasing hydrostatic head.

vadose zone – Soil zone located above the water table.

volatile organic compound (VOC) – Any organic compound which has a low boiling point and readily volatilizes into air (e.g., trichloroethane, tetrachloroethylene, and trichloroethylene).

atershed – The region draining into a river, river system, or body of water.

wetland – A lowland area, such as a marsh or swamp, inundated or saturated by surface or groundwater sufficiently to support hydrophytic vegetation typically adapted to life in saturated soils.

wind rose – A diagram in which statistical information concerning direction and speed of the wind at a location is summarized.

Appendix A: Radiation

This appendix gives basic information about radiation. This information is intended to be a basis for understanding normal radiation dose from sources unassociated with the Paducah Site. People are constantly exposed to radiation. For example, radon in air; potassium in food and water; and uranium, thorium, and radium in the earth's crust are all sources of radiation. The following discussion describes important aspects of radiation, including atoms and isotopes; types, sources, and pathways of radiation; radiation measurement; and dose information.

ATOMS AND ISOTOPES

All matter is made up of **atoms**. The atom is thought to consist of a dense central nucleus surrounded by a cloud of electrons. The nucleus is composed of protons and neutrons. **Table A.1** summarizes the basic components of an atom. In an electrically neutral atom, the number of protons equals the number of electrons. Atoms can lose or gain electrons through ionization. The number of protons in the nucleus determines an element's atomic number, or chemical identity. With the exception of hydrogen, the nucleus of each type of atom also contains at least one neutron. Unlike protons, the number of neutrons may vary among atoms of the same element. The number of neutrons and protons determine the atomic weight of the atom.

Atoms of the same element with a different number of neutrons are called **isotopes**. Isotopes have the same chemical properties but different atomic weights. **Figure A.1** depicts isotopes of the element hydrogen. Uranium, which has 92 protons, is another example of an element that has isotopes. All isotopes of uranium have 92 protons. However, each uranium isotope has a different number of neutrons. ^{234}U has 92 protons and 142 neutrons; ^{235}U has 92 protons and 143 neutrons; and ^{238}U has 92 protons and 146 neutrons.

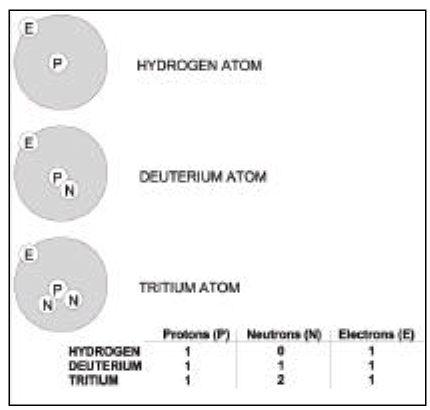

Figure A.1 Isotopes of the element hydrogen.

Table A.1 Summary of the basic parts of an atom.

Particle	Location	Charge	Comments
Protons	Nucleus	+ positive	The number of protons determines the element. If the number of protons changes, the element changes.
Neutrons	Nucleus	No charge	Atoms of the same element have the same number of protons, but can have a different number of neutrons. This is called an isotope.
Electrons	Orbit nucleus	– negative	This negative charge is equal in magnitude to the proton's positive charge.

Source: Bechtel Jacobs Company, LLC. *Radiological Worker I and II Academics Training*, Student Handbook, revision 2.

BASIC INFORMATION ABOUT RADIATION

Radioactivity was discovered in 1896 by the French physicist Antoine Henri Becquerel when he observed that the element uranium can blacken a photographic plate, even when separated from the plate by glass or black paper. In 1898 the French chemists Marie Curie and Pierre Curie concluded that radioactivity is a phenomenon associated with atoms, independent of their physical or chemical state. The Curies measured the heat associated with the decay of radium and established that 1 g (0.035 oz) of radium gives off about 100 cal of energy every hour. This release of energy continues hour after hour and year after year, whereas the complete combustion of a gram of coal results in the production of a total of only about 8000 cal of energy. Radioactivity attracted the attention of scientists throughout the world following these early discoveries. In the ensuing decades many aspects of the phenomenon were thoroughly investigated ("Radioactivity" 2002, Appendix A references).

Radiation is energy in the form of waves or particles moving through space. Radiation occurs because unstable atoms give off excess energy to become stable. **Ionization** is the process of removing electrons from neutral atoms. NOTE: Ionization should not be confused with radiation. Ionization is a result of the interaction of radiation with an atom, and is what allows the radiation to be detected. **Ionizing radiation** is energy (particles or rays) emitted from radioactive atoms that can cause ionization. Ionizing radiation is capable of displacing electrons and changing the chemical state of matter and subsequently causing biological damage. Therefore, ionizing radiation is potentially harmful to human health. Examples of ionizing radiation include alpha, beta, and gamma radiation. **Non-ionizing radiation** bounces off or passes through matter without displacing electrons. Non-ionizing radiation does not have enough energy to ionize an atom. It is unclear whether non-ionizing radiation is harmful to human health. Examples include visible light, radar waves, microwaves, and radio waves. **Radioactivity** is the process of unstable, or radioactive, atoms becoming stable by emitting radiant energy. Radioactivity that occurs over a period of time is called **radioactive decay**. The discovery that radium decays to produce radon proved conclusively that radioactive decay is accompanied by a change in the chemical nature of the decaying element. A **disintegration** is a single atom undergoing radioactive decay. **Radioactive half-life** is the time it takes for one half of the radioactive atoms present to decay (Bechtel Jacobs Company, LLC., Appendix A references).

TYPES, SOURCES, AND PATHWAYS OF RADIATION

Visible light, heat, radio waves, and alpha particles are examples of radiation. When people feel warmth from the sunlight, they are actually absorbing the radiant energy emitted by the sun. Electromagnetic radiation is radiation in the form of electromagnetic waves; examples include gamma rays, ultraviolet light, and radio waves. Particulate radiation is radiation in the form of particles; examples include alpha and beta particles. The spectrum of particle and electromagnetic radiations range from the extremely short wavelengths of cosmic rays and electrons to very long radio waves that are hundreds of kilometers in length. **Figure A.2** shows the difference between a longer wavelength and a shorter wavelength. **Figure A.3** illustrates the wavelengths of several types of radiation along with an example of something that is approximately the same dimension in length.

The Radiation's ability to penetrate material is an important consideration in protecting human health. Adequate shielding decreases the power of radiation by absorbing part or all of it. **Figure A.4** shows the different penetrating power of alpha, beta, and gamma rays. Alpha rays are stopped by the thickness of a few sheets of paper or a rubber glove. A few centimeters of wood or a thin sheet of copper stops beta rays. Gamma rays and X-rays require thick shielding of a heavy material such as iron, lead, or concrete ("Radiation" 2002, Appendix A references).

Radiation is everywhere. Most occurs naturally, but a small percentage is from human-made sources. Naturally occurring radiation is identical to the radiation resulting from human-made sources.

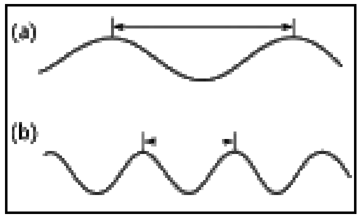

Figure A.2 Comparison between longer (a) and shorter (b) wavelengths. [a]

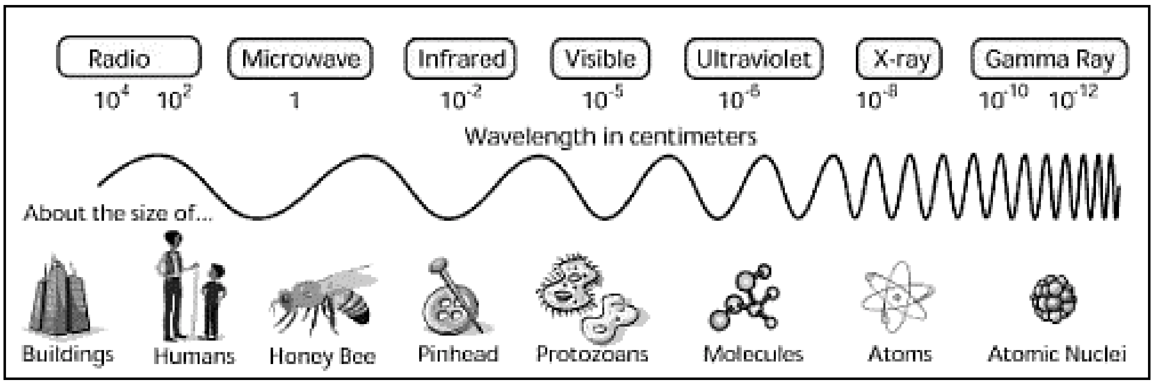

Figure A.3 The approximate wavelengths of the various regions of the electromagnetic spectrum and an example of something that is approximately the same size. [b]

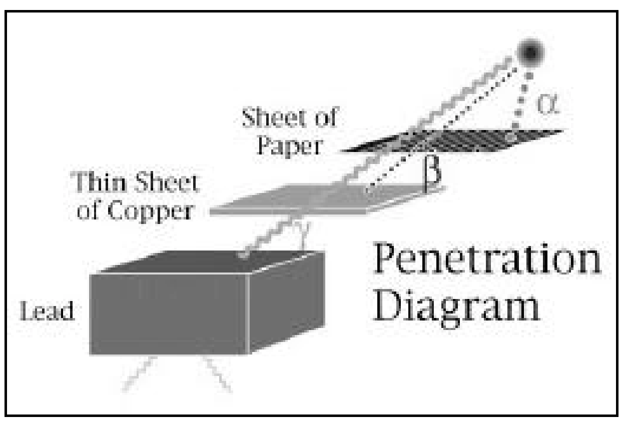

Figure A.4 The penetrating potential of the three types of ionizing radiation: alpha (a), beta (b), and gamma (?). [c]

[a] ("Electromagnetic…" 2002, Appendix A references)
[b] ("Exploring …" 2002, Appendix A references)
[c] ("Experiment…" 2002, Appendix A references)

Naturally occurring radiation is known as **background radiation**. In fact, this naturally occurring radiation is the major source of radiation in the environment. People have little control over the amount of background radiation to which they are exposed. Background radiation remains relatively constant over time. The amount of background radiation present in the environment today is much the same as it was hundreds of years ago. Sources of background radiation include uranium in the earth, radon in the air, and potassium in food. Depending on its origin, background radiation is categorized as cosmic, terrestrial, or internal. **Cosmic radiation** comes from the sun and outer space and is made up of energetically charged particles from that continuously hit the earth's atmosphere. Because the atmosphere provides some shielding against cosmic radiation, the intensity of cosmic radiation increases with altitude above sea level. Therefore, a person in Denver, Colorado, is exposed to more cosmic radiation than a person in Paducah, Kentucky. **Terrestrial radiation** refers to radiation emitted from radioactive materials in the earth's rocks, soils, and minerals. Radon (Rn); radon progeny, the relatively short-lived decay products of radium-235 (^{235}Ra); potassium (^{40}K); isotopes of thorium (Th); and isotopes of uranium (U) are the elements responsible for most terrestrial radiation. **Internal radiation** is radiation that is inside the body and is in close contact with body tissue. Internal radiation can deposit large amounts of energy in a small amount of tissue. Radioactive material in the environment enters the body through the air people breathe, the food they eat, and even through an open wound. Natural radionuclides in the body include isotopes of U, Th, Ra, Rn, Pu, bismuth (Bi), and lead in the ^{238}U and ^{212}Th decay series. In addition, the body contains isotopes of sodium-24 (^{24}Na), ^{40}K, rubidium (Rb), and carbon-14 (^{14}C). Most of our internal exposure comes from ^{40}K.

In addition to background radiation, there are human-made sources of radiation to which most people are exposed. Examples include consumer products, medical sources, and other sources. Some **consumer products** are sources of radiation. In some of these products, such as smoke detectors and airport X-ray baggage inspection systems, the radiation is essential to the performance of the device. In other products, such as televisions and tobacco products, the radiation occurs incidentally to the product function. **Medical sources** of radiation account for the majority of the exposure people receive from human-made radiation. Radiation is an important tool of diagnostic medicine and treatment. Exposure is deliberate and directly beneficial to the patients exposed. Generally, diagnostic or therapeutic medical exposures result from X-ray beams directed to specific areas of the body. Thus, all body organs generally are not irradiated uniformly. Radiation and radioactive materials are also used in a wide variety of pharmaceuticals and in the preparation of medical instruments, including the sterilization of heat-sensitive products such as plastic heart valves. Nuclear medical examinations and treatment involve the internal administration of radioactive compounds, or radiopharmaceuticals, by injection, inhalation, consumption, or insertion. Even then, radionuclides are not distributed uniformly throughout the body. **Other sources** of radiation include fallout from atmospheric atomic weapons tests; emissions of radioactive materials from nuclear facilities such as uranium mines, fuel processing plants, and nuclear power plants; emissions from mineral extraction facilities; and transportation of radioactive materials. Atmospheric testing of atomic weapons has been suspended. About one-half of 1% of the United States population performs work in which radiation in some form is present.

Radiation and radioactive material in the environment can reach people through many routes. Potential routes for radiation are referred to as **pathways**. Several radiation pathways are shown in **Figure A.5**. For example, radioactive material in the air could fall on a pasture. Cows could then eat the grass, and the radioactive material on the grass would show up in the cow's milk. People drinking the milk would thus be exposed to this radiation. Or, people could simply inhale the radioactive material in the air. The same events could occur with radioactive material in water. Fish living in the water would be exposed. People eating the fish would then be exposed to the radiation in the fish. Or, people swimming in the water would be exposed.

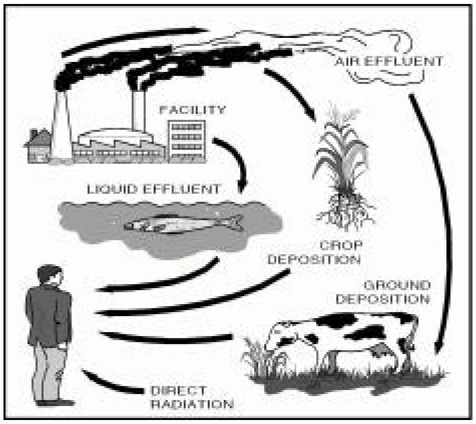

Figure A.5 Possible radiation pathways.

MEASURING RADIATION

To determine the possible effects of radiation on the environment and the health of people, the radiation must be measured. More precisely, its potential to cause damage must be determined. When measuring the amount of radiation in the environment, what is actually being measured is the rate of radioactive decay, or **activity**. The rate of decay varies widely among the various radioisotopes. For that reason, 1 g of one radioactive substance may contain the same amount of activity as several tons of another substance. Activity is measured by the number of disintegrations a radioactive material undergoes in a certain period of time. In the United States, activity is expressed in a unit of measure known as a **curie (Ci)**. In the international system of units, activity is expressed in a unit of measure known as a **Becquerel (Bq)**. One disintegration per second (dps) equals one Becquerel (Bq).

One curie equals:

- 37,000,000,000 atom disintegrations per second ($3.7x10^{10}$ dps).
- 37,000,000,000 Becquerels ($3.7x10^{10}$ Bq)
- 1,000,000 microcuries ($1x10^{6}$ µCi)

DOSE INFORMATION

The total amount of energy absorbed per unit mass as a result of exposure to radiation is expressed in a unit of measure known as a **radiation absorbed dose (rad)**. In the international system of units, 100 rad = 1 gray. However, in terms of human health, it is the effect of the absorbed energy that is important because some forms of radiation are more harmful than others. The unit, rad, does not take into account the potential effects that different types of radiation have on the body. The measure of potential biological damage caused by exposure to and subsequent absorption of radiation is expressed in a unit of measure known as a **Roentgen equivalent man (rem)**. One rem of any type of radiation has the same total damaging effect and pertains to the human body. Dose is expressed in millirems (mrem), because a rem represents a fairly large dose. One millirem is equal to 1/1000 rem. The International System of Units uses the **Sievert (Sv)**, l00 rem = 1 Sievert (Sv), 100 mrem = 1 millisievert (mSv).

Many terms are used to report **dose**, as listed in **Table A.2**. Several factors are taken into account, including the amount of radiation absorbed, the organ absorbing the radiation, and the effect of the radiation over a 50-year period. The term "dose," in this report, includes the committed effective dose equivalent (EDE) and the effective dose equivalent attributable to penetrating radiation from sources external to the body.

Determining dose is an involved process using complex mathematical equations based on several factors, including the type of radiation, the rate of exposure, weather conditions, and typical diet. Basically, radiant energy is generated from radioactive decay, or activity. People absorb some of the energy to which they are exposed. This absorbed energy is calculated as part of an individual's dose. Whether radiation is natural or human made, its effects on people are the same.

A comparison of some dose levels is presented in **Table A.3**. Included is an example of the type of exposure that may cause such a dose or the special significance of such a dose. This information is intended to help the reader become familiar with the type of doses individuals may receive. The average annual dose received by residents of the United States from cosmic radiation is about 27 mrem (0.27 mSv) (NCRP 1987). The average annual dose from cosmic radiation received by residents in the Paducah area is about 45 mrem (0.45 mSv). The average annual dose received from terrestrial gamma radiation in the United States is about 28 mrem (0.28 mSv). The terrestrial dose varies geographically across the country (NCRP 1987); typical reported values are 16 mrem (0.16 mSv) at the Atlantic and Gulf coastal plains and 63 mrem (0.63 mSv) at the eastern slopes of the Rocky Mountains. In the Paducah area, background levels of radionuclides in soils are within typical levels indicating that the dose received from terrestrial gamma radiation is within the range of typical reported values (DOE 1997). The major contributors to the annual dose equivalent for internal radionuclides are the short-lived decay products of radon, mostly Rn-222. They contribute an average dose of about 200 mrem (2.00 mSv) per year. This dose estimate is based on an average radon concentration of about 1 pCi/L (0.037 Bq/L) (NCRP 1987). The average dose from other internal radionuclides is about 39 mrem (0.39 mSv) per year, most of which can be attributed to the naturally occurring isotope of potassium, K-40. The concentration of radioactive potassium in human tissues is similar in all parts of the world. **Table A.4** presents the internal dose factors for an adult. The United States average annual dose received by an individual from consumer products is about 10 mrem (0.10 mSv) (NCRP 1987). The dose from medical sources include nuclear medicine examinations, which involve the internal administration of radiopharmaceuticals, and generally account for the largest portion of the dose received from human-made sources. However, the radionuclides used in specific tests are not distributed uniformly throughout the body. In these cases, comparisons are made using the concept of EDE, which relates exposure of organs or body parts to one effective whole-body dose. The average annual EDE from medical examinations is 53 mrem (0.53 mSv), including 39 mrem (0.39 mSv) for diagnostic X- rays and 14mrem (0.14mSv) for nuclear medicine procedures (NCRP 1989). The actual doses received by individuals who complete such medical exams are much higher than these values, but not everyone receives such exams each year (NCRP 1989). The dose from other sources include small doses received by individuals that occur as a result of radioactive fallout from atmospheric atomic weapons tests, emissions of radioactive materials

Table A.2 Dose terminology.

Term	Description
absorbed dose	quantity of radiation energy absorbed by an organ divided by an organ's mass
dose equivalent	absorbed dose to an organ multiplied by a quality factor
effective dose equivalent	single weighted sum of combined dose equivalents received by all organs
committed dose equivalent	effective dose equivalent to an organ over a 50-year period following intake
committed effective dose equivalent	total effective dose equivalent to all organs in the human body over a 50-year period following intake
collective effective dose equivalent	sum of effective dose equivalents of all members of a given population
quality factor	a modifying factor used to adjust for the effect of the type of radiation, for example, alpha particles or gamma rays, on tissue
weighting factor	tissue-specific modifying factor representing the fraction of the total health risk from uniform, whole-body exposure

from nuclear facilities, emissions from certain mineral extraction facilities, and transportation of radioactive materials. The combination of these sources contributes less than 1 mrem (0.01 mSv) per year to the average dose to an individual (NCRP 1987). A comprehensive EPA report of 1984 projected the average occupational dose to monitored radiation workers in medicine, industry, the nuclear fuel cycle, government, and miscellaneous industries to be 105 mrem (1.05 mSv) per year for 1985, down slightly from 110 mrem (1.10 mSv) per year in 1980 (EPA 1984).

Table A.3 Comparison and description of various dose levels

Dose level	Description
1 mrem (0.01 mSv)	Approximate daily dose from natural background radiation, including radon.
2.5 mrem (0.025 mSv)	Cosmic dose to a person on a one-way airplane flight from New York to Los Angeles.
10 mrem (0.10 mSv)	Annual exposure limit, set by the EPA for exposures from airborne emissions from operations of nuclear fuel cycle facilities, including power plants and uranium mines and mills .
45 mrem (0.45 mSv)	Average yearly dose from cosmic radiation received by people in the Paducah area.
46 mrem (0.46 mSv)	Estimate of the largest dose any off-site person could have received from the March 28, 1979, Three Mile Island nuclear power plant accident.
66 mrem (0.66 mSv)	Average yearly dose to people in the United States from human-made sources.
100 mrem (1.00 mSv)	Annual limit of dose from all DOE facilities to a member of the public who is not a radiation worker.
110 mrem (1.10 mSv)	Average occupational dose received by U.S. commercial radiation workers in 1980.
244 mrem (2.44 mSv)	Average dose from an upper gastrointestinal diagnostic X-ray series.
300 mrem (3.00 mSv)	Average yearly dose to people in the United States from all sources of natural background radiation.
1-5 rem (0.01-0.05 Sv)	EPA protective action guidelines state that public officials should take emergency action when the dose to a member of the public from a nuclear accident will likely reach this range.
5 rem (0.05 Sv)	Annual limit for occupational exposure of radiation workers set by NRC and DOE.
10 rem (0. 10 Sv)	The BEIR V report estimated that an acute dose at this level would result in a lifetime excess risk of death from cancer, caused by the radiation, of 0.8% (BEIR 1990).
25 rem (0.25 Sv)	EPA guideline for voluntary maximum dose to emergency workers for non-lifesaving work during an emergency.
75 rem (0.75 Sv)	EPA guideline for maximum dose to emergency workers volunteering for lifesaving work.
50-600 rem (0.50-6.00 Sv)	Doses in this range received over a short period of time will produce radiation sickness in varying degrees. At the lower end of this range, people are expected to recover completely, given proper medical attention. At the top of this range, most people would die within 60 days.

Adapted from *Savannah River Site Environmental Report for 1993, Summary Pamphlet,* WSRC-TR-94-076, Westinghouse Savannah River Company, 1994.

Table A.4 Internal dose factors for an adult.

Isotope	Half-life (years)	Intake[a] (mrem/pCi) Inhalation (soluble)	Inhalation (slightly soluble)	Inhalation (insoluble)	Ingestion
^{237}Np	2,100,000	NA	0.49	NA	0.0039
^{239}Pu	24,000	NA	0.51	0.33	0.0043
^{99}Tc	210,000	0.00000084	0.0000075	0.12	0.0000013
^{230}Th	75,000	NA	0.32	0.26	0.00053
^{234}U	240,000	0.0027	0.0071	0.13	0.00026
^{235}U	710,000,000	0.0025	0.0067	0.12	0.00025
^{238}U	4,500,000,000	0.0024	0.0062	0.12	0.00023

[a] Source: U.S. DOE. July 1988. *Internal Dose Conversion Factors for Calculations of Dose to the Public*, DOE/EH-0071.
NA = not available in the above-referenced document

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Appendix B: Radionuclide and Chemical Nomenclature

Table B.1 Half-life and DCG for selected radionuclides.

Radionuclide	Symbol	Half-life	Ingested Water DCG (µCi/ml)
Americium-241	^{241}Am	432 years	3 E - 08
Bismuth-210	^{210}Bi	5.01 days	2 E - 05
Cesium-137	^{137}Cs	30.2 years	3 E - 06
Cobalt-60	^{60}Co	5.3 years	1 E - 05
Lead-206	^{206}Pb	Stable	None
Lead-210	^{210}Pb	21 years	3 E - 08
Lead-214	^{214}Pb	26.8 minutes	2 E - 04
Neptunium-237	^{237}Np	2,140,000 years	3 E - 08
Plutonium-239	^{239}Pu	24,110 years	3 E - 08
Polonium-210	^{210}Po	138.9 days	8 E - 08
Polonium-214	^{214}Po	164 microseconds	None
Polonium-218	^{218}Po	3.05 minutes	None
Potassium-40	^{40}K	1,260,000,000 years	7 E - 06
Protactinium-234m	^{234m}Pa	1. 17 minutes	None
Radium-226	^{226}Ra	1,602 years	1 E - 07
Radon-222	^{222}Rn	3.821 days	None
Technetium-99	^{99}Tc	212,000 years	1 E - 04
Thorium-230	^{230}Th	80,000 years	3 E - 07
Thorium-231	^{231}Th	25.5 hours	1 E - 04
Thorium-234	^{234}Th	24.1 days	1 E - 05
Uranium-234	^{234}U	247,000 years	5 E - 07
Uranium-235	^{235}U	710,000,000 years	6 E - 07
Uranium-236	^{236}U	23,900,000 years	5 E - 07
Uranium-238	^{238}U	4,510,000,000 years	6 E - 07

Derived Concentration Guide (DCG) is the concentration of a radionuclide in air or water that, under conditions of continuous exposure for one year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation), would result in an effective dose equivalent of 100 mrem. DCGs do not consider decay products when the parent radionuclide is the cause of the exposure.

Table B.2 Nomenclature for elements and chemical compounds.

Constituent	Symbol	Constituent	Symbol
Aluminum	Al	Manganese	Mn
Ammonia	NH_3	Mercury	Hg
Antimony	Sb	Nickel	Ni
Arsenic	As	Nitrate	NO_3
Barium	Ba	Nitrite	NO_2
Beryllium	Be	Nitrogen	N
Cadmium	Cd	Oxygen	O
Calcium	Ca	Ozone	O_3
Calcium carbonate	$CaCO_3$	Phosphate	PO_4
Carbon	C	Phosphorus	P
Chlorine	Cl	Potassium	K
Chromium	Cr	Radium	Ra
Chromium, hexavalent	Cr^{6+}	Radon	Rn
Cobalt	Co	Selenium	Se
Copper	Cu	Silver	Ag
Fluorine	F	Sodium	Na
Hydrogen fluoride	HF	Sulfate	SO_4
Iron	Fe	Sulfur dioxide	SO_2
Lead	Pb	Thorium	Th
Lithium	Li	Uranium	U
Magnesium	Mg	Zinc	Zn

Appendix C: Groundwater Contamination Assessment

This appendix contains excerpts from the report, *Trichloroethene and Technetium-99 Groundwater Contamination in the Regional Gravel Aquifer for Calendar Year 2002 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (BJC/PAD-169/R3) issued by Bechtel Jacobs Company LLC in May 2003. The complete document is available through the U.S. Department of Energy Environmental Information Center in Kevil, Kentucky. Most of the information presented in the report is provided here; however, figures and maps are not reproduced in this publication. Where omissions from the original report occur, the text is bolded. Where Appendix A and Appendix B are referenced, these are appendices to the original report and are not included in this Annual Site Environmental Report.

The remaining tables of data sets and graphs in the report, *Trichloroethene and Technetium-99 Groundwater Contamination in the Regional Gravel Aquifer for Calendar Year 2002 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, (BJC/PAD-169/R3), are available in the DOE Environmental Information Center.

1. INTRODUCTION

This report is the fourth of a series of annual interpretations of groundwater data for the U.S. Department of Energy's (DOE's) Paducah Gaseous Diffusion Plant (PGDP). Including revision of the site groundwater plume maps, this report assesses contaminant trends and the extent of trichloroethene (TCE) and technetium-99 (^{99}Tc) in the shallow aquifer for the preceding year. The plume maps include data from various investigation reports, taking into consideration the age of the data, in addition to routine groundwater monitoring data collected through the end of calendar year (CY) 2002. These maps are consistent with interpreted groundwater flow directions determined from potentiometric trends of the shallow aquifer and conceptual models of the influence of surface-water bodies. These trends are shown on the potentiometric maps for each quarter of CY 2002 included in this report. Significant revisions to the 2001 edition of the plume maps are discussed in Sect. 4. These annual reports provide a basis for timely incorporation of routine groundwater monitoring and characterization data for planned remedial actions.

The PGDP has been the subject of intense environmental monitoring over the last decade. Annual DOE reports present a summary of yearly monitoring results. These yearly monitoring results have been incorporated within the database of site-wide investigations, as they occurred. The previous site-wide investigations have included the following:

- *Results of the Site Investigation, Phase I, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CH2M HILL 1991);
- *Results of the Site Investigation, Phase II, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CH2M HILL 1992);
- *Report of the Paducah Gaseous Diffusion Plant Groundwater Investigation Phase III* (MMES 1992);
- *Northeast Plume Preliminary Characterization Summary Report, Paducah, Kentucky* (DOE 1995a);
- *Final Report on Drive-Point Profiling of the Northwest Plume and Analysis of Related Data* (DOE 1995b);
- *Remedial Investigation Report for the Waste Area Grouping 6 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1999a);
- *Remedial Investigation Report for the Waste Area Grouping 27 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1999b);
- *Remedial Investigation Report for the Waste Area Grouping 28 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2000a);
- *Data Report for the Sitewide Remedial Evaluation for Source Areas Contributing to Off-Site Groundwater Contamination at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2000b);
- *Site Evaluation Report for Waste Area Grouping 8 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2000c); and
- *Remedial Investigation Report for Waste Area Grouping 3 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2000d).

2. SETTING

The PGDP is located in the Jackson Purchase region of western Kentucky, approximately 16.1 km (10 miles) west of Paducah, Kentucky and 6.5 km (4 miles) south of the Ohio River. Cretaceous marine sediments of the Mississippi Embayment, resting upon a Mississippian-age carbonate bedrock, underlie the PGDP at depth. Buried fluvial deposits of the ancestral Tennessee River unconformably overlie the Cretaceous sediments directly beneath the PGDP. A thick gravel deposit at a general depth of 18.3 m (60 ft) below most of the PGDP forms the shallow aquifer, the Regional Gravel Aquifer (RGA). The RGA is found throughout the plant area and to the north, but pinches out to the south, southeast, and southwest along the slope of the Porters Creek Terrace. The RGA is the main conduit for groundwater flow to the north, where groundwater discharges into the Ohio River, and the main pathway for off-site contaminant plume migration. Fig. 2.1 **(not shown in this report)** presents a general cross-section of the site geology, while Fig. 2.2 **(not shown**

in this report) illustrates the main features of the groundwater flow systems.

Trichloroethene, a common solvent, and ^{99}Tc, a man-made radioisotope, are the most widespread groundwater contaminants associated with the PGDP. Trichloroethene occurs as pure phase (free-product) dense nonaqueous-phase liquid (DNAPL) at multiple locations in the silts and clays overlying the RGA and, most probably, in the RGA itself at some locations. Technetium-99 is a widespread soil contaminant at the PGDP and a common contaminant in many PGDP burial grounds. Both dissolved TCE and ^{99}Tc migrate with downward percolating water to the RGA. In addition, pools of TCE, believed to exist within the RGA, are able to yield much higher dissolved levels in groundwater. These contaminants have resulted in large-scale dissolved-phase plumes that are migrating from the PGDP toward the Ohio River. Table 2.1 presents a summary of the PGDP groundwater plumes. Due to the lack of information at the plume's distal ends, off-site plume length is approximated, based on interpretation.

DOE has taken three discrete actions to contain the groundwater contamination and mitigate the risk to the public that is associated with groundwater. Two separate interim remedial actions installed pump-and-treat systems in the Northwest and Northeast Plumes. Both pump-and-treat systems consist of well fields in the high concentration core of the plumes. The Northwest Plume treatment system also includes a well field near the PGDP security fence. To minimize risks to residents and businesses north of the PGDP, DOE maintains a Water Policy, under which DOE provides municipal water to area residents and businesses.

3. REVISED PLUME MAPS

A primary component of the annual groundwater report is a revision of the site maps of TCE and ^{99}Tc levels in the RGA. These maps (presented in Appendix A) **(not shown in this report)** represent the contaminant extent during the preceding year based upon (1) analysis of groundwater samples collected during the previous year, (2) temporal trends in groundwater samples collected from monitoring wells (MWs), and (3) interpreted contaminant levels based on previous analyses and a conceptual model of contaminant trends. Appendix B **(not shown in this report)** includes plots of contaminant levels in individual wells over time for trends cited in this report. The attached maps are based on the available TCE and ^{99}Tc analyses of groundwater found in the Paducah Oak Ridge Environmental Information System (OREIS) database at the end of CY 2002. These data include records for 141 RGA wells and piezometers and the maximum results from depth-discrete samples collected from 197 temporary soil borings in the RGA. The data set (Appendix B) incorporates analyses of the Remedial Investigations (RIs) of Waste Area Groupings (WAGs) 3 (DOE 2000d), 27 (DOE 1999b), and 28 (DOE 2000a), as well as the Sitewide Evaluation for Source Areas Contributing to Off-Site Groundwater Contamination (DOE 2000b) and the Site Evaluation Report for WAG 8 (DOE 2000c). These data have been age-adjusted in order to take into consideration what the current concentration/activity likely might be. Age-adjusting was accomplished by comparing historical data in the boring to similar historical data in nearby MWs with a more recent value. The WAG 6 data set has been dropped from the CY 2002 data set because of the age of the data (five years) and insufficient number of wells to adequately age-adjust

Table 2.1. PGDP groundwater plumes, CY 2002

Plume	Approximate maximum off-site contaminant levels	Off-site plume length
	Trichloroethene	
Northeast	1100 µg/L	3.4 km (2.1 miles)
Northwest	10,000 µg/L	4.4 km (2.7 miles)
Southwest	350 µg/L	0.4 km (0.3 miles)
	Technetium-99	
Northwest	3000 pCi/L	4.7 km (2.9 miles)
Southwest	1670 pCi/L	0.7 km (0.4 miles)

the data. Data from two special limited sampling events, one in July 1997 and one in November 2002, that involved four wells have been removed from the CY 2002 data set due to questions about the analysis of those samples. Removal of this limited data does not impact the overall interpretation of contaminant trends. Data from older temporary borings and from wells that have been abandoned or no longer are sampled for TCE and ^{99}Tc are not included in the data set used for contouring. However, in areas where there is no contemporary data, the basic plume shapes defined by older data have been maintained in the current interpretation. The premise is that, while some of the internal details of the plumes change from year to year, the overall shape of the plumes does not change significantly.

Maps of TCE and ^{99}Tc are presented at two scales to best present the greater available detail for the PGDP plant and to show the larger off-site area impacted by the PGDP. Note that for this report, onsite refers to the area within the plant security fence and offsite refers to areas outside the plant secured area. The plant map (1:4800 scale) covers the 303 hectares (748 acres) contained within the PGDP security fence. The larger area map (1:12,000 scale) addresses approximately 5950 hectares (14,700 acres) of the DOE reservation and other lands between the plant and the Ohio River. Metropolis Lake Road and Bethel Church Road conveniently define the east and west boundaries, respectively, of the potential area impacted by the PGDP groundwater contamination. Each map represents contaminant levels observed in or implied from trend plots of RGA MWs during CY 2002, plus data from temporary characterization borings. These maps are composites of three sets of working maps of the lower, middle, and upper RGA [elevations 76.2 to 89.9 m (250 to 295 ft), 89.9 to 93.0 m (295 to 305 ft), and 93.0 to 97.5 m (305 to 320 ft) amsl]. Figures 3.1 and 3.2 show the composite maps. Additional discussion of how the maps were developed is presented in Appendix B. The data set and trend plots for MWs used in the interpretation also are included in Appendix B. Figure 3.3 shows the areas of Solid Waste Management Units (SWMUs) and WAGs identified in the text. Also, Figs. 3.4 and 3.5 **(not shown in this report)** show the locations of borings and wells that are referenced in this report.

4. REVISIONS TO PREVIOUS PLUME MAPS

This year's (CY 2002) plume maps continue the basic interpretation presented in the plume maps for CY 2001. Revisions for CY 2002 reflect the following: (1) increasing TCE trends in MWs at C-404 and C-720, (2) the consideration of surface water discharge to Little Bayou Creek, and (3) the installation of new MWs at the C-746-S&T and C-746-U Landfill areas.

The main revisions to the groundwater plume maps and contaminant trends for each plume are described in the following subsections.

4.1 NORTHEAST PLUME

4.1.1 Trichloroethene

Within the Northeast Plume, contaminant distributions have been interpreted similarly to those of the previous CY. In the lower RGA, an area of higher concentration was reinstated to the core of the plume on the basis of values in MW258. In early 2002, TCE levels in MW258 returned briefly to 1000 μg/L levels.

Contaminant contours for the middle RGA this CY include MW99, whose TCE values have steadily risen since 1995 to an interpreted June 2002 value of 17 μg/L.

In the upper RGA, MW193 has been reclassified as screened in the middle RGA. The screen for the well straddles the elevation used to differentiate upper RGA and middle RGA. As an upper RGA well with TCE, the interpretation requires an isolated area of TCE in the vicinity of the well, an interpretation that is difficult to defend. As a middle RGA well, the location and level of contamination is consistent with that already mapped for the middle RGA in that area.

4.1.2 Technetium-99

Contaminant levels generally are less than 25 pCi/L offsite and are only greater than 100 pCi/L at a few discrete locations. No significant changes were made to this CY's maps.

4.2 NORTHWEST PLUME

4.2.1 Trichloroethene

Contaminant distributions in the Northwest Plume also are very similar to CY 2001's interpretation. The most notable change is in the interpretation of the distal end, where the bifurcation has been reintroduced. Since TCE levels in both both the surface water near monitoring points L241 and L12 and in the seeps in Little Bayou Creek remain above detection limitsand in MW152 continue to increase, it is reasonable to interpret a more significant impact to the western edge of the plume due to the discharge to Little Bayou Creek. The increasing TCE in MW152 suggests that part of the plume is not discharging to Little Bayou Creek, but migrating underneath the creek toward MW152, hence the bifurcation. With only two monitoring well data points in the area, however, the true shape of the distal end of the plume is not well defined.

4.2.2 Technetium-99

Significant changes were made to the interpretation of ^{99}Tc distribution in the Northwest Plume. Previously, ^{99}Tc appeared as two separate plumes migrating from PGDP to near the Ohio River. In CY 2001, the interpretation was that these ^{99}Tc plumes were not separate plumes, but part of the same plume. The current interpretation shows a large area of low-level ^{99}Tc activity encompassing two separate plumes with relatively narrow cores. At the distal end, near the river, this CY's maps show one of the plumes terminating at Little Bayou Creek, where upwelling into the surface water is occurring and is monitored at six locations in the creek. In the middle and lower RGA horizons, ^{99}Tc from the second plume is believed to be passing under Little Bayou Creek, as detected in MW152.

4.3 SOUTHWEST PLUME

4.3.1 Trichloroethene

There are no significant changes to the interpretation of TCE distribution in the Southwest Plume.

4.3.2 Technetium-99

There are no significant changes to the interpretation of ^{99}Tc distribution in the Southwest Plume.

4.4 C-746-S, -T, AND -U AREA

4.4.1 Trichloroethene

In the previous CY's maps, TCE in the C-746-S, -T, and -U area was shown originating from within the plant. This CY's maps continue to show the TCE as isolated in the area for all three horizons; however, as a result of the new wells installed in 2002, the extent of the TCE has been modified to reflect the new data.

4.4.2 Technetium-99

In the previous CY's maps, ^{99}Tc in the C-746-S&T area was shown originating from within the plant and from the C-616 Lagoons. The CY2001 maps, however, show the 100 to 900 pCi/L ^{99}Tc contour as isolated in theseparated from the plant area for all three horizons. This year, as a result of the wells installed in 2002, increasing ^{99}Tc levels in MW353, and the potentiometric maps, the 100 to 900 pCi/L ^{99}Tc contour^{99}Tc again is depicted as originating from within the plant.

5. TRENDS IN PGDP MONITORING WELLS

MW systems located at the PGDP provide a means to assess the groundwater quality in the RGA for distinct areas. Records of TCE and ^{99}Tc levels over time for 141 RGA wells document overall groundwater contaminant trends for the PGDP. Approximately 39 wells of the 141 RGA MWs have shown an increase in TCE over the past year; 30 wells have shown a decline in TCE levels; 19 wells are nearly unchanged; 31 wells have no detectable TCE; and 22 wells are too new for trends to be established. Over the past year, 21 wells have shown an increasing trend of ^{99}Tc activity; 23 wells have shown a decline; 9 wells have shown no significant change; 66 wells have ^{99}Tc activities below 25 pCi/L (the practical detection limit); and 22 wells are too new for trends to be established.

The following sections summarize the interpretation of groundwater trends at PGDP.

5.1 RAINFALL AND RGA HYDRAULIC POTENTIAL TRENDS

Figure 5.1 **(not shown in this report)** is a plot of cumulative rainfall for the PGDP area for the period 1990 through 2002. The actual rainfall is compared against the average cumulative rainfall for the same duration, based on 30-year monthly average rainfalls for the PGDP area (now available for the years 1970 through 2000). The plot demonstrates a sustained rainfall deficit for the PGDP area over the period 1992 through 2002. For 2002, overall rainfall was just over 5 inches above normal, reducing, but not eliminating, a deficit that had been as high as 45 inches in 2001. Figure 5.1 **(not shown in this report)** also presents the same data in another perspective that highlights the significance of the rainfall deficit. As the period of deficient rain continues, the amount of water in storage in surficial soils is depleted, and the amount of water infiltrating through deeper soils, potentially carrying groundwater contaminants, is reduced.

Figure 5.2 **(not shown in this report)** is a plot of RGA hydraulic potential for MW179, screened in the RGA and central to the area of the 141 wells represented in this assessment. The figure also compares the RGA hydraulic potential for MW179 to the net cumulative rainfall shown on Fig. 5.1. All of the RGA water-level records exhibit identical trends (aside from rare outliers that appear to be measurement errors) with a similar magnitude of rise and fall (see Appendix B). The data define an overall decline of approximately 6 ft for the period 1997 to 2002. Consistent with the increased rainfall during the winter of 2001/2002 and spring 2002, the overall water level recovered to 1996 levels before dropping as a result of the dry summer. Lowered RGA water levels may result in less contaminant source zone in contact with groundwater and may alter groundwater flow paths. The identical trends in hydraulic potential across the PGDP reservation suggest that any change in the groundwater flow path has been local only.

5.2 TRENDS IN CONTAMINANT LEVELS

Several groups of wells with records of increased TCE or ^{99}Tc levels occur among the 141 wells represented in this analysis. In nearly all well records, the number of water level measurements greatly exceeds the number of analyses for TCE and ^{99}Tc; thus, a strict comparison of contaminant levels versus water-level events is not possible. The data does, however, support an analysis of overall trends that may reflect cause-and-effect relationships.

5.2.1 C-400 Area

There are eight MWs in the C-400 area – three (MW156, MW168, and MW178) are screened in the upper RGA; three (MW175, MW178, and MW342) are screened in the middle RGA; and two (MW155 and MW343) are screened in the lower RGA. Even though these wells are less than 1100 ft apart, there are significant variations in the TCE and ^{99}Tc trends among these wells. Figure 5.3 **(not shown in this report)** shows the relative positions of the wells and the TCE trend plot for each well. Figure 5.4 **(not shown in this report)** shows the same information for ^{99}Tc.

Trichloroethene

The three upper RGA wells each show declining TCE levels, but the character of their trends is indicative of their relative positions to the building. MW156, at the southeast corner of the building, has the highest TCE concentrations of all the wells in the C-400 area and is closest to the main TCE source area. This well has shown a steady decline in TCE levels, indicating a gradually depleting source in the overlying shallow soils. MW168, which is approximately 1100 ft downgradient of MW156, has generally lower levels of TCE. In this well, TCE increased to a peak in early 1996. Since that time, TCE levels have declined. The declines in the two wells closely resemble each other, which suggests they are monitoring the same flow path. Dividing the distance between the wells (1100 ft) by the apparent elapsed time of five years gives an approximate groundwater velocity of 0.6 ft per day for the upper RGA in this area. The TCE trend plot for MW178, on the other hand, bears no resemblance to the other two upper RGA wells. The well is located at the northeast corner of the building, near the C-403 acid neutralization pit. The erratic levels in this well possibly indicate the impact of activities associated with the pit. If not a data error, the spike in late 1997 may represent the impact of a nearby waterline leak, flushing some shallow residual TCE down to the RGA.

The two middle RGA wells located on the west side of C-400, MW175 and MW342, both show similar downward trends and levels of TCE. MW342 shows more variation in TCE levels, but this may reflect the fact that MW342 is sampled more frequently, yielding a greater resolution of fluctuations in contaminant levels. In contrast, the third, middle RGA well (MW341) indicates a trend of increasing TCE levels. Even though MW341 is only 200 ft northeast of MW178 and the midpoint of the well screen is only 15 ft deeper, the two wells do not appear to be monitoring the same source areas, nor is MW341 monitoring the same flow path as MW175 and MW342.

There are only two wells monitoring the lower RGA, MW155 at the southeast corner and MW343 near the northwest corner of C-400. Both wells show increasing TCE trends. MW155 is only 34 ft north of the upper RGA well MW156, but both its TCE trend and level are significantly different. The TCE levels in MW155 indicate that the well is on the edge of the contamination at the southeast corner of C-400. The increasing trend may be the result of some lateral dispersion of TCE from the source zone or perhaps the influence of a separate upgradient source. MW343, with its relatively high TCE levels, is near the core of the Northwest Plume. After large fluctuations in contaminant level during its first two years of sampling, the well has begun a general upward trend over the past two years. This is at odds with the two nearby middle RGA wells, MW 342 and MW175. The reason for this disparity is not clear, but one possibility is that the core of the plume is shifting to the north. Another possibility is that an additional source area is contributing to the TCE in MW343, but bypassing the two middle RGA wells.

Technetium-99

All three of the upper RGA MWs show declining levels of ^{99}Tc; however, the shapes of the trend plots are significantly different. MW156, at the southeast corner, is upgradient of the main ^{99}Tc source as evidenced by the relatively low activities. Of particular interest, however, is the apparent impact of the surfactant test that was performed in that area in the summer of 1994. Shortly after the test was completed, ^{99}Tc activities dropped dramatically to non-detect levels and have not recovered. (Note: This same test, designed to work on TCE, does not seem to have had a major impact on TCE levels, probably because so much of the source material is still in the shallow soils.) In contrast, MW178 shows a decline trend consistent with a single depleting source. MW168 shows increasing activity until early 1998, then declining levels. The activity spike in 2001 is possibly a data error. MW168 is near the North-South Diversion Ditch, so some of the ^{99}Tc may be attributable to that unit. The decline in activity may reflect the impact of the interim action that diverted water from that portion of the ditch.

The two middle RGA wells on the west side of C-400 both show declining ^{99}Tc activities. MW341, however, shows a trend of increasing ^{99}Tc activity and is, in fact, the only well of the eight that does have increasing ^{99}Tc. MW341 is at odds with MW178, which as noted earlier, has a declining trend curve. This is additional evidence that MW178 and MW341 are not monitoring the same source areas.

Both lower RGA wells also have declining ^{99}Tc activities. The decline in MW343 is similar to that in MW342, which suggests that the differences in TCE trends between these two wells may not be due to the core of the plume shifting to the north. The trend in MW155 also is opposite that for the TCE in the same well, again indicating that more than one mechanism or source area may be impacting this well.

5.2.2 On-Site Northwest Plume and Adjacent Areas

There are 13 MWs within or immediately adjacent to the Northwest Plume within the plant security fence. Going from southeast to northwest, these wells include five upper RGA wells – MW168 (also part of the C-400 area), MW205, MW173, MW63, and MW66; three middle RGA wells – MW169, MW185, and MW245; and five lower RGA wells – MW262, MW261, MW340, MW339, and MW65. Two of the wells (MW205 and MW173) are at the extreme edge of the plume and will not be discussed. MW168 was discussed in Sect. 5.2.1. Figures 5.5 **(not shown in this report)** and 5.6 **(not shown in this report)** show the subject wells and their individual TCE trend plots, while Figs. 5.7 **(not shown in this report)** and 5.8 **(not shown in this report)** show the same information for ^{99}Tc.

Trichloroethene

Besides MW168 at the southeast end of this area, MW63 and MW66 at the northwest end of this area are screened in the upper RGA. With the exception of two suspect data points in 1993, TCE levels in MW63 were at or below detection limits from 1990 until 2000. In 2000 TCE levels began to rise, continuing through 2002, although rainfall amounts in 2000 and 2001 were below average. The impact of the low rainfall can be seen superimposed on the trend with drops in TCE levels consistent with drier periods and rebound, particularly in late 2001 and early 2002 when total rainfall received was more than eight inches above average. These same weather related trends are even more dramatic in MW66 where TCE levels were dramatically depressed in 2000 and 2001, but rebounded to their highest values ever in May and June of 2002.

As suggested in last year's report, "MW66 contaminant levels (both TCE and ^{99}Tc) are clearly related to RGA hydraulic potential. Levels of both contaminants "spike" with high hydraulic potential events. The "base" contaminant levels significantly changed during 1997 when RGA hydraulic potential declined below 328.5 ft. This data suggests that the secondary contaminant source zone affecting groundwater in the MW66 area is at an elevation of approximately 328.5 ft. Whatever the cause-and-effect relationship, MW66 contaminant levels can be expected to rise significantly when the RGA hydraulic potential returns to 328.5 ft and above." In 2002, water levels in May and June rose above 328.5 ft. Rainfall infiltration through the source area also plays a large role because TCE values began to climb in January 2002 in step with the increased rainfall that began in December 2001 and continued through June 2002. Then, during the very dry summer of 2002, TCE levels decreased. Since MW63 is beginning to exhibit behavior similar to MW66, it appears that either the source area at MW66 has spread or a similar source area has become active near MW63.

All three wells screened in the middle RGA have shown increasing levels of TCE. MW169, although it appears to be situated near the core of the plume, may be screened too high in the RGA to adequately monitor the contamination. This well has shown low levels of TCE since 1997. During 2002, TCE increased from 4 to 8 μg/L then dropped back to 2 μg/L. This wide range makes the 2002 data suspect. MW185, in the northwest corner of the plant, has shown a steady increase in TCE since it was first sampled in early 1991. Over the past three years, the rate of increase appears to have slowed, but levels are still increasing. The third well, MW245, is just upgradient of the south extraction well field for the Northwest Plume. This well also has shown a steady increase in TCE since it was first sampled in mid-1995. Note, however, that the last two samples documented for 2002 are well outside the normal trend for this well and should be considered suspect data MW262, screened in the lower RGA, after increasing the first two years, began a dramatic slide in TCE levels over the next two, rebounded slightly, then began a steady decline in 2000 that continued through 2002. When taken in the context of the upgradient MW343 and the downgradient MW261, the trend in MW262 suggests that the core of the plume may have shifted to the northeast and away from the well. TCE levels in MW261 declined from mid-1995 until early 1998. Since then, TCE levels have steadily increased to early 1996 levels. The data for 2002 are suspect. In early 2002, there appears to be a problem with detection limits. The detection limit for the first sample collected in 2002 is the same as the reported result, contrary to all the previous data. The detection limit for the last sample collected in 2002 is reported as 1, again contrary to all the previous data. These irregularities make the data suspect. The last two TCE levels for 2002 are well above the recent trend for this well and should be discounted until further evidence supports the new trend. Further downgradient, MW339 and MW340 are showing nearly flat trends over the past six years. Note that the last two data points for MW340 are outside the well's normal range. MW65 is the furthest downgradient of this group of wells and lies on the south edge of the plume's core. In 1999, TCE levels rose above detection limits and, with the exception of the suspect last data point for 2002, have climbed steadily for four years.

Technetium-99

In the upper RGA well MW63, although there appears to be an increase in ^{99}Tc, the levels are still below the lab detection limits. The ^{99}Tc levels in MW66 closely mimic the TCE levels in the well, except that the rebound of the 2002 levels did not exceed some of the activities measured during the early history of the well.

Within the middle RGA, MW169 remains at non-detect levels. As mentioned earlier, the well may be screened too high in the RGA to provide adequate monitoring. MW185 showed increasing ^{99}Tc activities until early 2001. During 2001 and 2002, ^{99}Tc activities in MW185 have declined. MW245 shows a wide variation in measured ^{99}Tc levels, but the overall trend since 2000 appears to be nearly flat.

The ^{99}Tc activities in MW262, screened in the lower RGA, show the same trend as the TCE levels with an early increase, dramatic decline, partial rebound, and then a steady decline over the past four years. Likewise, ^{99}Tc activities in MW261 are similar to the TCE trend for the well, although the ^{99}Tc has not increased as rapidly as the TCE of the past four years. In both MW339 and MW340, ^{99}Tc activities have declined during the past four years. (Note: Both wells had at least one suspect data value during 2002.) Like nearby MW63, lower RGA well MW65 appears to have an increase in ^{99}Tc activity, but most of the values remain below the minimum detectable activity.

5.2.3 Northwest Plume ~ South Well Field

All seven MWs associated with the south extraction well field for the Northwest Plume are screened in the middle RGA. MW245, as described in Sect. 5.2.2, is an upgradient well, while the other six wells are at various distances downgradient from the two extraction wells. Figure 5.9 **(not shown in this report)** shows the wells and TCE trends for the south well field. Figure 5.10 **(not shown in this report)** shows the wells and ^{99}Tc trends for the south well field.

Trichloroethene

As discussed earlier, MW245 has shown a steady increase in TCE levels, although the data for the second half of 2002 should be discounted until additional data is available. MW249, MW250, and MW244 clearly show that the western extraction well, EW231, continues to capture most of the TCE in the middle RGA, on the west side of the plume. After the initial drop in TCE levels, all three wells demonstrate very low levels of TCE with minimal fluctuation. The eastern well, EW230, does not appear to be as effective in capturing the TCE. MW248, which is located between EW231 and EW230, did not respond as rapidly to the start of pumping as did the three wells on the west side of the plume. In early 1998, the well finally did feel the impact of an extraction well, responding with a sharp drop in TCE levels. The capture appears to be incomplete, however, because a seasonal variation, like the one in MW66, is now readily apparent. It appears that MW248 is monitoring the same source area as MW66. If approximately six months are allowed for migration, the curves for the two wells since early 1998 match up reasonably well. Further downgradient, MW242 and MW243 also demonstrate that while EW231 is capturing most of the TCE on the west side of the plume, EW230 is not as effective. MW243 does show the initial sharp decline that appears in MW244, MW249, and MW250; however, with the western portion contained, from 1998 on, the well shows the influence of TCE bypassing the extraction field on the east side. MW242, the well furthest from the extraction wells, shows the least influence. Its trend appears to be consistent with the decline associated with the depletion of a single source area. As a result of the apparent failure of EW230 to adequately capture the plume core, the CY2002 plume map shows a >1000 µg/L core migrating past the south extraction well field.

Technetium-99

In general, the trends for ^{99}Tc tell the same story as the TCE curves – EW 231 is more effective than EW230 in extracting groundwater and associated contamination in the middle RGA. There is one exception to the TCE trends. MW249 appears to be seeing the influence of a source of ^{99}Tc that is being pulled into EW231. The evidence for this is that unlike TCE, ^{99}Tc levels in MW249 have been gradually increasing. Additionally, MW250 and MW244, which are further downgradient to the extraction field, do not show this influence. This suggests that ^{99}Tc, from a source independent of the TCE, is beginning to migrate into the area of the extraction field. If so, MW249 then becomes an upgradient well relative to the capture of the ^{99}Tc in EW231. Since MW244 and MW250 are not showing any impacts, it appears that EW231 is capturing the additional ^{99}Tc.

5.2.4 Northwest Plume ~ North Well Field

There are five middle RGA MWs (MW233, MW235, MW238, MW240, and MW241) and three lower RGA MWs (MW202, MW234, and MW236) in the north extraction well field of the Northwest Plume. MW234 is considered an upgradient well to the extraction field. MW241, MW240, and MW238 are within the extraction field, while MW235 and MW236 are considered downgradient wells. MW202 and MW233 are west of the extraction field. During the summer of 2002, MW235 was abandoned and replaced with MW381, and MW234 was abandoned and replaced with MW380. Figure 5.11 **(not shown in this report)** shows the TCE trends and wells for the north well field, while Fig. 5.12 **(not shown in this report)** shows the same information for ^{99}Tc trends.

Trichloroethene

The trend curves for the middle RGA wells suggest that the extraction wells in the north well field are not as effective in capturing the high concentration area as those in the south well field. With the exception of MW233, which is upgradient of the extraction wells, and MW235, which is some distance downgradient of the extraction wells, none of the north wells demonstrate the sharp decline and asymptotic tail seen in the wells on the west side of the south well field. The three central wells – MW241, MW240, and MW238 – do show a decline in TCE values with levels in 2002 less than 100 µg/L. MW235, the downgradient, middle RGA well, increased significantly in mid-1998 and generally has remained above 1000 µg/L since that time.

Two of the three lower RGA wells (MW234 and MW236) show behavior similar to MW235, although they have shown some decline in TCE levels over the past two years. The third lower RGA well (MW202) has shown a steady decline since 1996.

The TCE trends for the MWs in the north well field have been interpreted as a migration of the plume's core to the east of the extraction field. This migration is demonstrated by the decline in TCE levels west and within the extraction field coincident with the increase of TCE east of the extraction field. The CY2002 maps show this configuration.

Technetium-99

As with the south well field, ^{99}Tc trends in the north well field generally mimic the TCE trends. Both wells on the west side of the extraction field, MW202 and MW233, have ^{99}Tc activities at or below the minimum detection limit, as do two of the wells within the extraction field, MW240 and MW241. The remaining wells also show declining ^{99}Tc activities with MW235, the easternmost well, showing the least amount of decline. This pattern of decline also generally supports the interpretation that the core of the Northwest Plume has shifted east of the extraction field.

5.2.5 Northwest Plume ~ Other Off-site Wells and Shawnee Steam Plant

In addition to the MWs associated with the north and south extraction well fields, there are 13 other wells monitoring contaminant migration in the Northwest Plume outside the secured area. These wells include two upper RGA wells (MW20 and MW197); five middle RGA wells (MW98, MW106, MW194, MW200, and MW201); and six lower RGA wells (MW125, MW134, MW135, MW146, MW152, and MW199). Figures 5.13 **(not shown in this report)** and 5.14 **(not shown in this report)** show the locations and TCE trends for this group of wells. Figures 5.15 **(not shown in this report)** and

5.16 **(not shown in this report)** show the locations and ^{99}Tc trends.

Trichloroethene

Located on the east side of the plume and downgradient of the south well field, upper RGA well MW197 saw a steady increase in TCE levels from early 1991 until mid-1996. From mid-1996 until mid-2000, TCE levels declined. After staying constant at 3 µg/L for nearly a year, in 2002, the TCE levels appear to start increasing again. The trend plot does not match any of the upgradient upper RGA wells (MW66 is the closest), so the mechanism for the changes is not clear. One possibility is minor variations in the location of the edge of the plume over time. The other upper RGA well in this group is MW20. This well is further downgradient and on the west edge of the plume. Since at least 1998, TCE levels in this well have been at or below the detection limit.

Within the middle RGA, MW106 and MW194 are both west of the plume near where it passes beyond the plant secured area. MW200 lies southeast of MW20 on the east fringe of the plume. None of these wells has had a credible TCE detection. MW98 lies due east of the north extraction well field. This well has seen a low but steady increase in TCE levels since 1996. MW201, the remaining middle RGA well, monitors the western edge of the plume north of the north extraction well field. This well saw an increase in TCE levels until mid-1995. Since then, TCE levels have declined to less than 50 µg/L. Taken together, the trends in MW201 and MW98 support the interpretation that the axis of the Northwest Plume is shifting eastward.

MW134, MW199, and MW146, all lower RGA MWs on the west side of the Northwest Plume, indicate TCE levels in those locations have been at or below the detection limit since at least 1998. The single apparent detection in MW146 in 2001 is probably an erroneous value. The three remaining lower RGA wells – MW125, MW135, and MW152 – are either on the east side or distal end of the Northwest Plume. All three wells document increasing TCE levels over the past two years, although each of the wells does appear to have some suspect data points. Like the wells in the middle RGA, the increasing TCE levels in these three wells support the interpretation that the axis of the Northwest Plume is shifting eastward and away from the north extraction well field.

Technetium-99

Located on the east side of the plume and downgradient of the south well field, upper RGA well MW197 saw a steady increase in ^{99}Tc activities from early 1991 until mid-1996. From mid-1996 until late 2000, ^{99}Tc declined; then in 2002, the ^{99}Tc activities start increasing again. The trend plot does not match any of the upgradient upper RGA wells (MW66 is the closest), so the mechanism for the changes is not clear. One possibility is minor variations in the location of the edge of the plume over time. The other upper RGA well in this group is MW20. This well is further downgradient and on the west edge of the plume. Since at least 1998, ^{99}Tc levels in this well have been at or below the detection limit.

Neither MW106 nor MW194, screened in the middle RGA on the west edge of the plume near where it passes beyond the plant secured area, has documented ^{99}Tc activities above 25 pCi/L. MW200 lies southeast of MW20 on the east fringe of the plume. Monitoring what appears to be a ^{99}Tc plume with no associated TCE, ^{99}Tc activities remained elevated until mid-1997 when they began to decline. In 2002, the ^{99}Tc activities were below 25 pCi/L, suggesting that the ^{99}Tc plume has either migrated away from this MW or dissipated. MW98 lies due east of the north extraction well field. This well saw a low but steady decrease in ^{99}Tc levels from 1994 until 2000. In 2000, the trend reversed and began to increase again. If the last two data points for 2002 are discounted, the upward trend continued into 2002. MW201, the remaining middle RGA well, monitors the western edge of the plume north of the north extraction well field. This well saw an increase in ^{99}Tc levels until mid-1995. Since then, ^{99}Tc activities, like the TCE levels, have declined. Taken together, the trends in MW201, MW200, and MW98 support the interpretation that the ^{99}Tc plume has either dissipated or migrated eastward and that the axis of the Northwest Plume is shifting eastward.

MW134, MW199, and MW146, all lower RGA MWs on the west side of the Northwest Plume, indicate ^{99}Tc levels in those locations have been at or below the detection limit since at least 1998. The three remaining lower RGA wells – MW125, MW135, and MW152 – are either on the east side or distal end of the Northwest Plume. Unlike the

TCE trends in these wells, only MW125 indicates increasing ^{99}Tc activities. Both MW135 and MW152 have decreasing ^{99}Tc trends. The disparity between the TCE and ^{99}Tc trends in MW135 and MW152 suggests that the ^{99}Tc is acting independently of the TCE.

5.2.6 C-746-S&T Landfills Area

The MW network at the C-746-S&T Landfills area underwent a major well replacement project in late 2002. Prior to the well replacement, there were seven wells screened in the upper RGA, three wells screened in the middle RGA, and one well screened in the lower RGA. At the completion of the project, there will be seven wells screened in the upper RGA, five wells screened in the middle RGA, and two wells screened in the lower RGA. The new wells have not been in place long enough for trends to be established and will not be discussed in this report. The upper RGA wells discussed in this report are MW220, MW221, MW222, MW223, MW224, MW264, and MW276. The middle RGA wells are MW263, MW267, and MW353. The lower RGA well is MW266. Figures 5.17, 5.18, and 5.19 show the TCE and ^{99}Tc trends for the wells associated with the C-746-S&T Landfills area.

Trichloroethene

Of the wells screened in the upper RGA, MW220 is located at the south end of the landfill area; MW224, MW222, MW223, and MW221 run from east to west across the middle of the area; and MW276 and MW264 are immediately north of the landfill area. MW220, at the south end, as well as MW223 and MW222, near the middle of the landfill area, have not detected any TCE. MW224, on the east edge, has detected low levels of TCE, but there is no clear trend to the TCE levels. Similarly, MW221 on the west edge of the landfill area has detected low levels of TCE. This well does appear to have declining TCE levels since a peak was detected in mid-1997. Northwest of MW220, MW276, which has had the highest TCE levels, also has shown a steady decline since 1997. MW264, off the northeast corner of the landfill area, has had low but steadily increasing TCE levels since it was installed in 1994.

Within the middle RGA, MW353 and MW267, at the south end of the landfills, have not detected any TCE. Conversely, MW263 and MW179, at the north end of the landfill area, have shown increasing levels of TCE since their installations. In the lower RGA, MW264 also has seen increasing levels of TCE since its installation.

Since the southern wells (MW353, MW220, and MW267) have not detected any TCE in the upper or middle RGA, the TCE that is present in other wells is mapped as localized in the area of the landfills. The trends are not, however, definitive evidence that the TCE is originating from the landfill area. A source area to the southwest also is a possibility.

Technetium-99

Of the upper RGA wells, only MW276, on the northwest side of the landfill area, has consistently detected ^{99}Tc, although there does not appear to be a trend to the data. MW220, at the south end of the landfill area, appears to have detected ^{99}Tc occasionally, but most of those have been below the 25 pCi/L threshold used for mapping ^{99}Tc activities.

Since the wells with detectable ^{99}Tc are found southwest, west, and northwest of the landfill area, the most likely sources either are from an upgradient source within or near the plant or perhaps from an eastward shift of the ^{99}Tc plume that had been mapped further west in past years.

5.2.7 C-746-U Landfill Area

Like C-746-S&T, the MW network at the C-746-U Landfill area underwent a major well replacement project in 2002. Because of the proximity of the C-746-S&T Landfill Areas, the downgradient wells to that unit may be considered upgradient wells to the S-746-U Landfill. Prior to the well replacement, there were four wells screened in the upper RGA, five wells screened in the middle RGA, and four wells screened in the lower RGA. At the completion of the project, there were seven new wells screened in the upper RGA, three new wells screened in the middle RGA, and five new wells screened in the lower RGA. The new wells have not been in place long enough for trends to be established and will not be discussed in this report. The upper RGA wells discussed in this report are MW264, MW268, MW274, and MW276. The middle RGA wells are MW139, MW179, MW263, MW271, and MW272. The lower RGA wells are MW266, MW269, MW273, and MW275. The TCE and ^{99}Tc trends for the wells associated with the C-746-U Landfill area are shown in Figs. 5.20, 5.21,and 5.22 **(not shown in this report)**.

Trichloroethene

The two upgradient upper RGA wells (MW276 and MW264) indicate different trends for TCE. As mentioned earlier, MW276 has a declining trend, while MW264 has an increasing trend. The two downgradient MW268 and MW274 have had two detections of TCE each. In the middle RGA, both upgradient MW263 and MW179, plus the lateral well MW139, show increasing levels of TCE. Neither downgradient MW271 nor MW272 has detected TCE. Two lower RGA wells, the upgradient MW266 and the downgradient MW269, both show increasing levels of TCE, but the remaining two downgradient wells (MW273 and MW275) have not had any detections.

The patterns suggested by the trends in these wells are that one area of TCE is migrating to the northeast between the C-746-S&T and C-746-U Landfills. Meanwhile, the TCE seen in MW269 appears to be the eastern fringe of the Northwest Plume, as it either spreads or shifts eastward.

Technetium-99

In the upper RGA, upgradient MW276 indicates erratic but detectable levels of ^{99}Tc, while the more easterly upgradient MW264 has not detected any ^{99}Tc. In the downgradient wells, a similar contradiction occurs. The western well (MW268) shows increasing levels of ^{99}Tc over the past three years, while the eastern MW274 has had declining levels of ^{99}Tc.

Both upgradient wells in the middle RGA show detectable ^{99}Tc, with MW263 indicating a consistent upward trend over the past three years, while MW179 tends to have erratic but large spikes of activity. MW139, the well lateral to and on the east side of the landfill, has not detected ^{99}Tc. The two downgradient MW271 and MW272 both show increasing levels of ^{99}Tc.

The upgradient lower RGA MW266 has not detected ^{99}Tc, but it is present in all three downgradient MWs. In MW269 and MW275, the ^{99}Tc activities are decreasing, while in MW273 the overall trend appears to be nearly flat.

Unlike the TCE in the landfill area, the ^{99}Tc trends do not present a coherent picture of contaminant migration patterns. As such, the ^{99}Tc maps for this area reflect a snapshot of the current distribution and level of ^{99}Tc activity in the RGA.

5.2.8 On-Site Northeast Plume and Adjacent Areas

Within the on-site portion of the Northeast Plume there are seven wells monitoring contaminant migration, two in the upper RGA (MW165 and MW206) and five in the lower RGA (MW163, MW255, MW256, MW260, and MW356). There also are three lower RGA MWs immediately east of the plant secured area (MW145, MW258, and MW352). Figures 5.23 and 5.24 **(not shown in this report)** show the TCE trends for these wells, while Figs. 5.25 and 5.26 **(not shown in this report)** show the ^{99}Tc trends.

Trichloroethene

With the exception of a few questionable data points, neither MW165 nor MW206 has detected TCE in the upper RGA. The lower RGA wells have been more successful in monitoring TCE levels. On the south flank of the Northeast Plume near the high concentration core, MW255 has shown a consistent decline in TCE levels. Conversely, MW256, also near the high concentration core and north of MW255, has documented steadily increasing levels of TCE. Further north, TCE levels in MW163 have been nearly constant, while the levels in MW260 have been steadily declining. In the northeast corner of the plant secured area, MW356 has measured erratic levels of TCE.

In the three wells immediately outside the fence, MW258 appears to be monitoring the same flow path as MW255 since their data curves are similar. The unusual feature of the two trend lines is that there does not appear to be a time lag between similar features in the two wells. This normally indicates that the direction of groundwater movement is at right angles to a line drawn between the two wells. This would put local groundwater movement most likely to the northwest, off the Porters Creek Terrace. This movement is supported by the potentiometric maps. MW352 was installed in an attempt to monitor the same pathway monitored by MW256. After monitoring declining TCE levels for two years, the well was abandoned in 2002 due to mechanical problems. The northernmost of the three wells, MW145, has seen nearly constant TCE levels for the past four years.

MW165 and MW206 appear to be screened too shallow in the RGA to provide adequate monitoring of the RGA. MW356 is near the north flank of the plume. MW260 and MW245 appear to be monitoring an area of higher concentration that has been traced back to the vicinity of the C-400 Building. MW163 and MW352 fall between this area of higher concentration and the main core of the Northeast Plume being monitored by MW255, MW256, and MW258. MW256 appears to be monitoring a different flow path and perhaps a different source than MW255 and MW258.

Technetium-99

The two upper RGA wells in this group, MW206 and MW165, have both detected ^{99}Tc, but their trends over time have been different. The ^{99}Tc activities have declined in MW206 since late 1996, dropping below 25 pCi/L in 1999. In contrast, MW165 has seen two episodes of increased ^{99}Tc including the current increase that began in early 2000.

In the lower RGA, three of the five on-site wells have detected ^{99}Tc, but none of the three wells immediately outside the fence have detected ^{99}Tc. Inside the fence, neither MW356, in the northeast corner, nor MW255, near the terrace face, has detected ^{99}Tc. Of the three wells inside the fence that have detected ^{99}Tc, two wells, MW260 and MW163, show declining levels of ^{99}Tc activity, while ^{99}Tc activities in MW256 have increased since mid-1998.

The ^{99}Tc trends in most of the wells are similar to the TCE trends or the levels of ^{99}Tc are below threshold values. The trends in two wells (MW165 and MW256) do suggest that there are sources of ^{99}Tc within the area of the Northeast Plume. At this time, the exact nature of the sources is not defined.

5.2.9 Northeast Plume Well Field

In addition to the two extraction wells, the Northeast Plume Containment System includes nine MWs, one screened in the middle RGA and the rest screened in the lower RGA. The middle RGA well is MW124, located on the east side of the extraction field and lateral to EW330EW332. The lower RGA wells are MW126, MW283, MW284, MW288, MW291, MW292, MW293, and MW294. MW292 and MW288 both are upgradient wells; MW283, MW284, MW291, MW293, and MW294 all are downgradient wells. MW126 is located on the east side of the extraction field next to MW124. Figures 5.27 and 5.28 **(not shown in this report)** show the TCE and ^{99}Tc trends for these wells.

Trichloroethene

Both upgradient MW292 and MW288 show decreasing levels of TCE, consistent with MW255 and MW258, as discussed in the previous section. MW283, MW284, and MW291 all clearly demonstrate the impact and effectiveness of EW331, the western extraction well, upon containing the high concentration core of the Northeast Plume. Showing a sharp decline within weeks of the start of pumping, in early 1998, the TCE concentrations leveled off and have maintained a slow but steady decrease since then.

The four MWs associated with the east extraction well, EW332, indicate that this well is not as effective as EW331. Both MW124 and MW126 illustrate the startup of the extraction well in early 1997, with a sharp drop in TCE levels. MW126 shows that the middle RGA was impacted faster than the lower RGA interval monitored by MW124. From June 1999 to October 1999, both extraction wells were turned off while the cooling towers to which the water is pumped underwent maintenance. From mid-February until late April 2000, EW332 was shut down due to biofouling. Again, MW126 and MW124 show this impact with increases in TCE and with MW126 responding faster than MW124. Since that time, EW332 appears to be containing the TCE in the intervals monitored by MW124 and MW126. The two downgradient wells, MW293 and MW294, indicate a much slower and muted response to EW332. Unlike the other five wells in the immediate vicinity of the extraction wells, MW293 and MW294 do not show an immediate drop in TCE levels after pumping began in early 1997. In these two wells, the decline from early 1997 until late 1999 more closely resembles the decline in the upgradient wells, MW288 and MW292. MW293 and MW294 are at their lowest during the time EW332 is not pumping, again showing a delayed response to the operation of EW332. In early 2001, TCE levels began to climb and continued climbing in 2002, exceeding 1000 µg/L in MW294. As a result of this rebound, the 1000 µg/L core for the Northeast Plume was added back to the plume maps for CY2002.

The ^{99}Tc activities measured in the extraction field MWs have been erratic, with the majority of the data showing activities at less than 25 pCi/L. In 1993, both MW124 and MW126 show brief spikes of ^{99}Tc, but these data points are far outside the normal range for the wells and should be considered suspect. The two upgradient wells (MW292 and MW288) both show a spike of ^{99}Tc in the second half of 2002. Because the spikes occur in the same sampling event and exceed the normal levels for these wells, this data should be considered suspect as well. For the CY2002 plume maps, no ^{99}Tc is shown in the vicinity of the extraction field.

5.2.10 Northeast Plume ~ Other Off-site Wells

There are six other RGA wells monitoring contaminant migration in the Northeast Plume outside the plant secured area. These wells include two upper RGA wells (MW192 and MW193); two middle RGA wells (MW99 and MW191); and two lower RGA wells (MW100 and MW150). MW191, MW192, and MW150 are on the eastern flank of the plume, while MW100 is at the distal end of the plume. None of these wells has any credible detections of either TCE or ^{99}Tc, thus they delineate the eastern and northeastern extent of the Northeast Plume. The TCE trends for these wells and their relative locations are shown on Fig. 5.29 **(not shown in this report)**. Since none of these wells has detected ^{99}Tc, there is not an equivalent figure for this contaminant.

MW193 has seen decreasing TCE levels since 1995. As noted earlier, sSince the screen in this well straddles the upper and middle RGA boundary and there are no other upper RGA wells nearby and there is no obvious source area upgradient, the TCE is shown as an isolated occurrence on the upper RGA TCE map in Appendix Athis well has been reclassified as a middle RGA well. There are no credible detections of ^{99}Tc in this well.

MW99 is located on the northwest flank of the Northeast Plume. Since mid-1995, TCE levels, although low, have been increasing steadily. Since the well has no credible ^{99}Tc detections, the TCE is interpreted to be part of the Northeast Plume and is depicted as such on the maps.

5.2.11 Southwest Plume Area

There are seven MWs currently associated with the Southwest Plume, four within the plant secured area and three to the west of the plant. Two of the wells are screened in the upper RGA, four are screened in the middle RGA, and one well is screened in the lower RGA. These wells, along with the temporary borings from WAG 27, WAG 3, and the Data Gaps investigation, form the primary basis for the configuration of the Southwest Plume. Supporting this interpretation are the three sets of baseline samples collected from the four multiport monitoring wells installed for the permeable treatment zone treatability study. Figures 5.30 and 5.31 **(not shown in this report)** show the TCE and ^{99}Tc trends for the MWs in this area. The data plots for the multiport wells are included in Appendix B **(not shown in this report)**.

Trichloroethene

Starting at the eastern edge of the plume, MW71, screened in the upper RGA, appears to be near the eastern extent of the plume. Since 1997, the TCE levels in this well have remained nearly constant at 15 µg/L. It is not clear whether this well is monitoring the Southwest Plume or material from C-400 or possible sources southeast of C-400, but its proximity to the Southwest Plume makes a mention of it here appropriate. Also, at the eastern edge of the plume is MW203, which is near the C-720 Building, one of the suspected sources for the Southwest Plume. During the past three years, this well has indicated a steady increase in TCE levels, although the data point for the first half of 2002 is suspect and should be discounted.

Farther west, MW188, in the middle RGA, and MW161, in the lower RGA, monitor the plume just inside the west plant security fence. These two wells provided the first indication of the existence of the Southwest Plume. Since 1998, TCE levels in MW161 have been relatively constant, although the CY2002 data appears to indicate a slight increase.

TCE levels in MW188 have been more erratic, but also seem to have increased slightly in CY2002.

West of the plant secured area, MW328, screened in the middle RGA; MW329, screened in the upper RGA; and MW354, screened in the middle RGA at the distal end of the plume, show no clear trends for TCE levels. MW328, although screened 10 ft higher, appears to be monitoring the same pathway as MW188. MW329 appears to be screened too shallow in the RGA to provide adequate monitoring of the plume. MW354 at the far west end of the plume appears to be seeing a drop in TCE levels, but at such low levels and with such a short history, there is not a clear trend.

Because of the increase in MW203, temporary boring values from WAG 27 in the vicinity of the C-720 Building have been adjusted upward as shown on the maps. Due to the age of this data, the temporary borings will be dropped from next year's interpretation.

Installed during the summer of 2000, the four multiport monitoring wells to support the permeable treatment zone test can monitor six different levels within the RGA. Three sets of baseline samples were collected over a period of 40 days in late September and October 2000. Because the data were collected over a relatively short time period and no subsequent data have been collected, a trend discussion is not appropriate. The highest TCE concentration seen in this data set is 350 μg/L from the lower RGA sampling port #4 in MW401, which is the upgradient well of the four. In general, the samples from ports #4 and #5, both lower RGA intervals, showed the highest levels of TCE with decreasing levels of TCE in samples from ports higher and lower in the RGA. The values are lower than expected based on temporary borings drilled in the area during WAG 27 and the Data Gaps investigation. The multiport wells have not been used at Paducah previously, so there is no sufficient operational history to determine the reliability of the sample results.

Technetium-99

Both MW71 and MW203 show steady increases in ^{99}Tc since 1998. In contrast, MW161, MW188, MW328, and MW329 do not have any credible detections of ^{99}Tc. Out at the end of the plume, MW354 appears to have a drop in ^{99}Tc activity, but like the TCE, at such low levels and with such a short history, there is not a clear trend. In the treatability study wells, the highest ^{99}Tc reported was 1700 pCi/L from the lower RGA port 6 in MW401. Ports 4 and 5 in MW401 had ^{99}Tc values above 900 pCi/L. In general, Ports 4, 5, and 6 also had the highest ^{99}Tc activities in the other multiport wells although at lower activities than in MW401. As with the TCE, the ^{99}Tc activities were lower than expected, based on temporary boring data from WAG 27 and the Data Gaps investigation.

Since both MW71 and MW203 show steady increases, ^{99}Tc data for temporary borings from WAG 27, WAG 3, and the Data Gaps investigation close to these wells have been adjusted upward and are reflected on the CY2002 maps. As mentioned earlier, the WAG 27 data will be dropped from the interpretations for CY2003 because of the age of the data and the lack of MWs in the area to confidently age-adjust the data.

5.2.12 C-404 and SWMU 2 Area

There are 14 RGA MWs currently being sampled in the C-404/SMWU 2 Area. Two wells, MW227, south of the area, and MW90A, at the northeast corner, are screened in the upper RGA. Six wells – MW84, at the northwest corner of C-404; MW87, due east of MW84 at the midpoint of the north edge of C-404; MW93, at the southwest corner of C-404; MW333, on the south edge of SWMU 2; MW337, at the northwest corner of SWMU 2; and MW338, at the northeast corner of SWMU 2, all are screened in the middle RGA. A seventh well, MW90, which was replaced by MW90A, also was screened in the middle RGA. There also are five wells screened in the lower RGA – MW86 (the twin to MW84), MW89 (the twin to MW87), MW92 (the twin to MW90 and MW90A), MW95 (the twin to MW93), and MW226 (the twin to MW227). MW90 and MW95 were replaced by MW90A and MW95A, respectively, in the fall of 2001. Figures 5.32 and 5.33 **(not shown in this report)** show the TCE trends for the wells in the C-404 and SWMU 2 areas, while Figs. 5.34 and 5.35 **(not shown in this report)** show the ^{99}Tc trends for these same wells.

Trichloroethene

In the upper RGA, MW90A did not detect any TCE during 2002, the first year it was sampled. MW227, located south of the east-west midpoint of C-404, has seen steadily increasing low levels of TCE since it was first sampled in mid-1993.. In mid-1999, TCE levels began to increase more rapidly, continuing through 2002. In early 2002, the TCE value spiked increased to 140 23 µg/L.

The middle RGA, defined as the interval between 305 and 295 ft amsl, appears to contain most of the TCE in this area. Since currently there is no sampled well screened in the middle RGA immediately upgradient of the C-404 area, either to the south or to the east, the source of the TCE is not readily obvious. All of the wells screened in the middle RGA show increasing levels of TCE. However, there is not a clear pattern to the migration of the TCE through the well field. Based on TCE levels, the area of highest contamination is on the west side of SWMU 2, with MW333 on the south side of the SWMU having the highest level, followed by MW337 at the northwest corner of SWMU 2. TCE levels generally drop to the east. This pattern suggests several possible source areas such as the west side of SWMU 2, SWMU 4, or the C-720 Building. The chronology of the first TCE detection in each well and the shape of the individual trend curves complicate the interpretation, suggesting the possibility of multiple sources contributing to the contamination.

Of the five wells screened in the lower RGA, MW89 and MW92, on the north and northeast side of C-404, have not yet detected TCE. There are no lower RGA wells at SWMU 2 and none currently are sampled on the east or southeast side of C-404. MW226, south of C-404, has had increasing levels of TCE since it was first sampled in 1993. The TCE levels have increased more rapidly since 1999. TCE levels in MW95, at the southwest corner of C-404 and northwest of MW226, saw its first detection of TCE in 1996. The upward trend in MW95 has continued in its replacement, MW95A. MW86, near the northwest corner of C-404, first detected TCE in 1999. TCE levels in this well have steadily increased as well. The pattern suggests that TCE is migrating to the northwest from a source southeast of C-404, possibly the C-720- Building.

Taken together, the data and trends indicate at least one source of TCE somewhere south or southeast of the C-404/SWMU 2 area. This points to either SWMU 4 or to the C-720 Building as possible source areas. The data from the middle RGA suggest the possibility of more than one source.

Technetium-99

In the upper RGA, only MW227, south of C-404, has detected ^{99}Tc with the first credible detection coming in 2002. Within the middle RGA, only MW337 has seen detectable ^{99}Tc since 1997. Activities in this well have increased steadily since it first was sampled in 1996. Of the five wells in the lower RGA, only MW226 has detectable ^{99}Tc, which has been increasing since 1993. Since the ^{99}Tc activities and trends do not match the TCE levels and trends, it appears that the two contaminants in this area do not have the same source or history.

5.3 Summary

The typical trend of contaminant levels in RGA groundwater is a decline over time; however, several PGDP wells evidence increasing TCE or ^{99}Tc levels. In a few cases, these trends reflect recent arrival of dissolved phase plumes in the RGA. More often, rising contaminant levels may be due to locally altered groundwater flow paths in the RGA (leading to lateral migration of contaminant plumes), related to a period of declining RGA hydraulic potential.

6. POTENTIOMETRIC DATA

The potentiometric surface of the RGA was contoured for each quarter of CY 2002 using water level data collected during quarterly water level suites. These maps are presented in Appendix A (Figs. A.13 through A.20) **(not shown in this report)**, following the plume maps. In addition to depths to water, barometric pressure also is collected. Water level elevations were normalized for the quarter using a barometric pressure of 30.0 inches of mercury. The collection dates for the data set were evaluated and each "quarter" was defined, based on when the preponderance of the data was collected. As a result, the first quarter actually centers on December 28, 2001, with the quarter defined as 45 days on either side of this date. So the first quarter centers on December 28, 2001, and represents winter conditions. The second quarter centers on March 22, 2002; the third quarter centers on June 18, 2002; and the fourth quarter centers on September 25, 2002, representing spring, summer, and fall conditions, respectively. The potentiometric data is presented in Tables B.3 through B.6 **(not shown in this report)**. Some data values were excluded from the hand-contoured map. Reasons such as multiple data values available for the well and data points not matching surrounding wells are denoted in the tables in Appendix B **(not shown in this report)**.

In general, the contours follow the shape of the terrace slope and indicate flow toward the Ohio River. A significant effort was made to integrate the contaminant concentration maps and the potentiometric maps so that the two data sets present a complementary picture. The two data sets were contoured independently then overlaid and adjustments made to each map to bring the interpretation of the two data sets into better agreement. The influence of streams, lagoons, or other surficial features in the area is not readily obvious on these potentiometric maps, although in the more detailed plant area maps, there are some indications where significant sources of recharge may exist. The apparent lack of influence may be related to the density of well coverage in these areas and the range of the contour interval.

Within and immediately adjacent to the plant secured area (Figs. A.14, A.16, A.18, and A.20) **(not shown in this report)**, there are several features that appear to have an impact on contaminant migration. In all four quarters there is a persistent high south of the C-404 area. The magnitude and shape of this high changed over the course of the year, potentially impacting the direction of groundwater flow for the C-404 / SWMU 2 area and the Southwest Plume. A second persistent groundwater high existed on the east side of the plant. This high, coupled with the low to the south in front of the terrace slope, served to focus groundwater movement in the Northeast Plume. Along the north side of the plant, two groundwater highs impacted groundwater flow in the Northwest Plume. Of particular note is the change in these highs during the second quarter (Fig. A.16) **(not shown in this report)**. One of the highs disappeared, while the other expanded, overrunning the depression normally seen due to the south extraction well field for the Northwest Plume. This large high appears to block normal groundwater movement in the Northwest Plume, causing it to take a more northeasterly pathway. This may be the result of the heavy rains during the first and second quarter when total rainfall amounts were more than 11 inches above normal.

Regionally, groundwater flow generally is toward the Ohio River as expected. There are, however, a couple of features of interest. The high concentration core of the Northeast Plume appears to be contained within a large depression, suggesting that the area of influence of the extraction field actually is quite large. It also is possible that the lack of data northeast of the extraction field is affecting the interpretation. A second feature is a groundwater high that appears in the C-746-S&T Landfills area. Like the high near the C-404 / SWMU 2 area, this high changes size and shape during the year, possibly diverting groundwater flow from one area to another.

7. USES OF THIS REPORT

This evaluation of groundwater contaminant trends for CY 2002 supports several goals of the PGDP environmental program. Foremost, the updated plume maps and definition of trends will be used as an input to remedial action decisions for the Groundwater Operable Unit to provide the following information:

- define additional areas contributing significant contamination to the RGA,
- scope the dimensions of potential remedial actions, and
- refine the extent of off-site areas that will be addressed by temporary or permanent institutional controls.

This same assessment will support the ongoing evaluation of the adequacy of DOE’s Water Policy and effectiveness of the PGDP groundwater monitoring program. To this end, this report is being included as an appendix to the 2002 Annual Site Environmental Report. In addition, the trends and extent of contamination defined by this report will be used as an aid in data interpretation and project planning.

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Volume II

Environmental Monitoring Results, Annual Site Environmental Report, Calendar Year 2002 Paducah Gaseous Diffusion Plant, Paducah, Kentucky

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UNITED STATES DEPARTMENT OF ENERGY

List of Tables

4. NON-RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE DATA

Notes:

1. "ND" means the parameter was not detected. Detection limits are available in the Paducah OREIS database. The count detects column represents the number of times the contaminant was detected when sampled during the year.

2. Monitoring programs often include measurement of extremely low concentrations of radionuclides, below the detection limit of the counting instruments. Less-than-detectable data will produce numerical measurements with values below the detection limit and sometimes negative values. All of the actual values, including those that are negative, are included in the statistical analyses in accordance with DOE's *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance* (DOE 1991).

3. For non-radiological data, average values are calculated using the actual result values from the OREIS database. Where analytical result values were below the detection level, half of the detection limit was used to calculate average concentration. For radiological data, the average concentration was calculated by using the actual result given for both detectable and non-detectable results.

4. Reference Criteria for Sections 1 and 2 are used for comparison of results to Derived Concentration Guide (DCG) levels or site action limits that have been defined by the Environmental Programs.

5. The following data volume includes monitoring results for surface water, sediment, air, and animal tissue. Groundwater results are not presented in this data volume because more significant detail and data tables are presented in the Annual Site Environmental Report, Volume I.

1. RADIOLOGICAL EFFLUENT DATA

KPDES Radiological Data

Table 1.1 Radiological Effluent Data for Outfall 001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/L	-2.33	19.5	8.59	1	2		
Beta activity	pCi/L	29	34.3	31.6	2	2		
Dissolved Alpha	pCi/L	-0.304	11.8	5.72	0	6		
Dissolved Beta	pCi/L	14.4	35.7	26.9	6	6		
Radium	pCi/L	0.204	0.208	0.206	0	2		
Suspended Alpha	pCi/L	-1.4	5.51	1.65	1	6		
Suspended Beta	pCi/L	0.876	3.92	2.26	0	6		
Technetium-99	pCi/L	0.237	29.8	14.8	3	6	ActionLimit	900

Table 1.2 Radiological Effluent Data for Outfall 015

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/L	52.8	52.8	52.8	1	1		
Beta activity	pCi/L	39.7	39.7	39.7	1	1		
Dissolved Alpha	pCi/L	5.35	100	41.6	3	4		
Dissolved Beta	pCi/L	5.56	58.4	38.6	3	4		
Radium	pCi/L	-0.427	-0.427	-0.427	0	1		
Suspended Alpha	pCi/L	1.6	4.24	2.42	0	4		
Suspended Beta	pCi/L	3.7	13.8	10	3	4		
Technetium-99	pCi/L	0.49	33.5	17.6	2	4	ActionLimit	900

Table 1.3 Radiological Effluent Data for Outfall 017

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/L	0.566	0.566	0.566	0	1		
Beta activity	pCi/L	7.93	7.93	7.93	1	1		
Dissolved Alpha	pCi/L	-2.23	1.33	-0.728	0	4		
Dissolved Beta	pCi/L	3.9	14	9.08	2	4		
Radium	pCi/L	-0.339	-0.339	-0.339	0	1		
Suspended Alpha	pCi/L	-1.87	0.883	-0.351	0	4		
Suspended Beta	pCi/L	-0.22	6.2	2.19	0	4		
Technetium-99	pCi/L	-5.4	19.6	4.66	1	4	ActionLimit	900

KPDES Radiological Data

Table 1.4 Radiological Effluent Data for Outfall 019

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/L	0.219	0.219	0.219	0	1		
Beta activity	pCi/L	1.49	1.49	1.49	0	1		
Dissolved Alpha	pCi/L	0.733	4.61	2.1	0	3		
Dissolved Beta	pCi/L	3.51	9.06	5.49	1	3		
Radium	pCi/L	0.443	0.443	0.443	0	1		
Suspended Alpha	pCi/L	-0.378	1.2	0.611	0	3		
Suspended Beta	pCi/L	0.427	1.29	0.956	0	3		
Technetium-99	pCi/L	-7.31	3.25	-2.67	0	3	ActionLimit	900

Surface Water Radiological Data

Table 1.5 Radiological Effluent Data for Landfill Surface Water Location L135

Upstream of the C-746 S&T Closed Landfills

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/L	-0.192	5.38	1.92	2	5		
Beta activity	pCi/L	8.41	40.7	18.5	5	5		

Table 1.6 Radiological Effluent Data for Landfill Surface Water Location L136

At the C-746 S&T Closed Landfills

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/L	-0.734	5.56	1.58	0	4		
Beta activity	pCi/L	7.08	35.4	15.2	4	4		

Table 1.7 Radiological Effluent Data for Landfill Surface Water Location L137

Downstream of the C-746 S&T Closed Landfills

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/L	0.479	22.7	6.5	1	4		
Beta activity	pCi/L	5.82	58.1	22.4	4	4		

Table 1.8 Radiological Effluent Data for Landfill Surface Water Location L150

At the C-746 U Landfill

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/L	1.41	5.77	2.74	1	4		
Beta activity	pCi/L	5.52	11.2	8.49	4	4		

Table 1.9 Radiological Effluent Data for Landfill Surface Water Location L154

Upstream of the C-746 U Landfill

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/L	2.01	3.14	2.55	0	4		
Beta activity	pCi/L	8.5	26	16.4	4	4		

Table 1.10 Radiological Effluent Data for Landfill Surface Water Location L155

Downstream of the C-746 U Landfill

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/L	2.06	14.4	7.28	3	5		
Beta activity	pCi/L	6.52	9.07	8.12	5	5		

2. RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE DATA

Ambient Air Data

Table 2.1 Kentucky Radiation Health and Toxics Branch Air Monitoring

Quarter 1										
	AMSW017	AMW015	AMNW001	AMNE	AME002	AME012	AMBKG2	AMBOLD	AMKOW	AMMWNE
Nuclide	Ci/m3	Ci/m3	Ci/m3	Ci/m3	Ci/m3	Ci/m3	Ci/m3	Ci/m3	Ci/m3	Ci/m3
Americium-241	1.5E-16	1.9E-16	1.9E-17	9.3E-17	2.4E-17	1.8E-16	-2.7E-16	-9.5E-17	6.8E-17	7.9E-17
Neptunium-237	-1.5E-16	-5.2E-17	5.2E-16	3.5E-16	-9.6E-17	-2.8E-16	-4.4E-16	4.3E-16	-2.3E-16	-3.3E-16
Technetium-99	-2.3E-16	-4.7E-16	-4.3E-16	-3.3E-16	-5.2E-17	-2.3E-16	2.1E-15	-4.2E-16	-1.6E-16	-4.4E-16
Uranium-238	1.20E-16	1.70E-16	1.90E-16	1.80E-16	1.90E-16	1.30E-16	1.40E-16	2.20E-16	1.70E-16	1.70E-16
Sum of ratios	-0.03	0.07	0.46	0.36	-0.05	-0.12	-0.48	0.33	-0.14	-0.22
Quarter 2										
Americium-241	-9.7E-16	-1E-15	8.5E-17	-1.1E-15	2.1E-16	-1E-15	-1.4E-15	2E-16	-6.6E-16	4.7E-16
Neptunium-237	2E-16	-4.9E-17	-1.1E-16	-6.7E-16	2E-16	-2.1E-17	6.2E-17	3.1E-16	5.2E-17	7.6E-16
Technetium-99	1.1E-16	-1E-16	-4.2E-16	1.9E-16	6.9E-17	1.4E-16	5.9E-17	2.6E-17	1.2E-16	-3E-16
U-238	2.40E-16	2.00E-16	2.20E-16	2.40E-16	2.00E-16	2.10E-16	1.30E-16	3.10E-16	2.70E-16	1.90E-16
Sum of ratios	-0.31	-0.54	-0.02	-1.10	0.30	-0.52	-0.67	0.40	-0.27	0.90
Quarter 3										
Americium-241	1.9E-16	6.1E-17	-5.9E-16	6.5E-17	1.1E-16	5.6E-16	2E-16	-9.1E-19	-4.9E-16	3.6E-16
Neptunium-237	-2E-17	-2.2E-17	-5.5E-16	1.6E-16	2.6E-16	1.3E-16	-5.7E-17	-3E-17	2.1E-16	1.2E-16
Technetium-99	5.8E-16	2.9E-16	5.3E-16	2.8E-16	3.1E-16	6.8E-16	4E-16	6.6E-16	3.2E-16	4.3E-16
Uranium-238	3.00E-16	3.30E-16	4.70E-16	4.50E-16	3.00E-16	2.90E-16	1.80E-16	6.10E-16	4.30E-16	2.80E-16
Sum of ratios	0.12	0.06	-0.71	0.22	0.31	0.44	0.08	0.05	-0.03	0.33
Quarter 4										
Americium-241	-7.7E-16	3.8E-16	-1.1E-15	-7E-16	3.7E-16	-9.8E-16	-8.2E-16	4.2E-16	-5.5E-16	-6.3E-16
Neptunium-237	-4.6E-16	-1.3E-17	-2.9E-16	5.1E-17	-2.4E-16	-2.9E-17	-7.3E-16	-1.8E-16	-3E-16	3.5E-17
Technetium-99	9.5E-17	1E-16	1.1E-16	1.4E-16	2.3E-16	9.4E-17	1.2E-16	-2.8E-17	2.8E-16	2.8E-16
Uranium-238	5.30E-16	4.50E-16	4.30E-16	6.50E-16	5.20E-16	4.70E-16	2.10E-16	7.10E-16	5.10E-16	5.90E-16
Sum of ratios	-0.72	0.24	-0.77	-0.25	0.06	-0.48	-1.00	0.16	-0.48	-0.23

*Sum of Ratios: The ratio of the measured concentration to the allowable concentration is added for all radionuclides for each quarter for each location. A value of less than one indicates regulatory compliance.

Surface Water Radiological Data

Table 2.2 Radiological Monitoring Data for Surface Water Location L1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-13.7	9.44	-3.42	0	4	10%DCG	3
Cesium-134	pCi/L	-14.5	6.5	-1.44	0	4		
Cesium-137	pCi/L	-5.75	0.988	-2.74	0	4	10%DCG	300
Cobalt-60	pCi/L	-7.1	2.76	-2.19	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-4.18	3.18	0.0936	0	4		
Dissolved Beta	pCi/L	0.491	9.62	3.67	1	4		
Neptunium-237	pCi/L	-0.123	0.816	0.268	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0512	0.0999	0.0141	0	4		
Plutonium-239/240	pCi/L	-0.0248	0.00871	-0.00701	0	4	10%DCG	3
Potassium-40	pCi/L	-359	148	-156	0	4		
Suspended Alpha	pCi/L	-2.83	4.02	0.141	0	4		
Suspended Beta	pCi/L	-0.876	6.07	1.19	0	4		
Technetium-99	pCi/L	-6.93	7.69	0.672	0	4	ActionLimit	900
Thorium-228	pCi/L	-0.0529	0.0538	0.0062	0	4		
Thorium-230	pCi/L	-0.0695	0.56	0.151	0	4	10%DCG	30
Thorium-232	pCi/L	-0.00793	0.0127	0.00297	0	4		
Thorium-234	pCi/L	152	152	152	0	1		
Uranium-235	pCi/L	-4.48	0	-2.24	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	1	10%DCG	60

Table 2.3 Radiological Monitoring Data for Surface Water Location L5

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-33.9	20.6	-3.98	0	4	10%DCG	3
Cesium-134	pCi/L	-23.9	3.83	-9.06	0	4		
Cesium-137	pCi/L	-5.67	3.94	-0.263	0	4	10%DCG	300
Cobalt-60	pCi/L	-2.85	3.15	-0.455	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	1.8	27.8	10.5	1	4		
Dissolved Beta	pCi/L	9.92	35.6	21.8	4	4		
Neptunium-237	pCi/L	-0.976	0.362	-0.268	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0442	0.0895	0.00443	0	4		
Plutonium-239/240	pCi/L	-0.04	-0.00507	-0.0195	0	4	10%DCG	3
Potassium-40	pCi/L	-233	33.7	-80.7	0	4		
Suspended Alpha	pCi/L	-0.762	3.01	1.01	0	4		
Suspended Beta	pCi/L	-2.72	13.5	4.17	1	4		
Technetium-99	pCi/L	-7.51	15.3	5.05	1	4	ActionLimit	900
Thorium-228	pCi/L	-0.0747	0.0541	-0.00457	0	4		
Thorium-230	pCi/L	-0.108	0.0884	-0.00055	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0254	0.0412	0.0081	0	4		
Thorium-234	pCi/L	-137	-137	-137	0	1		
Uranium-235	pCi/L	-3.26	0	-1.63	0	2	10%DCG	60
Uranium-238	pCi/L	0	249	124	0	2	10%DCG	60

Surface Water Radiological Data

Table 2.4 Radiological Monitoring Data for Surface Water Location L6

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Americium-241	pCi/L	-73.2	-38.8	-61.7	0	3	10%DCG	3
Cesium-134	pCi/L	-6.69	5.27	1.28	0	3		
Cesium-137	pCi/L	-0.037	3.54	1.16	0	3	10%DCG	300
Cobalt-60	pCi/L	6.53	10.3	9.04	0	3	10%DCG	1000
Dissolved Alpha	pCi/L	0.145	19.1	6.46	1	3		
Dissolved Beta	pCi/L	23.5	35.2	27.4	3	3		
Neptunium-237	pCi/L	-0.13	-0.105	-0.122	0	3	10%DCG	3
Plutonium-238	pCi/L	-0.053	0.0115	-0.0315	0	3		
Plutonium-239/240	pCi/L	-0.0194	-0.00311	-0.014	0	3	10%DCG	3
Potassium-40	pCi/L	36.1	79.9	65.3	0	3		
Suspended Alpha	pCi/L	1.04	1.45	1.18	0	3		
Suspended Beta	pCi/L	1.33	8.39	3.68	1	3		
Technetium-99	pCi/L	6.25	21.9	11.5	1	3	ActionLimit	900
Thorium-228	pCi/L	-0.0547	0.0309	-0.0262	0	3		
Thorium-230	pCi/L	0.0197	0.506	0.182	0	3	10%DCG	30
Thorium-232	pCi/L	0.0182	0.0298	0.0259	0	3		
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	1	10%DCG	60

Table 2.5 Radiological Monitoring Data for Surface Water Location C612

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	38.9	38.9	38.9	1	1		
Americium-241	pCi/L	-25.9	26.6	1.18	0	4	10%DCG	3
Cesium-134	pCi/L	-11.2	4.09	-3.35	0	4		
Cesium-137	pCi/L	-9.38	4.61	-2.67	0	4	10%DCG	300
Cobalt-60	pCi/L	-3.69	2.69	-1.84	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-2.13	6.65	1.41	0	4		
Dissolved Beta	pCi/L	0	3.37	2.05	0	4		
Neptunium-237	pCi/L	-0.347	0.136	-0.129	0	4	10%DCG	3
Plutonium-238	pCi/L	0.0194	0.0536	0.0331	0	4		
Plutonium-239/240	pCi/L	-0.0492	0.0158	-0.0131	0	4	10%DCG	3
Potassium-40	pCi/L	-63	168	20.9	1	4		
Suspended Alpha	pCi/L	-1.62	5.44	0.721	1	4		
Suspended Beta	pCi/L	1.06	5.74	3.04	0	4		
Technetium-99	pCi/L	-8.07	18.6	2.12	1	4	ActionLimit	900
Thorium-228	pCi/L	-0.0207	0.00769	-0.00876	0	4		
Thorium-230	pCi/L	-0.036	0.253	0.0632	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0216	0.00611	-0.00629	0	4		
Thorium-234	pCi/L	-267	-267	-267	0	1		
Uranium	pCi/L	1650	1650	1650	1	1	10%DCG	60
Uranium-234	pCi/L	594	594	594	1	1	10%DCG	50
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	389	1020	704	2	2	10%DCG	60

Surface Water Radiological Data

Table 2.6 Radiological Monitoring Data for Surface Water Location C616

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-33.6	4.53	-11.6	0	5	10%DCG	3
Cesium-134	pCi/L	-10.3	-2.72	-7.65	0	5		
Cesium-137	pCi/L	-5.5	4.88	-0.172	0	5	10%DCG	300
Cobalt-60	pCi/L	-7.75	7.28	0.369	0	5	10%DCG	1000
Dissolved Alpha	pCi/L	-7.63	-0.757	-2.83	0	5		
Dissolved Beta	pCi/L	21.6	48.5	37.7	5	5		
Neptunium-237	pCi/L	-0.303	0.259	0.00858	0	5	10%DCG	3
Plutonium-238	pCi/L	-0.0887	0.0741	-0.0193	0	5		
Plutonium-239/240	pCi/L	-0.0155	0.0193	0.00677	0	5	10%DCG	3
Potassium-40	pCi/L	-171	182	27.1	0	5		
Suspended Alpha	pCi/L	-3.69	0.686	-0.663	0	5		
Suspended Beta	pCi/L	-1.24	5.7	2.32	0	5		
Technetium-99	pCi/L	2.95	13.3	6.84	0	5	ActionLimit	900
Thorium-228	pCi/L	-0.0388	0.0177	-0.00473	0	5		
Thorium-230	pCi/L	-0.148	0.157	0.0469	0	5	10%DCG	30
Thorium-232	pCi/L	-0.0417	0.011	-0.00616	0	5		
Thorium-234	pCi/L	-201	-91.7	-146	0	2		
Uranium-235	pCi/L	0	0	0	0	3	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Surface Water Radiological Data

Table 2.7 Radiological Monitoring Data for Surface Water Location K004

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	19.3	19.3	19.3	1	1		
Americium-241	pCi/L	-37.6	12.1	-5.39	0	5	10%DCG	3
Cesium-134	pCi/L	-18.1	-1.83	-7.12	0	5		
Cesium-137	pCi/L	-2.04	6.91	3.09	0	5	10%DCG	300
Cobalt-60	pCi/L	-8.71	6.25	-2.14	0	5	10%DCG	1000
Dissolved Alpha	pCi/L	-0.289	60.9	17.5	3	5		
Dissolved Beta	pCi/L	4.4	63.2	24.7	2	5		
Neptunium-237	pCi/L	-0.26	0.442	0.121	0	5	10%DCG	3
Plutonium-238	pCi/L	-0.0586	0.0957	0.00358	0	5		
Plutonium-239/240	pCi/L	-0.0265	0.00577	-0.0127	0	5	10%DCG	3
Potassium-40	pCi/L	-139	128	-18.9	0	5		
Suspended Alpha	pCi/L	-5.03	5.66	0.509	1	5		
Suspended Beta	pCi/L	-4.39	162	43.1	3	5		
Technetium-99	pCi/L	-4.15	34	11.4	1	5	ActionLimit	900
Thorium-228	pCi/L	-0.0595	0.0337	-0.0044	0	5		
Thorium-230	pCi/L	-0.162	0.213	0.0647	0	5	10%DCG	30
Thorium-232	pCi/L	-0.0443	0.0197	-0.0144	0	5		
Thorium-234	pCi/L	326	326	326	0	1		
Uranium	pCi/L	790	790	790	0	1	10%DCG	60
Uranium-234	pCi/L	299	299	299	0	1	10%DCG	50
Uranium-235	pCi/L	0	0	0	0	3	10%DCG	60
Uranium-238	pCi/L	0	472	236	0	2	10%DCG	60

Surface Water Radiological Data

Table 2.8 Radiological Monitoring Data for Surface Water Location K006

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	2		
Americium-241	pCi/L	-21.9	15.1	-1.02	0	4	10%DCG	3
Cesium-134	pCi/L	-10.9	3.81	-4.07	0	4		
Cesium-137	pCi/L	-4.52	-0.191	-2.32	0	4	10%DCG	300
Cobalt-60	pCi/L	-2.14	7.29	0.889	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-6.98	2.09	-1.32	0	4		
Dissolved Beta	pCi/L	-0.48	6.26	2.95	0	4		
Neptunium-237	pCi/L	-0.445	0.181	-0.12	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0105	0.0384	0.0136	0	4		
Plutonium-239/240	pCi/L	-0.0146	0.0593	0.0141	0	4	10%DCG	3
Potassium-40	pCi/L	-290	-6.95	-107	0	4		
Suspended Alpha	pCi/L	-4.12	1.9	-0.673	0	4		
Suspended Beta	pCi/L	-2.16	2.86	0.525	0	4		
Technetium-99	pCi/L	-3.1	16	4.08	0	4	ActionLimit	900
Thorium-228	pCi/L	-0.0499	0.0172	-0.00601	0	4		
Thorium-230	pCi/L	-0.169	0.285	0.0285	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0392	0.0313	0.00274	0	4		
Thorium-234	pCi/L	-122	-122	-122	0	1		
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Surface Water Radiological Data

Table 2.9 Radiological Monitoring Data for Surface Water Location K008

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	51.7	25.8	1	2		
Americium-241	pCi/L	-46	17.4	-6.79	0	5	10%DCG	3
Cesium-134	pCi/L	-9.82	0.383	-3.52	0	5		
Cesium-137	pCi/L	-2.27	5.48	1.29	0	5	10%DCG	300
Cobalt-60	pCi/L	-10.1	3.14	-2.99	0	5	10%DCG	1000
Dissolved Alpha	pCi/L	5.71	55.2	24.2	2	5		
Dissolved Beta	pCi/L	8.79	41.9	23.3	4	5		
Neptunium-237	pCi/L	-0.0431	0.45	0.122	0	5	10%DCG	3
Plutonium-238	pCi/L	-0.0654	0.0801	-0.00271	0	5		
Plutonium-239/240	pCi/L	-0.0217	0.0216	-0.00127	0	5	10%DCG	3
Potassium-40	pCi/L	-128	266	-10.1	1	5		
Suspended Alpha	pCi/L	-3.44	1.66	-0.692	0	5		
Suspended Beta	pCi/L	0.632	68.7	19	3	5		
Technetium-99	pCi/L	-4.27	26.6	11.7	2	5	ActionLimit	900
Thorium-228	pCi/L	-0.0595	0.0109	-0.015	0	5		
Thorium-230	pCi/L	-0.185	0.0727	-0.0234	0	5	10%DCG	30
Thorium-232	pCi/L	-0.0438	0.0139	-0.00489	0	5		
Thorium-234	pCi/L	-164	-164	-164	0	1		
Uranium	pCi/L	1930	1930	1930	1	1	10%DCG	60
Uranium-234	pCi/L	838	838	838	1	1	10%DCG	50
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	1040	347	1	3	10%DCG	60

Surface Water Radiological Data

Table 2.10 Radiological Monitoring Data for Surface Water Location K009

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-47	30.1	-4.4	0	5	10%DCG	3
Cesium-134	pCi/L	-15.4	-0.407	-9.13	0	5		
Cesium-137	pCi/L	-5.26	5.36	-0.58	0	5	10%DCG	300
Cobalt-60	pCi/L	-6.34	6.76	-0.513	0	5	10%DCG	1000
Dissolved Alpha	pCi/L	-1.85	6.07	0.789	0	5		
Dissolved Beta	pCi/L	-0.257	16	5.87	1	5		
Neptunium-237	pCi/L	-0.347	0.853	0.154	0	5	10%DCG	3
Plutonium-238	pCi/L	-0.102	0.111	-0.00668	0	5		
Plutonium-239/240	pCi/L	-0.0322	0.0243	-0.00293	0	5	10%DCG	3
Potassium-40	pCi/L	-167	11.6	-73.3	0	5		
Suspended Alpha	pCi/L	-1.32	4.07	1.57	0	5		
Suspended Beta	pCi/L	-1.27	4.79	1.4	0	5		
Technetium-99	pCi/L	-0.221	22.9	5.3	1	5	ActionLimit	900
Thorium-228	pCi/L	-0.0286	0.0328	-0.00506	0	5		
Thorium-230	pCi/L	-0.237	0.229	0.00324	0	5	10%DCG	30
Thorium-232	pCi/L	-0.00621	0.0267	0.0111	0	5		
Thorium-234	pCi/L	-88.2	-17.2	-52.7	0	2		
Uranium-235	pCi/L	0	0	0	0	3	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Table 2.11 Radiological Monitoring Data for Surface Water Location K016

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-33.6	4.7	-8.2	0	4	10%DCG	3
Cesium-134	pCi/L	-11.7	2.73	-5.28	0	4		
Cesium-137	pCi/L	-4.85	6.92	2.13	0	4	10%DCG	300
Cobalt-60	pCi/L	-3.82	6.48	0.978	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-0.0807	4.02	1.35	0	4		
Dissolved Beta	pCi/L	1.16	6.07	3.59	0	4		
Neptunium-237	pCi/L	-0.622	0.442	-0.00015	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0284	0.0767	0.024	0	4		
Plutonium-239/240	pCi/L	-0.024	0.0245	-0.00453	0	4	10%DCG	3
Potassium-40	pCi/L	-158	95	-83	0	4		
Suspended Alpha	pCi/L	-3.39	0.885	-1.29	0	4		
Suspended Beta	pCi/L	-3.15	0	-1.87	0	4		
Technetium-99	pCi/L	0	11.8	8.11	0	4	ActionLimit	900
Thorium-228	pCi/L	-0.00688	0.0499	0.0163	0	4		
Thorium-230	pCi/L	-0.221	0.0817	-0.0303	0	4	10%DCG	30
Thorium-232	pCi/L	-0.118	0.00974	-0.023	0	4		
Thorium-234	pCi/L	-123	-123	-123	0	1		
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Surface Water Radiological Data

Table 2.12 Radiological Monitoring Data for Surface Water Location L291

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	37.1	37.1	37.1	1	1		
Americium-241	pCi/L	-35.3	3.1	-15.3	0	4	10%DCG	3
Cesium-134	pCi/L	-13	2.93	-2.5	0	4		
Cesium-137	pCi/L	-3.32	2.61	-0.775	0	4	10%DCG	300
Cobalt-60	pCi/L	-13.5	6.79	-0.76	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-0.656	1.06	0.313	0	4		
Dissolved Beta	pCi/L	1.73	6.89	4.46	0	4		
Neptunium-237	pCi/L	-0.169	0.297	-0.0183	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0192	0.0388	0.0108	0	4		
Plutonium-239/240	pCi/L	-0.031	0.0529	-0.00412	0	4	10%DCG	3
Potassium-40	pCi/L	-276	42.3	-127	0	4		
Suspended Alpha	pCi/L	-1.13	0.985	-0.285	0	4		
Suspended Beta	pCi/L	-3.83	3.88	0.887	0	4		
Technetium-99	pCi/L	-3.37	14.9	5.29	0	4	ActionLimit	900
Thorium-228	pCi/L	-0.0926	0.0136	-0.0364	0	4		
Thorium-230	pCi/L	-0.0946	0.0457	-0.00594	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0126	0.0193	0	0	4		
Thorium-234	pCi/L	-144	-144	-144	0	1		
Uranium	pCi/L	1620	1620	1620	1	1	10%DCG	60
Uranium-234	pCi/L	561	561	561	1	1	10%DCG	50
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	1020	510	1	2	10%DCG	60

Surface Water Radiological Data

Table 2.13 Radiological Monitoring Data for Surface Water Location K002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-14.2	7.49	-0.843	0	4	10%DCG	3
Cesium-134	pCi/L	-17	-0.722	-11	0	4		
Cesium-137	pCi/L	-9.21	4.98	-2.46	0	4	10%DCG	300
Cobalt-60	pCi/L	-3.97	5.84	-0.356	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	0.147	7.2	4.09	1	4		
Dissolved Beta	pCi/L	4.45	13.2	6.71	1	4		
Neptunium-237	pCi/L	-0.37	0.258	-0.000575	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0328	0.0941	0.0144	0	4		
Plutonium-239/240	pCi/L	-0.0198	0.0474	0.00103	0	4	10%DCG	3
Potassium-40	pCi/L	-212	19.8	-64.7	0	4		
Suspended Alpha	pCi/L	-4.64	2.77	-0.506	0	4		
Suspended Beta	pCi/L	-2.16	3.61	0.258	0	4		
Technetium-99	pCi/L	2.8	23.6	8.96	1	4	ActionLimit	900
Thorium-228	pCi/L	-0.0106	0.0523	0.0122	0	4		
Thorium-230	pCi/L	-0.188	0.0838	-0.0291	0	4	10%DCG	30
Thorium-232	pCi/L	-0.23	0.0541	-0.0394	0	4		
Thorium-234	pCi/L	-70.4	-70.4	-70.4	0	1		
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Table 2.14 Radiological Monitoring Data for Surface Water Location K010

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-0.753	6.11	1.11	0	4	10%DCG	3
Cesium-134	pCi/L	-14.3	-0.3	-5.52	0	4		
Cesium-137	pCi/L	-2.15	3.53	0.767	0	4	10%DCG	300
Cobalt-60	pCi/L	-0.957	7.04	2.51	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	3.17	14.3	6.49	0	4		
Dissolved Beta	pCi/L	4.68	18.6	9.81	1	4		
Neptunium-237	pCi/L	0	2.52	0.809	1	4	10%DCG	3
Plutonium-238	pCi/L	-0.0647	0.0237	-0.0215	0	4		
Plutonium-239/240	pCi/L	-0.0225	0.0431	0.00193	0	4	10%DCG	3
Potassium-40	pCi/L	-154	5.63	-51.9	0	4		
Suspended Alpha	pCi/L	-3.56	0.803	-1.28	0	4		
Suspended Beta	pCi/L	-4.08	5.49	0.812	0	4		
Technetium-99	pCi/L	0	17.2	7.72	1	4	ActionLimit	900
Thorium-228	pCi/L	-0.038	0.0198	-0.00988	0	4		
Thorium-230	pCi/L	-0.17	0.0761	-0.0261	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0174	0.0372	0.00505	0	4		
Thorium-234	pCi/L	-56.4	-56.4	-56.4	0	1		
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	362	181	1	2	10%DCG	60

Surface Water Radiological Data

Table 2.15 Radiological Monitoring Data for Surface Water Location K011

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-59.3	0.396	-18.4	0	4	10%DCG	3
Cesium-134	pCi/L	-11.5	-0.951	-6.39	0	4		
Cesium-137	pCi/L	-3.13	3.23	-0.917	0	4	10%DCG	300
Cobalt-60	pCi/L	-8	6.57	0.569	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	16.9	143	61.7	4	4		
Dissolved Beta	pCi/L	2	31.4	19.7	3	4		
Neptunium-237	pCi/L	-0.622	0.147	-0.215	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0762	0.138	0.004	0	4		
Plutonium-239/240	pCi/L	-0.0327	0.0236	-0.00447	0	4	10%DCG	3
Potassium-40	pCi/L	-198	104	-32.6	0	4		
Suspended Alpha	pCi/L	-1.32	2.6	0.579	0	4		
Suspended Beta	pCi/L	-3.26	9.87	5.07	1	4		
Technetium-99	pCi/L	-2.14	13.7	5.71	0	4	ActionLimit	900
Thorium-228	pCi/L	-0.0253	0.0203	0.0031	0	4		
Thorium-230	pCi/L	-0.228	0.138	-0.0262	0	4	10%DCG	30
Thorium-232	pCi/L	-0.192	0.0396	-0.0487	0	4		
Thorium-234	pCi/L	-18.4	-18.4	-18.4	0	1		
Uranium-235	pCi/L	0	19.7	9.85	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Surface Water Radiological Data

Table 2.16 Radiological Monitoring Data for Surface Water Location K012

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	26.8	26.8	26.8	1	1		
Americium-241	pCi/L	-48.9	10.3	-11.3	0	4	10%DCG	3
Cesium-134	pCi/L	-7.15	5.86	-1.49	0	4		
Cesium-137	pCi/L	-6.43	1.91	-1.43	0	4	10%DCG	300
Cobalt-60	pCi/L	-6.71	8.29	2.12	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-6.71	5.15	-0.0292	0	4		
Dissolved Beta	pCi/L	-2.15	5.87	1.82	0	4		
Neptunium-237	pCi/L	-0.37	0.381	-0.0152	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0868	0.0691	-0.0129	0	4		
Plutonium-239/240	pCi/L	-0.0585	0.0246	-0.00982	0	4	10%DCG	3
Potassium-40	pCi/L	-187	10.6	-89.8	0	4		
Suspended Alpha	pCi/L	-2.01	2.98	0.48	0	4		
Suspended Beta	pCi/L	-4.5	0.622	-1.34	0	4		
Technetium-99	pCi/L	-5.23	18.1	3.79	0	4	ActionLimit	900
Thorium-228	pCi/L	-0.0445	0.0198	0.0017	0	4		
Thorium-230	pCi/L	-0.0608	0.0404	-0.0106	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0347	0.0372	0.00792	0	4		
Thorium-234	pCi/L	189	189	189	0	1		
Uranium	pCi/L	1070	1070	1070	0	1	10%DCG	60
Uranium-234	pCi/L	421	421	421	0	1	10%DCG	50
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	620	310	1	2	10%DCG	60

Surface Water Radiological Data

Table 2.17 Radiological Monitoring Data for Surface Water Location K013

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-50.7	12.4	-15	0	5	10%DCG	3
Cesium-134	pCi/L	-6.69	4.45	-0.046	0	5		
Cesium-137	pCi/L	-12.7	-0.147	-5.34	0	5	10%DCG	300
Cobalt-60	pCi/L	-7.71	11.6	4.95	0	5	10%DCG	1000
Dissolved Alpha	pCi/L	-3.12	12.6	2.26	0	5		
Dissolved Beta	pCi/L	-0.693	27.1	9.21	1	5		
Neptunium-237	pCi/L	-0.408	0.0368	-0.187	0	5	10%DCG	3
Plutonium-238	pCi/L	-0.0722	0.057	-0.00149	0	5		
Plutonium-239/240	pCi/L	-0.0405	0.035	-0.00233	0	5	10%DCG	3
Potassium-40	pCi/L	-157	364	16.8	1	5		
Suspended Alpha	pCi/L	-3.56	2.66	0	0	5		
Suspended Beta	pCi/L	-3.06	9.62	1.34	0	5		
Technetium-99	pCi/L	-23.7	11.5	-1.26	0	5	ActionLimit	900
Thorium-228	pCi/L	-0.0425	0.0456	0.00189	0	5		
Thorium-230	pCi/L	-0.171	0.0397	-0.0223	0	5	10%DCG	30
Thorium-232	pCi/L	-0.0371	0.0119	-0.00858	0	5		
Thorium-234	pCi/L	346	346	346	0	1		
Uranium-235	pCi/L	-5.83	0	-2.91	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	3	10%DCG	60

Surface Water Radiological Data

Table 2.18 Radiological Monitoring Data for Surface Water Location L10

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	54.4	54.4	54.4	1	1		
Americium-241	pCi/L	-20.9	9.07	-2.39	0	4	10%DCG	3
Cesium-134	pCi/L	-9.42	1.88	-4.28	0	4		
Cesium-137	pCi/L	-4.98	3.31	-0.468	0	4	10%DCG	300
Cobalt-60	pCi/L	-4.97	4.27	-2.19	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	4.27	67.9	21.4	1	4		
Dissolved Beta	pCi/L	3.28	34.6	14.4	2	4		
Neptunium-237	pCi/L	-0.135	0.684	0.256	1	4	10%DCG	3
Plutonium-238	pCi/L	-0.0633	0.18	0.0264	0	4		
Plutonium-239/240	pCi/L	-0.0165	0.0134	-0.00122	0	4	10%DCG	3
Potassium-40	pCi/L	-160	-13.1	-91	0	4		
Suspended Alpha	pCi/L	-1.23	2.51	0.389	0	4		
Suspended Beta	pCi/L	-1.08	3.62	1.87	0	4		
Technetium-99	pCi/L	-1.6	19	9.2	0	4	ActionLimit	900
Thorium-228	pCi/L	-0.0777	0.021	-0.0243	0	4		
Thorium-230	pCi/L	-0.0481	0.0438	-0.00335	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0147	0.0463	0.00739	0	4		
Thorium-234	pCi/L	71.3	71.3	71.3	0	1		
Uranium	pCi/L	1440	2040	1740	2	2	10%DCG	60
Uranium-234	pCi/L	515	879	697	2	2	10%DCG	50
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	886	1110	998	2	2	10%DCG	60

Surface Water Radiological Data

Table 2.19 Radiological Monitoring Data for Surface Water Location L194

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-32.6	-8.72	-20.8	0	4	10%DCG	3
Cesium-134	pCi/L	-12.2	-0.399	-5.87	0	4		
Cesium-137	pCi/L	-9.04	1.34	-2.06	0	4	10%DCG	300
Cobalt-60	pCi/L	-2.4	2.86	-0.62	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-1.03	5.97	2.48	1	4		
Dissolved Beta	pCi/L	2.24	10.8	5.6	1	4		
Neptunium-237	pCi/L	-0.377	0.381	0.0367	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0202	0.0743	0.00735	0	4		
Plutonium-239/240	pCi/L	-0.0195	0.0519	0.00695	0	4	10%DCG	3
Potassium-40	pCi/L	-21.3	176	50	0	4		
Suspended Alpha	pCi/L	-3.58	2.01	-0.37	0	4		
Suspended Beta	pCi/L	-1.75	3.91	0.959	0	4		
Technetium-99	pCi/L	5.19	15.8	10.5	0	4	ActionLimit	900
Thorium-228	pCi/L	-0.0424	-0.000177	-0.0161	0	4		
Thorium-230	pCi/L	-0.188	0.0198	-0.0421	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0271	0.00406	-0.0159	0	4		
Thorium-234	pCi/L	82.5	82.5	82.5	0	1		
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	487	244	0	2	10%DCG	60

Table 2.20 Radiological Monitoring Data for Surface Water Location L55

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Americium-241	pCi/L	-22.9	26.6	8.54	0	4	10%DCG	3
Cesium-134	pCi/L	-4.76	1.12	-0.895	0	4		
Cesium-137	pCi/L	-15	2.78	-6.66	0	4	10%DCG	300
Cobalt-60	pCi/L	-6.31	13.6	3	1	4	10%DCG	1000
Dissolved Alpha	pCi/L	2.92	10.2	7.49	2	4		
Dissolved Beta	pCi/L	5.57	14.4	8.83	2	4		
Neptunium-237	pCi/L	-0.163	0.367	0.0102	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0482	0.0356	-0.0169	0	4		
Plutonium-239/240	pCi/L	-0.00486	0.01	0.00392	0	4	10%DCG	3
Potassium-40	pCi/L	-234	109	-76.3	0	4		
Suspended Alpha	pCi/L	0.956	2.67	1.59	0	4		
Suspended Beta	pCi/L	1.95	7.41	4.09	0	4		
Technetium-99	pCi/L	7.49	21.4	12.8	1	4	ActionLimit	900
Thorium-228	pCi/L	-0.0297	0.0319	-0.00945	0	4		
Thorium-230	pCi/L	0.0301	0.604	0.294	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0107	0.0391	0.0171	0	4		
Uranium-235	pCi/L	-5.26	18.7	4.48	0	3	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	1	10%DCG	60

Surface Water Radiological Data

Table 2.21 Radiological Monitoring Data for Surface Water Location L56

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-39.1	12	-5.89	0	4	10%DCG	3
Cesium-134	pCi/L	-14.4	3.63	-3.01	0	4		
Cesium-137	pCi/L	-8.54	5.82	-1.98	0	4	10%DCG	300
Cobalt-60	pCi/L	-8.82	3.61	-1.1	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-2.22	20	5.47	1	4		
Dissolved Beta	pCi/L	2.33	18.9	8.77	1	4		
Neptunium-237	pCi/L	-0.304	0.0942	-0.134	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0129	0.0932	0.0346	0	4		
Plutonium-239/240	pCi/L	-0.0497	0.0622	0.0264	0	4	10%DCG	3
Potassium-40	pCi/L	-93.6	200	-7.58	1	4		
Suspended Alpha	pCi/L	-1.3	2.52	-0.0168	0	4		
Suspended Beta	pCi/L	-3.7	5.1	0.685	0	4		
Technetium-99	pCi/L	-2.44	32.9	10	1	4	ActionLimit	900
Thorium-228	pCi/L	-0.0297	0.0461	0.00887	0	4		
Thorium-230	pCi/L	-0.196	0.0275	-0.0413	0	4	10%DCG	30
Thorium-232	pCi/L	0.00103	0.0421	0.0135	0	4		
Thorium-234	pCi/L	-227	-227	-227	0	1		
Uranium-235	pCi/L	-5.55	0	-2.77	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Table 2.22 Radiological Monitoring Data for Surface Water Location L11

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-45.9	22.5	-10.4	0	4	10%DCG	3
Cesium-134	pCi/L	-14.9	-0.259	-6.57	0	4		
Cesium-137	pCi/L	-0.0682	5.38	2.4	0	4	10%DCG	300
Cobalt-60	pCi/L	-4.16	2.41	-0.652	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-3.38	5.9	1.89	0	4		
Dissolved Beta	pCi/L	1.85	12.5	7.4	2	4		
Neptunium-237	pCi/L	-0.26	0.607	0.116	0	4	10%DCG	3
Plutonium-238	pCi/L	0.0095	0.0475	0.0316	0	4		
Plutonium-239/240	pCi/L	-0.0285	0.0231	-0.00619	0	4	10%DCG	3
Potassium-40	pCi/L	-114	56.5	-40.4	0	4		
Suspended Alpha	pCi/L	-2.23	1.65	0.0333	0	4		
Suspended Beta	pCi/L	-1.12	3.67	1.33	0	4		
Technetium-99	pCi/L	-0.402	20.9	5.72	1	4	ActionLimit	900
Thorium-228	pCi/L	-0.0276	0.0436	0.0154	0	4		
Thorium-230	pCi/L	-0.0773	0.267	0.0817	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0125	0.0239	0.00236	0	4		
Thorium-234	pCi/L	-106	-106	-106	0	1		
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	456	228	1	2	10%DCG	60

Surface Water Radiological Data

Table 2.23 Radiological Monitoring Data for Surface Water Location L12

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Americium-241	pCi/L	-21.7	-21.4	-21.5	0	3	10%DCG	3
Cesium-134	pCi/L	4.35	9.84	6.18	0	3		
Cesium-137	pCi/L	-3.82	7.84	3.95	0	3	10%DCG	300
Cobalt-60	pCi/L	-1.99	15.5	3.84	0	3	10%DCG	1000
Dissolved Alpha	pCi/L	1.95	7.28	3.73	1	3		
Dissolved Beta	pCi/L	20.9	22.7	22.1	3	3		
Neptunium-237	pCi/L	0.262	0.488	0.413	0	3	10%DCG	3
Plutonium-238	pCi/L	-0.0499	0.00818	-0.0305	0	3		
Plutonium-239/240	pCi/L	-0.0223	-0.0114	-0.0187	0	3	10%DCG	3
Potassium-40	pCi/L	-42	99.8	5.27	0	3		
Suspended Alpha	pCi/L	1.34	1.46	1.38	0	3		
Suspended Beta	pCi/L	1.09	1.29	1.16	0	3		
Technetium-99	pCi/L	20.9	30.7	24.2	3	3	ActionLimit	900
Thorium-228	pCi/L	-0.0366	0.000466	-0.0242	0	3		
Thorium-230	pCi/L	0.0603	0.434	0.185	0	3	10%DCG	30
Thorium-232	pCi/L	-0.00978	0.0354	0.0203	0	3		
Uranium-235	pCi/L	0	25.6	12.8	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	1	10%DCG	60

Table 2.24 Radiological Monitoring Data for Surface Water Location L241

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Americium-241	pCi/L	-41.8	-16.5	-24.9	0	3	10%DCG	3
Cesium-134	pCi/L	-5.07	0.389	-3.25	0	3		
Cesium-137	pCi/L	-5.22	0.838	-3.2	0	3	10%DCG	300
Cobalt-60	pCi/L	1.01	8.33	3.45	0	3	10%DCG	1000
Dissolved Alpha	pCi/L	-0.461	6.2	3.98	0	3		
Dissolved Beta	pCi/L	19.7	38.2	25.9	3	3		
Neptunium-237	pCi/L	-0.0325	0.035	-0.01	0	3	10%DCG	3
Plutonium-238	pCi/L	-0.0227	0.0638	0.035	0	3		
Plutonium-239/240	pCi/L	-0.0306	-0.0119	-0.0244	0	3	10%DCG	3
Potassium-40	pCi/L	-46.9	182	29.4	1	3		
Suspended Alpha	pCi/L	-0.579	0.595	0.204	0	3		
Suspended Beta	pCi/L	2.83	3.47	3.04	0	3		
Technetium-99	pCi/L	19.8	54.2	31.3	3	3	ActionLimit	900
Thorium-228	pCi/L	-0.0146	0.0541	0.0083	0	3		
Thorium-230	pCi/L	0.0669	0.158	0.0973	0	3	10%DCG	30
Thorium-232	pCi/L	0.00105	0.0013	0.00113	0	3		
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	1	10%DCG	60

Surface Water Radiological Data

Table 2.25 Radiological Monitoring Data for Surface Water Location LBCN1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-85.1	7.8	-23.1	0	4	10%DCG	3
Cesium-134	pCi/L	-13.9	-3.2	-10.2	0	4		
Cesium-137	pCi/L	-1.63	14.3	4.2	1	4	10%DCG	300
Cobalt-60	pCi/L	-6.48	8.48	1.03	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-3.48	7.9	2.56	0	4		
Dissolved Beta	pCi/L	3.29	14.9	8.55	1	4		
Neptunium-237	pCi/L	-0.206	0.0693	-0.0369	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0917	0.156	0.0359	0	4		
Plutonium-239/240	pCi/L	-0.00387	0.027	0.0114	0	4	10%DCG	3
Potassium-40	pCi/L	-91.3	118	-14.5	0	4		
Suspended Alpha	pCi/L	-3.32	3.8	0.738	0	4		
Suspended Beta	pCi/L	-1.45	8.26	1.9	1	4		
Technetium-99	pCi/L	5.08	24.5	11.5	1	4	ActionLimit	900
Thorium-228	pCi/L	-0.0708	0.0786	0.0128	0	4		
Thorium-230	pCi/L	-0.0633	0.347	0.142	1	4	10%DCG	30
Thorium-232	pCi/L	-0.00858	0.0971	0.0269	0	4		
Thorium-234	pCi/L	-10.6	-10.6	-10.6	0	1		
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Surface Water Radiological Data

Table 2.26 Radiological Monitoring Data for Surface Water Location C746K-5

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	26.6	13.3	1	2		
Americium-241	pCi/L	-38.2	2.24	-14.3	0	6	10%DCG	3
Cesium-134	pCi/L	-10.7	7.25	-0.107	0	6		
Cesium-137	pCi/L	-5.72	6.93	0.997	0	6	10%DCG	300
Cobalt-60	pCi/L	-4.2	2.95	-0.19	0	6	10%DCG	1000
Dissolved Alpha	pCi/L	-3.28	6.14	1.19	0	6		
Dissolved Beta	pCi/L	0.679	10.3	5.13	1	6		
Neptunium-237	pCi/L	-0.173	0.372	0.0599	0	6	10%DCG	3
Plutonium-238	pCi/L	-0.137	0.0269	-0.0372	0	6		
Plutonium-239/240	pCi/L	-0.0172	0.0426	0.0126	0	6	10%DCG	3
Potassium-40	pCi/L	-191	135	0.2	0	6		
Suspended Alpha	pCi/L	-2.12	3.11	0.236	0	6		
Suspended Beta	pCi/L	-1.1	2.61	0.276	0	6		
Technetium-99	pCi/L	-7.23	9.37	1.37	0	6	ActionLimit	900
Thorium-228	pCi/L	-0.0545	0.0147	-0.0124	0	6		
Thorium-230	pCi/L	-0.234	0.123	-0.043	0	6	10%DCG	30
Thorium-232	pCi/L	-0.0256	0.0213	0.00143	0	6		
Thorium-234	pCi/L	-254	-254	-254	0	1		
Uranium	pCi/L	1310	1310	1310	1	1	10%DCG	60
Uranium-234	pCi/L	382	382	382	1	1	10%DCG	50
Uranium-235	pCi/L	0	27.9	13.9	1	2	10%DCG	60
Uranium-238	pCi/L	0	899	225	1	4	10%DCG	60

Surface Water Radiological Data

Table 2.27 Radiological Monitoring Data for Surface Water Location C746KTB1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-55.4	3.04	-14	0	4	10%DCG	3
Cesium-134	pCi/L	-13.6	-3.16	-8.07	0	4		
Cesium-137	pCi/L	-6.71	3.61	-2.75	0	4	10%DCG	300
Cobalt-60	pCi/L	-2.48	3.23	-0.16	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-1.23	2.05	0.708	0	4		
Dissolved Beta	pCi/L	1.72	6.57	4.7	0	4		
Neptunium-237	pCi/L	-0.433	0.237	-0.114	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0274	0.069	0.0256	0	4		
Plutonium-239/240	pCi/L	-0.00814	0.0202	0.00366	0	4	10%DCG	3
Potassium-40	pCi/L	-218	4.58	-54.8	0	4		
Suspended Alpha	pCi/L	-1.56	9.85	2.13	1	4		
Suspended Beta	pCi/L	-1.7	1.53	0.126	0	4		
Technetium-99	pCi/L	0.0552	12.1	7.23	0	4	ActionLimit	900
Thorium-228	pCi/L	-0.0128	0.0308	0.00754	0	4		
Thorium-230	pCi/L	-0.174	0.0509	-0.0294	0	4	10%DCG	30
Thorium-232	pCi/L	0.000721	0.0412	0.0213	0	4		
Thorium-234	pCi/L	126	126	126	0	1		
Uranium-235	pCi/L	0	24.4	12.2	1	2	10%DCG	60
Uranium-238	pCi/L	0	603	201	1	3	10%DCG	60

Surface Water Radiological Data

Table 2.28 Radiological Monitoring Data for Surface Water Location C746KTB2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-29.4	13	0.727	0	4	10%DCG	3
Cesium-134	pCi/L	-7.81	-1.47	-4.62	0	4		
Cesium-137	pCi/L	-5.33	0.56	-1.47	0	4	10%DCG	300
Cobalt-60	pCi/L	-5.23	2.41	-0.627	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-3.95	4.32	-0.234	0	4		
Dissolved Beta	pCi/L	3.12	6.24	4.97	0	4		
Neptunium-237	pCi/L	-0.584	0.995	0.0965	1	4	10%DCG	3
Plutonium-238	pCi/L	-0.0942	0.0637	-0.0075	0	4		
Plutonium-239/240	pCi/L	-0.033	0.0305	0.000025	0	4	10%DCG	3
Potassium-40	pCi/L	-231	494	6.67	1	4		
Suspended Alpha	pCi/L	-5.61	9.25	0.661	0	4		
Suspended Beta	pCi/L	-3.97	5.35	0.897	0	4		
Technetium-99	pCi/L	1.32	30.4	10.2	1	4	ActionLimit	900
Thorium-228	pCi/L	-0.017	0.0497	0.0268	0	4		
Thorium-230	pCi/L	0.0461	0.0938	0.064	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0271	0.0337	0.00512	0	4		
Thorium-234	pCi/L	388	388	388	1	1		
Uranium	pCi/L	1600	1600	1600	1	1	10%DCG	60
Uranium-234	pCi/L	767	767	767	1	1	10%DCG	50
Uranium-235	pCi/L	0	45.8	22.9	1	2	10%DCG	60
Uranium-238	pCi/L	0	789	263	1	3	10%DCG	60

Surface Water Radiological Data

Table 2.29 Radiological Monitoring Data for Surface Water Location C746KUP

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-21	6.58	-5.57	0	4	10%DCG	3
Cesium-134	pCi/L	-0.993	11.9	3.55	0	4		
Cesium-137	pCi/L	-1.71	1.34	-0.638	0	4	10%DCG	300
Cobalt-60	pCi/L	-14.6	1.94	-3.51	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-5.33	6.25	-0.136	0	4		
Dissolved Beta	pCi/L	#VALUE!	4.46	2.39	0	4		
Neptunium-237	pCi/L	-0.302	4.01	0.915	1	4	10%DCG	3
Plutonium-238	pCi/L	0.0175	0.0673	0.0486	0	4		
Plutonium-239/240	pCi/L	0.022	0.0291	0.0246	0	4	10%DCG	3
Potassium-40	pCi/L	-160	156	-17.2	0	4		
Suspended Alpha	pCi/L	-0.851	1.38	0.329	0	4		
Suspended Beta	pCi/L	-3.1	3.32	0.08	0	4		
Technetium-99	pCi/L	-1.52	7.54	4.4	0	4	ActionLimit	900
Thorium-228	pCi/L	-0.0543	0.0418	-0.00604	0	4		
Thorium-230	pCi/L	-0.191	0.163	0.0066	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0216	0.0241	-0.00872	0	4		
Thorium-234	pCi/L	-153	-153	-153	0	1		
Uranium-235	pCi/L	0	13.2	6.6	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Table 2.30 Radiological Monitoring Data for Surface Water Location L8

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Americium-241	pCi/L	-28.7	-17.8	-25.1	0	3	10%DCG	3
Cesium-134	pCi/L	-10.7	-6.97	-8.21	0	3		
Cesium-137	pCi/L	-0.167	8.26	5.45	0	3	10%DCG	300
Cobalt-60	pCi/L	-3.55	14.3	2.4	1	3	10%DCG	1000
Dissolved Alpha	pCi/L	0.433	6.72	2.53	0	3		
Dissolved Beta	pCi/L	14.8	17.2	15.6	3	3		
Neptunium-237	pCi/L	-0.175	-0.13	-0.145	0	3	10%DCG	3
Plutonium-238	pCi/L	-0.0345	0.038	-0.0103	0	3		
Plutonium-239/240	pCi/L	-0.0138	0.00698	-0.00687	0	3	10%DCG	3
Potassium-40	pCi/L	-243	63.6	-141	0	3		
Suspended Alpha	pCi/L	0.21	2.76	1.06	0	3		
Suspended Beta	pCi/L	4.21	4.94	4.45	0	3		
Technetium-99	pCi/L	22.1	22.5	22.2	3	3	ActionLimit	900
Thorium-228	pCi/L	-0.0172	0.0354	0.000333	0	3		
Thorium-230	pCi/L	0.0286	0.641	0.233	0	3	10%DCG	30
Thorium-232	pCi/L	0	0.000693	0.000231	0	3		
Uranium	pCi/L	1590	1590	1590	1	1	10%DCG	60
Uranium-234	pCi/L	575	575	575	1	1	10%DCG	50
Uranium-235	pCi/L	0	37.6	18.8	1	2	10%DCG	60
Uranium-238	pCi/L	981	981	981	1	1	10%DCG	60

Surface Water Radiological Data

Table 2.31 Radiological Monitoring Data for Surface Water Location L29

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	20.5	20.5	20.5	1	1		
Americium-241	pCi/L	-18.7	46.6	3.76	0	4	10%DCG	3
Cesium-134	pCi/L	-10.5	4.24	-3.4	0	4		
Cesium-137	pCi/L	-2.15	4.66	1.33	0	4	10%DCG	300
Cobalt-60	pCi/L	-11.1	2.1	-4.86	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-0.964	2.84	1.53	0	4		
Dissolved Beta	pCi/L	-1.19	6.34	3.57	0	4		
Neptunium-237	pCi/L	-0.691	0.27	-0.155	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0583	0.072	-0.00865	0	4		
Plutonium-239/240	pCi/L	-0.0343	0.0347	0.0013	0	4	10%DCG	3
Potassium-40	pCi/L	-114	77.3	-9.9	0	4		
Suspended Alpha	pCi/L	-0.608	1.74	0.399	0	4		
Suspended Beta	pCi/L	1.43	4.08	2.72	0	4		
Technetium-99	pCi/L	-11.6	4.56	-3.18	0	4	ActionLimit	900
Thorium-228	pCi/L	-0.0543	0.0261	-0.0197	0	4		
Thorium-230	pCi/L	-0.142	0.375	0.0728	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0166	0	-0.00945	0	4		
Thorium-234	pCi/L	-139	-139	-139	0	1		
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Surface Water Radiological Data

Table 2.32 Radiological Monitoring Data for Surface Water Location L30

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-22.1	5.85	-8.93	0	4	10%DCG	3
Cesium-134	pCi/L	-10.7	-1.37	-4.53	0	4		
Cesium-137	pCi/L	-9.78	6.63	-1.82	0	4	10%DCG	300
Cobalt-60	pCi/L	-3.56	8.56	0.885	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-1.06	4.51	0.892	0	4		
Dissolved Beta	pCi/L	1.53	7.86	3.6	0	4		
Neptunium-237	pCi/L	-0.724	-0.195	-0.335	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0799	0.0662	-0.00485	0	4		
Plutonium-239/240	pCi/L	-0.0363	0.00671	-0.00734	0	4	10%DCG	3
Potassium-40	pCi/L	-63.2	67.1	0.8	0	4		
Suspended Alpha	pCi/L	-1.01	3.2	0.212	0	4		
Suspended Beta	pCi/L	0.955	8.88	3.77	1	4		
Technetium-99	pCi/L	-13.9	43.7	8.25	1	4	ActionLimit	900
Thorium-228	pCi/L	-0.0554	0.00416	-0.0263	0	4		
Thorium-230	pCi/L	-0.134	0.0394	-0.026	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0204	0.0487	0.0114	0	4		
Thorium-234	pCi/L	-81.3	-81.3	-81.3	0	1		
Uranium	pCi/L	832	832	832	0	1	10%DCG	60
Uranium-234	pCi/L	382	382	382	0	1	10%DCG	50
Uranium-235	pCi/L	0	23.1	11.6	1	2	10%DCG	60
Uranium-238	pCi/L	0	428	143	0	3	10%DCG	60

Surface Water Radiological Data

Table 2.33 Radiological Monitoring Data for Surface Water Location L306

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-75.1	8.19	-28.1	0	5	10%DCG	3
Cesium-134	pCi/L	-5.32	0.946	-1.96	0	5		
Cesium-137	pCi/L	-4.66	3.14	0.616	0	5	10%DCG	300
Cobalt-60	pCi/L	-14	5	-1.77	0	5	10%DCG	1000
Dissolved Alpha	pCi/L	0.167	4.16	2.2	0	5		
Dissolved Beta	pCi/L	5.04	9.98	7	1	5		
Neptunium-237	pCi/L	-0.477	-0.0325	-0.189	0	5	10%DCG	3
Plutonium-238	pCi/L	-0.0561	0.0775	0.014	0	5		
Plutonium-239/240	pCi/L	-0.0175	0.0621	0.011	0	5	10%DCG	3
Potassium-40	pCi/L	-150	171	8.68	0	5		
Suspended Alpha	pCi/L	-1.48	1.91	0.488	0	5		
Suspended Beta	pCi/L	-1.85	3.9	1.27	0	5		
Technetium-99	pCi/L	-5.14	148	30.3	1	5	ActionLimit	900
Thorium-228	pCi/L	-0.0518	0.0267	-0.0157	0	5		
Thorium-230	pCi/L	-0.0204	0.0606	0.0258	0	5	10%DCG	30
Thorium-232	pCi/L	-0.0116	0.0314	0.0128	0	5		
Thorium-234	pCi/L	-75.7	-75.7	-75.7	0	1		
Uranium-235	pCi/L	0	0	0	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	3	10%DCG	60

Table 2.34 Radiological Monitoring Data for Surface Water Location L64

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Americium-241	pCi/L	-31.1	-22.2	-24.7	0	5	10%DCG	3
Cesium-134	pCi/L	-17	7.7	-4.21	0	5		
Cesium-137	pCi/L	-0.137	1.41	0.782	0	5	10%DCG	300
Cobalt-60	pCi/L	-6.86	19	-0.4	0	5	10%DCG	1000
Dissolved Alpha	pCi/L	-1.18	1.85	0.334	0	5		
Dissolved Beta	pCi/L	2.08	6.63	5.53	0	5		
Neptunium-237	pCi/L	-0.28	0	-0.056	0	5	10%DCG	3
Plutonium-238	pCi/L	-0.0133	0.0932	0.0408	0	5		
Plutonium-239/240	pCi/L	-0.0471	0.0415	-0.00278	0	5	10%DCG	3
Potassium-40	pCi/L	-116	-44.6	-80	0	5		
Suspended Alpha	pCi/L	-0.807	1.74	0.486	0	5		
Suspended Beta	pCi/L	2.51	6.83	5.02	0	5		
Technetium-99	pCi/L	1.18	16.6	4.63	1	5	ActionLimit	900
Thorium-228	pCi/L	-0.0538	-0.011	-0.0318	0	5		
Thorium-230	pCi/L	0.0572	0.349	0.12	0	5	10%DCG	30
Thorium-232	pCi/L	-0.0105	0.017	0.00526	0	5		
Uranium-235	pCi/L	0	0	0	0	3	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Surface Water Radiological Data

Table 2.35 Radiological Monitoring Data for Surface Water Seep Location LBCSP1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-23.7	-15	-19	0	4	10%DCG	3
Cesium-134	pCi/L	-2.39	4.97	0.507	0	4		
Cesium-137	pCi/L	-2.54	0.718	-1.46	0	4	10%DCG	300
Cobalt-60	pCi/L	0.069	7.8	2.48	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	0.0335	3.84	1.36	0	4		
Dissolved Beta	pCi/L	7.92	25.8	20	3	4		
Neptunium-237	pCi/L	-0.129	0.203	-0.00825	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0129	0.0367	0.000428	0	4		
Plutonium-239/240	pCi/L	0.00945	0.0302	0.0197	0	4	10%DCG	3
Potassium-40	pCi/L	-83.3	81.1	-35.6	0	4		
Suspended Alpha	pCi/L	-0.538	4.61	1.18	0	4		
Suspended Beta	pCi/L	1.82	13.2	5.05	1	4		
Technetium-99	pCi/L	9.26	52.3	24.7	2	4	ActionLimit	900
Thorium-228	pCi/L	-0.017	0.0277	0.00872	0	4		
Thorium-230	pCi/L	-0.029	0.0753	0.0137	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0093	0.0479	0.0136	0	4		
Thorium-234	pCi/L	-153	-153	-153	0	1		
Uranium-235	pCi/L	-9.61	-6.94	-8.28	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Table 2.36 Radiological Monitoring Data for Surface Water Seep Location LBCSP2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-13.9	14.7	-2.73	0	3	10%DCG	3
Cesium-134	pCi/L	2.03	6.63	3.69	0	3		
Cesium-137	pCi/L	-10.8	-1.35	-5.44	0	3	10%DCG	300
Cobalt-60	pCi/L	-1.15	6.29	2.53	0	3	10%DCG	1000
Dissolved Alpha	pCi/L	-0.606	1.18	0.521	0	3		
Dissolved Beta	pCi/L	12.1	29.5	19.3	3	3		
Neptunium-237	pCi/L	-0.169	0.481	0.152	0	3	10%DCG	3
Plutonium-238	pCi/L	-0.0522	0.00892	-0.0157	0	3		
Plutonium-239/240	pCi/L	0.0102	0.0219	0.0179	0	3	10%DCG	3
Potassium-40	pCi/L	-123	7.4	-73.9	0	3		
Suspended Alpha	pCi/L	-0.962	2.49	0.776	0	3		
Suspended Beta	pCi/L	-2.48	2.13	-0.191	0	3		
Technetium-99	pCi/L	16.9	43.2	28.4	3	3	ActionLimit	900
Thorium-228	pCi/L	-0.0255	0.0453	0.00462	0	3		
Thorium-230	pCi/L	0.043	0.139	0.0782	0	3	10%DCG	30
Thorium-232	pCi/L	-0.177	0.0152	-0.0539	0	3		
Uranium-235	pCi/L	-13.9	-13.9	-13.9	0	1	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Surface Water Radiological Data

Table 2.37 Radiological Monitoring Data for Surface Water Seep Location LBCSP3

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-17.7	9.71	-3.33	0	4	10%DCG	3
Cesium-134	pCi/L	-6.97	1.78	-2.02	0	4		
Cesium-137	pCi/L	-8.29	3.66	-1.88	0	4	10%DCG	300
Cobalt-60	pCi/L	-3.66	4.16	0.237	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-3.6	6.95	0.782	0	4		
Dissolved Beta	pCi/L	30.2	49.3	38.1	4	4		
Neptunium-237	pCi/L	-0.0431	0.326	0.105	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.056	0.0652	0.00895	0	4		
Plutonium-239/240	pCi/L	-0.0263	0.0369	0.00322	0	4	10%DCG	3
Potassium-40	pCi/L	-346	209	-68.5	0	4		
Suspended Alpha	pCi/L	-0.0562	11.4	3.51	1	4		
Suspended Beta	pCi/L	1.27	10.1	4.74	1	4		
Technetium-99	pCi/L	29.5	61.8	44.3	4	4	ActionLimit	900
Thorium-228	pCi/L	-0.0264	0.0482	0.0119	0	4		
Thorium-230	pCi/L	0.0501	0.24	0.118	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0187	0.101	0.024	0	4		
Thorium-234	pCi/L	-74.6	-74.6	-74.6	0	1		
Uranium-235	pCi/L	-12	-8.17	-10.1	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Table 2.38 Radiological Monitoring Data for Surface Water Seep Location LBCSP4

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-19.8	18.6	-3.62	0	4	10%DCG	3
Cesium-134	pCi/L	-5.02	3.93	-0.103	0	4		
Cesium-137	pCi/L	-2.13	2.94	-0.0175	0	4	10%DCG	300
Cobalt-60	pCi/L	-4.36	6.81	0.4	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-1.82	6.52	2.41	0	4		
Dissolved Beta	pCi/L	30.8	176	84.8	4	4		
Neptunium-237	pCi/L	-0.203	0.464	0.114	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.116	0.0115	-0.0242	0	4		
Plutonium-239/240	pCi/L	-0.0236	0.0251	0.0094	0	4	10%DCG	3
Potassium-40	pCi/L	-63	305	46.1	1	4		
Suspended Alpha	pCi/L	-1.96	1.95	-0.309	0	4		
Suspended Beta	pCi/L	1.09	3.45	2.16	0	4		
Technetium-99	pCi/L	43.7	243	98.8	4	4	ActionLimit	900
Thorium-228	pCi/L	-0.00932	0.0332	0.00482	0	4		
Thorium-230	pCi/L	-0.0218	0.0422	0.0121	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0178	0.00939	-0.00184	0	4		
Thorium-234	pCi/L	-82.7	-82.7	-82.7	0	1		
Uranium-235	pCi/L	-10.6	0	-5.3	0	2	10%DCG	60
Uranium-238	pCi/L	0	463	232	1	2	10%DCG	60

Surface Water Radiological Data

Table 2.39 Radiological Monitoring Data for Surface Water Seep Location LBCSP5

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-23.4	12.4	-1.47	0	4	10%DCG	3
Cesium-134	pCi/L	-4.37	3.94	0.182	0	4		
Cesium-137	pCi/L	-9.12	0.0772	-2.99	0	4	10%DCG	300
Cobalt-60	pCi/L	-6.85	3.13	-3.29	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-2.48	4.07	1.03	0	4		
Dissolved Beta	pCi/L	144	215	172	4	4		
Neptunium-237	pCi/L	-0.259	0.109	-0.0477	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.106	-0.0488	-0.077	0	4		
Plutonium-239/240	pCi/L	-0.0124	0.0226	0.00677	0	4	10%DCG	3
Potassium-40	pCi/L	-136	180	-7	1	4		
Suspended Alpha	pCi/L	-0.703	0.828	-0.116	0	4		
Suspended Beta	pCi/L	-0.653	4.09	1.47	0	4		
Technetium-99	pCi/L	211	313	262	4	4	ActionLimit	900
Thorium-228	pCi/L	-0.00473	0.0316	0.0109	0	4		
Thorium-230	pCi/L	0.02	0.121	0.0581	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0153	0.0585	0.00765	0	4		
Thorium-234	pCi/L	-162	-162	-162	0	1		
Uranium-235	pCi/L	-12.5	-8.43	-10.5	0	2	10%DCG	60
Uranium-238	pCi/L	0	0	0	0	2	10%DCG	60

Table 2.40 Radiological Monitoring Data for Surface Water Seep Location LBCSP6

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Activity of U-235	pCi/L	0	0	0	0	1		
Americium-241	pCi/L	-15.7	28.8	3.02	0	4	10%DCG	3
Cesium-134	pCi/L	2.13	3.66	2.88	0	4		
Cesium-137	pCi/L	-5.8	5.8	-0.58	0	4	10%DCG	300
Cobalt-60	pCi/L	-2.56	0.674	-0.794	0	4	10%DCG	1000
Dissolved Alpha	pCi/L	-6.32	2	-1.47	0	4		
Dissolved Beta	pCi/L	73.3	133	111	4	4		
Neptunium-237	pCi/L	-0.181	0.107	-0.0123	0	4	10%DCG	3
Plutonium-238	pCi/L	-0.0334	0.0116	-0.00416	0	4		
Plutonium-239/240	pCi/L	-0.0117	0.0444	0.004	0	4	10%DCG	3
Potassium-40	pCi/L	-127	239	-10.9	1	4		
Suspended Alpha	pCi/L	-1.36	1.33	-0.251	0	4		
Suspended Beta	pCi/L	0.211	4.65	2.26	0	4		
Technetium-99	pCi/L	154	187	172	4	4	ActionLimit	900
Thorium-228	pCi/L	-0.00761	0.0273	0.0076	0	4		
Thorium-230	pCi/L	0.000675	0.215	0.0607	0	4	10%DCG	30
Thorium-232	pCi/L	-0.0324	0.0177	-0.00679	0	4		
Thorium-234	pCi/L	-131	-131	-131	0	1		
Uranium-235	pCi/L	-9.18	-8.61	-8.89	0	2	10%DCG	60
Uranium-238	pCi/L	0	414	207	1	2	10%DCG	60

Sediment Radiological Data

Table 2.41 Radiological Data for Sediment Location S20

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	1.55	1.86	1.71	2	2		
Americium-241	pCi/g	-0.0151	-0.00427	-0.00968	0	2		
Beta activity	pCi/g	1.29	2.25	1.77	2	2		
Cesium-137	pCi/g	0.00153	0.00531	0.00342	0	2		
Cobalt-60	pCi/g	-0.00515	0.0122	0.00352	0	2		
Neptunium-237	pCi/g	-0.0118	-0.00623	-0.00901	0	2		
Plutonium-239/240	pCi/g	-0.0015	0.00263	0.000565	0	2		
Potassium-40	pCi/g	2	2.16	2.08	2	2		
Technetium-99	pCi/g	0.122	0.192	0.157	1	2		
Thorium-230	pCi/g	0.107	0.14	0.123	2	2		

Table 2.42 Radiological Data for Sediment Location C612

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	4.98	18.7	11.8	2	2		
Americium-241	pCi/g	-0.00702	0.0249	0.00894	0	2		
Beta activity	pCi/g	10.2	27.5	18.9	2	2		
Cesium-137	pCi/g	0.0073	0.0672	0.0372	1	2		
Cobalt-60	pCi/g	-0.0049	0.00451	-0.000195	0	2		
Neptunium-237	pCi/g	0.0013	0.0596	0.0304	0	2		
Plutonium-239/240	pCi/g	0.0054	0.0615	0.0334	1	2		
Potassium-40	pCi/g	5.36	6.13	5.74	2	2		
Technetium-99	pCi/g	3.05	4.11	3.58	2	2		
Thorium-230	pCi/g	0.303	0.476	0.39	2	2		
Uranium-234	pCi/g	0.518	3.6	2.06	2	2		
Uranium-235	pCi/g	0.029	0.2	0.115	2	2		
Uranium-238	pCi/g	0.826	7	3.91	2	2		

Sediment Radiological Data

Table 2.43 Radiological Data for Sediment Location C616

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	17.2	37.3	27.2	2	2		
Americium-241	pCi/g	0.00148	0.0699	0.0357	0	2		
Beta activity	pCi/g	48.9	93.9	71.4	2	2		
Cesium-137	pCi/g	0.0165	0.168	0.0922	1	2		
Cobalt-60	pCi/g	-0.0067	-0.00379	-0.00524	0	2		
Neptunium-237	pCi/g	0.149	0.288	0.218	0	2		
Plutonium-239/240	pCi/g	0.141	0.222	0.181	2	2		
Potassium-40	pCi/g	5.8	6.43	6.12	2	2		
Technetium-99	pCi/g	17.1	43.2	30.1	2	2		
Thorium-230	pCi/g	0.814	1.21	1.01	2	2		
Uranium-234	pCi/g	3.8	11.3	7.54	2	2		
Uranium-235	pCi/g	0.2	0.612	0.406	2	2		
Uranium-238	pCi/g	5.3	16.6	11	2	2		

Table 2.44 Radiological Data for Sediment Location K001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	5.29	6.9	6.09	2	2		
Americium-241	pCi/g	0.024	0.0382	0.0311	0	2		
Beta activity	pCi/g	8.56	14.3	11.4	2	2		
Cesium-137	pCi/g	0.0182	0.0251	0.0216	1	2		
Cobalt-60	pCi/g	0.00287	0.00541	0.00414	0	2		
Neptunium-237	pCi/g	0.019	0.0266	0.0228	0	2		
Plutonium-239/240	pCi/g	0.0149	0.0214	0.0181	2	2		
Potassium-40	pCi/g	4.25	6.33	5.29	2	2		
Technetium-99	pCi/g	1.77	10.2	5.99	2	2		
Thorium-230	pCi/g	0.235	0.321	0.278	2	2		
Uranium-234	pCi/g	0.8	1.81	1.3	2	2		
Uranium-235	pCi/g	0.04	0.1	0.07	2	2		
Uranium-238	pCi/g	1.2	2.82	2.01	2	2		

Sediment Radiological Data

Table 2.45 Radiological Data for Sediment Location K006

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	1.95	3.46	2.71	2	2		
Americium-241	pCi/g	-0.028	-0.00539	-0.0167	0	2		
Beta activity	pCi/g	1.51	1.91	1.71	2	2		
Cesium-137	pCi/g	0.00337	0.0113	0.00733	0	2		
Cobalt-60	pCi/g	0.00148	0.0048	0.00314	0	2		
Neptunium-237	pCi/g	0.00165	0.00256	0.0021	0	2		
Plutonium-239/240	pCi/g	0.00299	0.00325	0.00312	0	2		
Potassium-40	pCi/g	4.81	4.92	4.87	2	2		
Technetium-99	pCi/g	0.0423	0.247	0.145	1	2		
Thorium-230	pCi/g	0.141	0.163	0.152	2	2		

Table 2.46 Radiological Data for Sediment Location S1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	4.85	7.74	6.29	2	2		
Americium-241	pCi/g	-0.0163	0.00346	-0.00642	0	2		
Beta activity	pCi/g	13.2	17.6	15.4	2	2		
Cesium-137	pCi/g	0.0255	0.0406	0.0331	2	2		
Cobalt-60	pCi/g	-0.0103	-0.00987	-0.0101	0	2		
Neptunium-237	pCi/g	0.0459	0.0708	0.0583	0	2		
Plutonium-239/240	pCi/g	0.00812	0.0193	0.0137	1	2		
Potassium-40	pCi/g	2.62	2.63	2.62	2	2		
Technetium-99	pCi/g	1.2	12.7	6.95	2	2		
Thorium-230	pCi/g	0.234	0.328	0.281	2	2		

Table 2.47 Radiological Data for Sediment Location S31

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	3.09	4.78	3.93	2	2		
Americium-241	pCi/g	-0.019	0.0101	-0.00445	0	2		
Beta activity	pCi/g	3.15	5.02	4.08	2	2		
Cesium-137	pCi/g	0.00142	0.0323	0.0169	1	2		
Cobalt-60	pCi/g	0.000343	0.00571	0.00303	0	2		
Neptunium-237	pCi/g	0.00861	0.0121	0.0104	0	2		
Plutonium-239/240	pCi/g	0.00647	0.0131	0.00978	1	2		
Potassium-40	pCi/g	3.17	3.2	3.18	2	2		
Technetium-99	pCi/g	0.464	0.879	0.671	2	2		
Thorium-230	pCi/g	0.172	0.297	0.234	2	2		
Uranium-234	pCi/g	0.521	0.521	0.521	1	1		
Uranium-235	pCi/g	0.025	0.025	0.025	1	1		
Uranium-238	pCi/g	0.456	0.456	0.456	1	1		

Sediment Radiological Data

Table 2.48 Radiological Data for Sediment Location S33

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	2.87	5.37	4.12	2	2		
Americium-241	pCi/g	0.00363	0.0116	0.00761	0	2		
Beta activity	pCi/g	3.6	5.93	4.76	2	2		
Cesium-137	pCi/g	0.0307	0.0625	0.0466	2	2		
Cobalt-60	pCi/g	0.00193	0.00517	0.00355	0	2		
Neptunium-237	pCi/g	0.00885	0.0196	0.0142	0	2		
Plutonium-239/240	pCi/g	0.0115	0.0239	0.0177	2	2		
Potassium-40	pCi/g	3.03	3.43	3.23	2	2		
Technetium-99	pCi/g	1.48	1.53	1.5	2	2		
Thorium-230	pCi/g	0.183	0.283	0.233	2	2		
Uranium-234	pCi/g	0.49	0.8	0.645	2	2		
Uranium-235	pCi/g	0.027	0.05	0.0385	2	2		
Uranium-238	pCi/g	0.772	1.4	1.09	2	2		

Table 2.49 Radiological Data for Sediment Location S21

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	2.76	4.04	3.6	3	3		
Americium-241	pCi/g	-0.0553	0.00448	-0.0167	0	3		
Beta activity	pCi/g	2.58	3.59	2.92	3	3		
Cesium-137	pCi/g	0.0122	0.0327	0.02	2	3		
Cobalt-60	pCi/g	-0.00684	0.00291	-0.00275	0	3		
Neptunium-237	pCi/g	-0.00136	0.00882	0.00237	0	3		
Plutonium-239/240	pCi/g	0.00242	0.00428	0.00341	0	3		
Potassium-40	pCi/g	3.88	5.17	4.45	3	3		
Technetium-99	pCi/g	0.117	0.24	0.17	2	3		
Thorium-230	pCi/g	0.254	0.286	0.269	3	3		

Sediment Radiological Data

Table 2.50 Radiological Data for Sediment Location K010

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	4.44	9.31	6.87	2	2		
Americium-241	pCi/g	0.0137	0.0356	0.0246	0	2		
Beta activity	pCi/g	4.65	11.4	8.03	2	2		
Cesium-137	pCi/g	0.0121	0.0191	0.0156	0	2		
Cobalt-60	pCi/g	0.00305	0.00445	0.00375	0	2		
Neptunium-237	pCi/g	0.00551	0.00694	0.00622	0	2		
Plutonium-239/240	pCi/g	0.000138	0.00549	0.00281	0	2		
Potassium-40	pCi/g	4.33	4.98	4.66	2	2		
Technetium-99	pCi/g	0.202	1.15	0.676	2	2		
Thorium-230	pCi/g	0.198	0.218	0.208	2	2		
Uranium-234	pCi/g	0.917	0.917	0.917	1	1		
Uranium-235	pCi/g	0.0599	0.0599	0.0599	1	1		
Uranium-238	pCi/g	2.41	2.41	2.41	1	1		

Table 2.51 Radiological Data for Sediment Location K012

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	2.27	4.06	3.16	2	2		
Americium-241	pCi/g	-0.0293	0.00536	-0.012	0	2		
Beta activity	pCi/g	4.75	5.13	4.94	2	2		
Cesium-137	pCi/g	0.0413	0.0505	0.0459	2	2		
Cobalt-60	pCi/g	-0.00488	-0.00102	-0.00295	0	2		
Neptunium-237	pCi/g	0.0337	0.0645	0.0491	0	2		
Plutonium-239/240	pCi/g	0.00919	0.0131	0.0111	0	2		
Potassium-40	pCi/g	3.55	3.96	3.75	2	2		
Technetium-99	pCi/g	0.0783	0.61	0.344	1	2		
Thorium-230	pCi/g	0.24	0.25	0.245	2	2		
Uranium-234	pCi/g	0.284	0.284	0.284	1	1		
Uranium-235	pCi/g	0.0174	0.0174	0.0174	1	1		
Uranium-238	pCi/g	0.629	0.629	0.629	1	1		

Sediment Radiological Data

Table 2.52 Radiological Data for Sediment Location S2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	6.32	24	17.5	3	3		
Americium-241	pCi/g	-0.0115	0.116	0.0407	0	3		
Beta activity	pCi/g	10.4	33.5	25.5	3	3		
Cesium-137	pCi/g	0.0187	0.0826	0.0586	2	3		
Cobalt-60	pCi/g	-0.00366	0.00683	0.0000533	0	3		
Neptunium-237	pCi/g	0.00249	0.0142	0.00862	0	3		
Plutonium-239/240	pCi/g	-0.000664	0.00922	0.00473	0	3		
Potassium-40	pCi/g	3.74	4.17	4.02	3	3		
Technetium-99	pCi/g	0.211	0.438	0.307	3	3		
Thorium-230	pCi/g	0.164	0.204	0.19	3	3		
Uranium-234	pCi/g	0.645	1.9	1.27	2	2		
Uranium-235	pCi/g	0.143	0.2	0.172	2	2		
Uranium-238	pCi/g	12.8	16	14.4	2	2		

Table 2.53 Radiological Data for Sediment Location S30

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	7.51	23.8	15.7	2	2		
Americium-241	pCi/g	-0.0666	-0.0167	-0.0416	0	2		
Beta activity	pCi/g	13.7	38.5	26.1	2	2		
Cesium-137	pCi/g	0.0119	0.0442	0.028	1	2		
Cobalt-60	pCi/g	-0.00589	-0.00394	-0.00491	0	2		
Neptunium-237	pCi/g	0.00183	0.00749	0.00466	0	2		
Plutonium-239/240	pCi/g	-0.000506	0.00504	0.00227	0	2		
Potassium-40	pCi/g	3.22	4.09	3.65	2	2		
Technetium-99	pCi/g	0.208	0.241	0.225	2	2		
Thorium-230	pCi/g	0.257	0.284	0.271	2	2		
Uranium-234	pCi/g	0.452	0.8	0.626	2	2		
Uranium-235	pCi/g	0.0897	0.2	0.145	2	2		
Uranium-238	pCi/g	7.82	16	11.9	2	2		

Sediment Radiological Data

Table 2.54 Radiological Data for Sediment Location LBCN1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	5.66	16.6	11.1	2	2		
Americium-241	pCi/g	0.00418	0.0273	0.0157	0	2		
Beta activity	pCi/g	13.3	76.6	45	2	2		
Cesium-137	pCi/g	-0.00372	0.0278	0.012	1	2		
Cobalt-60	pCi/g	-0.00568	0.00215	-0.00176	0	2		
Neptunium-237	pCi/g	0.0337	0.118	0.0758	1	2		
Plutonium-239/240	pCi/g	0.042	0.171	0.106	2	2		
Potassium-40	pCi/g	2.04	3.78	2.91	2	2		
Technetium-99	pCi/g	3.47	88.4	45.9	2	2		
Thorium-230	pCi/g	0.909	2.14	1.52	2	2		
Uranium-234	pCi/g	1.24	1.24	1.24	1	1		
Uranium-235	pCi/g	0.085	0.085	0.085	1	1		
Uranium-238	pCi/g	3.68	3.68	3.68	1	1		

Table 2.55 Radiological Data for Sediment Location S27

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	4.7	10.7	7.7	2	2		
Americium-241	pCi/g	0.0087	0.0956	0.0521	1	2		
Beta activity	pCi/g	4.83	13.9	9.37	2	2		
Cesium-137	pCi/g	0.0128	0.0323	0.0225	1	2		
Cobalt-60	pCi/g	-0.000205	0.000852	0.000324	0	2		
Neptunium-237	pCi/g	0.00455	0.0316	0.0181	0	2		
Plutonium-239/240	pCi/g	0.102	0.194	0.148	2	2		
Potassium-40	pCi/g	0.904	1.09	0.997	2	2		
Technetium-99	pCi/g	2.1	2.23	2.16	2	2		
Thorium-230	pCi/g	2.83	3.04	2.93	2	2		
Uranium-234	pCi/g	0.509	0.509	0.509	1	1		
Uranium-235	pCi/g	0.0365	0.0365	0.0365	1	1		
Uranium-238	pCi/g	1.69	1.69	1.69	1	1		

Sediment Radiological Data

Table 2.56 Radiological Data for Sediment Location S34

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	5.4	7.83	6.62	2	2		
Americium-241	pCi/g	0.015	0.022	0.0185	0	2		
Beta activity	pCi/g	5.28	8.3	6.79	2	2		
Cesium-137	pCi/g	0.0000761	0.0366	0.0183	1	2		
Cobalt-60	pCi/g	-0.00166	0.000133	-0.000763	0	2		
Neptunium-237	pCi/g	0.02	0.0255	0.0227	0	2		
Plutonium-239/240	pCi/g	0.0533	0.0846	0.0689	2	2		
Potassium-40	pCi/g	1.53	2.87	2.2	2	2		
Technetium-99	pCi/g	0.773	3.41	2.09	2	2		
Thorium-230	pCi/g	0.885	1.39	1.14	2	2		
Uranium-234	pCi/g	0.4	0.767	0.584	2	2		
Uranium-235	pCi/g	0.03	0.054	0.042	2	2		
Uranium-238	pCi/g	1.3	2.42	1.86	2	2		

Table 2.57 Radiological Data for Sediment Location C746KTB2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	1.78	2.54	2.16	2	2		
Americium-241	pCi/g	-0.00567	0.0176	0.00596	0	2		
Beta activity	pCi/g	2.67	2.94	2.81	2	2		
Cesium-137	pCi/g	0.0117	0.0255	0.0186	1	2		
Cobalt-60	pCi/g	0.00479	0.00939	0.00709	0	2		
Neptunium-237	pCi/g	0.0207	0.0222	0.0214	0	2		
Plutonium-239/240	pCi/g	-0.00121	0.00331	0.00105	0	2		
Potassium-40	pCi/g	2.28	4.15	3.21	2	2		
Technetium-99	pCi/g	0.133	0.487	0.31	2	2		
Thorium-230	pCi/g	0.1	0.26	0.18	2	2		

Table 2.58 Radiological Data for Sediment Location C746KUP

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	1.06	2.97	2.02	2	2		
Americium-241	pCi/g	0.00539	0.00686	0.00612	0	2		
Beta activity	pCi/g	1.71	2.01	1.86	2	2		
Cesium-137	pCi/g	0.0015	0.00189	0.00169	0	2		
Cobalt-60	pCi/g	-0.000224	0.00358	0.00168	0	2		
Neptunium-237	pCi/g	-0.00888	0.0062	-0.00134	0	2		
Plutonium-239/240	pCi/g	-0.000882	0.00381	0.00146	0	2		
Potassium-40	pCi/g	1.68	1.9	1.79	2	2		
Technetium-99	pCi/g	0.112	0.29	0.201	1	2		
Thorium-230	pCi/g	0.105	0.124	0.115	2	2		

Sediment Radiological Data

Table 2.59 Radiological Data for Sediment Location S32

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	63.2	125	94.1	2	2		
Americium-241	pCi/g	0.47	1.05	0.76	2	2		
Beta activity	pCi/g	64.7	172	118	2	2		
Cesium-137	pCi/g	0.66	0.985	0.822	2	2		
Cobalt-60	pCi/g	-0.00203	0.00285	0.00041	0	2		
Neptunium-237	pCi/g	0.525	1.18	0.853	2	2		
Plutonium-239/240	pCi/g	2.01	3.82	2.91	2	2		
Potassium-40	pCi/g	5.81	6.4	6.11	2	2		
Technetium-99	pCi/g	12.3	92.3	52.3	2	2		
Thorium-230	pCi/g	39.7	55.1	47.4	2	2		
Uranium-234	pCi/g	3	9.74	6.37	2	2		
Uranium-235	pCi/g	0.2	0.528	0.364	2	2		
Uranium-238	pCi/g	6	14.4	10.2	2	2		

Table 2.60 Radiological Data for Sediment Location S28

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Alpha activity	pCi/g	2.1	2.63	2.37	2	2		
Americium-241	pCi/g	-0.0343	0.00741	-0.0134	0	2		
Beta activity	pCi/g	2.05	2.57	2.31	2	2		
Cesium-137	pCi/g	0.00247	0.0322	0.0173	1	2		
Cobalt-60	pCi/g	-0.00424	0.000722	-0.00176	0	2		
Neptunium-237	pCi/g	-0.00831	-0.00422	-0.00626	0	2		
Plutonium-239/240	pCi/g	-0.00178	0.00333	0.000775	0	2		
Potassium-40	pCi/g	3.97	4.97	4.47	2	2		
Technetium-99	pCi/g	0.137	0.481	0.309	2	2		
Thorium-230	pCi/g	0.146	0.171	0.158	2	2		

Direct Gamma Radiation (TLD) Data

Table 2.61 Radiological Exposure Due to Gamma Radiation (mrem)

Location	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annualized[1]
TLD-1	105	115	100	88	406
TLD-2	185	220	175	140	716
TLD-3	43	45	44	35	165
TLD-4	21	23	22	22	87
TLD-5	22	23	23	23	91
TLD-6	19	21	21	22	81
TLD-7	23	26	26	26	100
TLD-8	16	18	18	18	69
TLD-9	22	25	20	19	85
TLD-10	17	19	20	19.5	75
TLD-11	20	21	22	21	84
TLD-12	18	20	21	19	77
TLD-13	23	24	25	23	94
TLD-14	18	20	20	19	77
TLD-15	17	18	18	19	71
TLD-16	22	22.5	25	23	92
TLD-17	17	19	19	19	74
TLD-18	17	19	19	19	73
TLD-19	18	20	21	19	77
TLD-20	20	22	22	21	85
TLD-25	22	25	24	22	92
TLD-27	22	23	23	23	91
TLD-28	19	21			76
TLD-29	18	20	20	19	76
TLD-30	18	20	22	20	79
TLD-31	20	21	25	23	88
TLD-32	18	23	27	25	91
TLD-35	18	19	20	20	77
TLD-36	18	18	19	19	75
TLD-37	16	18	19	18	70
TLD-38	17		19	19	76
TLD-39	17	18	18	18	71
TLD-40	24	26	26	22	98
TLD-41	17	19	18	18	71
TLD-46	19	20	21	21	80
TLD-47	62	70	64	54	249
TLD-48	26	28	29	24	106
TLD-49	21		21	20	85
TLD-50	34	36	34	39	141
TLD-51	28	29	29	26	111
TLD-52	28	24	25	29	105
TLD-53	56	68	56	48	227
TLD-21	23	25	26	81	97
TLD-22	23	24	23	91	92
TLD-23	23	24	25	80	93
TLD-26	20	21	22	80	82

[1]Note: Annualized results represent a summation of the quarters adjusted to ensure that there is a correlation between the results and 1 year (365 days). TLDs may not have been collected on the last day of each quarter so this accounts for varying number of days.

Deer Radiological Data

Table 2.62 Radiological Analysis of Deer Bone Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Neptunium-237	pCi/g	-0.0546	0.00691	-0.0208	0	6		
Plutonium-239/240	pCi/g	0	0.0141	0.0049	0	6		
Technetium-99	pCi/g	-0.0829	0.0909	-0.0094	0	6		
Thorium-230	pCi/g	-0.0117	0.12	0.0614	2	6		
Uranium-233/234	pCi/g	0.179	0.179	0.179	1	1		
Uranium-234	pCi/g	-0.00775	3.38	0.699	1	5		
Uranium-235	pCi/g	00000255	0.161	0.0305	1	6		
Uranium-238	pCi/g	-0.000594	0.572	0.109	1	6		

Table 2.63 Radiological Background (BCWA) Analysis of Deer Bone Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Neptunium-237	pCi/g	-0.0213	-0.0213	-0.0213	0	1		
Plutonium-239/240	pCi/g	0.00707	0.00707	0.00707	0	1		
Technetium-99	pCi/g	-0.0708	-0.0708	-0.0708	0	1		
Thorium-230	pCi/g	0.0577	0.0577	0.0577	0	1		
Uranium-233/234	pCi/g	0.114	0.114	0.114	0	1		
Uranium-235	pCi/g	0.00784	0.00784	0.00784	0	1		
Uranium-238	pCi/g	0.0629	0.0629	0.0629	0	1		

Table 2.64 Radiological Analysis of Deer Thyroid Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Technetium-99	pCi/g	-1.26	-0.228	-0.692	0	4		

Table 2.65 Radiological Background (BCWA) Analysis of Deer Thyroid Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Technetium-99	pCi/g	-0.739	-0.739	-0.739	0	1		

Table 2.66 Radiological Analysis of Deer Muscle Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Neptunium-237	pCi/g	-0.0392	0.0134	-0.00555	0	6		
Plutonium-239/240	pCi/g	-0.0142	0.0326	0.00761	0	6		
Technetium-99	pCi/g	-0.0204	0.0461	0.0126	0	6		
Thorium-230	pCi/g	-0.0864	0.109	0.0269	1	6		
Uranium-234	pCi/g	-0.0624	0.0656	-0.00755	0	6		
Uranium-235	pCi/g	0	0.0243	0.00811	0	6		
Uranium-238	pCi/g	-0.0131	0.0118	0.00211	0	6		

Deer Radiological Data

Table 2.67 Radiological Background (BCWA) Analysis of Deer Muscle Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Neptunium-237	pCi/g	0	0	0	0	1		
Plutonium-239/240	pCi/g	0.0195	0.0195	0.0195	0	1		
Technetium-99	pCi/g	0.0659	0.0659	0.0659	0	1		
Thorium-230	pCi/g	0.045	0.045	0.045	0	1		
Uranium-234	pCi/g	0.0281	0.0281	0.0281	0	1		
Uranium-235	pCi/g	00000159	00000159	0.0000015	0	1		
Uranium-238	pCi/g	0.014	0.014	0.014	0	1		

Table 2.68 Radiological Analysis of Deer Liver Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Neptunium-237	pCi/g	-0.0581	0.00724	-0.0185	0	6		
Plutonium-239/240	pCi/g	-0.0144	0.0144	0.00112	0	6		
Technetium-99	pCi/g	-0.00513	0.0888	0.0366	0	6		
Thorium-230	pCi/g	0.0443	0.136	0.0756	1	6		
Uranium-234	pCi/g	-0.0345	0.254	0.0518	1	6		
Uranium-235	pCi/g	-0.0141	0.0254	0.00604	0	6		
Uranium-238	pCi/g	-0.0282	0.025	0.00129	0	6		

Table 2.69 Radiological Background (BCWA) Analysis of Deer Liver Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples	Reference Criteria	Reference Value
Neptunium-237	pCi/g	-0.0135	-0.0135	-0.0135	0	1		
Plutonium-239/240	pCi/g	-0.0135	-0.0135	-0.0135	0	1		
Technetium-99	pCi/g	0.00512	0.00512	0.00512	0	1		
Thorium-230	pCi/g	0.0245	0.0245	0.0245	0	1		
Uranium-234	pCi/g	0.00185	0.00185	0.00185	0	1		
Uranium-235	pCi/g	0.0164	0.0164	0.0164	0	1		
Uranium-238	pCi/g	0.0256	0.0256	0.0256	0	1		

3. NON-RADIOLOGICAL EFFLUENT DATA

KPDES Outfall Non-Radiological Data

Table 3.1 Non-Radiological Effluent Data for Outfall 001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1,1-Trichloroethane	ug/L	ND	ND	ND	0	2
1,1,2,2-Tetrachloroethane	ug/L	ND	ND	ND	0	2
1,1,2-Trichloroethane	ug/L	ND	ND	ND	0	2
1,1-Dichloroethane	ug/L	ND	ND	ND	0	2
1,1-Dichloroethene	ug/L	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/L	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/L	ND	ND	ND	0	2
1,2-Dichloroethane	ug/L	ND	ND	ND	0	2
1,2-Dichloropropane	ug/L	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/L	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/L	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/L	ND	ND	ND	0	2
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ng/L	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/L	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/L	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/L	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/L	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/L	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/L	ND	ND	ND	0	2
2-Chloroethyl vinyl ether	ug/L	ND	ND	ND	0	2
2-Chloronaphthalene	ug/L	ND	ND	ND	0	2
2-Chlorophenol	ug/L	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/L	ND	ND	ND	0	2
2-Nitrophenol	ug/L	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/L	ND	ND	ND	0	2
4,4'-DDD	ug/L	ND	ND	ND	0	2
4,4'-DDE	ug/L	ND	ND	ND	0	2
4,4'-DDT	ug/L	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/L	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/L	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/L	ND	ND	ND	0	2
4-Nitrophenol	ug/L	ND	ND	ND	0	2
Acenaphthene	ug/L	ND	ND	ND	0	2
Acenaphthylene	ug/L	ND	ND	ND	0	2
Acrolein	ug/L	ND	ND	ND	0	2
Acrylonitrile	ug/L	ND	ND	ND	0	2
Aldrin	ug/L	ND	ND	ND	0	2
alpha-BHC	ug/L	ND	ND	ND	0	2
alpha-Chlordane	ug/L	ND	ND	ND	0	2
Aluminum	mg/L	0.447	0.454	0.451	2	2
Ammonia	mg/L	ND	ND	ND	0	2
Anthracene	ug/L	ND	ND	ND	0	2
Antimony	mg/L	ND	ND	ND	0	8
Arsenic	mg/L	ND	ND	ND	0	8
Barium	mg/L	0.031	0.032	0.0315	2	2
Benz(a)anthracene	ug/L	ND	ND	ND	0	2
Benzene	ug/L	ND	ND	ND	0	2
Benzidine	ug/L	ND	ND	ND	0	2

KPDES Outfall Non-Radiological Data

Table 3.1 Non-Radiological Effluent Data for Outfall 001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Benzo(a)pyrene	ug/L	ND	ND	ND	0	2
Benzo(b)fluoranthene	ug/L	ND	ND	ND	0	2
Benzo(ghi)perylene	ug/L	ND	ND	ND	0	2
Benzo(k)fluoranthene	ug/L	ND	ND	ND	0	2
Beryllium	mg/L	ND	ND	ND	0	8
beta-BHC	ug/L	ND	ND	ND	0	2
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/L	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/L	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/L	ND	ND	ND	0	2
Boron	mg/L	ND	ND	ND	0	2
Bromide	mg/L	ND	ND	ND	0	2
Bromodichloromethane	ug/L	ND	ND	ND	0	2
Bromoform	ug/L	ND	ND	ND	0	2
Bromomethane	ug/L	ND	ND	ND	0	2
Butyl benzyl phthalate	ug/L	ND	ND	ND	0	2
Cadmium	mg/L	ND	ND	ND	0	8
Carbon tetrachloride	ug/L	ND	ND	ND	0	2
Chemical Oxygen Demand (COD)	mg/L	ND	ND	ND	0	2
Chlordane	ug/L	ND	ND	ND	0	2
Chloride	mg/L	96.1	98.1	97.1	2	2
Chlorine, Total Residual	mg/L	ND	0.12	0.0226	17	102
Chlorobenzene	ug/L	ND	ND	ND	0	2
Chloroethane	ug/L	ND	ND	ND	0	2
Chloroform	ug/L	ND	ND	ND	0	2
Chloromethane	ug/L	ND	ND	ND	0	2
Chromium	mg/L	ND	ND	ND	0	8
Chrysene	ug/L	ND	ND	ND	0	2
Cobalt	mg/L	ND	ND	ND	0	2
Color	TCU	22	25	23.5	2	2
Conductivity	umho/cm	591	1610	1150	105	105
Copper	mg/L	ND	0.05	0.0158	1	8
Cyanide	mg/L	ND	ND	ND	0	2
delta-BHC	ug/L	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/L	ND	ND	ND	0	2
Di-n-octylphthalate	ug/L	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/L	ND	ND	ND	0	2
Dibromochloromethane	ug/L	ND	ND	ND	0	2
Dieldrin	ug/L	ND	ND	ND	0	2
Diethyl phthalate	ug/L	ND	ND	ND	0	2
Dimethyl phthalate	ug/L	ND	ND	ND	0	2
Dissolved Oxygen	mg/L	5.92	12.1	8.89	105	105
Endosulfan I	ug/L	ND	ND	ND	0	2
Endosulfan II	ug/L	ND	ND	ND	0	2
Endosulfan sulfate	ug/L	ND	ND	ND	0	2
Endrin	ug/L	ND	ND	ND	0	2
Endrin aldehyde	ug/L	ND	ND	ND	0	2
Endrin ketone	ug/L	ND	ND	ND	0	2
Ethylbenzene	ug/L	ND	ND	ND	0	2
Fecal Coliform (PIP)	col/100m	14	26	20	2	2

KPDES Outfall Non-Radiological Data

Table 3.1 Non-Radiological Effluent Data for Outfall 001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Flow Rate	mgd	0.3	6	2.26	105	105
Fluoranthene	ug/L	ND	ND	ND	0	2
Fluorene	ug/L	ND	ND	ND	0	2
Fluoride	mg/L	0.53	0.54	0.535	2	2
gamma-Chlordane	ug/L	ND	ND	ND	0	2
Hardness - Total as CaCO3	mg/L	126	405	241	13	13
Heptachlor	ug/L	ND	ND	ND	0	2
Heptachlor epoxide	ug/L	ND	ND	ND	0	2
Hexachlorobenzene	ug/L	ND	ND	ND	0	2
Hexachlorobutadiene	ug/L	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/L	ND	ND	ND	0	2
Hexachloroethane	ug/L	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	ND	0	2
Iron	mg/L	0.253	0.946	0.678	8	8
Isophorone	ug/L	ND	ND	ND	0	2
Lead	mg/L	ND	ND	ND	0	8
Lindane	ug/L	ND	ND	ND	0	2
Magnesium	mg/L	25.6	26.5	26	2	2
Manganese	mg/L	0.051	0.053	0.052	2	2
MBAS	mg/L	ND	ND	ND	0	2
Mercury	mg/L	ND	ND	ND	0	8
Methoxychlor	ug/L	ND	ND	ND	0	2
Methylene chloride	ug/L	ND	ND	ND	0	2
Molybdenum	mg/L	ND	ND	ND	0	2
N-Nitroso-di-n-propylamine	ug/L	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/L	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/L	ND	ND	ND	0	2
Naphthalene	ug/L	ND	ND	ND	0	2
Nickel	mg/L	ND	ND	ND	0	8
Nitrate/Nitrite as Nitrogen	mg/L	4.4	4.5	4.45	2	2
Nitrobenzene	ug/L	ND	ND	ND	0	2
Oil and Grease	mg/L	ND	ND	ND	0	56
PCB-1016	ug/L	ND	ND	ND	0	15
PCB-1221	ug/L	ND	ND	ND	0	15
PCB-1232	ug/L	ND	ND	ND	0	15
PCB-1242	ug/L	ND	ND	ND	0	15
PCB-1248	ug/L	ND	ND	ND	0	15
PCB-1254	ug/L	ND	ND	ND	0	15
PCB-1260	ug/L	ND	ND	ND	0	15
PCB-1268	ug/L	ND	ND	ND	0	15
Pentachlorophenol	ug/L	ND	ND	ND	0	2
pH	Std Unit	6.9	8.41	7.4	105	105
Phenanthrene	ug/L	ND	ND	ND	0	2
Phenol	ug/L	ND	ND	ND	0	2
Phenols	ug/L	ND	ND	ND	0	2
Phosphorous	mg/L	0.09	0.57	0.226	56	56
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	15
Pyrene	ug/L	ND	ND	ND	0	2
Selenium	mg/L	ND	ND	ND	0	8
Silver	mg/L	ND	ND	ND	0	8

KPDES Outfall Non-Radiological Data

Table 3.1 Non-Radiological Effluent Data for Outfall 001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Sulfate	mg/L	408	414	411	2	2
Sulfide	mg/L	ND	ND	ND	0	2
Sulfite	mg/L	ND	ND	ND	0	2
Suspended Solids	mg/L	ND	ND	ND	0	2
Temperature	deg F	39.1	89.5	66.7	105	105
Tetrachloroethene	ug/L	ND	ND	ND	0	2
Thallium	mg/L	ND	ND	ND	0	8
Tin	mg/L	ND	ND	ND	0	2
Titanium	mg/L	ND	ND	ND	0	2
Toluene	ug/L	ND	ND	ND	0	2
Total Metals	mg/L	ND	5	2.92	1	6
Total Organic Carbon (TOC)	mg/L	7.6	7.7	7.65	2	2
Total Organic Nitrogen	mg/L	0.92	1.2	1.06	2	2
Toxaphene	ug/L	ND	ND	ND	0	2
trans-1,2-Dichloroethene	ug/L	ND	ND	ND	0	2
trans-1,3-Dichloropropene	ug/L	ND	ND	ND	0	2
Trichloroethene	ug/L	ND	ND	ND	0	15
Uranium	mg/L	0.00267	0.018	0.0078	6	6
Vinyl chloride	ug/L	ND	ND	ND	0	2
Zinc	mg/L	ND	0.1	0.0379	1	8

KPDES Outfall Non-Radiological Data

Table 3.2 Non-Radiological Effluent Data for Outfall 015

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1,1-Trichloroethane	ug/L	ND	ND	ND	0	1
1,1,2,2-Tetrachloroethane	ug/L	ND	ND	ND	0	1
1,1,2-Trichloroethane	ug/L	ND	ND	ND	0	1
1,1-Dichloroethane	ug/L	ND	ND	ND	0	1
1,1-Dichloroethene	ug/L	ND	ND	ND	0	1
1,2,4-Trichlorobenzene	ug/L	ND	ND	ND	0	1
1,2-Dichlorobenzene	ug/L	ND	ND	ND	0	1
1,2-Dichloroethane	ug/L	ND	ND	ND	0	1
1,2-Dichloropropane	ug/L	ND	ND	ND	0	1
1,2-Diphenylhydrazine	ug/L	ND	ND	ND	0	1
1,3-Dichlorobenzene	ug/L	ND	ND	ND	0	1
1,4-Dichlorobenzene	ug/L	ND	ND	ND	0	1
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ng/L	ND	ND	ND	0	1
2,4,6-Trichlorophenol	ug/L	ND	ND	ND	0	1
2,4-Dichlorophenol	ug/L	ND	ND	ND	0	1
2,4-Dimethylphenol	ug/L	ND	ND	ND	0	1
2,4-Dinitrophenol	ug/L	ND	ND	ND	0	1
2,4-Dinitrotoluene	ug/L	ND	ND	ND	0	1
2,6-Dinitrotoluene	ug/L	ND	ND	ND	0	1
2-Chloroethyl vinyl ether	ug/L	ND	ND	ND	0	1
2-Chloronaphthalene	ug/L	ND	ND	ND	0	1
2-Chlorophenol	ug/L	ND	ND	ND	0	1
2-Methyl-4,6-dinitrophenol	ug/L	ND	ND	ND	0	1
2-Nitrophenol	ug/L	ND	ND	ND	0	1
3,3'-Dichlorobenzidine	ug/L	ND	ND	ND	0	1
4,4'-DDD	ug/L	ND	ND	ND	0	1
4,4'-DDE	ug/L	ND	ND	ND	0	1
4,4'-DDT	ug/L	ND	ND	ND	0	1
4-Bromophenyl phenyl ether	ug/L	ND	ND	ND	0	1
4-Chloro-3-methylphenol	ug/L	ND	ND	ND	0	1
4-Chlorophenyl phenyl ether	ug/L	ND	ND	ND	0	1
4-Nitrophenol	ug/L	ND	ND	ND	0	1
Acenaphthene	ug/L	ND	ND	ND	0	1
Acenaphthylene	ug/L	ND	ND	ND	0	1
Acrolein	ug/L	ND	ND	ND	0	1
Acrylonitrile	ug/L	ND	ND	ND	0	1
Aldrin	ug/L	ND	ND	ND	0	1
alpha-BHC	ug/L	ND	ND	ND	0	1
alpha-Chlordane	ug/L	ND	ND	ND	0	1
Aluminum	mg/L	1.03	1.03	1.03	1	1
Ammonia	mg/L	ND	ND	ND	0	1
Anthracene	ug/L	ND	ND	ND	0	1
Antimony	mg/L	ND	ND	ND	0	5
Arsenic	mg/L	ND	ND	ND	0	5
Barium	mg/L	0.059	0.059	0.059	1	1
Benz(a)anthracene	ug/L	ND	ND	ND	0	1
Benzene	ug/L	ND	ND	ND	0	1
Benzidine	ug/L	ND	ND	ND	0	1
Benzo(a)pyrene	ug/L	ND	ND	ND	0	1
Benzo(b)fluoranthene	ug/L	ND	ND	ND	0	1

KPDES Outfall Non-Radiological Data

Table 3.2 Non-Radiological Effluent Data for Outfall 015

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Benzo(ghi)perylene	ug/L	ND	ND	ND	0	1
Benzo(k)fluoranthene	ug/L	ND	ND	ND	0	1
Beryllium	mg/L	ND	ND	ND	0	5
beta-BHC	ug/L	ND	ND	ND	0	1
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	1
Bis(2-chloroethoxy)methane	ug/L	ND	ND	ND	0	1
Bis(2-chloroisopropyl) ether	ug/L	ND	ND	ND	0	1
Bis(2-ethylhexyl)phthalate	ug/L	ND	ND	ND	0	1
Boron	mg/L	ND	ND	ND	0	1
Bromide	mg/L	ND	ND	ND	0	1
Bromodichloromethane	ug/L	ND	ND	ND	0	1
Bromoform	ug/L	ND	ND	ND	0	1
Bromomethane	ug/L	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/L	ND	ND	ND	0	1
Cadmium	mg/L	ND	ND	ND	0	5
Carbon tetrachloride	ug/L	ND	ND	ND	0	1
Chemical Oxygen Demand (COD)	mg/L	ND	ND	ND	0	1
Chloride	mg/L	6.6	6.6	6.6	1	1
Chlorine, Total Residual	mg/L	ND	0.03	0.0175	2	12
Chlorobenzene	ug/L	ND	ND	ND	0	1
Chloroethane	ug/L	ND	ND	ND	0	1
Chloroform	ug/L	ND	ND	ND	0	1
Chloromethane	ug/L	ND	ND	ND	0	1
Chromium	mg/L	ND	ND	ND	0	5
Chrysene	ug/L	ND	ND	ND	0	1
Cobalt	mg/L	ND	ND	ND	0	1
Color	TCU	80	80	80	1	1
Conductivity	umho/cm	86	643	411	22	22
Copper	mg/L	ND	ND	ND	0	5
Cyanide	mg/L	ND	ND	ND	0	1
delta-BHC	ug/L	ND	ND	ND	0	1
Di-n-butyl phthalate	ug/L	ND	ND	ND	0	1
Di-n-octylphthalate	ug/L	ND	ND	ND	0	1
Dibenz(a,h)anthracene	ug/L	ND	ND	ND	0	1
Dibromochloromethane	ug/L	ND	ND	ND	0	1
Dieldrin	ug/L	ND	ND	ND	0	1
Diethyl phthalate	ug/L	ND	ND	ND	0	1
Dimethyl phthalate	ug/L	ND	ND	ND	0	1
Dissolved Oxygen	mg/L	6.2	12	8.48	22	22
Endosulfan I	ug/L	ND	ND	ND	0	1
Endosulfan II	ug/L	ND	ND	ND	0	1
Endosulfan sulfate	ug/L	ND	ND	ND	0	1
Endrin	ug/L	ND	ND	ND	0	1
Endrin aldehyde	ug/L	ND	ND	ND	0	1
Endrin ketone	ug/L	ND	ND	ND	0	1
Ethylbenzene	ug/L	ND	ND	ND	0	1
Fecal Coliform (PIP)	col/100m	134	134	134	1	1
Flow Rate	mgd	0.0014	4.76	0.777	22	22
Fluoranthene	ug/L	ND	ND	ND	0	1
Fluorene	ug/L	ND	ND	ND	0	1

KPDES Outfall Non-Radiological Data

Table 3.2 Non-Radiological Effluent Data for Outfall 015

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Fluoride	mg/L	0.45	0.45	0.45	1	1
gamma-Chlordane	ug/L	ND	ND	ND	0	1
Hardness - Total as CaCO3	mg/L	56	212	152	12	12
Heptachlor	ug/L	ND	ND	ND	0	1
Heptachlor epoxide	ug/L	ND	ND	ND	0	1
Hexachlorobenzene	ug/L	ND	ND	ND	0	1
Hexachlorobutadiene	ug/L	ND	ND	ND	0	1
Hexachlorocyclopentadiene	ug/L	ND	ND	ND	0	1
Hexachloroethane	ug/L	ND	ND	ND	0	1
Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	ND	0	1
Iron	mg/L	0.671	2.1	1.16	5	5
Isophorone	ug/L	ND	ND	ND	0	1
Lead	mg/L	ND	ND	ND	0	5
Lindane	ug/L	ND	ND	ND	0	1
Magnesium	mg/L	7.33	7.33	7.33	1	1
Manganese	mg/L	0.211	0.211	0.211	1	1
MBAS	mg/L	ND	ND	ND	0	1
Mercury	mg/L	ND	ND	ND	0	5
Methoxychlor	ug/L	ND	ND	ND	0	1
Methylene chloride	ug/L	ND	ND	ND	0	1
Molybdenum	mg/L	ND	ND	ND	0	1
N-Nitroso-di-n-propylamine	ug/L	ND	ND	ND	0	1
N-Nitrosodimethylamine	ug/L	ND	ND	ND	0	1
N-Nitrosodiphenylamine	ug/L	ND	ND	ND	0	1
Naphthalene	ug/L	ND	ND	ND	0	1
Nickel	mg/L	ND	ND	ND	0	5
Nitrate/Nitrite as Nitrogen	mg/L	0.04	0.04	0.04	1	1
Nitrobenzene	ug/L	ND	ND	ND	0	1
Oil and Grease	mg/L	ND	ND	ND	0	13
PCB-1016	ug/L	ND	ND	ND	0	13
PCB-1221	ug/L	ND	ND	ND	0	13
PCB-1232	ug/L	ND	ND	ND	0	13
PCB-1242	ug/L	ND	ND	ND	0	13
PCB-1248	ug/L	ND	ND	ND	0	13
PCB-1254	ug/L	ND	ND	ND	0	13
PCB-1260	ug/L	ND	ND	ND	0	13
PCB-1268	ug/L	ND	ND	ND	0	13
Pentachlorophenol	ug/L	ND	ND	ND	0	1
pH	Std Unit	7.3	7.6	7.44	22	22
Phenanthrene	ug/L	ND	ND	ND	0	1
Phenol	ug/L	ND	ND	ND	0	1
Phenols	ug/L	ND	ND	ND	0	1
Phosphorous	mg/L	0.12	0.12	0.12	1	1
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	13
Pyrene	ug/L	ND	ND	ND	0	1
Selenium	mg/L	ND	ND	ND	0	5
Silver	mg/L	ND	ND	ND	0	5
Sulfate	mg/L	46.2	46.2	46.2	1	1
Sulfide	mg/L	ND	ND	ND	0	1
Sulfite	mg/L	ND	ND	ND	0	1

KPDES Outfall Non-Radiological Data

Table 3.2 Non-Radiological Effluent Data for Outfall 015

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Suspended Solids	mg/L	ND	ND	ND	0	1
Temperature	deg F	38.9	75.8	60.2	22	22
Tetrachloroethene	ug/L	ND	ND	ND	0	1
Thallium	mg/L	ND	ND	ND	0	5
Tin	mg/L	ND	ND	ND	0	1
Titanium	mg/L	ND	ND	ND	0	1
Toluene	ug/L	ND	ND	ND	0	1
Total Metals	mg/L	ND	ND	ND	0	4
Total Organic Carbon (TOC)	mg/L	9.6	9.6	9.6	1	1
Total Organic Nitrogen	mg/L	0.64	0.64	0.64	1	1
Toxaphene	ug/L	ND	ND	ND	0	1
trans-1,2-Dichloroethene	ug/L	ND	ND	ND	0	1
trans-1,3-Dichloropropene	ug/L	ND	ND	ND	0	1
Trichloroethene	ug/L	ND	ND	ND	0	1
Uranium	mg/L	0.016	0.173	0.0952	4	4
Vinyl chloride	ug/L	ND	ND	ND	0	1
Zinc	mg/L	ND	0.1	0.0506	1	5

KPDES Outfall Non-Radiological Data

Table 3.3 Non-Radiological Effluent Data for Outfall 017

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1,1-Trichloroethane	ug/L	ND	ND	ND	0	1
1,1,2,2-Tetrachloroethane	ug/L	ND	ND	ND	0	1
1,1,2-Trichloroethane	ug/L	ND	ND	ND	0	1
1,1-Dichloroethane	ug/L	ND	ND	ND	0	1
1,1-Dichloroethene	ug/L	ND	ND	ND	0	1
1,2,4-Trichlorobenzene	ug/L	ND	ND	ND	0	1
1,2-Dichlorobenzene	ug/L	ND	ND	ND	0	1
1,2-Dichloroethane	ug/L	ND	ND	ND	0	1
1,2-Dichloropropane	ug/L	ND	ND	ND	0	1
1,2-Diphenylhydrazine	ug/L	ND	ND	ND	0	1
1,3-Dichlorobenzene	ug/L	ND	ND	ND	0	1
1,4-Dichlorobenzene	ug/L	ND	ND	ND	0	1
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ng/L	ND	ND	ND	0	1
2,4,6-Trichlorophenol	ug/L	ND	ND	ND	0	1
2,4-Dichlorophenol	ug/L	ND	ND	ND	0	1
2,4-Dimethylphenol	ug/L	ND	ND	ND	0	1
2,4-Dinitrophenol	ug/L	ND	ND	ND	0	1
2,4-Dinitrotoluene	ug/L	ND	ND	ND	0	1
2,6-Dinitrotoluene	ug/L	ND	ND	ND	0	1
2-Chloroethyl vinyl ether	ug/L	ND	ND	ND	0	1
2-Chloronaphthalene	ug/L	ND	ND	ND	0	1
2-Chlorophenol	ug/L	ND	ND	ND	0	1
2-Methyl-4,6-dinitrophenol	ug/L	ND	ND	ND	0	1
2-Nitrophenol	ug/L	ND	ND	ND	0	1
3,3'-Dichlorobenzidine	ug/L	ND	ND	ND	0	1
4,4'-DDD	ug/L	ND	ND	ND	0	1
4,4'-DDE	ug/L	ND	ND	ND	0	1
4,4'-DDT	ug/L	ND	ND	ND	0	1
4-Bromophenyl phenyl ether	ug/L	ND	ND	ND	0	1
4-Chloro-3-methylphenol	ug/L	ND	ND	ND	0	1
4-Chlorophenyl phenyl ether	ug/L	ND	ND	ND	0	1
4-Nitrophenol	ug/L	ND	ND	ND	0	1
Acenaphthene	ug/L	ND	ND	ND	0	1
Acenaphthylene	ug/L	ND	ND	ND	0	1
Acrolein	ug/L	ND	ND	ND	0	1
Acrylonitrile	ug/L	ND	ND	ND	0	1
Aldrin	ug/L	ND	ND	ND	0	1
alpha-BHC	ug/L	ND	ND	ND	0	1
alpha-Chlordane	ug/L	ND	ND	ND	0	1
Aluminum	mg/L	0.825	0.825	0.825	1	1
Ammonia	mg/L	ND	ND	ND	0	1
Anthracene	ug/L	ND	ND	ND	0	1
Antimony	mg/L	ND	ND	ND	0	5
Arsenic	mg/L	ND	ND	ND	0	5
Barium	mg/L	0.061	0.061	0.061	1	1
Benz(a)anthracene	ug/L	ND	ND	ND	0	1
Benzene	ug/L	ND	ND	ND	0	1
Benzidine	ug/L	ND	ND	ND	0	1
Benzo(a)pyrene	ug/L	ND	ND	ND	0	1
Benzo(b)fluoranthene	ug/L	ND	ND	ND	0	1

KPDES Outfall Non-Radiological Data

Table 3.3 Non-Radiological Effluent Data for Outfall 017

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Benzo(ghi)perylene	ug/L	ND	ND	ND	0	1
Benzo(k)fluoranthene	ug/L	ND	ND	ND	0	1
Beryllium	mg/L	ND	ND	ND	0	5
beta-BHC	ug/L	ND	ND	ND	0	1
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	1
Bis(2-chloroethoxy)methane	ug/L	ND	ND	ND	0	1
Bis(2-chloroisopropyl) ether	ug/L	ND	ND	ND	0	1
Bis(2-ethylhexyl)phthalate	ug/L	ND	ND	ND	0	1
Boron	mg/L	ND	ND	ND	0	1
Bromide	mg/L	ND	ND	ND	0	1
Bromodichloromethane	ug/L	ND	ND	ND	0	1
Bromoform	ug/L	ND	ND	ND	0	1
Bromomethane	ug/L	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/L	ND	ND	ND	0	1
Cadmium	mg/L	ND	ND	ND	0	5
Carbon tetrachloride	ug/L	ND	ND	ND	0	1
Chemical Oxygen Demand (COD)	mg/L	ND	ND	ND	0	1
Chloride	mg/L	3.3	3.3	3.3	1	1
Chlorine, Total Residual	mg/L	ND	ND	ND	0	21
Chlorobenzene	ug/L	ND	ND	ND	0	1
Chloroethane	ug/L	ND	ND	ND	0	1
Chloroform	ug/L	ND	ND	ND	0	1
Chloromethane	ug/L	ND	ND	ND	0	1
Chromium	mg/L	ND	ND	ND	0	5
Chrysene	ug/L	ND	ND	ND	0	1
Cobalt	mg/L	ND	ND	ND	0	1
Color	TCU	33	33	33	1	1
Conductivity	umho/cm	48	508	226	30	30
Copper	mg/L	ND	0.05	0.0189	1	5
Cyanide	mg/L	ND	ND	ND	0	1
delta-BHC	ug/L	ND	ND	ND	0	1
Di-n-butyl phthalate	ug/L	ND	ND	ND	0	1
Di-n-octylphthalate	ug/L	ND	ND	ND	0	1
Dibenz(a,h)anthracene	ug/L	ND	ND	ND	0	1
Dibromochloromethane	ug/L	ND	ND	ND	0	1
Dieldrin	ug/L	ND	ND	ND	0	1
Diethyl phthalate	ug/L	ND	ND	ND	0	1
Dimethyl phthalate	ug/L	ND	ND	ND	0	1
Dissolved Oxygen	mg/L	5.41	14.9	8.39	30	30
Endosulfan I	ug/L	ND	ND	ND	0	1
Endosulfan II	ug/L	ND	ND	ND	0	1
Endosulfan sulfate	ug/L	ND	ND	ND	0	1
Endrin	ug/L	ND	ND	ND	0	1
Endrin aldehyde	ug/L	ND	ND	ND	0	1
Endrin ketone	ug/L	ND	ND	ND	0	1
Ethylbenzene	ug/L	ND	ND	ND	0	1
Fecal Coliform (PIP)	col/100m	61	61	61	1	1
Flow Rate	mgd	0.178	19.5	3.15	30	30
Fluoranthene	ug/L	ND	ND	ND	0	1
Fluorene	ug/L	ND	ND	ND	0	1

KPDES Outfall Non-Radiological Data

Table 3.3 Non-Radiological Effluent Data for Outfall 017

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Fluoride	mg/L	0.35	0.35	0.35	1	1
gamma-Chlordane	ug/L	ND	ND	ND	0	1
Hardness - Total as CaCO3	mg/L	30	146	84.9	20	20
Heptachlor	ug/L	ND	ND	ND	0	1
Heptachlor epoxide	ug/L	ND	ND	ND	0	1
Hexachlorobenzene	ug/L	ND	ND	ND	0	1
Hexachlorobutadiene	ug/L	ND	ND	ND	0	1
Hexachlorocyclopentadiene	ug/L	ND	ND	ND	0	1
Hexachloroethane	ug/L	ND	ND	ND	0	1
Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	ND	0	1
Iron	mg/L	0.333	1.17	0.74	5	5
Isophorone	ug/L	ND	ND	ND	0	1
Lead	mg/L	ND	ND	ND	0	5
Lindane	ug/L	ND	ND	ND	0	1
Magnesium	mg/L	5.23	5.23	5.23	1	1
Manganese	mg/L	0.062	0.062	0.062	1	1
MBAS	mg/L	ND	ND	ND	0	1
Mercury	mg/L	ND	ND	ND	0	5
Methoxychlor	ug/L	ND	ND	ND	0	1
Methylene chloride	ug/L	ND	ND	ND	0	1
Molybdenum	mg/L	ND	ND	ND	0	1
N-Nitroso-di-n-propylamine	ug/L	ND	ND	ND	0	1
N-Nitrosodimethylamine	ug/L	ND	ND	ND	0	1
N-Nitrosodiphenylamine	ug/L	ND	ND	ND	0	1
Naphthalene	ug/L	ND	ND	ND	0	1
Nickel	mg/L	ND	ND	ND	0	5
Nitrate/Nitrite as Nitrogen	mg/L	0.62	0.62	0.62	1	1
Nitrobenzene	ug/L	ND	ND	ND	0	1
Oil and Grease	mg/L	ND	ND	ND	0	13
PCB-1016	ug/L	ND	ND	ND	0	13
PCB-1221	ug/L	ND	ND	ND	0	13
PCB-1232	ug/L	ND	ND	ND	0	13
PCB-1242	ug/L	ND	ND	ND	0	13
PCB-1248	ug/L	ND	ND	ND	0	13
PCB-1254	ug/L	ND	ND	ND	0	13
PCB-1260	ug/L	ND	ND	ND	0	13
PCB-1268	ug/L	ND	ND	ND	0	13
Pentachlorophenol	ug/L	ND	ND	ND	0	1
pH	Std Unit	7	8.85	7.8	30	30
Phenanthrene	ug/L	ND	ND	ND	0	1
Phenol	ug/L	ND	ND	ND	0	1
Phenols	ug/L	ND	ND	ND	0	1
Phosphorous	mg/L	0.09	0.09	0.09	1	1
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	13
Pyrene	ug/L	ND	ND	ND	0	1
Selenium	mg/L	ND	ND	ND	0	5
Silver	mg/L	ND	ND	ND	0	5
Sulfate	mg/L	27.5	27.5	27.5	1	1
Sulfide	mg/L	ND	ND	ND	0	1
Sulfite	mg/L	ND	ND	ND	0	1

KPDES Outfall Non-Radiological Data

Table 3.3 Non-Radiological Effluent Data for Outfall 017

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Suspended Solids	mg/L	22	64	35.2	4	4
Temperature	deg F	36.9	85.3	61.2	30	30
Tetrachloroethene	ug/L	ND	ND	ND	0	1
Thallium	mg/L	ND	ND	ND	0	5
Tin	mg/L	ND	ND	ND	0	1
Titanium	mg/L	ND	ND	ND	0	1
Toluene	ug/L	ND	ND	ND	0	1
Total Metals	mg/L	ND	ND	ND	0	4
Total Organic Carbon (TOC)	mg/L	5.3	5.3	5.3	1	1
Total Organic Nitrogen	mg/L	ND	ND	ND	0	1
Toxaphene	ug/L	ND	ND	ND	0	1
trans-1,2-Dichloroethene	ug/L	ND	ND	ND	0	1
trans-1,3-Dichloropropene	ug/L	ND	ND	ND	0	1
Trichloroethene	ug/L	ND	ND	ND	0	1
Uranium	mg/L	ND	0.006	0.0021	2	4
Vinyl chloride	ug/L	ND	ND	ND	0	1
Zinc	mg/kg	104	104	104	1	1
Zinc	mg/L	ND	0.31	0.0749	37	130
Zinc, Dissolved	mg/L	ND	0.257	0.0583	10	121

KPDES Outfall Non-Radiological Data

Table 3.4 Non-Radiological Effluent Data for Outfall 019

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1,1-Trichloroethane	ug/L	ND	ND	ND	0	1
1,1,2,2-Tetrachloroethane	ug/L	ND	ND	ND	0	1
1,1,2-Trichloroethane	ug/L	ND	ND	ND	0	1
1,1-Dichloroethane	ug/L	ND	ND	ND	0	1
1,1-Dichloroethene	ug/L	ND	ND	ND	0	1
1,2,4-Trichlorobenzene	ug/L	ND	ND	ND	0	1
1,2-Dichlorobenzene	ug/L	ND	ND	ND	0	1
1,2-Dichloroethane	ug/L	ND	ND	ND	0	1
1,2-Dichloropropane	ug/L	ND	ND	ND	0	1
1,2-Diphenylhydrazine	ug/L	ND	ND	ND	0	1
1,3-Dichlorobenzene	ug/L	ND	ND	ND	0	1
1,4-Dichlorobenzene	ug/L	ND	ND	ND	0	1
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ng/L	ND	ND	ND	0	1
2,4,6-Trichlorophenol	ug/L	ND	ND	ND	0	1
2,4-Dichlorophenol	ug/L	ND	ND	ND	0	1
2,4-Dimethylphenol	ug/L	ND	ND	ND	0	1
2,4-Dinitrophenol	ug/L	ND	ND	ND	0	1
2,4-Dinitrotoluene	ug/L	ND	ND	ND	0	1
2,6-Dinitrotoluene	ug/L	ND	ND	ND	0	1
2-Chloroethyl vinyl ether	ug/L	ND	ND	ND	0	1
2-Chloronaphthalene	ug/L	ND	ND	ND	0	1
2-Chlorophenol	ug/L	ND	ND	ND	0	1
2-Methyl-4,6-dinitrophenol	ug/L	ND	ND	ND	0	1
2-Nitrophenol	ug/L	ND	ND	ND	0	1
3,3'-Dichlorobenzidine	ug/L	ND	ND	ND	0	1
4,4'-DDD	ug/L	ND	ND	ND	0	1
4,4'-DDE	ug/L	ND	ND	ND	0	1
4,4'-DDT	ug/L	ND	ND	ND	0	1
4-Bromophenyl phenyl ether	ug/L	ND	ND	ND	0	1
4-Chloro-3-methylphenol	ug/L	ND	ND	ND	0	1
4-Chlorophenyl phenyl ether	ug/L	ND	ND	ND	0	1
4-Nitrophenol	ug/L	ND	ND	ND	0	1
Acenaphthene	ug/L	ND	ND	ND	0	1
Acenaphthylene	ug/L	ND	ND	ND	0	1
Acrolein	ug/L	ND	ND	ND	0	1
Acrylonitrile	ug/L	ND	ND	ND	0	1
Aldrin	ug/L	ND	ND	ND	0	1
alpha-BHC	ug/L	ND	ND	ND	0	1
alpha-Chlordane	ug/L	ND	ND	ND	0	1
Aluminum	mg/L	1.02	1.02	1.02	1	1
Ammonia	mg/L	ND	ND	ND	0	1
Anthracene	ug/L	ND	ND	ND	0	1
Antimony	mg/L	ND	ND	ND	0	4
Arsenic	mg/L	ND	ND	ND	0	4
Barium	mg/L	0.037	0.037	0.037	1	1
Benz(a)anthracene	ug/L	ND	ND	ND	0	1
Benzene	ug/L	ND	ND	ND	0	1
Benzidine	ug/L	ND	ND	ND	0	1
Benzo(a)pyrene	ug/L	ND	ND	ND	0	1
Benzo(b)fluoranthene	ug/L	ND	ND	ND	0	1

KPDES Outfall Non-Radiological Data

Table 3.4 Non-Radiological Effluent Data for Outfall 019

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Benzo(ghi)perylene	ug/L	ND	ND	ND	0	1
Benzo(k)fluoranthene	ug/L	ND	ND	ND	0	1
Beryllium	mg/L	ND	ND	ND	0	4
beta-BHC	ug/L	ND	ND	ND	0	1
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	1
Bis(2-chloroethoxy)methane	ug/L	ND	ND	ND	0	1
Bis(2-chloroisopropyl) ether	ug/L	ND	ND	ND	0	1
Bis(2-ethylhexyl)phthalate	ug/L	ND	ND	ND	0	1
Boron	mg/L	ND	ND	ND	0	1
Bromide	mg/L	ND	ND	ND	0	1
Bromodichloromethane	ug/L	ND	ND	ND	0	1
Bromoform	ug/L	ND	ND	ND	0	1
Bromomethane	ug/L	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/L	ND	ND	ND	0	1
Cadmium	mg/L	ND	ND	ND	0	4
Carbon tetrachloride	ug/L	ND	ND	ND	0	1
Chemical Oxygen Demand (COD)	mg/L	ND	ND	ND	0	1
Chlordane	ug/L	ND	ND	ND	0	1
Chloride	mg/L	7.4	7.4	7.4	1	1
Chlorine, Total Residual	mg/L	ND	ND	ND	0	11
Chlorobenzene	ug/L	ND	ND	ND	0	1
Chloroethane	ug/L	ND	ND	ND	0	1
Chloroform	ug/L	ND	ND	ND	0	1
Chloromethane	ug/L	ND	ND	ND	0	1
Chromium	mg/L	ND	ND	ND	0	4
Chrysene	ug/L	ND	ND	ND	0	1
Cobalt	mg/L	ND	ND	ND	0	1
Color	TCU	13	13	13	1	1
Conductivity	umho/cm	117	153	138	12	12
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	1
delta-BHC	ug/L	ND	ND	ND	0	1
Di-n-butyl phthalate	ug/L	ND	ND	ND	0	1
Di-n-octylphthalate	ug/L	ND	ND	ND	0	1
Dibenz(a,h)anthracene	ug/L	ND	ND	ND	0	1
Dibromochloromethane	ug/L	ND	ND	ND	0	1
Dieldrin	ug/L	ND	ND	ND	0	1
Diethyl phthalate	ug/L	ND	ND	ND	0	1
Dimethyl phthalate	ug/L	ND	ND	ND	0	1
Dissolved Oxygen	mg/L	7.6	13.2	9.94	12	12
Endosulfan I	ug/L	ND	ND	ND	0	1
Endosulfan II	ug/L	ND	ND	ND	0	1
Endosulfan sulfate	ug/L	ND	ND	ND	0	1
Endrin	ug/L	ND	ND	ND	0	1
Endrin aldehyde	ug/L	ND	ND	ND	0	1
Endrin ketone	ug/L	ND	ND	ND	0	1
Ethylbenzene	ug/L	ND	ND	ND	0	1
Fecal Coliform (PIP)	col/100m	ND	ND	ND	0	1
Flow Rate	mgd	0.15	0.8	0.583	12	12
Fluoranthene	ug/L	ND	ND	ND	0	1

KPDES Outfall Non-Radiological Data

Table 3.4 Non-Radiological Effluent Data for Outfall 019

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Fluorene	ug/L	ND	ND	ND	0	1
Fluoride	mg/L	0.15	0.15	0.15	1	1
gamma-Chlordane	ug/L	ND	ND	ND	0	1
Hardness - Total as CaCO3	mg/L	60	73	67.2	4	4
Heptachlor	ug/L	ND	ND	ND	0	1
Heptachlor epoxide	ug/L	ND	ND	ND	0	1
Hexachlorobenzene	ug/L	ND	ND	ND	0	1
Hexachlorobutadiene	ug/L	ND	ND	ND	0	1
Hexachlorocyclopentadiene	ug/L	ND	ND	ND	0	1
Hexachloroethane	ug/L	ND	ND	ND	0	1
Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	ND	0	1
Iron	mg/L	0.205	1.43	0.572	4	4
Isophorone	ug/L	ND	ND	ND	0	1
Lead	mg/L	ND	ND	ND	0	4
Lindane	ug/L	ND	ND	ND	0	1
Magnesium	mg/L	3.42	3.42	3.42	1	1
Manganese	mg/L	ND	ND	ND	0	1
MBAS	mg/L	ND	ND	ND	0	1
Mercury	mg/L	ND	ND	ND	0	4
Methoxychlor	ug/L	ND	ND	ND	0	1
Methylene chloride	ug/L	ND	ND	ND	0	1
Molybdenum	mg/L	ND	ND	ND	0	1
N-Nitroso-di-n-propylamine	ug/L	ND	ND	ND	0	1
N-Nitrosodimethylamine	ug/L	ND	ND	ND	0	1
N-Nitrosodiphenylamine	ug/L	ND	ND	ND	0	1
Naphthalene	ug/L	ND	ND	ND	0	1
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.03	0.03	0.03	1	1
Nitrobenzene	ug/L	ND	ND	ND	0	1
Oil and Grease	mg/L	ND	ND	ND	0	5
PCB-1016	ug/L	ND	ND	ND	0	5
PCB-1221	ug/L	ND	ND	ND	0	5
PCB-1232	ug/L	ND	ND	ND	0	5
PCB-1242	ug/L	ND	ND	ND	0	5
PCB-1248	ug/L	ND	ND	ND	0	5
PCB-1254	ug/L	ND	ND	ND	0	5
PCB-1260	ug/L	ND	ND	ND	0	5
PCB-1268	ug/L	ND	ND	ND	0	5
Pentachlorophenol	ug/L	ND	ND	ND	0	1
pH	Std Unit	7.73	8.2	7.89	12	12
Phenanthrene	ug/L	ND	ND	ND	0	1
Phenol	ug/L	ND	ND	ND	0	1
Phenols	ug/L	ND	ND	ND	0	1
Phosphorous	mg/L	ND	ND	ND	0	1
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	5
Pyrene	ug/L	ND	ND	ND	0	1
Selenium	mg/L	ND	ND	ND	0	4
Silver	mg/L	ND	ND	ND	0	4
Sulfate	mg/L	11.1	11.1	11.1	1	1
Sulfide	mg/L	ND	ND	ND	0	1

KPDES Outfall Non-Radiological Data

Table 3.4 Non-Radiological Effluent Data for Outfall 019

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Sulfite	mg/L	ND	ND	ND	0	1
Suspended Solids	mg/L	ND	29	14.3	1	5
Temperature	deg F	41.4	69	51.8	12	12
Tetrachloroethene	ug/L	ND	ND	ND	0	1
Thallium	mg/L	ND	ND	ND	0	4
Tin	mg/L	ND	ND	ND	0	1
Titanium	mg/L	ND	ND	ND	0	1
Toluene	ug/L	ND	ND	ND	0	1
Total Metals	mg/L	ND	ND	ND	0	3
Total Organic Carbon (TOC)	mg/L	1.8	1.8	1.8	1	1
Total Organic Nitrogen	mg/L	1.2	1.2	1.2	1	1
Toxaphene	ug/L	ND	ND	ND	0	1
trans-1,2-Dichloroethene	ug/L	ND	ND	ND	0	1
trans-1,3-Dichloropropene	ug/L	ND	ND	ND	0	1
Trichloroethene	ug/L	ND	ND	ND	0	1
Uranium	mg/L	ND	ND	ND	0	3
Vinyl chloride	ug/L	ND	ND	ND	0	1
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 3.5 Non-Radiological Effluent Data for Landfill Surface Water Location L135

Upstream of the C-746 S&T Closed Landfills

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Chemical Oxygen Demand (COD)	mg/L	ND	45	27.9	2	5
Chloride	mg/L	ND	5.4	2.34	3	5
Conductivity	umho/cm	73	255	116	5	5
Dissolved Oxygen	mg/L	6.46	9.9	8.04	5	5
Dissolved Solids	mg/L	ND	214	94.8	2	5
Flow Rate	mgd	0.09	6.62	3.09	5	5
Iron	mg/L	1.55	4.02	2.33	5	5
pH	Std Unit	6.96	7.65	7.32	5	5
Sodium	mg/L	ND	6.93	2.44	1	5
Sulfate	mg/L	ND	11.5	5.96	2	5
Suspended Solids	mg/L	ND	70	40.8	4	5
Temperature	deg F	48	72	63.5	5	5
Total Organic Carbon (TOC)	mg/L	ND	17.4	11.7	4	5
Total Solids	mg/L	113	436	237	5	5
Uranium	mg/L	ND	0.0171	0.0049	4	5

Table 3.6 Non-Radiological Effluent Data for Landfill Surface Water Location L136

At the C-746 S&T Closed Landfills

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Chemical Oxygen Demand (COD)	mg/L	ND	66	40.1	3	4
Chloride	mg/L	2.2	6.4	3.98	4	4
Conductivity	umho/cm	33	368	185	4	4
Dissolved Oxygen	mg/L	2.53	8.28	5.85	4	4
Dissolved Solids	mg/L	109	257	187	4	4
Flow Rate	mgd	0.01	2.21	0.583	4	4
Iron	mg/L	ND	0.574	0.376	3	4
pH	Std Unit	7.5	73.9	24.2	4	4
Sodium	mg/L	ND	7.12	3.6	2	4
Sulfate	mg/L	7.2	47.3	24.9	4	4
Suspended Solids	mg/L	ND	ND	ND	0	4
Temperature	deg F	47.4	72.7	65.9	4	4
Total Organic Carbon (TOC)	mg/L	4.8	21.2	13.8	4	4
Total Solids	mg/L	141	248	176	4	4
Uranium	mg/L	ND	0.005	0.0022	2	4

Surface Water Non-Radiological Data

Table 3.7 Non-Radiological Effluent Data for Landfill Surface Water Location L137

Downstream of the C-746 S&T Closed Landfills

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Chemical Oxygen Demand (COD)	mg/L	ND	66	42.1	3	4
Chloride	mg/L	ND	3.9	2.23	2	4
Conductivity	umho/cm	61	343	164	4	4
Dissolved Oxygen	mg/L	4.64	10.9	7.55	4	4
Dissolved Solids	mg/L	ND	244	122	2	4
Flow Rate	mgd	0.0016	3.95	1.45	4	4
Iron	mg/L	1.49	4.03	2.64	4	4
pH	Std Unit	7.1	7.5	7.36	4	4
Sodium	mg/L	ND	3	1.69	1	4
Sulfate	mg/L	ND	16.7	8.8	2	4
Suspended Solids	mg/L	ND	279	97.5	2	4
Temperature	deg F	49	71.9	63.1	4	4
Total Organic Carbon (TOC)	mg/L	3.8	23.2	13.2	4	4
Total Solids	mg/L	129	528	253	4	4
Uranium	mg/L	ND	0.0299	0.0083	3	4

Table 3.8 Non-Radiological Effluent Data for Landfill Surface Water Location L150

At the C-746 U Landfill

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Chemical Oxygen Demand (COD)	mg/L	ND	59	32.7	2	4
Chloride	mg/L	ND	4.3	2.83	3	4
Conductivity	umho/cm	104	224	170	4	4
Dissolved Oxygen	mg/L	6.9	10.3	8.68	4	4
Dissolved Solids	mg/L	ND	181	134	3	4
Flow Rate	mgd	0.1	2.91	0.848	4	4
Iron	mg/L	0.912	3.88	2.43	4	4
pH	Std Unit	7.43	7.74	7.62	4	4
Sodium	mg/L	ND	3	1.59	1	4
Sulfate	mg/L	7.7	50.1	23.8	4	4
Suspended Solids	mg/L	ND	69	32.4	2	4
Temperature	deg F	48.2	71.5	63.4	4	4
Total Organic Carbon (TOC)	mg/L	6.4	19.1	10.8	4	4
Total Solids	mg/L	149	252	187	4	4
Uranium	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 3.9 Non-Radiological Effluent Data for Landfill Surface Water Location L154

Upstream of the C-746 U Landfill

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Chemical Oxygen Demand (COD)	mg/L	ND	73	45.4	3	4
Chloride	mg/L	ND	5.4	3.45	3	4
Conductivity	umho/cm	64.6	221	137	4	4
Dissolved Oxygen	mg/L	4.11	9.8	7.28	4	4
Dissolved Solids	mg/L	ND	179	100	2	4
Flow Rate	mgd	0.16	5.2	2.66	4	4
Iron	mg/L	1.11	2.36	1.68	4	4
pH	Std Unit	6.99	7.46	7.2	4	4
Sodium	mg/L	ND	3.55	2.23	2	4
Sulfate	mg/L	ND	11.4	7.25	3	4
Suspended Solids	mg/L	ND	50	24	1	4
Temperature	deg F	48.4	72.6	63.3	4	4
Total Organic Carbon (TOC)	mg/L	9.9	24.2	17.2	4	4
Total Solids	mg/L	112	208	153	4	4
Uranium	mg/L	ND	0.00437	0.0022	3	4

Table 3.10 Non-Radiological Effluent Data for Landfill Surface Water Location L155

Downstream of the C-746 U Landfill

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Chemical Oxygen Demand (COD)	mg/L	ND	ND	ND	0	5
Chloride	mg/L	ND	23.2	7.4	3	5
Conductivity	umho/cm	48	281	129	5	5
Dissolved Oxygen	mg/L	6.47	10.2	8	5	5
Dissolved Solids	mg/L	ND	178	109	3	5
Flow Rate	mgd	0.19	22.1	11.1	2	2
Iron	mg/L	1.17	8.2	5.9	5	5
pH	Std Unit	6.99	7.75	7.23	5	5
Sodium	mg/L	ND	28.6	9.23	3	5
Sulfate	mg/L	ND	50.6	21.8	3	5
Suspended Solids	mg/L	ND	438	218	4	5
Temperature	deg F	49.1	72.6	63.2	5	5
Total Organic Carbon (TOC)	mg/L	2.8	9.8	7.46	5	5
Total Solids	mg/L	201	562	375	5	5
Uranium	mg/L	0.005	0.008	0.0068	5	5

4. NON-RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE DATA

Surface Water Non-Radiological Data

Table 4.1 Non-Radiological Monitoring Data for Surface Water Location L1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	0.319	0.155	1	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	5.8	48.7	20.6	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	142	331	233	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	7.51	11.3	9.38	4	4
Flow Rate	mgd	ND	6.25	1.94	3	4
Hardness - Total as CaCO3	mg/L	52	80	61.5	4	4
Iron	mg/L	0.215	0.476	0.337	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.04	1	0.522	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	6.85	7.65	7.37	4	4
Phosphorous	mg/L	ND	0.1	0.0612	3	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	17.6	26.8	21.9	4	4
Suspended Solids	mg/L	ND	ND	ND	0	4
Temperature	deg F	38	75.5	54.9	4	4
Trichloroethene	ug/L	ND	2	1	2	4
Turbidity	NTU	2.2	6	3.7	4	4
Uranium	mg/L	ND	0.005	0.00101	1	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.2 Non-Radiological Monitoring Data for Surface Water Location L5

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	0.302	0.178	2	4
Ammonia	mg/L	ND	0.27	0.142	1	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	17.3	78.7	49.1	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	326	857	622	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	7.02	10.9	9.11	4	4
Flow Rate	mgd	ND	12.2	8.7	3	4
Hardness - Total as CaCO3	mg/L	98	186	156	4	4
Iron	mg/L	ND	0.449	0.268	3	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	1.15	2.65	1.85	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.2	7.71	7.43	4	4
Phosphorous	mg/L	0.09	0.18	0.125	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	68.4	233	164	4	4
Suspended Solids	mg/L	ND	ND	ND	0	4
Temperature	deg F	45.7	83.2	61.4	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	4.3	8.4	5.97	4	4
Uranium	mg/L	ND	0.0609	0.0176	3	4
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.3 Non-Radiological Monitoring Data for Surface Water Location L6

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/L	ND	ND	ND	0	2
2,4'-DDD	ug/L	ND	ND	ND	0	2
2,4'-DDE	ug/L	ND	ND	ND	0	2
2,4'-DDT	ug/L	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/L	ND	ND	ND	0	2
2-Methylnaphthalene	ug/L	ND	ND	ND	0	2
4,4'-DDD	ug/L	ND	ND	ND	0	2
4,4'-DDE	ug/L	ND	ND	ND	0	2
4,4'-DDT	ug/L	ND	ND	ND	0	2
Acenaphthene	ug/L	ND	ND	ND	0	2
Acenaphthylene	ug/L	ND	ND	ND	0	2
Aldrin	ug/L	ND	ND	ND	0	2
alpha-BHC	ug/L	ND	ND	ND	0	2
alpha-Chlordane	ug/L	ND	ND	ND	0	2
Aluminum	mg/L	0.203	0.26	0.232	2	2
Anthracene	ug/L	ND	ND	ND	0	2
Antimony	mg/L	ND	ND	ND	0	2
Arsenic	mg/L	ND	ND	ND	0	2
Azinphos-methyl	ug/L	ND	ND	ND	0	2
Barium	mg/L	0.046	0.048	0.047	2	2
Benz(a)anthracene	ug/L	ND	ND	ND	0	2
Benzo(a)pyrene	ug/L	ND	ND	ND	0	2
Benzo(b)fluoranthene	ug/L	ND	ND	ND	0	2
Benzo(e)pyrene	ug/L	ND	ND	ND	0	2
Benzo(ghi)perylene	ug/L	ND	ND	ND	0	2
Benzo(k)fluoranthene	ug/L	ND	ND	ND	0	2
Beryllium	mg/L	ND	ND	ND	0	2
beta-BHC	ug/L	ND	ND	ND	0	2
Cadmium	mg/L	ND	ND	ND	0	2
Chlordane	ug/L	ND	ND	ND	0	2
Chromium	mg/L	ND	ND	ND	0	2
Chrysene	ug/L	ND	ND	ND	0	2
Chrysene C1	ug/L	ND	ND	ND	0	2
Co-Ral	ug/L	ND	ND	ND	0	2
Cobalt	mg/L	ND	ND	ND	0	2
Conductivity	umho/cm	625	879	752	2	2
Copper	mg/L	ND	ND	ND	0	2
delta-BHC	ug/L	ND	ND	ND	0	2
Diazinon	ug/L	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/L	ND	ND	ND	0	2
Dibenzothiophene	ug/L	ND	ND	ND	0	1
Dibenzothiophene C1	ug/L	ND	ND	ND	0	2
Dibenzothiophene C2	ug/L	ND	ND	ND	0	2
Dichlorvos	ug/L	ND	ND	ND	0	2
Dieldrin	ug/L	ND	ND	ND	0	2
Dimethoate	ug/L	ND	ND	ND	0	2
Dissolved Oxygen	mg/L	6.52	10.7	8.6	2	2

Surface Water Non-Radiological Data

Table 4.3 Non-Radiological Monitoring Data for Surface Water Location L6

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/L	ND	ND	ND	0	2
Endosulfan II	ug/L	ND	ND	ND	0	2
Endosulfan sulfate	ug/L	ND	ND	ND	0	2
Endrin	ug/L	ND	ND	ND	0	2
Endrin aldehyde	ug/L	ND	ND	ND	0	2
Ethion	ug/L	ND	ND	ND	0	2
Famphur	ug/L	ND	ND	ND	0	2
Fensulfothion	ug/L	ND	ND	ND	0	2
Fenthion	ug/L	ND	ND	ND	0	2
Flow Rate	mgd	ND	23	13.9	1	2
Fluoranthene	ug/L	ND	ND	ND	0	2
Fluoranthene C1	ug/L	ND	ND	ND	0	2
Fluorene	ug/L	ND	ND	ND	0	2
Fluorene C1	ug/L	ND	ND	ND	0	2
Fluorene C2	ug/L	ND	ND	ND	0	2
gamma-Chlordane	ug/L	ND	ND	ND	0	2
Heptachlor	ug/L	ND	ND	ND	0	2
Heptachlor epoxide	ug/L	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	ND	0	2
Iron	mg/L	0.315	0.355	0.335	2	2
Lead	mg/L	ND	ND	ND	0	2
Lindane	ug/L	ND	ND	ND	0	2
Malathion	ug/L	ND	ND	ND	0	2
Manganese	mg/L	0.053	0.129	0.091	2	2
Mercury	mg/L	ND	ND	ND	0	2
Methoxychlor	ug/L	ND	ND	ND	0	2
Methyl parathion	ug/L	ND	ND	ND	0	2
Mirex	ug/L	ND	ND	ND	0	2
Mocap	ug/L	ND	ND	ND	0	2
Molybdenum	mg/L	ND	ND	ND	0	2
Naphthalene	ug/L	ND	ND	ND	0	2
Naphthalene C1	ug/L	ND	ND	ND	0	2
Naphthalene C2	ug/L	ND	ND	ND	0	2
Naphthalene C3	ug/L	ND	ND	ND	0	2
Naphthalene C4	ug/L	ND	ND	ND	0	2
Nickel	mg/L	ND	ND	ND	0	2
Parathion	ug/L	ND	ND	ND	0	2
Perylene	ug/L	ND	ND	ND	0	2
pH	Std Unit	6.96	7.44	7.2	2	2
Phenanthrene	ug/L	ND	ND	ND	0	2
Phenanthrene C1	ug/L	ND	ND	ND	0	2
Phenanthrene C2	ug/L	ND	ND	ND	0	2
Phenanthrene C3	ug/L	ND	ND	ND	0	2
Phenanthrene C4	ug/L	ND	ND	ND	0	2
Phorate	ug/L	ND	ND	ND	0	2
Pyrene	ug/L	ND	ND	ND	0	2
Pyrene C1	ug/L	ND	ND	ND	0	1

Surface Water Non-Radiological Data

Table 4.3 Non-Radiological Monitoring Data for Surface Water Location L6

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Selenium	mg/L	ND	ND	ND	0	2
Silver	mg/L	ND	ND	ND	0	2
Strontium	mg/L	ND	0.264	0.138	1	2
Temperature	deg F	47.7	78.5	63.1	2	2
Thallium	mg/L	ND	ND	ND	0	2
Toxaphene	ug/L	ND	ND	ND	0	2
Trichloroethene	ug/L	ND	ND	ND	0	2
Uranium	mg/L	0.001	0.004	0.0025	2	2
Vanadium	mg/L	ND	0.031	0.0217	1	2
Zinc	mg/L	ND	ND	ND	0	2

Surface Water Non-Radiological Data

Table 4.4 Non-Radiological Monitoring Data for Surface Water Location C616

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	5
Acetone	ug/L	ND	ND	ND	0	5
Aluminum	mg/L	ND	0.221	0.124	1	5
Ammonia	mg/L	ND	0.37	0.212	3	5
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	5
Cadmium	mg/L	ND	ND	ND	0	5
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	5
Chloride	mg/L	101	156	132	5	5
Chromium	mg/L	ND	ND	ND	0	5
Conductivity	umho/cm	1260	1540	1460	5	5
Copper	mg/L	ND	ND	ND	0	5
Cyanide	mg/L	ND	ND	ND	0	5
Dissolved Oxygen	mg/L	6.44	9.74	8.78	5	5
Flow Rate	mgd	ND	16.8	6.84	4	5
Hardness - Total as CaCO3	mg/L	325	367	346	5	5
Iron	mg/L	ND	0.29	0.138	1	5
Lead	mg/L	ND	ND	ND	0	5
Nickel	mg/L	ND	ND	ND	0	5
Nitrate/Nitrite as Nitrogen	mg/L	2.5	5.5	4.08	5	5
PCB-1016	ug/L	ND	ND	ND	0	5
PCB-1221	ug/L	ND	ND	ND	0	5
PCB-1232	ug/L	ND	ND	ND	0	5
PCB-1242	ug/L	ND	ND	ND	0	5
PCB-1248	ug/L	ND	ND	ND	0	5
PCB-1254	ug/L	ND	ND	ND	0	5
PCB-1260	ug/L	ND	ND	ND	0	5
PCB-1268	ug/L	ND	ND	ND	0	5
pH	Std Unit	7.1	7.5	7.22	5	5
Phosphorous	mg/L	0.15	0.32	0.25	5	5
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	5
Sulfate	mg/L	415	498	472	5	5
Suspended Solids	mg/L	ND	25	11.3	1	5
Temperature	deg F	56	85.9	67	5	5
Trichloroethene	ug/L	ND	ND	ND	0	5
Turbidity	NTU	3.7	10	5.6	5	5
Uranium	mg/L	ND	0.005	0.00258	4	5
Zinc	mg/L	ND	ND	ND	0	5

Surface Water Non-Radiological Data

Table 4.5 Non-Radiological Monitoring Data for Surface Water Location C612

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	ND	ND	0	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	35.4	37.5	36.6	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	233	335	301	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	4.78	8.15	7.12	4	4
Hardness - Total as CaCO3	mg/L	91	101	95.7	4	4
Iron	mg/L	ND	ND	ND	0	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.61	2.6	1.85	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	0.17	0.0693	1	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	6	7.9	7.38	4	4
Phosphorous	mg/L	ND	0.1	0.05	2	4
Polychlorinated biphenyl	ug/L	ND	0.17	0.0892	1	4
Sulfate	mg/L	14.2	16	15.1	4	4
Suspended Solids	mg/L	ND	27	14	1	4
Temperature	deg F	56.7	67.3	60.6	4	4
Trichloroethene	ug/L	ND	2	1.37	3	4
Turbidity	NTU	ND	ND	ND	0	4
Uranium	mg/L	ND	ND	ND	0	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.6 Non-Radiological Monitoring Data for Surface Water Location K004

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	5
Acetone	ug/L	ND	ND	ND	0	5
Aluminum	mg/L	ND	0.379	0.205	2	5
Ammonia	mg/L	ND	3.5	1.56	3	5
Biochemical Oxygen Demand (BOD)	mg/L	ND	11	7.3	2	5
Cadmium	mg/L	ND	ND	ND	0	5
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	10	6	1	5
Chloride	mg/L	10.6	22.7	16.9	5	5
Chromium	mg/L	ND	ND	ND	0	5
Conductivity	umho/cm	297	332	320	5	5
Copper	mg/L	ND	ND	ND	0	5
Cyanide	mg/L	ND	ND	ND	0	5
Dissolved Oxygen	mg/L	6.04	7.37	6.4	5	5
Flow Rate	mgd	ND	5.42	2.5	4	5
Hardness - Total as CaCO3	mg/L	58	105	78.2	5	5
Iron	mg/L	ND	0.379	0.28	4	5
Lead	mg/L	ND	ND	ND	0	5
Nickel	mg/L	ND	ND	ND	0	5
Nitrate/Nitrite as Nitrogen	mg/L	0.35	4.6	2.6	5	5
PCB-1016	ug/L	ND	ND	ND	0	5
PCB-1221	ug/L	ND	ND	ND	0	5
PCB-1232	ug/L	ND	ND	ND	0	5
PCB-1242	ug/L	ND	ND	ND	0	5
PCB-1248	ug/L	ND	ND	ND	0	5
PCB-1254	ug/L	ND	ND	ND	0	5
PCB-1260	ug/L	ND	0.367	0.125	1	5
PCB-1268	ug/L	ND	ND	ND	0	5
pH	Std Unit	6.9	7.4	7.21	5	5
Phosphorous	mg/L	0.7	1.27	0.908	5	5
Polychlorinated biphenyl	ug/L	ND	0.367	0.141	1	5
Sulfate	mg/L	14	38.8	25.4	5	5
Suspended Solids	mg/L	ND	ND	ND	0	5
Temperature	deg F	65.7	86	75.7	5	5
Trichloroethene	ug/L	ND	ND	ND	0	5
Turbidity	NTU	3.6	16	10.5	5	5
Uranium	mg/L	0.003	0.065	0.02	6	6
Zinc	mg/L	ND	ND	ND	0	5

Surface Water Non-Radiological Data

Table 4.7 Non-Radiological Monitoring Data for Surface Water Location K006

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	0.22	0.452	0.333	4	4
Ammonia	mg/L	ND	0.21	0.127	1	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	8.1	16.8	11.9	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	201	248	230	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	8.23	11.3	9.83	4	4
Flow Rate	mgd	ND	2.6	1.28	3	4
Hardness - Total as CaCO3	mg/L	56	73	68.2	4	4
Iron	mg/L	0.59	1.03	0.738	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.03	0.7	0.495	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.42	8.3	7.74	4	4
Phosphorous	mg/L	ND	0.14	0.0675	2	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	35.1	52.2	43.6	4	4
Suspended Solids	mg/L	ND	33	13.7	2	4
Temperature	deg F	47.6	84.8	63.4	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	9.5	19	14.4	4	4
Uranium	mg/L	ND	ND	ND	0	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.8 Non-Radiological Monitoring Data for Surface Water Location K008

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	5
Acetone	ug/L	ND	ND	ND	0	5
Aluminum	mg/L	ND	ND	ND	0	5
Ammonia	mg/L	0.46	1.5	1.05	5	5
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	5
Cadmium	mg/L	ND	ND	ND	0	5
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	5
Chloride	mg/L	14.6	24.1	19.9	5	5
Chromium	mg/L	ND	ND	ND	0	5
Conductivity	umho/cm	235	360	322	5	5
Copper	mg/L	ND	ND	ND	0	5
Cyanide	mg/L	ND	ND	ND	0	5
Dissolved Oxygen	mg/L	4.75	7.29	6.02	5	5
Flow Rate	mgd	ND	0.95	0.643	4	5
Hardness - Total as CaCO3	mg/L	52	96	75.6	5	5
Iron	mg/L	ND	0.289	0.239	4	5
Lead	mg/L	ND	ND	ND	0	5
Nickel	mg/L	ND	ND	ND	0	5
Nitrate/Nitrite as Nitrogen	mg/L	1.1	3.05	2.21	5	5
PCB-1016	ug/L	ND	ND	ND	0	5
PCB-1221	ug/L	ND	ND	ND	0	5
PCB-1232	ug/L	ND	ND	ND	0	5
PCB-1242	ug/L	ND	ND	ND	0	5
PCB-1248	ug/L	ND	ND	ND	0	5
PCB-1254	ug/L	ND	ND	ND	0	5
PCB-1260	ug/L	ND	0.584	0.169	1	5
PCB-1268	ug/L	ND	ND	ND	0	5
pH	Std Unit	7	7.3	7.16	5	5
Phosphorous	mg/L	0.37	0.98	0.608	5	5
Polychlorinated biphenyl	ug/L	ND	0.584	0.185	1	5
Sulfate	mg/L	50.8	78	65.7	5	5
Suspended Solids	mg/L	ND	22	9.8	2	5
Temperature	deg F	63.2	85.4	73	5	5
Trichloroethene	ug/L	ND	ND	ND	0	5
Turbidity	NTU	1.8	7	5.22	5	5
Uranium	mg/L	0.002	0.043	0.0237	6	6
Zinc	mg/L	ND	ND	ND	0	5

Surface Water Non-Radiological Data

Table 4.9 Non-Radiological Monitoring Data for Surface Water Location K009

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	5
Acetone	ug/L	ND	ND	ND	0	5
Aluminum	mg/L	ND	0.379	0.278	4	5
Ammonia	mg/L	ND	ND	ND	0	5
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	5
Cadmium	mg/L	ND	ND	ND	0	5
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	5
Chloride	mg/L	13.1	241	111	5	5
Chromium	mg/L	ND	ND	ND	0	5
Conductivity	umho/cm	197	956	553	5	5
Copper	mg/L	ND	ND	ND	0	5
Cyanide	mg/L	ND	ND	ND	0	5
Dissolved Oxygen	mg/L	5.42	9.71	7.68	5	5
Flow Rate	mgd	0.0134	1.02	0.68	5	5
Hardness - Total as CaCO3	mg/L	40	117	88.2	5	5
Iron	mg/L	0.418	0.559	0.464	5	5
Lead	mg/L	ND	ND	ND	0	5
Nickel	mg/L	ND	ND	ND	0	5
Nitrate/Nitrite as Nitrogen	mg/L	0.2	0.56	0.382	5	5
PCB-1016	ug/L	ND	ND	ND	0	5
PCB-1221	ug/L	ND	ND	ND	0	5
PCB-1232	ug/L	ND	ND	ND	0	5
PCB-1242	ug/L	ND	ND	ND	0	5
PCB-1248	ug/L	ND	ND	ND	0	5
PCB-1254	ug/L	ND	ND	ND	0	5
PCB-1260	ug/L	ND	ND	ND	0	5
PCB-1268	ug/L	ND	ND	ND	0	5
pH	Std Unit	6.3	7.43	7.11	5	5
Phosphorous	mg/L	0.1	0.11	0.102	5	5
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	5
Sulfate	mg/L	31.7	51.4	38	5	5
Suspended Solids	mg/L	ND	ND	ND	0	5
Temperature	deg F	48.4	81.6	58.4	5	5
Trichloroethene	ug/L	ND	2	0.8	1	5
Turbidity	NTU	4	5.6	4.62	5	5
Uranium	mg/L	ND	0.005	0.00217	4	6
Zinc	mg/L	ND	ND	ND	0	5

Surface Water Non-Radiological Data

Table 4.10 Non-Radiological Monitoring Data for Surface Water Location K016

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	0.369	1.53	0.923	4	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	4.3	124	42.9	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	203	667	361	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	5.83	13.8	8.68	4	4
Flow Rate	mgd	ND	5.47	1.62	3	4
Hardness - Total as CaCO3	mg/L	109	149	127	4	4
Iron	mg/L	0.376	1.1	0.698	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.15	831	208	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.43	7.6	7.54	4	4
Phosphorous	mg/L	0.11	0.57	0.268	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	8.7	20	16.4	4	4
Suspended Solids	mg/L	ND	50	20.2	1	4
Temperature	deg F	36.9	72.6	55.7	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	8.6	50	29.6	4	4
Uranium	mg/L	ND	0.005	0.00217	2	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.11 Non-Radiological Monitoring Data for Surface Water Location L291

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	0.285	0.181	2	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	5.8	14.9	11.1	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	143	274	212	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	5.22	12.1	9.07	4	4
Flow Rate	mgd	ND	5.73	2.08	3	4
Hardness - Total as CaCO3	mg/L	54	70	61.7	4	4
Iron	mg/L	ND	0.581	0.3	2	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.04	0.84	0.415	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.12	7.77	7.43	4	4
Phosphorous	mg/L	ND	0.08	0.0562	3	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	19.7	27.8	22.5	4	4
Suspended Solids	mg/L	ND	ND	ND	0	4
Temperature	deg F	41.6	72.8	53.5	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	0.8	4.9	2.58	4	4
Uranium	mg/L	ND	ND	ND	0	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.12 Non-Radiological Monitoring Data for Surface Water Location K002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	3.25	1.42	3	4
Ammonia	mg/L	ND	0.95	0.312	1	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	ND	558	145	3	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	167	1960	637	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	6.01	9.55	7.92	4	4
Flow Rate	mgd	0.0195	0.185	0.067	4	4
Hardness - Total as CaCO3	mg/L	62	275	128	4	4
Iron	mg/L	ND	2.51	1.15	3	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.05	938	235	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.4	8.06	7.59	4	4
Phosphorous	mg/L	0.13	0.3	0.212	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	6.5	60.7	33.8	4	4
Suspended Solids	mg/L	ND	30	18.2	2	4
Temperature	deg F	41.8	82.8	59.2	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	4.6	38	23.6	4	4
Uranium	mg/L	ND	0.0126	0.00502	4	5
Zinc	mg/L	ND	0.1	0.0553	1	4

Surface Water Non-Radiological Data

Table 4.13 Non-Radiological Monitoring Data for Surface Water Location K010

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	0.234	0.134	1	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	13.4	39.3	23.8	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	293	339	313	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	6.55	9.42	8.21	4	4
Flow Rate	mgd	ND	0.6	0.381	3	4
Hardness - Total as CaCO3	mg/L	61	94	75.5	4	4
Iron	mg/L	ND	0.336	0.241	3	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.43	1.25	0.805	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.11	8.2	7.63	4	4
Phosphorous	mg/L	0.2	0.34	0.265	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	51.7	74	63.8	4	4
Suspended Solids	mg/L	ND	24	11	1	4
Temperature	deg F	61.6	88.2	72	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	1.7	7.4	3.92	4	4
Uranium	mg/L	0.002	0.052	0.0174	5	5
Zinc	mg/L	ND	0.1	0.052	1	4

Surface Water Non-Radiological Data

Table 4.14 Non-Radiological Monitoring Data for Surface Water Location K011

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	0.738	0.421	3	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	3.4	65.4	35.5	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	108	614	380	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	6.68	10.9	8.93	4	4
Flow Rate	mgd	ND	0.937	0.373	3	4
Hardness - Total as CaCO3	mg/L	47	204	129	4	4
Iron	mg/L	ND	0.497	0.393	3	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.13	1.4	0.632	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	0.414	0.204	2	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.5	7.7	7.59	4	4
Phosphorous	mg/L	0.16	0.26	0.193	4	4
Polychlorinated biphenyl	ug/L	ND	0.414	0.214	2	4
Sulfate	mg/L	7.1	22	14.9	4	4
Suspended Solids	mg/L	ND	ND	ND	0	4
Temperature	deg F	45.7	74.1	56.4	4	4
Trichloroethene	ug/L	ND	130	43.4	3	4
Turbidity	NTU	5	18	10.8	4	4
Uranium	mg/L	0.039	0.408	0.221	5	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.15 Non-Radiological Monitoring Data for Surface Water Location K012

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	0.727	0.286	2	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	11.4	62.8	36.6	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	348	767	519	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	6.72	11	8.57	4	4
Flow Rate	mgd	ND	0.118	0.067	3	4
Hardness - Total as CaCO3	mg/L	125	147	139	4	4
Iron	mg/L	0.295	1.36	0.764	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.02	0.56	0.252	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	6.91	7.79	7.39	4	4
Phosphorous	mg/L	0.08	0.18	0.127	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	18.9	66.2	42.2	4	4
Suspended Solids	mg/L	ND	22	11.7	1	4
Temperature	deg F	39.8	74.3	53.9	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	1.9	18	7.67	4	4
Uranium	mg/L	ND	0.012	0.0055	4	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.16 Non-Radiological Monitoring Data for Surface Water Location K013

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	5
Acetone	ug/L	ND	ND	ND	0	5
Aluminum	mg/L	ND	1.61	0.51	2	5
Ammonia	mg/L	ND	ND	ND	0	5
Biochemical Oxygen Demand (BOD)	mg/L	ND	12	6.4	1	5
Cadmium	mg/L	ND	ND	ND	0	5
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	5
Chloride	mg/L	ND	945	203	4	5
Chromium	mg/L	ND	ND	ND	0	5
Conductivity	umho/cm	213	3070	990	5	5
Copper	mg/L	ND	ND	ND	0	5
Cyanide	mg/L	ND	ND	ND	0	5
Dissolved Oxygen	mg/L	4.94	11.4	8.6	5	5
Flow Rate	mgd	ND	0.73	0.194	3	5
Hardness - Total as CaCO3	mg/L	45	259	179	5	5
Iron	mg/L	ND	1.76	0.668	4	5
Lead	mg/L	ND	ND	ND	0	5
Nickel	mg/L	ND	ND	ND	0	5
Nitrate/Nitrite as Nitrogen	mg/L	0.18	1.7	0.582	5	5
PCB-1016	ug/L	ND	ND	ND	0	5
PCB-1221	ug/L	ND	ND	ND	0	5
PCB-1232	ug/L	ND	ND	ND	0	5
PCB-1242	ug/L	ND	ND	ND	0	5
PCB-1248	ug/L	ND	ND	ND	0	5
PCB-1254	ug/L	ND	ND	ND	0	5
PCB-1260	ug/L	ND	ND	ND	0	5
PCB-1268	ug/L	ND	ND	ND	0	5
pH	Std Unit	6.24	7.7	6.99	5	5
Phosphorous	mg/L	ND	0.27	0.121	4	5
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	5
Sulfate	mg/L	24	137	92.9	5	5
Suspended Solids	mg/L	ND	26	12.1	1	5
Temperature	deg F	35.1	75.8	50.7	5	5
Trichloroethene	ug/L	ND	ND	ND	0	5
Turbidity	NTU	4.4	24	9.74	5	5
Uranium	mg/L	ND	0.005	0.00215	3	6
Zinc	mg/L	ND	0.5	0.104	1	5

Surface Water Non-Radiological Data

Table 4.17 Non-Radiological Monitoring Data for Surface Water Location L10

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	0.214	1.61	0.656	4	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	25.3	85	40.6	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	305	465	360	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	7.09	11.9	9.19	4	4
Flow Rate	mgd	ND	2.91	1.43	3	4
Hardness - Total as CaCO3	mg/L	65	104	84.5	4	4
Iron	mg/L	0.284	1.1	0.653	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.44	0.92	0.672	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.03	7.53	7.29	4	4
Phosphorous	mg/L	0.13	0.23	0.187	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	34.9	62.7	47.6	4	4
Suspended Solids	mg/L	ND	ND	ND	0	4
Temperature	deg F	43.7	75.8	56.7	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	4.1	16	8.25	4	4
Uranium	mg/L	0.002	0.021	0.013	5	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.18 Non-Radiological Monitoring Data for Surface Water Location L194

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	1.11	0.474	2	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	10.5	93.7	38.1	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	233	547	359	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	5.59	9.34	8.33	4	4
Flow Rate	mgd	ND	3.82	1.81	3	4
Hardness - Total as CaCO3	mg/L	57	118	83.2	4	4
Iron	mg/L	0.211	1.38	0.626	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.42	1.3	0.723	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.1	7.71	7.47	4	4
Phosphorous	mg/L	0.16	0.31	0.205	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	34.9	72.1	56.8	4	4
Suspended Solids	mg/L	ND	44	21	2	4
Temperature	deg F	48.7	83.6	62.3	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	3.7	19	8.4	4	4
Uranium	mg/L	0.001	0.0322	0.014	5	5
Zinc	mg/L	ND	0.1	0.0505	1	4

Surface Water Non-Radiological Data

Table 4.19 Non-Radiological Monitoring Data for Surface Water Location L55

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/L	ND	ND	ND	0	3
2,4'-DDD	ug/L	ND	ND	ND	0	3
2,4'-DDE	ug/L	ND	ND	ND	0	3
2,4'-DDT	ug/L	ND	ND	ND	0	3
2,6-Dimethylnaphthalene	ug/L	ND	ND	ND	0	3
2-Methylnaphthalene	ug/L	ND	ND	ND	0	3
4,4'-DDD	ug/L	ND	ND	ND	0	3
4,4'-DDE	ug/L	ND	ND	ND	0	3
4,4'-DDT	ug/L	ND	ND	ND	0	3
Acenaphthene	ug/L	ND	ND	ND	0	3
Acenaphthylene	ug/L	ND	ND	ND	0	3
Aldrin	ug/L	ND	ND	ND	0	3
alpha-BHC	ug/L	ND	ND	ND	0	3
alpha-Chlordane	ug/L	ND	ND	ND	0	3
Aluminum	mg/L	0.487	1.62	0.887	3	3
Anthracene	ug/L	ND	ND	ND	0	3
Antimony	mg/L	ND	ND	ND	0	3
Arsenic	mg/L	ND	ND	ND	0	3
Azinphos-methyl	ug/L	ND	ND	ND	0	3
Barium	mg/L	0.11	0.146	0.132	3	3
Benz(a)anthracene	ug/L	ND	ND	ND	0	3
Benzo(a)pyrene	ug/L	ND	ND	ND	0	3
Benzo(b)fluoranthene	ug/L	ND	ND	ND	0	3
Benzo(e)pyrene	ug/L	ND	ND	ND	0	3
Benzo(ghi)perylene	ug/L	ND	ND	ND	0	3
Benzo(k)fluoranthene	ug/L	ND	ND	ND	0	3
Beryllium	mg/L	ND	ND	ND	0	3
beta-BHC	ug/L	ND	ND	ND	0	3
Cadmium	mg/L	ND	ND	ND	0	3
Chlordane	ug/L	ND	ND	ND	0	3
Chromium	mg/L	ND	ND	ND	0	3
Chrysene	ug/L	ND	ND	ND	0	3
Chrysene C1	ug/L	ND	ND	ND	0	3
Co-Ral	ug/L	ND	ND	ND	0	3
Cobalt	mg/L	ND	ND	ND	0	3
Conductivity	umho/cm	419	557	511	3	3
Copper	mg/L	ND	ND	ND	0	3
delta-BHC	ug/L	ND	ND	ND	0	3
Diazinon	ug/L	ND	ND	ND	0	3
Dibenz(a,h)anthracene	ug/L	ND	ND	ND	0	3
Dibenzothiophene	ug/L	ND	ND	ND	0	1
Dibenzothiophene C1	ug/L	ND	ND	ND	0	3
Dibenzothiophene C2	ug/L	ND	ND	ND	0	3
Dichlorvos	ug/L	ND	ND	ND	0	3
Dieldrin	ug/L	ND	ND	ND	0	3
Dimethoate	ug/L	ND	ND	ND	0	3
Dissolved Oxygen	mg/L	5.01	11.3	7.1	3	3

Surface Water Non-Radiological Data

Table 4.19 Non-Radiological Monitoring Data for Surface Water Location L55

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/L	ND	ND	ND	0	3
Endosulfan II	ug/L	ND	ND	ND	0	3
Endosulfan sulfate	ug/L	ND	ND	ND	0	3
Endrin	ug/L	ND	ND	ND	0	3
Endrin aldehyde	ug/L	ND	ND	ND	0	3
Ethion	ug/L	ND	ND	ND	0	3
Famphur	ug/L	ND	ND	ND	0	3
Fensulfothion	ug/L	ND	ND	ND	0	3
Fenthion	ug/L	ND	ND	ND	0	3
Flow Rate	mgd	ND	0.06	0.0483	2	3
Fluoranthene	ug/L	ND	ND	ND	0	3
Fluoranthene C1	ug/L	ND	ND	ND	0	3
Fluorene	ug/L	ND	ND	ND	0	3
Fluorene C1	ug/L	ND	ND	ND	0	3
Fluorene C2	ug/L	ND	ND	ND	0	3
gamma-Chlordane	ug/L	ND	ND	ND	0	3
Heptachlor	ug/L	ND	ND	ND	0	3
Heptachlor epoxide	ug/L	ND	ND	ND	0	3
Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	ND	0	3
Iron	mg/L	0.419	1.29	0.878	3	3
Lead	mg/L	ND	ND	ND	0	3
Lindane	ug/L	ND	ND	ND	0	3
Malathion	ug/L	ND	ND	ND	0	3
Manganese	mg/L	0.051	0.197	0.102	3	3
Mercury	mg/L	ND	ND	ND	0	3
Methoxychlor	ug/L	ND	ND	ND	0	3
Methyl parathion	ug/L	ND	ND	ND	0	3
Mirex	ug/L	ND	ND	ND	0	3
Mocap	ug/L	ND	ND	ND	0	3
Molybdenum	mg/L	ND	ND	ND	0	3
Naphthalene	ug/L	ND	ND	ND	0	3
Naphthalene C1	ug/L	ND	ND	ND	0	3
Naphthalene C2	ug/L	ND	ND	ND	0	3
Naphthalene C3	ug/L	ND	ND	ND	0	3
Naphthalene C4	ug/L	ND	ND	ND	0	3
Nickel	mg/L	ND	ND	ND	0	3
Parathion	ug/L	ND	ND	ND	0	3
Perylene	ug/L	ND	ND	ND	0	3
pH	Std Unit	6.94	7.04	7.01	3	3
Phenanthrene	ug/L	ND	ND	ND	0	3
Phenanthrene C1	ug/L	ND	ND	ND	0	3
Phenanthrene C2	ug/L	ND	ND	ND	0	3
Phenanthrene C3	ug/L	ND	ND	ND	0	3
Phenanthrene C4	ug/L	ND	ND	ND	0	3
Phorate	ug/L	ND	ND	ND	0	3
Pyrene	ug/L	ND	ND	ND	0	3
Pyrene C1	ug/L	ND	ND	ND	0	1

Surface Water Non-Radiological Data

Table 4.19 Non-Radiological Monitoring Data for Surface Water Location L55

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Selenium	mg/L	ND	ND	ND	0	3
Silver	mg/L	ND	ND	ND	0	3
Strontium	mg/L	0.298	0.909	0.699	3	3
Temperature	deg F	47.6	71.4	63.5	3	3
Thallium	mg/L	ND	ND	ND	0	3
Toxaphene	ug/L	ND	ND	ND	0	3
Trichloroethene	ug/L	ND	ND	ND	0	3
Uranium	mg/L	0.004	0.006	0.00533	3	3
Vanadium	mg/L	ND	ND	ND	0	3
Zinc	mg/L	ND	ND	ND	0	3

Surface Water Non-Radiological Data

Table 4.20 Non-Radiological Monitoring Data for Surface Water Location L56

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	0.288	1.37	0.791	4	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	18.5	122	56.4	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	249	694	456	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	8.09	11.3	9.16	4	4
Flow Rate	mgd	ND	0.9	0.379	3	4
Hardness - Total as CaCO3	mg/L	89	156	111	4	4
Iron	mg/L	0.333	2.14	1.1	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.32	0.71	0.545	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	6.8	7.03	6.96	4	4
Phosphorous	mg/L	ND	0.21	0.0925	2	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	16.5	63.1	29.5	4	4
Suspended Solids	mg/L	ND	25	13.6	1	4
Temperature	deg F	43.2	74.1	55.1	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	5	18	10.6	4	4
Uranium	mg/L	ND	0.005	0.00117	1	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.21 Non-Radiological Monitoring Data for Surface Water Location L11

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	0.24	2.04	0.786	4	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	11.8	79	32.4	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	209	432	292	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	5.47	11.1	8.08	4	4
Flow Rate	mgd	ND	4.37	2.65	3	4
Hardness - Total as CaCO3	mg/L	43	85	66.5	4	4
Iron	mg/L	0.544	1.41	0.908	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.33	0.47	0.385	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.1	7.33	7.23	4	4
Phosphorous	mg/L	0.1	0.27	0.165	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	29.4	59.8	38.4	4	4
Suspended Solids	mg/L	ND	41	17.7	1	4
Temperature	deg F	40.5	73.1	55.4	4	4
Trichloroethene	ug/L	ND	1	0.625	1	4
Turbidity	NTU	8.8	2450	626	4	4
Uranium	mg/L	0.002	0.01	0.00653	5	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.22 Non-Radiological Monitoring Data for Surface Water Location L12

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/L	ND	ND	ND	0	2
2,4'-DDD	ug/L	ND	ND	ND	0	2
2,4'-DDE	ug/L	ND	ND	ND	0	2
2,4'-DDT	ug/L	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/L	ND	ND	ND	0	2
2-Methylnaphthalene	ug/L	ND	ND	ND	0	2
4,4'-DDD	ug/L	ND	ND	ND	0	2
4,4'-DDE	ug/L	ND	ND	ND	0	2
4,4'-DDT	ug/L	ND	ND	ND	0	2
Acenaphthene	ug/L	ND	ND	ND	0	2
Acenaphthylene	ug/L	ND	ND	ND	0	2
Aldrin	ug/L	ND	ND	ND	0	2
alpha-BHC	ug/L	ND	ND	ND	0	2
alpha-Chlordane	ug/L	ND	ND	ND	0	2
Aluminum	mg/L	ND	1.34	0.72	1	2
Anthracene	ug/L	ND	ND	ND	0	2
Antimony	mg/L	ND	ND	ND	0	2
Arsenic	mg/L	ND	ND	ND	0	2
Azinphos-methyl	ug/L	ND	ND	ND	0	2
Barium	mg/L	0.076	0.08	0.078	2	2
Benz(a)anthracene	ug/L	ND	ND	ND	0	2
Benzo(a)pyrene	ug/L	ND	ND	ND	0	2
Benzo(b)fluoranthene	ug/L	ND	ND	ND	0	2
Benzo(e)pyrene	ug/L	ND	ND	ND	0	2
Benzo(ghi)perylene	ug/L	ND	ND	ND	0	2
Benzo(k)fluoranthene	ug/L	ND	ND	ND	0	2
Beryllium	mg/L	ND	ND	ND	0	2
beta-BHC	ug/L	ND	ND	ND	0	2
Cadmium	mg/L	ND	ND	ND	0	2
Chlordane	ug/L	ND	ND	ND	0	2
Chromium	mg/L	ND	ND	ND	0	2
Chrysene	ug/L	ND	ND	ND	0	2
Chrysene C1	ug/L	ND	ND	ND	0	2
Co-Ral	ug/L	ND	ND	ND	0	2
Cobalt	mg/L	ND	ND	ND	0	2
Conductivity	umho/cm	338	357	348	2	2
Copper	mg/L	ND	ND	ND	0	2
delta-BHC	ug/L	ND	ND	ND	0	2
Demeton	ug/L	ND	ND	ND	0	1
Diazinon	ug/L	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/L	ND	ND	ND	0	2
Dibenzothiophene	ug/L	ND	ND	ND	0	1
Dibenzothiophene C1	ug/L	ND	ND	ND	0	2
Dibenzothiophene C2	ug/L	ND	ND	ND	0	2
Dichlorvos	ug/L	ND	ND	ND	0	2
Dieldrin	ug/L	ND	ND	ND	0	2
Dimethoate	ug/L	ND	ND	ND	0	2

Surface Water Non-Radiological Data

Table 4.22 Non-Radiological Monitoring Data for Surface Water Location L12

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Dissolved Oxygen	mg/L	7.88	7.9	7.89	2	2
Endosulfan I	ug/L	ND	ND	ND	0	2
Endosulfan II	ug/L	ND	ND	ND	0	2
Endosulfan sulfate	ug/L	ND	ND	ND	0	2
Endrin	ug/L	ND	ND	ND	0	2
Endrin aldehyde	ug/L	ND	ND	ND	0	2
Ethion	ug/L	ND	ND	ND	0	2
Famphur	ug/L	ND	ND	ND	0	2
Fensulfothion	ug/L	ND	ND	ND	0	2
Fenthion	ug/L	ND	ND	ND	0	2
Flow Rate	mgd	ND	8.26	5.93	1	2
Fluoranthene	ug/L	ND	ND	ND	0	2
Fluoranthene C1	ug/L	ND	ND	ND	0	2
Fluorene	ug/L	ND	ND	ND	0	2
Fluorene C1	ug/L	ND	ND	ND	0	2
Fluorene C2	ug/L	ND	ND	ND	0	2
gamma-Chlordane	ug/L	ND	ND	ND	0	2
Heptachlor	ug/L	ND	ND	ND	0	2
Heptachlor epoxide	ug/L	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	ND	0	2
Iron	mg/L	0.316	1.61	0.963	2	2
Lead	mg/L	ND	ND	ND	0	2
Lindane	ug/L	ND	ND	ND	0	2
Malathion	ug/L	ND	ND	ND	0	2
Manganese	mg/L	0.45	0.482	0.466	2	2
Mercury	mg/L	ND	ND	ND	0	2
Methoxychlor	ug/L	ND	ND	ND	0	2
Methyl parathion	ug/L	ND	ND	ND	0	2
Mirex	ug/L	ND	ND	ND	0	2
Mocap	ug/L	ND	ND	ND	0	2
Molybdenum	mg/L	ND	ND	ND	0	2
Naphthalene	ug/L	ND	ND	ND	0	2
Naphthalene C1	ug/L	ND	ND	ND	0	2
Naphthalene C2	ug/L	ND	ND	ND	0	2
Naphthalene C3	ug/L	ND	ND	ND	0	2
Naphthalene C4	ug/L	ND	ND	ND	0	2
Nickel	mg/L	ND	ND	ND	0	2
Parathion	ug/L	ND	ND	ND	0	2
Perylene	ug/L	ND	ND	ND	0	2
pH	Std Unit	6.73	7.03	6.88	2	2
Phenanthrene	ug/L	ND	ND	ND	0	2
Phenanthrene C1	ug/L	ND	ND	ND	0	2
Phenanthrene C2	ug/L	ND	ND	ND	0	2
Phenanthrene C3	ug/L	ND	ND	ND	0	2
Phenanthrene C4	ug/L	ND	ND	ND	0	2
Phorate	ug/L	ND	ND	ND	0	2
Pyrene	ug/L	ND	ND	ND	0	2

Surface Water Non-Radiological Data

Table 4.22 Non-Radiological Monitoring Data for Surface Water Location L12

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Pyrene C1	ug/L	ND	ND	ND	0	1
Selenium	mg/L	ND	ND	ND	0	2
Silver	mg/L	ND	ND	ND	0	2
Strontium	mg/L	0.212	0.312	0.262	2	2
Temperature	deg F	54.6	70.8	62.7	2	2
Thallium	mg/L	ND	ND	ND	0	2
Toxaphene	ug/L	ND	ND	ND	0	2
Trichloroethene	ug/L	3	3	3	2	2
Uranium	mg/L	0.002	0.008	0.005	2	2
Vanadium	mg/L	ND	ND	ND	0	2
Zinc	mg/L	ND	ND	ND	0	2

Surface Water Non-Radiological Data

Table 4.23 Non-Radiological Monitoring Data for Surface Water Location L241

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/L	ND	ND	ND	0	2
2,4'-DDD	ug/L	ND	ND	ND	0	2
2,4'-DDE	ug/L	ND	ND	ND	0	2
2,4'-DDT	ug/L	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/L	ND	ND	ND	0	2
2-Methylnaphthalene	ug/L	ND	ND	ND	0	2
4,4'-DDD	ug/L	ND	ND	ND	0	2
4,4'-DDE	ug/L	ND	ND	ND	0	2
4,4'-DDT	ug/L	ND	ND	ND	0	2
Acenaphthene	ug/L	ND	ND	ND	0	2
Acenaphthylene	ug/L	ND	ND	ND	0	2
Aldrin	ug/L	ND	ND	ND	0	2
alpha-BHC	ug/L	ND	ND	ND	0	2
alpha-Chlordane	ug/L	ND	ND	ND	0	2
Aluminum	mg/L	0.243	0.572	0.407	2	2
Anthracene	ug/L	ND	ND	ND	0	2
Antimony	mg/L	ND	ND	ND	0	2
Arsenic	mg/L	ND	ND	ND	0	2
Azinphos-methyl	ug/L	ND	ND	ND	0	2
Barium	mg/L	0.069	0.101	0.085	2	2
Benz(a)anthracene	ug/L	ND	ND	ND	0	2
Benzo(a)pyrene	ug/L	ND	ND	ND	0	2
Benzo(b)fluoranthene	ug/L	ND	ND	ND	0	2
Benzo(e)pyrene	ug/L	ND	ND	ND	0	2
Benzo(ghi)perylene	ug/L	ND	ND	ND	0	2
Benzo(k)fluoranthene	ug/L	ND	ND	ND	0	2
Beryllium	mg/L	ND	ND	ND	0	2
beta-BHC	ug/L	ND	ND	ND	0	2
Cadmium	mg/L	ND	ND	ND	0	2
Chlordane	ug/L	ND	ND	ND	0	2
Chromium	mg/L	ND	ND	ND	0	2
Chrysene	ug/L	ND	ND	ND	0	2
Chrysene C1	ug/L	ND	ND	ND	0	2
Co-Ral	ug/L	ND	ND	ND	0	2
Cobalt	mg/L	ND	ND	ND	0	2
Conductivity	umho/cm	212	319	266	2	2
Copper	mg/L	ND	ND	ND	0	2
delta-BHC	ug/L	ND	ND	ND	0	2
Diazinon	ug/L	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/L	ND	ND	ND	0	2
Dibenzothiophene	ug/L	ND	ND	ND	0	1
Dibenzothiophene C1	ug/L	ND	ND	ND	0	2
Dibenzothiophene C2	ug/L	ND	ND	ND	0	2
Dichlorvos	ug/L	ND	ND	ND	0	2
Dieldrin	ug/L	ND	ND	ND	0	2
Dimethoate	ug/L	ND	ND	ND	0	2
Dissolved Oxygen	mg/L	7.07	11.1	9.06	2	2

Surface Water Non-Radiological Data

Table 4.23 Non-Radiological Monitoring Data for Surface Water Location L241

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/L	ND	0.05	0.0225	1	2
Endosulfan II	ug/L	ND	ND	ND	0	2
Endosulfan sulfate	ug/L	ND	ND	ND	0	2
Endrin	ug/L	ND	ND	ND	0	2
Endrin aldehyde	ug/L	ND	ND	ND	0	2
Ethion	ug/L	ND	ND	ND	0	2
Famphur	ug/L	ND	ND	ND	0	2
Fensulfothion	ug/L	ND	ND	ND	0	2
Fenthion	ug/L	ND	ND	ND	0	2
Flow Rate	mgd	ND	5.24	2.9	1	2
Fluoranthene	ug/L	ND	ND	ND	0	2
Fluoranthene C1	ug/L	ND	ND	ND	0	2
Fluorene	ug/L	ND	ND	ND	0	2
Fluorene C1	ug/L	ND	ND	ND	0	2
Fluorene C2	ug/L	ND	ND	ND	0	2
gamma-Chlordane	ug/L	ND	ND	ND	0	2
Heptachlor	ug/L	ND	ND	ND	0	2
Heptachlor epoxide	ug/L	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	ND	0	2
Iron	mg/L	0.448	0.849	0.648	2	2
Lead	mg/L	ND	ND	ND	0	2
Lindane	ug/L	ND	ND	ND	0	2
Malathion	ug/L	ND	ND	ND	0	2
Manganese	mg/L	0.066	0.141	0.103	2	2
Mercury	mg/L	ND	ND	ND	0	2
Methoxychlor	ug/L	ND	ND	ND	0	2
Methyl parathion	ug/L	ND	ND	ND	0	2
Mirex	ug/L	ND	ND	ND	0	2
Mocap	ug/L	ND	ND	ND	0	2
Molybdenum	mg/L	ND	ND	ND	0	2
Naphthalene	ug/L	ND	ND	ND	0	2
Naphthalene C1	ug/L	ND	ND	ND	0	2
Naphthalene C2	ug/L	ND	ND	ND	0	2
Naphthalene C3	ug/L	ND	ND	ND	0	2
Naphthalene C4	ug/L	ND	ND	ND	0	2
Nickel	mg/L	ND	ND	ND	0	2
Parathion	ug/L	ND	ND	ND	0	2
Perylene	ug/L	ND	ND	ND	0	2
pH	Std Unit	6.7	6.79	6.74	2	2
Phenanthrene	ug/L	ND	ND	ND	0	2
Phenanthrene C1	ug/L	ND	ND	ND	0	2
Phenanthrene C2	ug/L	ND	ND	ND	0	2
Phenanthrene C3	ug/L	ND	ND	ND	0	2
Phenanthrene C4	ug/L	ND	ND	ND	0	2
Phorate	ug/L	ND	ND	ND	0	2
Pyrene	ug/L	ND	ND	ND	0	2
Pyrene C1	ug/L	ND	ND	ND	0	1

Surface Water Non-Radiological Data

Table 4.23 Non-Radiological Monitoring Data for Surface Water Location L241

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Selenium	mg/L	ND	ND	ND	0	2
Silver	mg/L	ND	ND	ND	0	2
Strontium	mg/L	0.212	0.246	0.229	2	2
Temperature	deg F	43.1	71.2	57.1	2	2
Thallium	mg/L	ND	ND	ND	0	2
Toxaphene	ug/L	ND	ND	ND	0	2
Trichloroethene	ug/L	14	40	27	2	2
Uranium	mg/L	0.002	0.005	0.0035	2	2
Vanadium	mg/L	ND	ND	ND	0	2
Zinc	mg/L	ND	ND	ND	0	2

Surface Water Non-Radiological Data

Table 4.24 Non-Radiological Monitoring Data for Surface Water Location LBCN1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	0.267	2.46	0.891	4	4
Ammonia	mg/L	ND	0.57	0.217	1	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	9.9	60.6	26.5	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	187	380	268	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	5.41	11.5	8.73	4	4
Flow Rate	mgd	ND	4.99	2.45	3	4
Hardness - Total as CaCO3	mg/L	63	86	72.7	4	4
Iron	mg/L	0.621	2.44	1.19	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.34	0.83	0.48	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7	7.4	7.19	4	4
Phosphorous	mg/L	0.1	0.36	0.182	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	23.4	57.6	36.4	4	4
Suspended Solids	mg/L	ND	70	26.4	2	4
Temperature	deg F	40.1	74.3	55.9	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	12	27	20.7	4	4
Uranium	mg/L	0.003	0.0119	0.00697	4	4
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.25 Non-Radiological Monitoring Data for Surface Water Location C746K-5

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	6
Acetone	ug/L	ND	ND	ND	0	6
Aluminum	mg/L	ND	0.354	0.224	3	6
Ammonia	mg/L	ND	ND	ND	0	6
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	6
Cadmium	mg/L	ND	ND	ND	0	6
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	6
Chloride	mg/L	6.2	13.8	9.78	6	6
Chromium	mg/L	ND	ND	ND	0	6
Conductivity	umho/cm	161	247	205	6	6
Copper	mg/L	ND	ND	ND	0	6
Cyanide	mg/L	ND	ND	ND	0	6
Dissolved Oxygen	mg/L	7.58	11.1	9.09	6	6
Flow Rate	mgd	ND	6.51	2.74	5	6
Hardness - Total as CaCO3	mg/L	63	74	67.2	6	6
Iron	mg/L	ND	0.786	0.521	4	6
Lead	mg/L	ND	ND	ND	0	6
Nickel	mg/L	ND	ND	ND	0	6
Nitrate/Nitrite as Nitrogen	mg/L	0.09	0.76	0.482	6	6
PCB-1016	ug/L	ND	ND	ND	0	6
PCB-1221	ug/L	ND	ND	ND	0	6
PCB-1232	ug/L	ND	ND	ND	0	6
PCB-1242	ug/L	ND	ND	ND	0	6
PCB-1248	ug/L	ND	ND	ND	0	6
PCB-1254	ug/L	ND	ND	ND	0	6
PCB-1260	ug/L	ND	ND	ND	0	6
PCB-1268	ug/L	ND	0.173	0.0872	1	6
pH	Std Unit	6.83	7.7	7.32	6	6
Phosphorous	mg/L	ND	0.09	0.0567	4	6
Polychlorinated biphenyl	ug/L	ND	0.173	0.0997	1	6
Sulfate	mg/L	21.9	39.9	32.5	6	6
Suspended Solids	mg/L	ND	ND	ND	0	6
Temperature	deg F	47.1	78.5	61.2	6	6
Trichloroethene	ug/L	ND	ND	ND	0	6
Turbidity	NTU	1.3	7.1	4.23	6	6
Uranium	mg/L	ND	ND	ND	0	7
Zinc	mg/L	ND	ND	ND	0	6

Surface Water Non-Radiological Data

Table 4.26 Non-Radiological Monitoring Data for Surface Water Location C746KTB1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	0.491	10.4	3.78	4	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	0.029	0.0124	1	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	2.3	13.1	8.28	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	63.9	186	127	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	8.37	10.7	9.37	4	4
Flow Rate	mgd	ND	30.6	8.77	3	4
Hardness - Total as CaCO3	mg/L	27	50	42.2	4	4
Iron	mg/L	0.291	10	3.41	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.5	1.2	0.82	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.15	7.32	7.21	4	4
Phosphorous	mg/L	ND	1.12	0.356	3	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	ND	26.6	15.7	3	4
Suspended Solids	mg/L	ND	342	91	1	4
Temperature	deg F	39.6	69.4	51.9	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	4	140	45	4	4
Uranium	mg/L	ND	ND	ND	0	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.27 Non-Radiological Monitoring Data for Surface Water Location C746KTB2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	0.364	7.03	2.54	4	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	0.021	0.0104	1	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	3.4	19.8	10.5	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	138	204	170	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	6.52	11.4	9.45	4	4
Flow Rate	mgd	ND	32.8	9.13	3	4
Hardness - Total as CaCO3	mg/L	50	54	52.2	4	4
Iron	mg/L	0.347	7.24	2.39	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.47	0.68	0.542	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	6.87	7.5	7.3	4	4
Phosphorous	mg/L	0.05	0.75	0.26	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	8.8	23.8	15.9	4	4
Suspended Solids	mg/L	ND	300	80.5	1	4
Temperature	deg F	39.7	70.1	52.7	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	6.2	75	29	4	4
Uranium	mg/L	ND	ND	ND	0	6
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.28 Non-Radiological Monitoring Data for Surface Water Location C746KUP

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	0.389	0.198	2	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	4.7	14.8	10.6	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	138	244	202	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	6.17	12.1	9.27	4	4
Flow Rate	mgd	ND	3.15	1.21	3	4
Hardness - Total as CaCO3	mg/L	55	72	61.7	4	4
Iron	mg/L	ND	0.603	0.276	2	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.04	0.78	0.46	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	6.82	7.46	7.23	4	4
Phosphorous	mg/L	ND	0.1	0.0637	3	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	18.3	37.1	26.4	4	4
Suspended Solids	mg/L	ND	ND	ND	0	4
Temperature	deg F	45	78.4	55.9	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	1.1	6.8	3.25	4	4
Uranium	mg/L	ND	ND	ND	0	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.29 Non-Radiological Monitoring Data for Surface Water Location L8

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/L	ND	ND	ND	0	2
2,4'-DDD	ug/L	ND	ND	ND	0	2
2,4'-DDE	ug/L	ND	ND	ND	0	2
2,4'-DDT	ug/L	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/L	ND	ND	ND	0	2
2-Methylnaphthalene	ug/L	ND	ND	ND	0	2
4,4'-DDD	ug/L	ND	ND	ND	0	2
4,4'-DDE	ug/L	ND	ND	ND	0	2
4,4'-DDT	ug/L	ND	ND	ND	0	2
Acenaphthene	ug/L	ND	ND	ND	0	2
Acenaphthylene	ug/L	ND	ND	ND	0	2
Aldrin	ug/L	ND	ND	ND	0	2
alpha-BHC	ug/L	ND	ND	ND	0	2
alpha-Chlordane	ug/L	ND	ND	ND	0	2
Aluminum	mg/L	0.48	0.601	0.54	2	2
Anthracene	ug/L	ND	ND	ND	0	2
Antimony	mg/L	ND	ND	ND	0	2
Arsenic	mg/L	ND	ND	ND	0	2
Azinphos-methyl	ug/L	ND	ND	ND	0	2
Barium	mg/L	0.06	0.07	0.065	2	2
Benz(a)anthracene	ug/L	ND	ND	ND	0	2
Benzo(a)pyrene	ug/L	ND	ND	ND	0	2
Benzo(b)fluoranthene	ug/L	ND	ND	ND	0	2
Benzo(e)pyrene	ug/L	ND	ND	ND	0	2
Benzo(ghi)perylene	ug/L	ND	ND	ND	0	2
Benzo(k)fluoranthene	ug/L	ND	ND	ND	0	2
Beryllium	mg/L	ND	ND	ND	0	2
beta-BHC	ug/L	ND	ND	ND	0	2
Cadmium	mg/L	ND	ND	ND	0	2
Chlordane	ug/L	ND	ND	ND	0	2
Chromium	mg/L	ND	ND	ND	0	2
Chrysene	ug/L	ND	ND	ND	0	2
Chrysene C1	ug/L	ND	ND	ND	0	2
Co-Ral	ug/L	ND	ND	ND	0	2
Cobalt	mg/L	ND	ND	ND	0	2
Conductivity	umho/cm	278	578	428	2	2
Copper	mg/L	ND	ND	ND	0	2
delta-BHC	ug/L	ND	ND	ND	0	2
Diazinon	ug/L	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/L	ND	ND	ND	0	2
Dibenzothiophene	ug/L	ND	ND	ND	0	1
Dibenzothiophene C1	ug/L	ND	ND	ND	0	2
Dibenzothiophene C2	ug/L	ND	ND	ND	0	2
Dichlorvos	ug/L	ND	ND	ND	0	2
Dieldrin	ug/L	ND	ND	ND	0	2
Dimethoate	ug/L	ND	ND	ND	0	2
Dissolved Oxygen	mg/L	7.5	10.4	8.96	2	2

Surface Water Non-Radiological Data

Table 4.29 Non-Radiological Monitoring Data for Surface Water Location L8

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/L	ND	ND	ND	0	2
Endosulfan II	ug/L	ND	ND	ND	0	2
Endosulfan sulfate	ug/L	ND	ND	ND	0	2
Endrin	ug/L	ND	ND	ND	0	2
Endrin aldehyde	ug/L	ND	ND	ND	0	2
Ethion	ug/L	ND	ND	ND	0	2
Famphur	ug/L	ND	ND	ND	0	2
Fensulfothion	ug/L	ND	ND	ND	0	2
Fenthion	ug/L	ND	ND	ND	0	2
Fluoranthene	ug/L	ND	ND	ND	0	2
Fluoranthene C1	ug/L	ND	ND	ND	0	2
Fluorene	ug/L	ND	ND	ND	0	2
Fluorene C1	ug/L	ND	ND	ND	0	2
Fluorene C2	ug/L	ND	ND	ND	0	2
gamma-Chlordane	ug/L	ND	ND	ND	0	2
Heptachlor	ug/L	ND	ND	ND	0	2
Heptachlor epoxide	ug/L	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	ND	0	2
Iron	mg/L	0.792	1.08	0.936	2	2
Lead	mg/L	ND	ND	ND	0	2
Lindane	ug/L	ND	ND	ND	0	2
Malathion	ug/L	ND	ND	ND	0	2
Manganese	mg/L	0.365	0.429	0.397	2	2
Mercury	mg/L	ND	ND	ND	0	2
Methoxychlor	ug/L	ND	ND	ND	0	2
Methyl parathion	ug/L	ND	ND	ND	0	2
Mirex	ug/L	ND	ND	ND	0	2
Mocap	ug/L	ND	ND	ND	0	2
Molybdenum	mg/L	ND	ND	ND	0	2
Naphthalene	ug/L	ND	ND	ND	0	2
Naphthalene C1	ug/L	ND	ND	ND	0	2
Naphthalene C2	ug/L	ND	ND	ND	0	2
Naphthalene C3	ug/L	ND	ND	ND	0	2
Naphthalene C4	ug/L	ND	ND	ND	0	2
Nickel	mg/L	ND	ND	ND	0	2
Parathion	ug/L	ND	ND	ND	0	2
Perylene	ug/L	ND	ND	ND	0	2
pH	Std Unit	6.9	7	6.95	2	2
Phenanthrene	ug/L	ND	ND	ND	0	2
Phenanthrene C1	ug/L	ND	ND	ND	0	2
Phenanthrene C2	ug/L	ND	ND	ND	0	2
Phenanthrene C3	ug/L	ND	ND	ND	0	2
Phenanthrene C4	ug/L	ND	ND	ND	0	2
Phorate	ug/L	ND	ND	ND	0	2
Pyrene	ug/L	ND	ND	ND	0	2
Pyrene C1	ug/L	ND	ND	ND	0	1
Selenium	mg/L	ND	ND	ND	0	2

Surface Water Non-Radiological Data

Table 4.29 Non-Radiological Monitoring Data for Surface Water Location L8

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Silver	mg/L	ND	ND	ND	0	2
Strontium	mg/L	0.192	0.244	0.218	2	2
Temperature	deg F	51.7	74.5	63.1	2	2
Thallium	mg/L	ND	ND	ND	0	2
Toxaphene	ug/L	ND	ND	ND	0	2
Trichloroethene	ug/L	ND	2	1.25	1	2
Uranium	mg/L	0.001	0.01	0.0055	2	2
Vanadium	mg/L	ND	ND	ND	0	2
Zinc	mg/L	ND	ND	ND	0	2

Surface Water Non-Radiological Data

Table 4.30 Non-Radiological Monitoring Data for Surface Water Location L29

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	1.97	0.945	2	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	11	6.5	1	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	6	15.4	9.47	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	108	274	193	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	7.41	11.5	9.47	4	4
Hardness - Total as CaCO3	mg/L	63	220	120	4	4
Iron	mg/L	0.221	2.3	1.11	4	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.36	1.18	0.647	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.5	7.7	7.6	4	4
Phosphorous	mg/L	0.05	0.25	0.165	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	11.3	34.6	23	4	4
Suspended Solids	mg/L	ND	46	25.1	2	4
Temperature	deg F	46.7	82.4	61.6	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	8.5	38	22.1	4	4
Uranium	mg/L	ND	ND	ND	0	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.31 Non-Radiological Monitoring Data for Surface Water Location L30

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	1.92	0.741	2	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	6.4	13.6	9.1	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	148	249	196	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	7.51	12	9.42	4	4
Hardness - Total as CaCO3	mg/L	68	113	91	4	4
Iron	mg/L	ND	2.31	0.9	3	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.31	1.25	0.685	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	7.5	7.7	7.6	4	4
Phosphorous	mg/L	0.05	0.24	0.165	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	13.3	31	22.7	4	4
Suspended Solids	mg/L	ND	48	27.5	2	4
Temperature	deg F	48.8	82.6	62.7	4	4
Trichloroethene	ug/L	ND	ND	ND	0	4
Turbidity	NTU	11	34	18.7	4	4
Uranium	mg/L	ND	ND	ND	0	6
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.32 Non-Radiological Monitoring Data for Surface Water Location L306

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	5
Acetone	ug/L	ND	ND	ND	0	5
Aluminum	mg/L	0.354	5.72	2.63	5	5
Ammonia	mg/L	ND	0.36	0.152	1	5
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	5
Cadmium	mg/L	ND	ND	ND	0	5
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	5
Chloride	mg/L	14.5	21	18.3	5	5
Chromium	mg/L	ND	ND	ND	0	5
Conductivity	umho/cm	177	357	296	5	5
Copper	mg/L	ND	0.05	0.0221	1	5
Cyanide	mg/L	ND	ND	ND	0	5
Dissolved Oxygen	mg/L	6.14	10.9	9.02	5	5
Hardness - Total as CaCO3	mg/L	119	162	148	5	5
Iron	mg/L	0.542	7.31	3.36	5	5
Lead	mg/L	ND	ND	ND	0	5
Nickel	mg/L	ND	ND	ND	0	5
Nitrate/Nitrite as Nitrogen	mg/L	0.29	3	1.72	5	5
PCB-1016	ug/L	ND	ND	ND	0	5
PCB-1221	ug/L	ND	ND	ND	0	5
PCB-1232	ug/L	ND	ND	ND	0	5
PCB-1242	ug/L	ND	ND	ND	0	5
PCB-1248	ug/L	ND	ND	ND	0	5
PCB-1254	ug/L	ND	ND	ND	0	5
PCB-1260	ug/L	ND	ND	ND	0	5
PCB-1268	ug/L	ND	ND	ND	0	5
pH	Std Unit	7.6	7.91	7.7	5	5
Phosphorous	mg/L	0.07	0.52	0.35	5	5
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	5
Sulfate	mg/L	33.3	54.7	42.5	5	5
Suspended Solids	mg/L	ND	153	86.9	4	5
Temperature	deg F	43.3	83.1	59.8	5	5
Trichloroethene	ug/L	ND	ND	ND	0	5
Turbidity	NTU	8.6	65	32.1	5	5
Uranium	mg/L	ND	0.005	0.00121	2	7
Zinc	mg/L	ND	ND	ND	0	5

Surface Water Non-Radiological Data

Table 4.33 Non-Radiological Monitoring Data for Surface Water Location L64

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/L	ND	ND	ND	0	3
2,4'-DDD	ug/L	ND	ND	ND	0	3
2,4'-DDE	ug/L	ND	ND	ND	0	3
2,4'-DDT	ug/L	ND	ND	ND	0	3
2,6-Dimethylnaphthalene	ug/L	ND	ND	ND	0	3
2-Methylnaphthalene	ug/L	ND	ND	ND	0	3
4,4'-DDD	ug/L	ND	ND	ND	0	3
4,4'-DDE	ug/L	ND	ND	ND	0	3
4,4'-DDT	ug/L	ND	ND	ND	0	3
Acenaphthene	ug/L	ND	ND	ND	0	3
Acenaphthylene	ug/L	ND	ND	ND	0	3
Aldrin	ug/L	ND	ND	ND	0	3
alpha-BHC	ug/L	ND	ND	ND	0	3
alpha-Chlordane	ug/L	ND	ND	ND	0	3
Aluminum	mg/L	ND	0.318	0.241	2	3
Anthracene	ug/L	ND	ND	ND	0	3
Antimony	mg/L	ND	ND	ND	0	3
Arsenic	mg/L	ND	ND	ND	0	3
Azinphos-methyl	ug/L	ND	ND	ND	0	3
Barium	mg/L	0.037	0.057	0.049	3	3
Benz(a)anthracene	ug/L	ND	ND	ND	0	3
Benzo(a)pyrene	ug/L	ND	ND	ND	0	3
Benzo(b)fluoranthene	ug/L	ND	ND	ND	0	3
Benzo(e)pyrene	ug/L	ND	ND	ND	0	3
Benzo(ghi)perylene	ug/L	ND	ND	ND	0	3
Benzo(k)fluoranthene	ug/L	ND	ND	ND	0	3
Beryllium	mg/L	ND	ND	ND	0	3
beta-BHC	ug/L	ND	ND	ND	0	3
Cadmium	mg/L	ND	ND	ND	0	3
Chlordane	ug/L	ND	ND	ND	0	3
Chromium	mg/L	ND	ND	ND	0	3
Chrysene	ug/L	ND	ND	ND	0	3
Chrysene C1	ug/L	ND	ND	ND	0	3
Co-Ral	ug/L	ND	ND	ND	0	3
Cobalt	mg/L	ND	ND	ND	0	3
Conductivity	umho/cm	113	139	121	3	3
Copper	mg/L	ND	ND	ND	0	3
delta-BHC	ug/L	ND	ND	ND	0	3
Diazinon	ug/L	ND	ND	ND	0	3
Dibenz(a,h)anthracene	ug/L	ND	ND	ND	0	3
Dibenzothiophene	ug/L	ND	ND	ND	0	2
Dibenzothiophene C1	ug/L	ND	ND	ND	0	3
Dibenzothiophene C2	ug/L	ND	ND	ND	0	3
Dichlorvos	ug/L	ND	ND	ND	0	3
Dieldrin	ug/L	ND	ND	ND	0	3
Dimethoate	ug/L	ND	ND	ND	0	3
Dissolved Oxygen	mg/L	4.96	10.9	8.95	3	3

Surface Water Non-Radiological Data

Table 4.33 Non-Radiological Monitoring Data for Surface Water Location L64

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/L	ND	ND	ND	0	3
Endosulfan II	ug/L	ND	ND	ND	0	3
Endosulfan sulfate	ug/L	ND	ND	ND	0	3
Endrin	ug/L	ND	ND	ND	0	3
Endrin aldehyde	ug/L	ND	ND	ND	0	3
Ethion	ug/L	ND	ND	ND	0	3
Famphur	ug/L	ND	ND	ND	0	3
Fensulfothion	ug/L	ND	ND	ND	0	3
Fenthion	ug/L	ND	ND	ND	0	3
Flow Rate	mgd	ND	5.32	2.21	1	3
Fluoranthene	ug/L	ND	ND	ND	0	3
Fluoranthene C1	ug/L	ND	ND	ND	0	3
Fluorene	ug/L	ND	ND	ND	0	3
Fluorene C1	ug/L	ND	ND	ND	0	3
Fluorene C2	ug/L	ND	ND	ND	0	3
gamma-Chlordane	ug/L	ND	ND	ND	0	3
Heptachlor	ug/L	ND	ND	ND	0	3
Heptachlor epoxide	ug/L	ND	ND	ND	0	3
Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	ND	0	3
Iron	mg/L	0.871	0.974	0.928	3	3
Lead	mg/L	ND	ND	ND	0	3
Lindane	ug/L	ND	ND	ND	0	3
Malathion	ug/L	ND	ND	ND	0	3
Manganese	mg/L	0.254	0.274	0.265	3	3
Mercury	mg/L	ND	ND	ND	0	3
Methoxychlor	ug/L	ND	ND	ND	0	3
Methyl parathion	ug/L	ND	ND	ND	0	3
Mirex	ug/L	ND	ND	ND	0	3
Mocap	ug/L	ND	ND	ND	0	3
Molybdenum	mg/L	ND	ND	ND	0	3
Naphthalene	ug/L	ND	ND	ND	0	3
Naphthalene C1	ug/L	ND	ND	ND	0	3
Naphthalene C2	ug/L	ND	ND	ND	0	3
Naphthalene C3	ug/L	ND	ND	ND	0	3
Naphthalene C4	ug/L	ND	ND	ND	0	3
Nickel	mg/L	ND	ND	ND	0	3
Parathion	ug/L	ND	ND	ND	0	3
Perylene	ug/L	ND	ND	ND	0	3
pH	Std Unit	6.24	7.02	6.5	3	3
Phenanthrene	ug/L	ND	ND	ND	0	3
Phenanthrene C1	ug/L	ND	ND	ND	0	3
Phenanthrene C2	ug/L	ND	ND	ND	0	3
Phenanthrene C3	ug/L	ND	ND	ND	0	3
Phenanthrene C4	ug/L	ND	ND	ND	0	3
Phorate	ug/L	ND	ND	ND	0	3
Pyrene	ug/L	ND	ND	ND	0	3
Pyrene C1	ug/L	ND	ND	ND	0	2

Surface Water Non-Radiological Data

Table 4.33 Non-Radiological Monitoring Data for Surface Water Location L64

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Selenium	mg/L	ND	ND	ND	0	3
Silver	mg/L	ND	ND	ND	0	3
Strontium	mg/L	0.072	0.107	0.0917	3	3
Temperature	deg F	43.2	79	55.1	3	3
Thallium	mg/L	ND	ND	ND	0	3
Toxaphene	ug/L	ND	ND	ND	0	3
Trichloroethene	ug/L	ND	ND	ND	0	3
Uranium	mg/L	ND	ND	ND	0	3
Vanadium	mg/L	ND	ND	ND	0	3
Zinc	mg/L	ND	ND	ND	0	3

Surface Water Non-Radiological Data

Table 4.34 Non-Radiological Monitoring Data for Surface Water Seep Location LBCSP1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	10.8	3.67	3	4
Ammonia	mg/L	ND	0.41	0.177	1	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	0.022	0.0106	1	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	35.6	40.6	37.7	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	297	371	332	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	3.7	4.85	4.34	4	4
Hardness - Total as CaCO3	mg/L	92	106	98.2	4	4
Iron	mg/L	ND	6.17	2.13	3	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	2.65	3.7	3.08	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	6.13	6.5	6.34	4	4
Phosphorous	mg/L	0.08	0.26	0.145	4	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	10.6	10.9	10.8	4	4
Suspended Solids	mg/L	36	292	119	4	4
Temperature	deg F	55.5	63.5	59.5	4	4
Trichloroethene	ug/L	10	38	23.5	4	4
Turbidity	NTU	5	60	24.4	4	4
Uranium	mg/L	ND	0.005	0.001	1	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.35 Non-Radiological Monitoring Data for Surface Water Seep Location LBCSP2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	3
Acetone	ug/L	ND	ND	ND	0	3
Aluminum	mg/L	ND	1.91	0.748	2	3
Ammonia	mg/L	ND	ND	ND	0	3
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	3
Cadmium	mg/L	ND	ND	ND	0	3
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	3
Chloride	mg/L	38.8	40.6	39.6	3	3
Chromium	mg/L	ND	ND	ND	0	3
Conductivity	umho/cm	216	356	302	3	3
Copper	mg/L	ND	ND	ND	0	3
Cyanide	mg/L	ND	ND	ND	0	3
Dissolved Oxygen	mg/L	3.42	5.13	4.19	3	3
Hardness - Total as CaCO3	mg/L	101	109	104	3	3
Iron	mg/L	ND	1.17	0.457	1	3
Lead	mg/L	ND	ND	ND	0	3
Nickel	mg/L	ND	ND	ND	0	3
Nitrate/Nitrite as Nitrogen	mg/L	3.3	3.8	3.58	3	3
PCB-1016	ug/L	ND	ND	ND	0	3
PCB-1221	ug/L	ND	ND	ND	0	3
PCB-1232	ug/L	ND	ND	ND	0	3
PCB-1242	ug/L	ND	ND	ND	0	3
PCB-1248	ug/L	ND	ND	ND	0	3
PCB-1254	ug/L	ND	ND	ND	0	3
PCB-1260	ug/L	ND	ND	ND	0	3
PCB-1268	ug/L	ND	ND	ND	0	3
pH	Std Unit	6.06	6.1	6.08	3	3
Phosphorous	mg/L	ND	0.05	0.0333	1	3
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	3
Sulfate	mg/L	10.6	10.8	10.7	3	3
Suspended Solids	mg/L	ND	38	26.7	2	3
Temperature	deg F	56.1	63.5	60	3	3
Trichloroethene	ug/L	22	36	31	3	3
Turbidity	NTU	2.1	15	7.83	3	3
Uranium	mg/L	ND	ND	ND	0	4
Zinc	mg/L	ND	ND	ND	0	3

Surface Water Non-Radiological Data

Table 4.36 Non-Radiological Monitoring Data for Surface Water Seep Location LBCSP3

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	2.37	0.921	3	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	38.6	40.8	39.5	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	344	367	354	4	4
Copper	mg/L	ND	0.326	0.0934	1	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	3.81	4.79	4.41	4	4
Hardness - Total as CaCO3	mg/L	93	108	101	4	4
Iron	mg/L	ND	2.39	0.741	2	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	2.5	3.45	2.94	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	6.04	6.22	6.1	4	4
Phosphorous	mg/L	ND	0.1	0.0525	2	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	10.7	11.9	11.1	4	4
Suspended Solids	mg/L	32	174	78.7	4	4
Temperature	deg F	56.9	60.4	58.4	4	4
Trichloroethene	ug/L	48	77	61	4	4
Turbidity	NTU	4.6	23	11.2	4	4
Uranium	mg/L	ND	0.005	0.00123	1	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.37 Non-Radiological Monitoring Data for Surface Water Seep Location LBCSP4

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	0.28	0.176	2	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	30.7	40.7	37.7	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	330	361	352	4	4
Copper	mg/L	ND	ND	ND	0	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	3.9	4.44	4.12	4	4
Hardness - Total as CaCO3	mg/L	95	103	100	4	4
Iron	mg/L	ND	0.289	0.194	2	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	2.35	3.6	2.85	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	6.03	6.22	6.12	4	4
Phosphorous	mg/L	ND	0.09	0.0525	2	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	12.1	14.8	13	4	4
Suspended Solids	mg/L	ND	84	27.9	1	4
Temperature	deg F	56.5	60.9	58.3	4	4
Trichloroethene	ug/L	49	380	152	4	4
Turbidity	NTU	1.5	8.1	3.52	4	4
Uranium	mg/L	ND	ND	ND	0	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.38 Non-Radiological Monitoring Data for Surface Water Seep Location LBCSP5

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	2.5	0.771	2	4
Ammonia	mg/L	ND	0.22	0.13	1	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	29.7	33.7	31.4	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	330	346	339	4	4
Copper	mg/L	ND	0.306	0.0884	1	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	3.3	5.92	4.12	4	4
Hardness - Total as CaCO3	mg/L	85	96	92.7	4	4
Iron	mg/L	ND	2.07	0.725	3	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.7	2.4	1.94	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	6.07	6.21	6.16	4	4
Phosphorous	mg/L	ND	0.12	0.0712	3	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	15.3	16.3	15.7	4	4
Suspended Solids	mg/L	ND	58	23.6	1	4
Temperature	deg F	58.3	62.4	59.5	4	4
Trichloroethene	ug/L	340	420	360	4	4
Turbidity	NTU	2.3	25	9.25	4	4
Uranium	mg/L	ND	ND	ND	0	5
Zinc	mg/L	ND	ND	ND	0	4

Surface Water Non-Radiological Data

Table 4.39 Non-Radiological Monitoring Data for Surface Water Seep Location LBCSP6

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
2-Propanol	ug/L	ND	ND	ND	0	4
Acetone	ug/L	ND	ND	ND	0	4
Aluminum	mg/L	ND	1.23	0.664	3	4
Ammonia	mg/L	ND	ND	ND	0	4
Biochemical Oxygen Demand (BOD)	mg/L	ND	ND	ND	0	4
Cadmium	mg/L	ND	ND	ND	0	4
Carbonaceous Biochemical Oxygen Demand	mg/L	ND	ND	ND	0	4
Chloride	mg/L	31.5	33.1	32.4	4	4
Chromium	mg/L	ND	ND	ND	0	4
Conductivity	umho/cm	301	316	307	4	4
Copper	mg/L	ND	0.318	0.0914	1	4
Cyanide	mg/L	ND	ND	ND	0	4
Dissolved Oxygen	mg/L	3.8	4.86	4.39	4	4
Hardness - Total as CaCO3	mg/L	83	86	84.2	4	4
Iron	mg/L	ND	0.752	0.425	3	4
Lead	mg/L	ND	ND	ND	0	4
Nickel	mg/L	ND	ND	ND	0	4
Nitrate/Nitrite as Nitrogen	mg/L	0.65	2.25	1.69	4	4
PCB-1016	ug/L	ND	ND	ND	0	4
PCB-1221	ug/L	ND	ND	ND	0	4
PCB-1232	ug/L	ND	ND	ND	0	4
PCB-1242	ug/L	ND	ND	ND	0	4
PCB-1248	ug/L	ND	ND	ND	0	4
PCB-1254	ug/L	ND	ND	ND	0	4
PCB-1260	ug/L	ND	ND	ND	0	4
PCB-1268	ug/L	ND	ND	ND	0	4
pH	Std Unit	6	6.19	6.11	4	4
Phosphorous	mg/L	ND	0.07	0.0475	2	4
Polychlorinated biphenyl	ug/L	ND	ND	ND	0	4
Sulfate	mg/L	13.8	14.2	14	4	4
Suspended Solids	mg/L	ND	38	18.6	1	4
Temperature	deg F	55.1	62.5	58.6	4	4
Trichloroethene	ug/L	180	240	212	4	4
Turbidity	NTU	1.4	12	5.42	4	4
Uranium	mg/L	ND	ND	ND	0	5
Zinc	mg/L	ND	ND	ND	0	4

Sediment Non-Radiological Data

Table 4.40 Non-Radiological Data for Sediment Location S20

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	2430	2540	2480	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	ND	ND	0	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.40 Non-Radiological Data for Sediment Location S20

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	30	31.6	30.8	2	2
Benz(a)anthracene	ug/kg	ND	470	136	2	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	470	138	2	4
Benzo(b)fluoranthene	ug/kg	ND	470	150	2	4
Benzo(e)pyrene	ug/kg	29	29	29	2	2
Benzo(ghi)perylene	ug/kg	ND	ND	ND	0	4
Benzo(k)fluoranthene	ug/kg	ND	470	135	2	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	0.592	0.421	1	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	546	593	570	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	7.1	7.2	7.15	2	2
Chrysene	ug/kg	ND	470	141	2	4
Chrysene C1	ug/kg	ND	ND	ND	0	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	3.35	3.85	3.6	2	2
Copper	mg/kg	5.13	6.03	5.58	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	ND	ND	ND	0	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	320	98	1	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.40 Non-Radiological Data for Sediment Location S20

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	470	151	2	4
Fluoranthene C1	ug/kg	20	20	20	2	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	320	97.5	1	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	340	520	430	2	2
Heptadecane	ug/kg	ND	320	104	1	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	320	96.5	1	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	470	130	1	4
Iron	mg/kg	5710	5810	5760	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	257	278	268	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	139	215	177	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	33	35.3	34.1	2	2
n-Hentriacontane	ug/kg	1100	1200	1150	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	64	68	66	2	2
n-Pentacosane	ug/kg	120	130	125	2	2

Sediment Non-Radiological Data

Table 4.40 Non-Radiological Data for Sediment Location S20

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	66	78	72	2	2
n-Tricosane	ug/kg	46	72	59	2	2
n-Tritriacontane	ug/kg	240	240	240	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	64	26	1	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	ND	ND	0	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	1200	1300	1250	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	18.8	21.2	20	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	35.2	37.4	36.3	2	2
Perylene	ug/kg	ND	ND	ND	0	2
Phenanthrene	ug/kg	ND	470	144	2	4
Phenanthrene C1	ug/kg	ND	64	28.5	1	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	ND	ND	0	2
Potassium	mg/kg	ND	ND	ND	0	2
Pyrene	ug/kg	ND	470	147	2	4
Pyrene C1	ug/kg	ND	64	26	1	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	282	204	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	8660	16200	12400	2	2

Sediment Non-Radiological Data

Table 4.40 Non-Radiological Data for Sediment Location S20

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	ug/g	ND	ND	ND	0	2
Uranium	mg/kg	ND	ND	ND	0	2
Vanadium	mg/kg	13.1	13.9	13.5	2	2
Zinc	mg/kg	12.8	12.8	12.8	2	2

Sediment Non-Radiological Data

Table 4.41 Non-Radiological Data for Sediment Location C612

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	6740	7220	6980	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	ND	ND	0	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.41 Non-Radiological Data for Sediment Location C612

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	64.7	76.8	70.7	2	2
Benz(a)anthracene	ug/kg	ND	490	138	1	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	490	138	1	4
Benzo(b)fluoranthene	ug/kg	ND	490	142	1	4
Benzo(e)pyrene	ug/kg	ND	86	35	1	2
Benzo(ghi)perylene	ug/kg	ND	ND	ND	0	4
Benzo(k)fluoranthene	ug/kg	ND	490	139	1	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	0.6	0.634	0.617	2	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	2
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	1300	1470	1380	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	12.3	12.7	12.5	2	2
Chrysene	ug/kg	ND	490	140	1	4
Chrysene C1	ug/kg	ND	ND	ND	0	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	3.45	6.14	4.79	2	2
Copper	mg/kg	10.3	14.8	12.6	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	ND	1300	768	1	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	ND	ND	0	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.41 Non-Radiological Data for Sediment Location C612

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	490	141	1	4
Fluoranthene C1	ug/kg	ND	ND	ND	0	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	ND	220	98.5	1	2
Heptadecane	ug/kg	ND	220	96	1	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	ND	ND	0	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	ND	ND	0	4
Iron	mg/kg	9860	10400	10100	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	853	989	921	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	96.5	153	125	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	29	39.1	34	2	2
n-Hentriacontane	ug/kg	190	550	370	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	ND	ND	ND	0	2
n-Pentacosane	ug/kg	ND	220	76.5	1	2

Sediment Non-Radiological Data

Table 4.41 Non-Radiological Data for Sediment Location C612

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	ND	220	73	1	2
n-Tricosane	ug/kg	ND	220	71	1	2
n-Tritriacontane	ug/kg	63	160	112	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	86	35	1	2
Naphthalene C3	ug/kg	ND	86	31.5	1	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	6.41	11.1	8.76	2	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	95	460	278	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	29.2	39.5	34.3	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	45	61.4	53.2	2	2
Perylene	ug/kg	ND	ND	ND	0	2
Phenanthrene	ug/kg	ND	490	135	1	4
Phenanthrene C1	ug/kg	ND	ND	ND	0	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	ND	ND	0	2
Potassium	mg/kg	468	615	542	2	2
Pyrene	ug/kg	ND	490	140	1	4
Pyrene C1	ug/kg	ND	ND	ND	0	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	354	240	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	3120	10500	6810	2	2

Sediment Non-Radiological Data

Table 4.41 Non-Radiological Data for Sediment Location C612

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	mg/kg	ND	282	166	1	2
Uranium	ug/g	2.47	20.6	11.5	2	2
Vanadium	mg/kg	20.2	22.3	21.2	2	2
Zinc	mg/kg	19.6	39.9	29.7	2	2

Sediment Non-Radiological Data

Table 4.42 Non-Radiological Data for Sediment Location C616

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	4340	5860	5100	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	ND	ND	0	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.42 Non-Radiological Data for Sediment Location C616

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	20	8.07	1	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	53.6	72.4	63	2	2
Benz(a)anthracene	ug/kg	ND	ND	ND	0	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	ND	ND	0	4
Benzo(b)fluoranthene	ug/kg	ND	ND	ND	0	4
Benzo(e)pyrene	ug/kg	ND	ND	ND	0	2
Benzo(ghi)perylene	ug/kg	ND	ND	ND	0	4
Benzo(k)fluoranthene	ug/kg	ND	ND	ND	0	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	0.56	0.619	0.59	2	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	869	1000	934	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	24.6	68.2	46.4	2	2
Chrysene	ug/kg	ND	ND	ND	0	4
Chrysene C1	ug/kg	ND	ND	ND	0	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	5.01	5.58	5.29	2	2
Copper	mg/kg	16.9	25.9	21.4	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Demeton	ug/kg	26	170	98	2	2
Di-n-butyl phthalate	ug/kg	ND	790	518	1	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	330	98.5	1	2

Sediment Non-Radiological Data

Table 4.42 Non-Radiological Data for Sediment Location C616

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Eicosane	ug/kg	ND	330	94	1	2
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	ND	ND	0	4
Fluoranthene C1	ug/kg	ND	ND	ND	0	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	330	98	1	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	100	140	120	2	2
Heptadecane	ug/kg	22	350	186	2	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	ND	ND	0	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	ND	ND	0	4
Iron	mg/kg	7580	8860	8220	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	531	737	634	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	76.5	205	141	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	36	56.6	46.3	2	2
n-Hentriacontane	ug/kg	450	1000	725	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	ND	330	102	1	2

Sediment Non-Radiological Data

Table 4.42 Non-Radiological Data for Sediment Location C616

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Pentacosane	ug/kg	43	45	44	2	2
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	33	39	36	2	2
n-Tricosane	ug/kg	ND	330	106	1	2
n-Tritriacontane	ug/kg	110	320	215	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	86	33.5	1	2
Naphthalene C3	ug/kg	ND	86	31	1	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	7.6	16.7	12.1	2	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	410	440	425	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	220	72	1	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	32.8	35.5	34.1	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	220	71.5	1	2
Percent Moisture	%	46.3	62	54.1	2	2
Perylene	ug/kg	ND	ND	ND	0	2
Phenanthrene	ug/kg	ND	ND	ND	0	4
Phenanthrene C1	ug/kg	ND	ND	ND	0	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	ND	ND	0	2
Potassium	mg/kg	327	499	413	2	2
Pyrene	ug/kg	ND	ND	ND	0	4
Pyrene C1	ug/kg	ND	ND	ND	0	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	396	260	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.42 Non-Radiological Data for Sediment Location C616

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Total Organic Carbon (TOC)	mg/kg	13600	28100	20900	2	2
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	ug/g	15.8	49.8	32.8	2	2
Uranium	mg/kg	ND	271	160	1	2
Vanadium	mg/kg	13.9	19.3	16.6	2	2
Zinc	mg/kg	25.8	32.5	29.1	2	2

Sediment Non-Radiological Data

Table 4.43 Non-Radiological Data for Sediment Location K001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	3300	4490	3900	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	ND	ND	0	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.43 Non-Radiological Data for Sediment Location K001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	29.6	38.3	34	2	2
Benz(a)anthracene	ug/kg	ND	480	142	1	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	480	143	1	4
Benzo(b)fluoranthene	ug/kg	ND	480	151	2	4
Benzo(e)pyrene	ug/kg	ND	65	40.7	1	2
Benzo(ghi)perylene	ug/kg	ND	480	137	1	4
Benzo(k)fluoranthene	ug/kg	ND	480	143	1	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	1130	2720	1920	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	8.21	10.9	9.55	2	2
Chrysene	ug/kg	ND	480	148	1	4
Chrysene C1	ug/kg	ND	65	30.2	1	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	2.89	3.75	3.32	2	2
Copper	mg/kg	10.2	32.6	21.4	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	480	670	575	2	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	ND	ND	0	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.43 Non-Radiological Data for Sediment Location K001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	480	153	2	4
Fluoranthene C1	ug/kg	ND	65	30.7	1	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	54	210	132	2	2
Heptadecane	ug/kg	57	96	76.5	2	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	ND	ND	0	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	480	136	1	4
Iron	mg/kg	5220	5730	5480	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	540	928	734	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	72.3	74.3	73.3	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	40	84.3	62.1	2	2
n-Hentriacontane	ug/kg	230	1400	815	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	ND	320	135	1	2
n-Pentacosane	ug/kg	ND	320	124	1	2

Sediment Non-Radiological Data

Table 4.43 Non-Radiological Data for Sediment Location K001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	ND	320	118	1	2
n-Tricosane	ug/kg	ND	320	104	1	2
n-Tritriacontane	ug/kg	55	200	128	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	6.51	4.5	1	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	350	1800	1080	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	48.4	77.3	62.8	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	31.4	44.9	38.1	2	2
Perylene	ug/kg	ND	ND	ND	0	2
Phenanthrene	ug/kg	ND	480	139	1	4
Phenanthrene C1	ug/kg	ND	65	39.7	1	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	ND	ND	0	2
Potassium	mg/kg	304	386	345	2	2
Pyrene	ug/kg	ND	480	159	1	4
Pyrene C1	ug/kg	ND	65	27.2	1	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	389	257	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	4360	14400	9380	2	2

Sediment Non-Radiological Data

Table 4.43 Non-Radiological Data for Sediment Location K001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	mg/kg	ND	144	97	1	2
Uranium	ug/g	3.6	8.43	6.01	2	2
Vanadium	mg/kg	9.66	13.4	11.5	2	2
Zinc	mg/kg	29.2	33.3	31.2	2	2

Sediment Non-Radiological Data

Table 4.44 Non-Radiological Data for Sediment Location K006

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	3620	4020	3820	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	ND	ND	0	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.44 Non-Radiological Data for Sediment Location K006

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	28.4	30	29.2	2	2
Benz(a)anthracene	ug/kg	ND	ND	ND	0	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	ND	ND	0	4
Benzo(b)fluoranthene	ug/kg	ND	ND	ND	0	4
Benzo(e)pyrene	ug/kg	ND	ND	ND	0	2
Benzo(ghi)perylene	ug/kg	ND	ND	ND	0	4
Benzo(k)fluoranthene	ug/kg	ND	ND	ND	0	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	743	839	791	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	5.96	11.5	8.73	2	2
Chrysene	ug/kg	ND	ND	ND	0	4
Chrysene C1	ug/kg	ND	ND	ND	0	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	ND	2.73	1.99	1	2
Copper	mg/kg	4.72	74.3	39.5	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	ND	910	570	1	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	ND	ND	0	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.44 Non-Radiological Data for Sediment Location K006

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	ND	ND	0	4
Fluoranthene C1	ug/kg	ND	ND	ND	0	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	270	550	410	2	2
Heptadecane	ug/kg	ND	ND	ND	0	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	430	120	1	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	ND	ND	0	4
Iron	mg/kg	5410	7570	6490	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	415	493	454	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	106	165	136	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	26	29.1	27.5	2	2
n-Hentriacontane	ug/kg	410	1100	755	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	ND	430	128	1	2
n-Pentacosane	ug/kg	100	160	130	2	2

Sediment Non-Radiological Data

Table 4.44 Non-Radiological Data for Sediment Location K006

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	ND	430	126	1	2
n-Tricosane	ug/kg	ND	430	119	1	2
n-Tritriacontane	ug/kg	56	170	113	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	ND	ND	0	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	550	840	695	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	47	47.1	47	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	28.8	29.7	29.2	2	2
Perylene	ug/kg	ND	ND	ND	0	2
Phenanthrene	ug/kg	ND	ND	ND	0	4
Phenanthrene C1	ug/kg	ND	ND	ND	0	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	ND	ND	0	2
Potassium	mg/kg	213	267	240	2	2
Pyrene	ug/kg	ND	ND	ND	0	4
Pyrene C1	ug/kg	ND	ND	ND	0	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	ND	ND	0	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	7400	8070	7730	2	2

Sediment Non-Radiological Data

Table 4.44 Non-Radiological Data for Sediment Location K006

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	ug/g	ND	ND	ND	0	2
Uranium	mg/kg	ND	214	132	1	2
Vanadium	mg/kg	12.7	17.1	14.9	2	2
Zinc	mg/kg	12.4	24	18.2	2	2

Sediment Non-Radiological Data

Table 4.46 Non-Radiological Data for Sediment Location S1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	3940	5470	4700	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	460	135	1	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.46 Non-Radiological Data for Sediment Location S1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	27.6	34	30.8	2	2
Benz(a)anthracene	ug/kg	ND	460	142	2	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	460	143	2	4
Benzo(b)fluoranthene	ug/kg	ND	460	148	2	4
Benzo(e)pyrene	ug/kg	30	30	30	2	2
Benzo(ghi)perylene	ug/kg	ND	ND	ND	0	4
Benzo(k)fluoranthene	ug/kg	ND	460	139	2	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	971	987	979	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	14.1	15.1	14.6	2	2
Chrysene	ug/kg	ND	460	155	2	4
Chrysene C1	ug/kg	ND	64	27.5	1	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	3.82	4.27	4.04	2	2
Copper	mg/kg	8.67	11.6	10.1	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	ND	540	385	1	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	34	67	50.5	2	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.46 Non-Radiological Data for Sediment Location S1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	460	154	2	4
Fluoranthene C1	ug/kg	ND	64	33	1	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	320	98.5	1	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	230	1200	715	2	2
Heptadecane	ug/kg	ND	320	104	1	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	32	74	53	2	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	460	129	1	4
Iron	mg/kg	7990	8820	8400	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	459	460	460	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	91	175	133	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	30	40	35	2	2
n-Hentriacontane	ug/kg	600	1700	1150	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	48	99	73.5	2	2
n-Pentacosane	ug/kg	82	250	166	2	2

Sediment Non-Radiological Data

Table 4.46 Non-Radiological Data for Sediment Location S1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	52	82	67	2	2
n-Tricosane	ug/kg	ND	320	106	1	2
n-Tritriacontane	ug/kg	200	460	330	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	5.98	6.22	6.1	2	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	570	1500	1040	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	28.1	28.7	28.4	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	110	80	1	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	28.6	38.5	33.5	2	2
Perylene	ug/kg	ND	ND	ND	0	2
Phenanthrene	ug/kg	ND	460	130	2	4
Phenanthrene C1	ug/kg	ND	64	28	1	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	110	80	1	2
Potassium	mg/kg	266	310	288	2	2
Pyrene	ug/kg	ND	460	150	2	4
Pyrene C1	ug/kg	ND	64	37.5	1	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	339	232	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	8880	10400	9630	2	2

Sediment Non-Radiological Data

Table 4.46 Non-Radiological Data for Sediment Location S1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	mg/kg	ND	ND	ND	0	2
Uranium	ug/g	ND	ND	ND	0	2
Vanadium	mg/kg	16.4	17.5	16.9	2	2
Zinc	mg/kg	29.9	38	34	2	2

Sediment Non-Radiological Data

Table 4.47 Non-Radiological Data for Sediment Location S31

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	64	29	1	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	64	30	1	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	500	148	1	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	500	207	1	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	3980	6830	5400	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	500	218	2	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.47 Non-Radiological Data for Sediment Location S31

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	29.6	40.6	35.1	2	2
Benz(a)anthracene	ug/kg	ND	1200	448	2	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	1200	448	2	4
Benzo(b)fluoranthene	ug/kg	ND	1800	614	2	4
Benzo(e)pyrene	ug/kg	65	850	458	2	2
Benzo(ghi)perylene	ug/kg	ND	500	240	2	4
Benzo(k)fluoranthene	ug/kg	ND	940	381	2	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	826	1020	923	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	8.88	11.7	10.3	2	2
Chrysene	ug/kg	ND	1300	479	2	4
Chrysene C1	ug/kg	46	930	488	2	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	ND	3.16	2.21	1	2
Copper	mg/kg	6.49	25.1	15.8	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Demeton	ug/kg	ND	ND	ND	0	1
Di-n-butyl phthalate	ug/kg	ND	580	412	1	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	500	152	2	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	64	38.5	1	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	320	112	1	2

Sediment Non-Radiological Data

Table 4.47 Non-Radiological Data for Sediment Location S31

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Eicosane	ug/kg	ND	ND	ND	0	2
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	2300	862	3	4
Fluoranthene C1	ug/kg	54	670	362	2	2
Fluorene	ug/kg	ND	500	202	1	4
Fluorene C1	ug/kg	ND	74	53	1	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	65	410	238	2	2
Heptadecane	ug/kg	ND	ND	ND	0	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	320	98	1	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	520	264	2	4
Iron	mg/kg	6510	6720	6620	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	591	624	608	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	121	143	132	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	30	39.4	34.7	2	2
n-Hentriacontane	ug/kg	140	1200	670	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	33	65	49	2	2

Sediment Non-Radiological Data

Table 4.47 Non-Radiological Data for Sediment Location S31

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Pentacosane	ug/kg	39	100	69.5	2	2
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	ND	320	112	1	2
n-Tricosane	ug/kg	ND	320	99	1	2
n-Tritriacontane	ug/kg	56	250	153	2	2
Naphthalene	ug/kg	ND	500	167	1	4
Naphthalene C1	ug/kg	ND	64	45	1	2
Naphthalene C2	ug/kg	ND	100	66	1	2
Naphthalene C3	ug/kg	19	68	43.5	2	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	ND	ND	0	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	160	800	480	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	17.2	29.8	23.5	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	120	85	1	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	23	32	27.5	2	2
Perylene	ug/kg	21	380	200	2	2
Phenanthrene	ug/kg	ND	2200	706	2	4
Phenanthrene C1	ug/kg	32	690	361	2	2
Phenanthrene C2	ug/kg	29	230	130	2	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	120	85	1	2
Potassium	mg/kg	248	263	256	2	2
Pyrene	ug/kg	ND	1900	720	3	4
Pyrene C1	ug/kg	56	790	423	2	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	322	224	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.47 Non-Radiological Data for Sediment Location S31

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Total Organic Carbon (TOC)	mg/kg	11300	13000	12100	2	2
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	mg/kg	ND	ND	ND	0	2
Uranium	ug/g	ND	2.5	1.31	1	2
Vanadium	mg/kg	14.3	15.2	14.7	2	2
Zinc	mg/kg	22.9	27.3	25.1	2	2

Sediment Non-Radiological Data

Table 4.48 Non-Radiological Data for Sediment Location S33

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	430	124	1	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	2530	4380	3460	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	ND	ND	0	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.48 Non-Radiological Data for Sediment Location S33

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	28.8	37.9	33.3	2	2
Benz(a)anthracene	ug/kg	ND	490	140	1	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	490	139	1	4
Benzo(b)fluoranthene	ug/kg	ND	490	149	2	4
Benzo(e)pyrene	ug/kg	ND	85	32.7	1	2
Benzo(ghi)perylene	ug/kg	ND	ND	ND	0	4
Benzo(k)fluoranthene	ug/kg	ND	490	138	1	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	527	787	657	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	8.05	10.2	9.12	2	2
Chrysene	ug/kg	ND	490	138	2	4
Chrysene C1	ug/kg	ND	ND	ND	0	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	ND	3.7	2.48	1	2
Copper	mg/kg	4.69	8.27	6.48	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	560	770	665	2	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	290	128	1	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.48 Non-Radiological Data for Sediment Location S33

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	490	144	2	4
Fluoranthene C1	ug/kg	ND	ND	ND	0	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	130	320	225	2	2
Heptadecane	ug/kg	ND	290	122	1	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	ND	ND	0	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	ND	ND	0	4
Iron	mg/kg	4960	6560	5760	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	311	486	398	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	158	279	218	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	25	32.7	28.8	2	2
n-Hentriacontane	ug/kg	340	2000	1170	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	ND	290	110	1	2
n-Pentacosane	ug/kg	48	77	62.5	2	2

Sediment Non-Radiological Data

Table 4.48 Non-Radiological Data for Sediment Location S33

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	ND	290	109	1	2
n-Tricosane	ug/kg	ND	ND	ND	0	2
n-Tritriacontane	ug/kg	88	600	344	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	ND	ND	0	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	270	940	605	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	29.1	38.1	33.6	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	25.6	35.6	30.6	2	2
Perylene	ug/kg	ND	85	44.2	1	2
Phenanthrene	ug/kg	ND	490	142	1	4
Phenanthrene C1	ug/kg	ND	ND	ND	0	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	ND	ND	0	2
Potassium	mg/kg	ND	288	194	1	2
Pyrene	ug/kg	ND	490	140	2	4
Pyrene C1	ug/kg	ND	ND	ND	0	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	262	194	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	6760	9620	8180	2	2

Sediment Non-Radiological Data

Table 4.48 Non-Radiological Data for Sediment Location S33

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	ug/g	2.31	4.3	3.31	2	2
Uranium	mg/kg	ND	135	92.5	1	2
Vanadium	mg/kg	10.5	13.9	12.2	2	2
Zinc	mg/kg	14.7	27.5	21.1	2	2

Sediment Non-Radiological Data

Table 4.49 Non-Radiological Data for Sediment Location S21

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	3
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	3
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	3
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	3
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	3
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	3
2,4'-DDD	ug/kg	ND	ND	ND	0	3
2,4'-DDE	ug/kg	ND	ND	ND	0	3
2,4'-DDT	ug/kg	ND	ND	ND	0	3
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	3
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	3
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	3
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	3
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	3
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	3
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	3
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	3
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	3
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	3
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	3
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	3
2-Chlorophenol	ug/kg	ND	ND	ND	0	3
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	3
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	6
2-Methylphenol	ug/kg	ND	ND	ND	0	3
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	3
2-Nitrophenol	ug/kg	ND	ND	ND	0	3
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	3
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	3
4,4'-DDD	ug/kg	ND	ND	ND	0	3
4,4'-DDE	ug/kg	ND	ND	ND	0	3
4,4'-DDT	ug/kg	ND	ND	ND	0	3
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	3
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	3
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	3
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	3
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	3
4-Nitrophenol	ug/kg	ND	ND	ND	0	3
Acenaphthene	ug/kg	ND	ND	ND	0	6
Acenaphthylene	ug/kg	ND	ND	ND	0	6
Aldrin	ug/kg	ND	ND	ND	0	3
alpha-BHC	ug/kg	ND	ND	ND	0	3
alpha-Chlordane	ug/kg	ND	ND	ND	0	3
Aluminum	mg/kg	5890	6190	6080	3	3
Aniline	ug/kg	ND	ND	ND	0	3
Anthracene	ug/kg	ND	ND	ND	0	6
Antimony	mg/kg	ND	ND	ND	0	3

Sediment Non-Radiological Data

Table 4.49 Non-Radiological Data for Sediment Location S21

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	3
Azinphos-methyl	ug/kg	ND	ND	ND	0	3
Barium	mg/kg	65.9	71.1	68.4	3	3
Benz(a)anthracene	ug/kg	ND	ND	ND	0	6
Benzenemethanol	ug/kg	ND	ND	ND	0	3
Benzidine	ug/kg	ND	ND	ND	0	3
Benzo(a)pyrene	ug/kg	ND	ND	ND	0	6
Benzo(b)fluoranthene	ug/kg	ND	ND	ND	0	6
Benzo(e)pyrene	ug/kg	ND	ND	ND	0	3
Benzo(ghi)perylene	ug/kg	ND	ND	ND	0	6
Benzo(k)fluoranthene	ug/kg	ND	ND	ND	0	6
Benzoic acid	ug/kg	ND	ND	ND	0	3
Beryllium	mg/kg	0.51	0.57	0.547	3	3
beta-BHC	ug/kg	ND	ND	ND	0	3
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	3
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	3
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	3
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	3
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	3
Cadmium	mg/kg	ND	ND	ND	0	3
Calcium	mg/kg	1120	1190	1150	3	3
Carbazole	ug/kg	ND	ND	ND	0	3
Chlordane	ug/kg	ND	ND	ND	0	3
Chromium	mg/kg	10.2	15	12.1	3	3
Chrysene	ug/kg	ND	ND	ND	0	6
Chrysene C1	ug/kg	ND	ND	ND	0	3
Co-Ral	ug/kg	ND	ND	ND	0	3
Cobalt	mg/kg	5.75	9.51	7.27	3	3
Copper	mg/kg	7.51	67.6	27.7	3	3
Decane	ug/kg	ND	ND	ND	0	3
delta-BHC	ug/kg	ND	ND	ND	0	3
Di-n-butyl phthalate	ug/kg	ND	820	535	2	3
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	3
Diazinon	ug/kg	ND	ND	ND	0	3
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	6
Dibenzofuran	ug/kg	ND	ND	ND	0	3
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	3
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	3
Dichlorvos	ug/kg	ND	ND	ND	0	3
Dieldrin	ug/kg	ND	ND	ND	0	3
Diethyl phthalate	ug/kg	ND	ND	ND	0	3
Dimethoate	ug/kg	ND	ND	ND	0	3
Dimethyl phthalate	ug/kg	ND	ND	ND	0	3
Docosane	ug/kg	ND	ND	ND	0	3
Dodecane	ug/kg	ND	ND	ND	0	3
Dotriacontane	ug/kg	ND	430	104	2	3
Eicosane	ug/kg	ND	ND	ND	0	3

Sediment Non-Radiological Data

Table 4.49 Non-Radiological Data for Sediment Location S21

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	3
Endosulfan II	ug/kg	ND	ND	ND	0	3
Endosulfan sulfate	ug/kg	ND	ND	ND	0	3
Endrin	ug/kg	ND	ND	ND	0	3
Endrin aldehyde	ug/kg	ND	ND	ND	0	3
Ethion	ug/kg	ND	ND	ND	0	3
Famphur	ug/kg	ND	ND	ND	0	3
Fensulfothion	ug/kg	ND	ND	ND	0	3
Fenthion	ug/kg	ND	ND	ND	0	3
Fluoranthene	ug/kg	ND	ND	ND	0	6
Fluoranthene C1	ug/kg	ND	ND	ND	0	3
Fluorene	ug/kg	ND	ND	ND	0	6
Fluorene C1	ug/kg	ND	ND	ND	0	3
Fluorene C2	ug/kg	ND	ND	ND	0	3
gamma-Chlordane	ug/kg	ND	ND	ND	0	3
Henicosane	ug/kg	ND	ND	ND	0	3
Heptachlor	ug/kg	ND	ND	ND	0	3
Heptachlor epoxide	ug/kg	ND	ND	ND	0	3
heptacosane	ug/kg	260	320	283	3	3
Heptadecane	ug/kg	ND	320	124	2	3
Hexachlorobenzene	ug/kg	ND	ND	ND	0	3
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	3
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	3
Hexachloroethane	ug/kg	ND	ND	ND	0	3
Hexacosane	ug/kg	ND	430	155	1	3
Hexadecane	ug/kg	ND	ND	ND	0	3
Indeno(1,2,3-cd)pyrene	ug/kg	ND	ND	ND	0	6
Iron	mg/kg	9420	12500	11300	3	3
Isophorone	ug/kg	ND	ND	ND	0	3
Lead	mg/kg	ND	ND	ND	0	3
Lindane	ug/kg	ND	ND	ND	0	3
m,p-Cresol	ug/kg	ND	ND	ND	0	3
Magnesium	mg/kg	744	769	758	3	3
Malathion	ug/kg	ND	ND	ND	0	3
Manganese	mg/kg	127	259	204	3	3
Mercury	mg/kg	ND	ND	ND	0	3
Methoxychlor	ug/kg	ND	ND	ND	0	3
Methyl parathion	ug/kg	ND	ND	ND	0	3
Mirex	ug/kg	ND	ND	ND	0	3
Mocap	ug/kg	ND	ND	ND	0	3
Moisture	%	29	50.5	39.9	4	4
n-Hentriacontane	ug/kg	890	3000	1700	3	3
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	3
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	3
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	3
n-Octacosane	ug/kg	66	89	78.7	3	3
n-Pentacosane	ug/kg	70	95	83	3	3

Sediment Non-Radiological Data

Table 4.49 Non-Radiological Data for Sediment Location S21

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	3
n-Triacontane	ug/kg	47	91	73.3	3	3
n-Tricosane	ug/kg	46	60	52.3	3	3
n-Tritriacontane	ug/kg	210	370	273	3	3
Naphthalene	ug/kg	ND	ND	ND	0	6
Naphthalene C1	ug/kg	ND	ND	ND	0	3
Naphthalene C2	ug/kg	ND	ND	ND	0	3
Naphthalene C3	ug/kg	ND	ND	ND	0	3
Naphthalene C4	ug/kg	ND	ND	ND	0	3
Nickel	mg/kg	6.1	6.48	6.25	3	3
Nitrobenzene	ug/kg	ND	ND	ND	0	3
Nonacosane	ug/kg	1100	2400	1600	3	3
Nonadecane	ug/kg	ND	ND	ND	0	3
Octadecane	ug/kg	ND	ND	ND	0	3
Parathion	ug/kg	ND	ND	ND	0	3
Particle Size	%	31.4	35.3	33	3	3
PCB-1016	ug/kg	ND	ND	ND	0	3
PCB-1221	ug/kg	ND	ND	ND	0	3
PCB-1232	ug/kg	ND	ND	ND	0	3
PCB-1242	ug/kg	ND	ND	ND	0	3
PCB-1248	ug/kg	ND	ND	ND	0	3
PCB-1254	ug/kg	ND	ND	ND	0	3
PCB-1260	ug/kg	ND	ND	ND	0	3
PCB-1268	ug/kg	ND	ND	ND	0	3
Pentachlorophenol	ug/kg	ND	ND	ND	0	3
Pentadecane	ug/kg	ND	430	143	1	3
Percent Moisture	%	30.5	45.6	38	2	2
Perylene	ug/kg	ND	ND	ND	0	3
Phenanthrene	ug/kg	ND	ND	ND	0	6
Phenanthrene C1	ug/kg	ND	ND	ND	0	3
Phenanthrene C2	ug/kg	ND	ND	ND	0	3
Phenanthrene C3	ug/kg	ND	ND	ND	0	3
Phenanthrene C4	ug/kg	ND	ND	ND	0	3
Phenol	ug/kg	ND	ND	ND	0	3
Phorate	ug/kg	ND	ND	ND	0	3
Polychlorinated biphenyl	ug/kg	ND	ND	ND	0	3
Potassium	mg/kg	264	346	295	3	3
Pyrene	ug/kg	ND	ND	ND	0	6
Pyrene C1	ug/kg	ND	ND	ND	0	3
Pyridine	ug/kg	ND	ND	ND	0	3
Selenium	mg/kg	ND	ND	ND	0	3
Silver	mg/kg	ND	ND	ND	0	3
Sodium	mg/kg	ND	284	223	2	3
Tetradecane	ug/kg	ND	ND	ND	0	3
Tetratriacontane	ug/kg	ND	ND	ND	0	3
Thallium	mg/kg	ND	ND	ND	0	3
Total Organic Carbon (TOC)	mg/kg	4520	14000	7900	3	3

Sediment Non-Radiological Data

Table 4.49 Non-Radiological Data for Sediment Location S21

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	3
Tridecane	ug/kg	ND	ND	ND	0	3
Undecane	ug/kg	ND	ND	ND	0	3
Uranium	ug/g	ND	ND	ND	0	3
Uranium	mg/kg	ND	326	229	2	3
Vanadium	mg/kg	22.6	23.2	23	3	3
Zinc	mg/kg	22.5	33.5	26.7	3	3

Sediment Non-Radiological Data

Table 4.50 Non-Radiological Data for Sediment Location K010

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	3910	6360	5140	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	ND	ND	0	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.50 Non-Radiological Data for Sediment Location K010

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	31.6	47.6	39.6	2	2
Benz(a)anthracene	ug/kg	ND	490	154	1	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	490	152	2	4
Benzo(b)fluoranthene	ug/kg	ND	490	184	2	4
Benzo(e)pyrene	ug/kg	9	100	54.5	2	2
Benzo(ghi)perylene	ug/kg	ND	490	142	1	4
Benzo(k)fluoranthene	ug/kg	ND	490	146	2	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	997	1020	1010	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	14.1	14.5	14.3	2	2
Chrysene	ug/kg	ND	490	158	2	4
Chrysene C1	ug/kg	ND	53	34.7	1	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	2.75	2.95	2.85	2	2
Copper	mg/kg	10.8	59	34.9	2	2
Decane	ug/kg	ND	330	158	1	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	ND	630	438	1	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	330	124	1	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.50 Non-Radiological Data for Sediment Location K010

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	490	199	2	4
Fluoranthene C1	ug/kg	ND	63	39.7	1	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	42	110	76	2	2
Heptadecane	ug/kg	ND	330	116	1	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	ND	ND	0	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	490	143	1	4
Iron	mg/kg	5760	7090	6420	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	596	752	674	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	53.9	54.1	54	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	40	57	48.5	2	2
n-Hentriacontane	ug/kg	170	540	355	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	ND	ND	ND	0	2
n-Pentacosane	ug/kg	ND	330	118	1	2

Sediment Non-Radiological Data

Table 4.50 Non-Radiological Data for Sediment Location K010

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	ND	330	110	1	2
n-Tricosane	ug/kg	ND	330	102	1	2
n-Tritriacontane	ug/kg	58	220	139	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	ND	ND	0	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	120	320	220	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	44.6	66.6	55.6	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	200	122	1	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	330	108	1	2
Percent Moisture	%	32.7	42.3	37.5	2	2
Perylene	ug/kg	ND	33	20.2	1	2
Phenanthrene	ug/kg	ND	490	157	2	4
Phenanthrene C1	ug/kg	ND	50	33.2	1	2
Phenanthrene C2	ug/kg	ND	33	24.7	1	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	200	125	1	2
Potassium	mg/kg	239	289	264	2	2
Pyrene	ug/kg	ND	490	168	2	4
Pyrene C1	ug/kg	ND	55	35.7	1	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	277	201	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	4220	12800	8510	2	2

Sediment Non-Radiological Data

Table 4.50 Non-Radiological Data for Sediment Location K010

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	mg/kg	ND	ND	ND	0	2
Uranium	ug/g	ND	7.21	4.23	1	2
Vanadium	mg/kg	10.8	17.4	14.1	2	2
Zinc	mg/kg	32.8	64.8	48.8	2	2

Sediment Non-Radiological Data

Table 4.51 Non-Radiological Data for Sediment Location K012

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	12	8.45	1	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	48	16.9	1	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	470	132	2	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	4670	7360	6020	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	470	141	2	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.51 Non-Radiological Data for Sediment Location K012

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	50.2	53.2	51.7	2	2
Benz(a)anthracene	ug/kg	ND	470	284	2	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	470	281	2	4
Benzo(b)fluoranthene	ug/kg	ND	610	369	2	4
Benzo(e)pyrene	ug/kg	210	250	230	2	2
Benzo(ghi)perylene	ug/kg	ND	470	170	2	4
Benzo(k)fluoranthene	ug/kg	ND	470	249	2	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	0.647	0.449	1	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	2
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	1870	4690	3280	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	24.7	25.6	25.1	2	2
Chrysene	ug/kg	ND	470	286	2	4
Chrysene C1	ug/kg	120	180	150	2	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	4.37	4.53	4.45	2	2
Copper	mg/kg	8.5	67.6	38	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	610	770	690	2	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	470	132	2	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	ND	ND	0	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.51 Non-Radiological Data for Sediment Location K012

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	730	451	2	4
Fluoranthene C1	ug/kg	110	150	130	2	2
Fluorene	ug/kg	ND	470	130	1	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	180	220	200	2	2
Heptadecane	ug/kg	ND	ND	ND	0	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	310	100	1	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	470	201	2	4
Iron	mg/kg	8540	8660	8600	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	760	816	788	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	59.4	111	85.2	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	29	40.1	34.5	2	2
n-Hentriacontane	ug/kg	930	2200	1560	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	58	90	74	2	2
n-Pentacosane	ug/kg	46	73	59.5	2	2

Sediment Non-Radiological Data

Table 4.51 Non-Radiological Data for Sediment Location K012

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	51	78	64.5	2	2
n-Tricosane	ug/kg	ND	310	96	1	2
n-Tritriacontane	ug/kg	200	430	315	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	5.02	5.59	5.3	2	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	1300	1400	1350	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	25.8	41.2	33.5	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	170	110	1	2
PCB-1260	ug/kg	ND	100	75	1	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	32.6	45.4	39	2	2
Perylene	ug/kg	80	92	86	2	2
Phenanthrene	ug/kg	ND	470	291	2	4
Phenanthrene C1	ug/kg	ND	100	65.7	1	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	270	160	1	2
Potassium	mg/kg	235	332	284	2	2
Pyrene	ug/kg	ND	510	339	2	4
Pyrene C1	ug/kg	65	160	112	2	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	327	226	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	9500	14600	12000	2	2

Sediment Non-Radiological Data

Table 4.51 Non-Radiological Data for Sediment Location K012

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	ug/g	ND	2.5	1.56	1	2
Uranium	mg/kg	ND	ND	ND	0	2
Vanadium	mg/kg	17.7	20.2	18.9	2	2
Zinc	mg/kg	84.6	100	92.3	2	2

Sediment Non-Radiological Data

Table 4.52 Non-Radiological Data for Sediment Location S2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	3
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	3
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	3
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	3
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	3
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	3
2,4'-DDD	ug/kg	ND	ND	ND	0	3
2,4'-DDE	ug/kg	ND	ND	ND	0	3
2,4'-DDT	ug/kg	ND	ND	ND	0	3
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	3
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	3
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	3
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	3
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	3
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	3
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	3
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	3
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	3
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	3
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	3
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	3
2-Chlorophenol	ug/kg	ND	ND	ND	0	3
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	3
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	6
2-Methylphenol	ug/kg	ND	ND	ND	0	3
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	3
2-Nitrophenol	ug/kg	ND	ND	ND	0	3
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	3
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	3
4,4'-DDD	ug/kg	ND	ND	ND	0	3
4,4'-DDE	ug/kg	ND	ND	ND	0	3
4,4'-DDT	ug/kg	ND	ND	ND	0	3
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	3
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	3
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	3
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	3
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	3
4-Nitrophenol	ug/kg	ND	ND	ND	0	3
Acenaphthene	ug/kg	ND	ND	ND	0	6
Acenaphthylene	ug/kg	ND	ND	ND	0	6
Aldrin	ug/kg	ND	ND	ND	0	3
alpha-BHC	ug/kg	ND	ND	ND	0	3
alpha-Chlordane	ug/kg	ND	ND	ND	0	3
Aluminum	mg/kg	4330	5760	5280	3	3
Aniline	ug/kg	ND	ND	ND	0	3
Anthracene	ug/kg	ND	ND	ND	0	6
Antimony	mg/kg	ND	ND	ND	0	3

Sediment Non-Radiological Data

Table 4.52 Non-Radiological Data for Sediment Location S2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	20	6.46	1	3
Azinphos-methyl	ug/kg	ND	ND	ND	0	3
Barium	mg/kg	44.5	73.2	61.4	3	3
Benz(a)anthracene	ug/kg	ND	490	140	3	6
Benzenemethanol	ug/kg	ND	ND	ND	0	3
Benzidine	ug/kg	ND	ND	ND	0	3
Benzo(a)pyrene	ug/kg	ND	490	144	3	6
Benzo(b)fluoranthene	ug/kg	ND	490	161	3	6
Benzo(e)pyrene	ug/kg	35	49	40.3	3	3
Benzo(ghi)perylene	ug/kg	ND	490	136	1	6
Benzo(k)fluoranthene	ug/kg	ND	490	148	3	6
Benzoic acid	ug/kg	ND	ND	ND	0	3
Beryllium	mg/kg	ND	0.53	0.43	2	3
beta-BHC	ug/kg	ND	ND	ND	0	3
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	3
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	3
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	3
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	2
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	3
Cadmium	mg/kg	ND	ND	ND	0	3
Calcium	mg/kg	781	1080	887	3	3
Carbazole	ug/kg	ND	ND	ND	0	3
Chlordane	ug/kg	ND	ND	ND	0	3
Chromium	mg/kg	15.1	169	106	3	3
Chrysene	ug/kg	ND	490	149	3	6
Chrysene C1	ug/kg	ND	65	27.3	1	3
Co-Ral	ug/kg	ND	ND	ND	0	3
Cobalt	mg/kg	3.47	6.14	4.92	3	3
Copper	mg/kg	5.02	123	68.9	3	3
Decane	ug/kg	ND	ND	ND	0	3
delta-BHC	ug/kg	ND	ND	ND	0	3
Di-n-butyl phthalate	ug/kg	620	880	790	3	3
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	3
Diazinon	ug/kg	ND	ND	ND	0	3
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	6
Dibenzofuran	ug/kg	ND	ND	ND	0	3
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	3
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	3
Dichlorvos	ug/kg	ND	ND	ND	0	3
Dieldrin	ug/kg	ND	48	20	2	3
Diethyl phthalate	ug/kg	ND	ND	ND	0	3
Dimethoate	ug/kg	ND	ND	ND	0	3
Dimethyl phthalate	ug/kg	ND	ND	ND	0	3
Docosane	ug/kg	ND	ND	ND	0	3
Dodecane	ug/kg	ND	ND	ND	0	3
Dotriacontane	ug/kg	ND	ND	ND	0	3
Eicosane	ug/kg	ND	ND	ND	0	3

Sediment Non-Radiological Data

Table 4.52 Non-Radiological Data for Sediment Location S2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	3
Endosulfan II	ug/kg	ND	ND	ND	0	3
Endosulfan sulfate	ug/kg	ND	ND	ND	0	3
Endrin	ug/kg	ND	ND	ND	0	3
Endrin aldehyde	ug/kg	ND	ND	ND	0	3
Ethion	ug/kg	ND	ND	ND	0	3
Famphur	ug/kg	ND	ND	ND	0	3
Fensulfothion	ug/kg	ND	ND	ND	0	3
Fenthion	ug/kg	ND	ND	ND	0	3
Fluoranthene	ug/kg	ND	490	165	3	6
Fluoranthene C1	ug/kg	ND	65	27.7	1	3
Fluorene	ug/kg	ND	ND	ND	0	6
Fluorene C1	ug/kg	ND	ND	ND	0	3
Fluorene C2	ug/kg	ND	ND	ND	0	3
gamma-Chlordane	ug/kg	ND	ND	ND	0	3
Grain Size Diameter	%	44.1	44.1	44.1	1	1
Henicosane	ug/kg	ND	ND	ND	0	3
Heptachlor	ug/kg	ND	ND	ND	0	3
Heptachlor epoxide	ug/kg	ND	ND	ND	0	3
heptacosane	ug/kg	71	110	93.7	3	3
Heptadecane	ug/kg	ND	ND	ND	0	3
Hexachlorobenzene	ug/kg	ND	ND	ND	0	3
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	3
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	3
Hexachloroethane	ug/kg	ND	ND	ND	0	3
Hexacosane	ug/kg	ND	ND	ND	0	3
Hexadecane	ug/kg	ND	ND	ND	0	3
Indeno(1,2,3-cd)pyrene	ug/kg	ND	490	134	2	6
Iron	mg/kg	6440	9590	8440	3	3
Isophorone	ug/kg	ND	ND	ND	0	3
Lead	mg/kg	ND	ND	ND	0	3
Lindane	ug/kg	ND	ND	ND	0	3
m,p-Cresol	ug/kg	ND	ND	ND	0	3
Magnesium	mg/kg	459	675	599	3	3
Malathion	ug/kg	ND	ND	ND	0	3
Manganese	mg/kg	206	381	273	3	3
Mercury	mg/kg	ND	ND	ND	0	3
Methoxychlor	ug/kg	ND	ND	ND	0	3
Methyl parathion	ug/kg	ND	ND	ND	0	3
Mirex	ug/kg	ND	ND	ND	0	3
Mocap	ug/kg	ND	ND	ND	0	3
Moisture	%	29	34.8	31.9	2	2
n-Hentriacontane	ug/kg	150	940	430	3	3
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	3
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	3
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	3
n-Octacosane	ug/kg	ND	ND	ND	0	3

Sediment Non-Radiological Data

Table 4.52 Non-Radiological Data for Sediment Location S2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Pentacosane	ug/kg	ND	330	79	2	3
n-Tetracosane	ug/kg	ND	ND	ND	0	3
n-Triacontane	ug/kg	ND	330	123	1	3
n-Tricosane	ug/kg	ND	ND	ND	0	3
n-Tritriacontane	ug/kg	42	190	97	3	3
Naphthalene	ug/kg	ND	ND	ND	0	6
Naphthalene C1	ug/kg	ND	ND	ND	0	3
Naphthalene C2	ug/kg	ND	ND	ND	0	3
Naphthalene C3	ug/kg	ND	ND	ND	0	3
Naphthalene C4	ug/kg	ND	ND	ND	0	3
Nickel	mg/kg	ND	5.18	3.39	1	3
Nitrobenzene	ug/kg	ND	ND	ND	0	3
Nonacosane	ug/kg	160	530	303	3	3
Nonadecane	ug/kg	ND	ND	ND	0	3
Octadecane	ug/kg	ND	ND	ND	0	3
Parathion	ug/kg	ND	ND	ND	0	3
Particle Size	%	38	42.7	40.3	2	2
PCB-1016	ug/kg	ND	ND	ND	0	3
PCB-1221	ug/kg	ND	ND	ND	0	3
PCB-1232	ug/kg	ND	ND	ND	0	3
PCB-1242	ug/kg	ND	ND	ND	0	3
PCB-1248	ug/kg	ND	ND	ND	0	3
PCB-1254	ug/kg	ND	900	550	2	3
PCB-1260	ug/kg	ND	400	217	2	3
PCB-1268	ug/kg	ND	ND	ND	0	3
Pentachlorophenol	ug/kg	ND	ND	ND	0	3
Pentadecane	ug/kg	ND	ND	ND	0	3
Percent Moisture	%	30.4	41.8	36.2	4	4
Perylene	ug/kg	ND	ND	ND	0	3
Phenanthrene	ug/kg	ND	490	143	3	6
Phenanthrene C1	ug/kg	ND	65	29	1	3
Phenanthrene C2	ug/kg	ND	ND	ND	0	3
Phenanthrene C3	ug/kg	ND	ND	ND	0	3
Phenanthrene C4	ug/kg	ND	ND	ND	0	3
Phenol	ug/kg	ND	ND	ND	0	3
Phorate	ug/kg	ND	ND	ND	0	3
Polychlorinated biphenyl	ug/kg	ND	1300	750	2	3
Potassium	mg/kg	225	352	307	3	3
Pyrene	ug/kg	ND	490	157	3	6
Pyrene C1	ug/kg	ND	65	28.7	1	3
Pyridine	ug/kg	ND	ND	ND	0	3
Selenium	mg/kg	ND	ND	ND	0	3
Silver	mg/kg	ND	ND	ND	0	3
Sodium	mg/kg	ND	279	176	1	3
Tetradecane	ug/kg	ND	ND	ND	0	3
Tetratriacontane	ug/kg	ND	ND	ND	0	3
Thallium	mg/kg	ND	ND	ND	0	3

Sediment Non-Radiological Data

Table 4.52 Non-Radiological Data for Sediment Location S2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Total Organic Carbon (TOC)	mg/kg	9550	10500	10100	3	3
Toxaphene	ug/kg	ND	ND	ND	0	3
Tridecane	ug/kg	ND	ND	ND	0	3
Undecane	ug/kg	ND	ND	ND	0	3
Uranium	ug/g	ND	48.8	29.4	2	3
Uranium	mg/kg	ND	ND	ND	0	3
Vanadium	mg/kg	13.5	23	18.8	3	3
Zinc	mg/kg	25	50.7	41	3	3

Sediment Non-Radiological Data

Table 4.53 Non-Radiological Data for Sediment Location S30

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	15	9.95	1	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	45	22.2	1	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	6240	6500	6370	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	490	133	1	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.53 Non-Radiological Data for Sediment Location S30

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	54.5	68.2	61.3	2	2
Benz(a)anthracene	ug/kg	ND	490	160	2	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	490	169	2	4
Benzo(b)fluoranthene	ug/kg	ND	490	178	2	4
Benzo(e)pyrene	ug/kg	51	80	65.5	2	2
Benzo(ghi)perylene	ug/kg	ND	490	136	2	4
Benzo(k)fluoranthene	ug/kg	ND	490	172	2	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	0.54	0.636	0.588	2	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	949	1790	1370	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	14.9	49.6	32.2	2	2
Chrysene	ug/kg	ND	490	170	2	4
Chrysene C1	ug/kg	ND	65	26.2	1	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	4.71	5.33	5.02	2	2
Copper	mg/kg	9.7	54.5	32.1	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	45	15	1	2
Di-n-butyl phthalate	ug/kg	ND	1300	772	1	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	45	23.7	1	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	ND	ND	0	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.53 Non-Radiological Data for Sediment Location S30

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	490	205	2	4
Fluoranthene C1	ug/kg	24	34	29	2	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	87	290	188	2	2
Heptadecane	ug/kg	ND	ND	ND	0	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	320	99	1	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	490	139	2	4
Iron	mg/kg	9160	12000	10600	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	595	843	719	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	100	131	116	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	25	34.6	29.8	2	2
n-Hentriacontane	ug/kg	420	740	580	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	37	64	50.5	2	2
n-Pentacosane	ug/kg	ND	320	124	1	2

Sediment Non-Radiological Data

Table 4.53 Non-Radiological Data for Sediment Location S30

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	ND	320	106	1	2
n-Tricosane	ug/kg	ND	320	100	1	2
n-Tritriacontane	ug/kg	85	140	112	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	6.52	4.51	1	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	380	1000	690	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	24.3	34.4	29.4	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	500	275	1	2
PCB-1260	ug/kg	ND	300	175	1	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	32.4	43.7	38	2	2
Perylene	ug/kg	20	38	29	2	2
Phenanthrene	ug/kg	ND	490	172	2	4
Phenanthrene C1	ug/kg	ND	65	28.7	1	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	800	425	1	2
Potassium	mg/kg	287	302	294	2	2
Pyrene	ug/kg	ND	490	180	2	4
Pyrene C1	ug/kg	24	31	27.5	2	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	305	215	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	3240	6780	5010	2	2

Sediment Non-Radiological Data

Table 4.53 Non-Radiological Data for Sediment Location S30

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	ug/g	23.3	49.1	36.2	2	2
Uranium	mg/kg	ND	ND	ND	0	2
Vanadium	mg/kg	20.5	25.3	22.9	2	2
Zinc	mg/kg	29.5	62.3	45.9	2	2

Sediment Non-Radiological Data

Table 4.54 Non-Radiological Data for Sediment Location LBCN1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	2340	4090	3220	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	470	128	1	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.54 Non-Radiological Data for Sediment Location LBCN1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	20.1	33.9	27	2	2
Benz(a)anthracene	ug/kg	ND	470	145	1	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	470	148	1	4
Benzo(b)fluoranthene	ug/kg	ND	470	150	1	4
Benzo(e)pyrene	ug/kg	ND	51	33.5	1	2
Benzo(ghi)perylene	ug/kg	ND	470	130	1	4
Benzo(k)fluoranthene	ug/kg	ND	470	148	1	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	2
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	384	438	411	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	29.6	70	49.8	2	2
Chrysene	ug/kg	ND	470	150	1	4
Chrysene C1	ug/kg	ND	49	32.5	1	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	ND	ND	ND	0	2
Copper	mg/kg	17.4	67.9	42.6	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	490	710	600	2	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	450	120	1	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.54 Non-Radiological Data for Sediment Location LBCN1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	470	180	1	4
Fluoranthene C1	ug/kg	ND	32	24	1	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	120	370	245	2	2
Heptadecane	ug/kg	ND	ND	ND	0	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	ND	ND	0	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	470	133	1	4
Iron	mg/kg	3010	3510	3260	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	235	388	312	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	36.1	48.3	42.2	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	22	37.5	29.7	2	2
n-Hentriacontane	ug/kg	340	850	595	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	ND	450	126	1	2
n-Pentacosane	ug/kg	37	63	50	2	2

Sediment Non-Radiological Data

Table 4.54 Non-Radiological Data for Sediment Location LBCN1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	ND	450	128	1	2
n-Tricosane	ug/kg	ND	450	125	1	2
n-Tritriacontane	ug/kg	110	140	125	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	6.08	4.29	1	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	290	650	470	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	20.3	35.7	28	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	25	28.8	26.9	2	2
Perylene	ug/kg	78	220	149	2	2
Phenanthrene	ug/kg	ND	470	165	1	4
Phenanthrene C1	ug/kg	ND	47	31.5	1	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	ND	ND	0	2
Potassium	mg/kg	ND	253	176	1	2
Pyrene	ug/kg	ND	470	160	1	4
Pyrene C1	ug/kg	ND	32	23.5	1	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	ND	ND	0	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	4360	7040	5700	2	2

Sediment Non-Radiological Data

Table 4.54 Non-Radiological Data for Sediment Location LBCN1

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	ug/g	ND	11	6.12	1	2
Uranium	mg/kg	ND	ND	ND	0	2
Vanadium	mg/kg	8.47	10.7	9.59	2	2
Zinc	mg/kg	29.9	30.9	30.4	2	2

Sediment Non-Radiological Data

Table 4.554 Non-Radiological Data for Sediment Location S27

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	64	20.5	1	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	490	134	1	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	490	169	1	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	1260	1650	1460	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	490	177	1	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.554 Non-Radiological Data for Sediment Location S27

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	12.1	15.5	13.8	2	2
Benz(a)anthracene	ug/kg	ND	730	309	1	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	620	282	1	4
Benzo(b)fluoranthene	ug/kg	ND	970	369	1	4
Benzo(e)pyrene	ug/kg	ND	470	251	1	2
Benzo(ghi)perylene	ug/kg	ND	490	167	1	4
Benzo(k)fluoranthene	ug/kg	ND	640	287	1	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	264	290	277	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	37.4	45.9	41.6	2	2
Chrysene	ug/kg	ND	720	307	1	4
Chrysene C1	ug/kg	ND	330	181	1	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	ND	ND	ND	0	2
Copper	mg/kg	2.78	6.05	4.41	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	ND	950	598	1	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	490	145	1	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	ND	ND	0	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.554 Non-Radiological Data for Sediment Location S27

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	1600	524	2	4
Fluoranthene C1	ug/kg	ND	220	126	1	2
Fluorene	ug/kg	ND	490	154	1	4
Fluorene C1	ug/kg	ND	64	21.5	1	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	320	88	1	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	180	220	200	2	2
Heptadecane	ug/kg	ND	ND	ND	0	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	320	89.5	1	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	490	212	1	4
Iron	mg/kg	3020	3820	3420	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	138	159	148	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	39.7	63.5	51.6	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	23	25.9	24.4	2	2
n-Hentriacontane	ug/kg	290	370	330	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	ND	320	104	1	2
n-Pentacosane	ug/kg	ND	320	165	1	2

Sediment Non-Radiological Data

Table 4.554 Non-Radiological Data for Sediment Location S27

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	ND	320	97	1	2
n-Tricosane	ug/kg	ND	320	104	1	2
n-Tritriacontane	ug/kg	47	70	58.5	2	2
Naphthalene	ug/kg	ND	490	154	1	4
Naphthalene C1	ug/kg	ND	64	29	1	2
Naphthalene C2	ug/kg	ND	64	29	1	2
Naphthalene C3	ug/kg	ND	64	22	1	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	ND	ND	0	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	240	570	405	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	6.53	12.1	9.32	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	160	105	1	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	24.6	33.3	28.9	2	2
Perylene	ug/kg	ND	220	126	1	2
Phenanthrene	ug/kg	ND	1400	477	1	4
Phenanthrene C1	ug/kg	ND	330	181	1	2
Phenanthrene C2	ug/kg	ND	68	50	1	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	160	105	1	2
Potassium	mg/kg	ND	ND	ND	0	2
Pyrene	ug/kg	ND	1300	448	2	4
Pyrene C1	ug/kg	ND	240	136	1	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	ND	ND	0	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	2190	11000	6620	2	2

Sediment Non-Radiological Data

Table 4.554 Non-Radiological Data for Sediment Location S27

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	mg/kg	ND	ND	ND	0	2
Uranium	ug/g	ND	5.06	3.15	1	2
Vanadium	mg/kg	7.14	9.26	8.2	2	2
Zinc	mg/kg	19.5	29.5	24.5	2	2

Sediment Non-Radiological Data

Table 4.56 Non-Radiological Data for Sediment Location S34

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	2920	3810	3360	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	ND	ND	0	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.56 Non-Radiological Data for Sediment Location S34

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	30	35.6	32.8	2	2
Benz(a)anthracene	ug/kg	ND	490	146	2	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	490	143	2	4
Benzo(b)fluoranthene	ug/kg	ND	490	153	2	4
Benzo(e)pyrene	ug/kg	19	41	30	2	2
Benzo(ghi)perylene	ug/kg	ND	490	135	1	4
Benzo(k)fluoranthene	ug/kg	ND	490	142	2	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	385	615	500	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	13.4	22.6	18	2	2
Chrysene	ug/kg	ND	490	151	2	4
Chrysene C1	ug/kg	ND	57	25.2	1	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	2.56	3.31	2.93	2	2
Copper	mg/kg	6.89	79.1	43	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Demeton	ug/kg	ND	ND	ND	0	1
Di-n-butyl phthalate	ug/kg	ND	1500	872	1	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	290	97.5	1	2

Sediment Non-Radiological Data

Table 4.56 Non-Radiological Data for Sediment Location S34

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Eicosane	ug/kg	ND	ND	ND	0	2
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	490	172	2	4
Fluoranthene C1	ug/kg	ND	57	26.7	1	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	430	126	1	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	360	510	435	2	2
Heptadecane	ug/kg	60	65	62.5	2	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	430	128	1	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	490	133	2	4
Iron	mg/kg	4400	6430	5420	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	254	387	320	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	68.5	130	99.2	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	27	37.6	32.3	2	2
n-Hentriacontane	ug/kg	810	1200	1000	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	54	56	55	2	2

Sediment Non-Radiological Data

Table 4.56 Non-Radiological Data for Sediment Location S34

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Pentacosane	ug/kg	120	320	220	2	2
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	46	53	49.5	2	2
n-Tricosane	ug/kg	44	100	72	2	2
n-Tritriacontane	ug/kg	160	280	220	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	ND	ND	0	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	900	920	910	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	17.1	28.2	22.7	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	27.9	30	28.9	2	2
Perylene	ug/kg	ND	ND	ND	0	2
Phenanthrene	ug/kg	ND	490	158	2	4
Phenanthrene C1	ug/kg	ND	57	28.7	1	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	ND	ND	0	2
Potassium	mg/kg	ND	263	182	1	2
Pyrene	ug/kg	ND	490	163	2	4
Pyrene C1	ug/kg	ND	57	27.2	1	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	ND	ND	0	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.56 Non-Radiological Data for Sediment Location S34

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Total Organic Carbon (TOC)	mg/kg	3140	9650	6400	2	2
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	mg/kg	ND	183	116	1	2
Uranium	ug/g	4.01	7.24	5.62	2	2
Vanadium	mg/kg	9.95	12.4	11.2	2	2
Zinc	mg/kg	20.4	21	20.7	2	2

Sediment Non-Radiological Data

Table 4.57 Non-Radiological Data for Sediment Location C746KTB2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	3150	6530	4840	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	ND	ND	0	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.57 Non-Radiological Data for Sediment Location C746KTB2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	35.3	59.9	47.6	2	2
Benz(a)anthracene	ug/kg	ND	490	149	2	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	490	154	2	4
Benzo(b)fluoranthene	ug/kg	ND	490	182	2	4
Benzo(e)pyrene	ug/kg	29	81	55	2	2
Benzo(ghi)perylene	ug/kg	ND	490	132	2	4
Benzo(k)fluoranthene	ug/kg	ND	490	148	2	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	0.59	0.42	1	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	620	797	708	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	10.7	19.7	15.2	2	2
Chrysene	ug/kg	ND	490	161	2	4
Chrysene C1	ug/kg	ND	35	25.2	1	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	3.82	4.59	4.2	2	2
Copper	mg/kg	5.49	47.4	26.4	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	ND	1000	622	1	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	17	150	83.5	2	2
Eicosane	ug/kg	ND	160	60.5	1	2

Sediment Non-Radiological Data

Table 4.57 Non-Radiological Data for Sediment Location C746KTB2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	490	184	2	4
Fluoranthene C1	ug/kg	18	33	25.5	2	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	110	510	310	2	2
Heptadecane	ug/kg	ND	160	105	1	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	22	48	35	2	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	490	136	2	4
Iron	mg/kg	8690	10800	9740	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	362	763	562	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	239	320	280	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	38	48.3	43.1	2	2
n-Hentriacontane	ug/kg	240	1200	720	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	34	89	61.5	2	2
n-Pentacosane	ug/kg	41	140	90.5	2	2

Sediment Non-Radiological Data

Table 4.57 Non-Radiological Data for Sediment Location C746KTB2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	17	37	27	2	2
n-Triacontane	ug/kg	24	110	67	2	2
n-Tricosane	ug/kg	22	47	34.5	2	2
n-Tritriacontane	ug/kg	78	400	239	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	5.96	4.23	1	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	300	950	625	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	23.7	42.1	32.9	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	100	75	1	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	22	27.1	24.5	2	2
Perylene	ug/kg	ND	84	58.2	1	2
Phenanthrene	ug/kg	ND	490	162	2	4
Phenanthrene C1	ug/kg	ND	39	27.2	1	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	100	75	1	2
Potassium	mg/kg	229	449	339	2	2
Pyrene	ug/kg	ND	490	174	2	4
Pyrene C1	ug/kg	16	37	26.5	2	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	ND	ND	0	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	160	85	1	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	8330	14000	11200	2	2

Sediment Non-Radiological Data

Table 4.57 Non-Radiological Data for Sediment Location C746KTB2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	mg/kg	ND	ND	ND	0	2
Uranium	ug/g	ND	ND	ND	0	2
Vanadium	mg/kg	18.8	22.3	20.5	2	2
Zinc	mg/kg	20.2	33.7	26.9	2	2

Sediment Non-Radiological Data

Table 4.58 Non-Radiological Data for Sediment Location C746KUP

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	2690	3520	3100	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	ND	ND	0	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.58 Non-Radiological Data for Sediment Location C746KUP

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	25.4	30.1	27.7	2	2
Benz(a)anthracene	ug/kg	ND	500	144	1	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	500	147	1	4
Benzo(b)fluoranthene	ug/kg	ND	500	155	1	4
Benzo(e)pyrene	ug/kg	ND	64	41.5	1	2
Benzo(ghi)perylene	ug/kg	ND	500	136	1	4
Benzo(k)fluoranthene	ug/kg	ND	500	150	1	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	387	713	550	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	6.18	7.6	6.89	2	2
Chrysene	ug/kg	ND	500	148	1	4
Chrysene C1	ug/kg	ND	ND	ND	0	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	2.82	3.13	2.98	2	2
Copper	mg/kg	4.42	85.5	45	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	ND	4400	2320	1	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	ND	ND	0	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.58 Non-Radiological Data for Sediment Location C746KUP

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	500	159	1	4
Fluoranthene C1	ug/kg	ND	64	27.5	1	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	100	530	315	2	2
Heptadecane	ug/kg	ND	ND	ND	0	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	ND	ND	0	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	500	138	1	4
Iron	mg/kg	5660	6160	5910	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	248	332	290	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	113	237	175	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	28.8	31	29.9	2	2
n-Hentriacontane	ug/kg	180	1000	590	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	18	51	34.5	2	2
n-Pentacosane	ug/kg	29	88	58.5	2	2

Sediment Non-Radiological Data

Table 4.58 Non-Radiological Data for Sediment Location C746KUP

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	18	34	26	2	2
n-Tricosane	ug/kg	ND	ND	ND	0	2
n-Tritriacontane	ug/kg	53	250	152	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	ND	ND	0	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	230	870	550	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	13.5	17.8	15.7	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	32.9	40.8	36.8	2	2
Perylene	ug/kg	ND	ND	ND	0	2
Phenanthrene	ug/kg	ND	500	146	1	4
Phenanthrene C1	ug/kg	ND	31	16.2	1	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	ND	ND	0	2
Potassium	mg/kg	ND	ND	ND	0	2
Pyrene	ug/kg	ND	500	152	1	4
Pyrene C1	ug/kg	ND	64	26	1	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	ND	ND	0	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	5310	6240	5770	2	2

Sediment Non-Radiological Data

Table 4.58 Non-Radiological Data for Sediment Location C746KUP

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	ug/g	ND	ND	ND	0	2
Uranium	mg/kg	ND	ND	ND	0	2
Vanadium	mg/kg	12.3	13.6	12.9	2	2
Zinc	mg/kg	14	29.5	21.7	2	2

Sediment Non-Radiological Data

Table 4.59 Non-Radiological Data for Sediment Location S32

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	54	28.6	1	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	480	133	1	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	40	28.5	1	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	480	131	1	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	34	21.5	1	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	5700	7280	6490	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	480	139	1	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.59 Non-Radiological Data for Sediment Location S32

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	48.3	52.2	50.2	2	2
Benz(a)anthracene	ug/kg	ND	480	216	1	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	480	206	1	4
Benzo(b)fluoranthene	ug/kg	ND	480	233	2	4
Benzo(e)pyrene	ug/kg	ND	260	146	1	2
Benzo(ghi)perylene	ug/kg	ND	480	158	1	4
Benzo(k)fluoranthene	ug/kg	ND	480	210	1	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	1590	1790	1690	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	44.5	51.8	48.1	2	2
Chrysene	ug/kg	ND	480	206	1	4
Chrysene C1	ug/kg	ND	240	136	1	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	3.34	3.5	3.42	2	2
Copper	mg/kg	39.9	113	76.4	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	ND	ND	ND	0	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	480	138	1	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	33	37	35	2	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	58	91	74.5	2	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.59 Non-Radiological Data for Sediment Location S32

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	810	410	3	4
Fluoranthene C1	ug/kg	ND	150	91	1	2
Fluorene	ug/kg	ND	480	130	1	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	49	54	51.5	2	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	190	540	365	2	2
Heptadecane	ug/kg	39	68	53.5	2	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	49	69	59	2	2
Hexadecane	ug/kg	ND	320	96.5	1	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	480	168	1	4
Iron	mg/kg	7770	8190	7980	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	672	822	747	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	113	116	114	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	42	49.1	45.5	2	2
n-Hentriacontane	ug/kg	1200	1300	1250	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	110	120	115	2	2
n-Pentacosane	ug/kg	68	140	104	2	2

Sediment Non-Radiological Data

Table 4.59 Non-Radiological Data for Sediment Location S32

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	33	39	36	2	2
n-Triacontane	ug/kg	79	110	94.5	2	2
n-Tricosane	ug/kg	55	85	70	2	2
n-Tritriacontane	ug/kg	250	350	300	2	2
Naphthalene	ug/kg	ND	480	131	1	4
Naphthalene C1	ug/kg	ND	64	32	1	2
Naphthalene C2	ug/kg	ND	100	66	1	2
Naphthalene C3	ug/kg	ND	120	76	1	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	22.7	24.3	23.5	2	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	930	1500	1220	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	16	12	1	2
Particle Size	%	42.2	43.5	42.9	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	400	710	555	2	2
PCB-1260	ug/kg	200	540	370	2	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	320	100	1	2
Percent Moisture	%	49.3	62.8	56	2	2
Perylene	ug/kg	ND	73	52.5	1	2
Phenanthrene	ug/kg	ND	680	332	3	4
Phenanthrene C1	ug/kg	ND	220	126	1	2
Phenanthrene C2	ug/kg	ND	88	60	1	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	600	1250	925	2	2
Potassium	mg/kg	384	520	452	2	2
Pyrene	ug/kg	ND	710	374	3	4
Pyrene C1	ug/kg	ND	180	106	1	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	3.15	2.2	1	2
Sodium	mg/kg	ND	259	192	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	16600	17500	17100	2	2

Sediment Non-Radiological Data

Table 4.59 Non-Radiological Data for Sediment Location S32

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	mg/kg	ND	ND	ND	0	2
Uranium	ug/g	16.6	43.1	29.8	2	2
Vanadium	mg/kg	14.6	16.6	15.6	2	2
Zinc	mg/kg	78.6	91	84.8	2	2

Sediment Non-Radiological Data

Table 4.60 Non-Radiological Data for Sediment Location S28

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
1,1-biphenyl	ug/kg	ND	ND	ND	0	2
1,2,4-Trichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,2-Diphenylhydrazine	ug/kg	ND	ND	ND	0	2
1,3-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
1,4-Dichlorobenzene	ug/kg	ND	ND	ND	0	2
2,4'-DDD	ug/kg	ND	ND	ND	0	2
2,4'-DDE	ug/kg	ND	ND	ND	0	2
2,4'-DDT	ug/kg	ND	ND	ND	0	2
2,4,5-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4,6-Trichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,4-Dimethylphenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrophenol	ug/kg	ND	ND	ND	0	2
2,4-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylhexadecane	ug/kg	ND	ND	ND	0	2
2,6,10,14-Tetramethylpentadecane	ug/kg	ND	ND	ND	0	2
2,6-Dichlorophenol	ug/kg	ND	ND	ND	0	2
2,6-Dimethylnaphthalene	ug/kg	ND	ND	ND	0	2
2,6-Dinitrotoluene	ug/kg	ND	ND	ND	0	2
2-Chloronaphthalene	ug/kg	ND	ND	ND	0	2
2-Chlorophenol	ug/kg	ND	ND	ND	0	2
2-Methyl-4,6-dinitrophenol	ug/kg	ND	ND	ND	0	2
2-Methylnaphthalene	ug/kg	ND	ND	ND	0	4
2-Methylphenol	ug/kg	ND	ND	ND	0	2
2-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
2-Nitrophenol	ug/kg	ND	ND	ND	0	2
3,3'-Dichlorobenzidine	ug/kg	ND	ND	ND	0	2
3-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4,4'-DDD	ug/kg	ND	ND	ND	0	2
4,4'-DDE	ug/kg	ND	ND	ND	0	2
4,4'-DDT	ug/kg	ND	ND	ND	0	2
4-Bromophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Chloro-3-methylphenol	ug/kg	ND	ND	ND	0	2
4-Chlorobenzenamine	ug/kg	ND	ND	ND	0	2
4-Chlorophenyl phenyl ether	ug/kg	ND	ND	ND	0	2
4-Nitrobenzenamine	ug/kg	ND	ND	ND	0	2
4-Nitrophenol	ug/kg	ND	ND	ND	0	2
Acenaphthene	ug/kg	ND	ND	ND	0	4
Acenaphthylene	ug/kg	ND	ND	ND	0	4
Aldrin	ug/kg	ND	ND	ND	0	2
alpha-BHC	ug/kg	ND	ND	ND	0	2
alpha-Chlordane	ug/kg	ND	ND	ND	0	2
Aluminum	mg/kg	2990	4320	3660	2	2
Aniline	ug/kg	ND	ND	ND	0	2
Anthracene	ug/kg	ND	ND	ND	0	4
Antimony	mg/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.60 Non-Radiological Data for Sediment Location S28

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Arsenic	mg/kg	ND	ND	ND	0	2
Azinphos-methyl	ug/kg	ND	ND	ND	0	2
Barium	mg/kg	35.4	44.7	40	2	2
Benz(a)anthracene	ug/kg	ND	ND	ND	0	4
Benzenemethanol	ug/kg	ND	ND	ND	0	2
Benzidine	ug/kg	ND	ND	ND	0	2
Benzo(a)pyrene	ug/kg	ND	ND	ND	0	4
Benzo(b)fluoranthene	ug/kg	ND	ND	ND	0	4
Benzo(e)pyrene	ug/kg	ND	ND	ND	0	2
Benzo(ghi)perylene	ug/kg	ND	ND	ND	0	4
Benzo(k)fluoranthene	ug/kg	ND	ND	ND	0	4
Benzoic acid	ug/kg	ND	ND	ND	0	2
Beryllium	mg/kg	ND	ND	ND	0	2
beta-BHC	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethoxy)methane	ug/kg	ND	ND	ND	0	2
Bis(2-chloroethyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-chloroisopropyl) ether	ug/kg	ND	ND	ND	0	2
Bis(2-ethylhexyl)phthalate	ug/kg	ND	ND	ND	0	1
Butyl benzyl phthalate	ug/kg	ND	ND	ND	0	2
Cadmium	mg/kg	ND	ND	ND	0	2
Calcium	mg/kg	391	423	407	2	2
Carbazole	ug/kg	ND	ND	ND	0	2
Chlordane	ug/kg	ND	ND	ND	0	2
Chromium	mg/kg	4.67	6.01	5.34	2	2
Chrysene	ug/kg	ND	ND	ND	0	4
Chrysene C1	ug/kg	ND	ND	ND	0	2
Co-Ral	ug/kg	ND	ND	ND	0	2
Cobalt	mg/kg	3.31	3.48	3.39	2	2
Copper	mg/kg	4.21	31.3	17.8	2	2
Decane	ug/kg	ND	ND	ND	0	2
delta-BHC	ug/kg	ND	ND	ND	0	2
Di-n-butyl phthalate	ug/kg	540	1300	920	2	2
Di-n-octylphthalate	ug/kg	ND	ND	ND	0	2
Diazinon	ug/kg	ND	ND	ND	0	2
Dibenz(a,h)anthracene	ug/kg	ND	ND	ND	0	4
Dibenzofuran	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C1	ug/kg	ND	ND	ND	0	2
Dibenzothiophene C2	ug/kg	ND	ND	ND	0	2
Dichlorvos	ug/kg	ND	ND	ND	0	2
Dieldrin	ug/kg	ND	ND	ND	0	2
Diethyl phthalate	ug/kg	ND	ND	ND	0	2
Dimethoate	ug/kg	ND	ND	ND	0	2
Dimethyl phthalate	ug/kg	ND	ND	ND	0	2
Docosane	ug/kg	ND	ND	ND	0	2
Dodecane	ug/kg	ND	ND	ND	0	2
Dotriacontane	ug/kg	ND	ND	ND	0	2
Eicosane	ug/kg	ND	ND	ND	0	2

Sediment Non-Radiological Data

Table 4.60 Non-Radiological Data for Sediment Location S28

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Endosulfan I	ug/kg	ND	ND	ND	0	2
Endosulfan II	ug/kg	ND	ND	ND	0	2
Endosulfan sulfate	ug/kg	ND	ND	ND	0	2
Endrin	ug/kg	ND	ND	ND	0	2
Endrin aldehyde	ug/kg	ND	ND	ND	0	2
Ethion	ug/kg	ND	ND	ND	0	2
Famphur	ug/kg	ND	ND	ND	0	2
Fensulfothion	ug/kg	ND	ND	ND	0	2
Fenthion	ug/kg	ND	ND	ND	0	2
Fluoranthene	ug/kg	ND	ND	ND	0	4
Fluoranthene C1	ug/kg	ND	ND	ND	0	2
Fluorene	ug/kg	ND	ND	ND	0	4
Fluorene C1	ug/kg	ND	ND	ND	0	2
Fluorene C2	ug/kg	ND	ND	ND	0	2
gamma-Chlordane	ug/kg	ND	ND	ND	0	2
Henicosane	ug/kg	ND	ND	ND	0	2
Heptachlor	ug/kg	ND	ND	ND	0	2
Heptachlor epoxide	ug/kg	ND	ND	ND	0	2
heptacosane	ug/kg	62	120	91	2	2
Heptadecane	ug/kg	ND	ND	ND	0	2
Hexachlorobenzene	ug/kg	ND	ND	ND	0	2
Hexachlorobutadiene	ug/kg	ND	ND	ND	0	2
Hexachlorocyclopentadiene	ug/kg	ND	ND	ND	0	2
Hexachloroethane	ug/kg	ND	ND	ND	0	2
Hexacosane	ug/kg	ND	ND	ND	0	2
Hexadecane	ug/kg	ND	ND	ND	0	2
Indeno(1,2,3-cd)pyrene	ug/kg	ND	ND	ND	0	4
Iron	mg/kg	5140	5950	5540	2	2
Isophorone	ug/kg	ND	ND	ND	0	2
Lead	mg/kg	ND	ND	ND	0	2
Lindane	ug/kg	ND	ND	ND	0	2
m,p-Cresol	ug/kg	ND	ND	ND	0	2
Magnesium	mg/kg	378	497	438	2	2
Malathion	ug/kg	ND	ND	ND	0	2
Manganese	mg/kg	260	341	300	2	2
Mercury	mg/kg	ND	ND	ND	0	2
Methoxychlor	ug/kg	ND	ND	ND	0	2
Methyl parathion	ug/kg	ND	ND	ND	0	2
Mirex	ug/kg	ND	ND	ND	0	2
Mocap	ug/kg	ND	ND	ND	0	2
Moisture	%	30	36.1	33	2	2
n-Hentriacontane	ug/kg	270	540	405	2	2
N-Nitroso-di-n-propylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodimethylamine	ug/kg	ND	ND	ND	0	2
N-Nitrosodiphenylamine	ug/kg	ND	ND	ND	0	2
n-Octacosane	ug/kg	ND	ND	ND	0	2
n-Pentacosane	ug/kg	34	47	40.5	2	2

Sediment Non-Radiological Data

Table 4.60 Non-Radiological Data for Sediment Location S28

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
n-Tetracosane	ug/kg	ND	ND	ND	0	2
n-Triacontane	ug/kg	ND	320	90	1	2
n-Tricosane	ug/kg	ND	320	90.5	1	2
n-Tritriacontane	ug/kg	88	230	159	2	2
Naphthalene	ug/kg	ND	ND	ND	0	4
Naphthalene C1	ug/kg	ND	ND	ND	0	2
Naphthalene C2	ug/kg	ND	ND	ND	0	2
Naphthalene C3	ug/kg	ND	ND	ND	0	2
Naphthalene C4	ug/kg	ND	ND	ND	0	2
Nickel	mg/kg	ND	ND	ND	0	2
Nitrobenzene	ug/kg	ND	ND	ND	0	2
Nonacosane	ug/kg	160	340	250	2	2
Nonadecane	ug/kg	ND	ND	ND	0	2
Octadecane	ug/kg	ND	ND	ND	0	2
Parathion	ug/kg	ND	ND	ND	0	2
Particle Size	%	35.7	55.4	45.6	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	ND	ND	0	2
PCB-1268	ug/kg	ND	ND	ND	0	2
Pentachlorophenol	ug/kg	ND	ND	ND	0	2
Pentadecane	ug/kg	ND	ND	ND	0	2
Percent Moisture	%	31.6	35.6	33.6	2	2
Perylene	ug/kg	ND	ND	ND	0	2
Phenanthrene	ug/kg	ND	ND	ND	0	4
Phenanthrene C1	ug/kg	ND	ND	ND	0	2
Phenanthrene C2	ug/kg	ND	ND	ND	0	2
Phenanthrene C3	ug/kg	ND	ND	ND	0	2
Phenanthrene C4	ug/kg	ND	ND	ND	0	2
Phenol	ug/kg	ND	ND	ND	0	2
Phorate	ug/kg	ND	ND	ND	0	2
Polychlorinated biphenyl	ug/kg	ND	ND	ND	0	2
Potassium	mg/kg	229	311	270	2	2
Pyrene	ug/kg	ND	ND	ND	0	4
Pyrene C1	ug/kg	ND	ND	ND	0	2
Pyridine	ug/kg	ND	ND	ND	0	2
Selenium	mg/kg	ND	ND	ND	0	2
Silver	mg/kg	ND	ND	ND	0	2
Sodium	mg/kg	ND	257	191	1	2
Tetradecane	ug/kg	ND	ND	ND	0	2
Tetratriacontane	ug/kg	ND	ND	ND	0	2
Thallium	mg/kg	ND	ND	ND	0	2
Total Organic Carbon (TOC)	mg/kg	6740	7060	6900	2	2

Sediment Non-Radiological Data

Table 4.60 Non-Radiological Data for Sediment Location S28

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Toxaphene	ug/kg	ND	ND	ND	0	2
Tridecane	ug/kg	ND	ND	ND	0	2
Undecane	ug/kg	ND	ND	ND	0	2
Uranium	mg/kg	ND	ND	ND	0	2
Uranium	ug/g	ND	ND	ND	0	2
Vanadium	mg/kg	9.86	12.6	11.2	2	2
Zinc	mg/kg	13.4	20.4	16.9	2	2

Deer Non-Radiological Data

Table 4.61 Non-Radiological Analysis of Deer Liver Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Aluminum	mg/kg	ND	1.41	0.901	2	6
Antimony	mg/kg	ND	ND	ND	0	6
Arsenic	mg/kg	ND	ND	ND	0	6
Barium	mg/kg	0.114	0.191	0.143	6	6
Beryllium	mg/kg	ND	ND	ND	0	6
Cadmium	mg/kg	ND	0.164	0.0728	1	6
Chromium	mg/kg	ND	ND	ND	0	6
Cobalt	mg/kg	ND	0.171	0.0802	1	6
Copper	mg/kg	6.51	66.9	35.4	6	6
Iron	mg/kg	48	223	103	6	6
Lead	mg/kg	ND	ND	ND	0	6
Lipids	%	2.15	5.87	4.62	6	6
Manganese	mg/kg	2.46	4.49	3.13	6	6
Mercury	mg/kg	ND	ND	ND	0	6
Nickel	mg/kg	ND	0.277	0.148	1	6
PCB-1016	ug/L	ND	ND	ND	0	1
PCB-1016	ug/kg	ND	ND	ND	0	5
PCB-1221	ug/kg	ND	ND	ND	0	5
PCB-1221	ug/L	ND	ND	ND	0	1
PCB-1232	ug/kg	ND	ND	ND	0	5
PCB-1232	ug/L	ND	ND	ND	0	1
PCB-1242	ug/kg	ND	ND	ND	0	5
PCB-1242	ug/L	ND	ND	ND	0	1
PCB-1248	ug/kg	ND	ND	ND	0	5
PCB-1248	ug/L	ND	ND	ND	0	1
PCB-1254	ug/kg	ND	ND	ND	0	5
PCB-1254	ug/L	ND	ND	ND	0	1
PCB-1260	ug/kg	ND	ND	ND	0	5
PCB-1260	ug/L	ND	ND	ND	0	1
PCB-1268	ug/L	ND	ND	ND	0	1
PCB-1268	ug/kg	ND	ND	ND	0	5
Selenium	mg/kg	ND	0.67	0.214	1	6
Silver	mg/kg	ND	ND	ND	0	6
Thallium	mg/kg	ND	ND	ND	0	6
Vanadium	mg/kg	ND	ND	ND	0	6
Zinc	mg/kg	30.3	44.1	34.4	6	6

Deer Non-Radiological Data

Table 4.62 Non-Radiological Background (BCWA) Analysis of Deer Liver Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Aluminum	mg/kg	ND	ND	ND	0	1
Antimony	mg/kg	ND	ND	ND	0	1
Arsenic	mg/kg	ND	ND	ND	0	1
Barium	mg/kg	0.26	0.26	0.26	1	1
Beryllium	mg/kg	ND	ND	ND	0	1
Cadmium	mg/kg	0.132	0.132	0.132	1	1
Chromium	mg/kg	ND	ND	ND	0	1
Cobalt	mg/kg	ND	ND	ND	0	1
Copper	mg/kg	12.6	12.6	12.6	1	1
Iron	mg/kg	168	168	168	1	1
Lead	mg/kg	ND	ND	ND	0	1
Lipids	%	4.55	4.55	4.55	1	1
Manganese	mg/kg	2.38	2.38	2.38	1	1
Mercury	mg/kg	ND	ND	ND	0	1
Nickel	mg/kg	ND	ND	ND	0	1
PCB-1016	ug/kg	ND	ND	ND	0	1
PCB-1221	ug/kg	ND	ND	ND	0	1
PCB-1232	ug/kg	ND	ND	ND	0	1
PCB-1242	ug/kg	ND	ND	ND	0	1
PCB-1248	ug/kg	ND	ND	ND	0	1
PCB-1254	ug/kg	ND	ND	ND	0	1
PCB-1260	ug/kg	ND	ND	ND	0	1
PCB-1268	ug/kg	ND	ND	ND	0	1
Selenium	mg/kg	ND	ND	ND	0	1
Silver	mg/kg	ND	ND	ND	0	1
Thallium	mg/kg	ND	ND	ND	0	1
Vanadium	mg/kg	ND	ND	ND	0	1
Zinc	mg/kg	37.8	37.8	37.8	1	1

Deer Non-Radiological Data

Table 4.63 Non-Radiological Analysis of Deer Muscle Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Aluminum	mg/kg	ND	1.94	1.34	4	6
Antimony	mg/kg	ND	0.955	0.535	1	6
Arsenic	mg/kg	ND	ND	ND	0	6
Barium	mg/kg	ND	0.375	0.102	2	6
Beryllium	mg/kg	ND	ND	ND	0	6
Cadmium	mg/kg	ND	ND	ND	0	6
Chromium	mg/kg	ND	ND	ND	0	6
Cobalt	mg/kg	ND	ND	ND	0	6
Copper	mg/kg	1.16	1.8	1.49	6	6
Iron	mg/kg	29.6	41.4	35.6	6	6
Lead	mg/kg	ND	ND	ND	0	6
Manganese	mg/kg	0.12	0.293	0.203	6	6
Mercury	mg/kg	ND	ND	ND	0	6
Nickel	mg/kg	ND	ND	ND	0	6
Selenium	mg/kg	ND	0.29	0.218	4	6
Silver	mg/kg	ND	33.5	6.47	3	6
Thallium	mg/kg	ND	ND	ND	0	6
Vanadium	mg/kg	ND	0.0669	0.0367	1	6
Zinc	mg/kg	15.3	31.3	20.7	6	6

Table 4.64 Non-Radiological Background (BCWA) Analysis of Deer Muscle Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Aluminum	mg/kg	2.07	2.07	2.07	1	1
Antimony	mg/kg	ND	ND	ND	0	1
Arsenic	mg/kg	ND	ND	ND	0	1
Barium	mg/kg	ND	ND	ND	0	1
Beryllium	mg/kg	ND	ND	ND	0	1
Cadmium	mg/kg	ND	ND	ND	0	1
Chromium	mg/kg	ND	ND	ND	0	1
Cobalt	mg/kg	ND	ND	ND	0	1
Copper	mg/kg	1.75	1.75	1.75	1	1
Iron	mg/kg	41.5	41.5	41.5	1	1
Lead	mg/kg	ND	ND	ND	0	1
Manganese	mg/kg	0.181	0.181	0.181	1	1
Mercury	mg/kg	ND	ND	ND	0	1
Nickel	mg/kg	ND	ND	ND	0	1
Selenium	mg/kg	ND	ND	ND	0	1
Silver	mg/kg	ND	ND	ND	0	1
Thallium	mg/kg	ND	ND	ND	0	1
Vanadium	mg/kg	ND	ND	ND	0	1
Zinc	mg/kg	33.6	33.6	33.6	1	1

Deer Non-Radiological Data

Table 4.65 Non-Radiological Analysis of Deer Kidney Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Aluminum	mg/kg	ND	1.91	0.868	1	6
Antimony	mg/kg	ND	ND	ND	0	6
Arsenic	mg/kg	ND	ND	ND	0	6
Barium	mg/kg	0.363	0.541	0.464	6	6
Beryllium	mg/kg	ND	ND	ND	0	6
Cadmium	mg/kg	0.112	3.91	1.87	6	6
Chromium	mg/kg	ND	ND	ND	0	6
Cobalt	mg/kg	ND	0.129	0.0731	1	6
Copper	mg/kg	3.21	3.8	3.57	6	6
Iron	mg/kg	42.4	82.7	56.5	6	6
Lead	mg/kg	ND	ND	ND	0	6
Manganese	mg/kg	1.16	1.97	1.46	6	6
Mercury	mg/kg	ND	0.034	0.0183	2	6
Nickel	mg/kg	ND	ND	ND	0	6
Selenium	mg/kg	0.68	0.89	0.768	6	6
Silver	mg/kg	ND	ND	ND	0	6
Thallium	mg/kg	ND	ND	ND	0	6
Vanadium	mg/kg	ND	ND	ND	0	6
Zinc	mg/kg	20.6	33.4	27.3	6	6

Table 4.66 Non-Radiological Background (BCWA) Analysis of Deer Kidney Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Aluminum	mg/kg	ND	ND	ND	0	1
Antimony	mg/kg	ND	ND	ND	0	1
Arsenic	mg/kg	ND	ND	ND	0	1
Barium	mg/kg	0.127	0.127	0.127	1	1
Beryllium	mg/kg	ND	ND	ND	0	1
Cadmium	mg/kg	2.14	2.14	2.14	1	1
Chromium	mg/kg	ND	ND	ND	0	1
Cobalt	mg/kg	ND	ND	ND	0	1
Copper	mg/kg	2.62	2.62	2.62	1	1
Iron	mg/kg	187	187	187	1	1
Lead	mg/kg	ND	ND	ND	0	1
Manganese	mg/kg	0.709	0.709	0.709	1	1
Mercury	mg/kg	ND	ND	ND	0	1
Nickel	mg/kg	ND	ND	ND	0	1
Selenium	mg/kg	0.73	0.73	0.73	1	1
Silver	mg/kg	ND	ND	ND	0	1
Thallium	mg/kg	ND	ND	ND	0	1
Vanadium	mg/kg	ND	ND	ND	0	1
Zinc	mg/kg	17.3	17.3	17.3	1	1

Deer Non-Radiological Data

Table 4.67 Non-Radiological Analysis of Deer Fat Tissue for 2002

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Lipids	%	19.7	85	57.3	8	8
PCB-1016	ug/kg	ND	ND	ND	0	8
PCB-1221	ug/kg	ND	ND	ND	0	8
PCB-1232	ug/kg	ND	ND	ND	0	8
PCB-1242	ug/kg	ND	ND	ND	0	8
PCB-1248	ug/kg	ND	ND	ND	0	8
PCB-1254	ug/kg	ND	ND	ND	0	8
PCB-1260	ug/kg	ND	28.8	11.5	3	8
PCB-1268	ug/L	46.1	46.1	46.1	1	1
PCB-1268	ug/kg	ND	57.1	20.9	2	7

Table 4.68 Non-Radiological Background (BCWA) Analysis of Deer Fat Tissue for 2001

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Lipids	%	78.2	79.5	78.9	2	2
PCB-1016	ug/kg	ND	ND	ND	0	2
PCB-1221	ug/kg	ND	ND	ND	0	2
PCB-1232	ug/kg	ND	ND	ND	0	2
PCB-1242	ug/kg	ND	ND	ND	0	2
PCB-1248	ug/kg	ND	ND	ND	0	2
PCB-1254	ug/kg	ND	ND	ND	0	2
PCB-1260	ug/kg	ND	33.7	19.3	1	2
PCB-1268	ug/kg	ND	ND	ND	0	2

Fish Tissue Non-Radiological Data

Table 4.69 Non-Radiological Analysis of Fish Tissue for 2002 at Location LUM 2.7

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Lipids	%	1.71	2.38	1.98	6	6
PCB-1016	ug/kg	ND	ND	ND	0	6
PCB-1221	ug/kg	ND	ND	ND	0	6
PCB-1232	ug/kg	ND	ND	ND	0	6
PCB-1242	ug/kg	ND	ND	ND	0	6
PCB-1248	ug/kg	ND	47.8	18.2	3	6
PCB-1254	ug/kg	ND	ND	ND	0	6
PCB-1260	ug/kg	ND	47.7	25.3	5	6
PCB-1268	ug/kg	ND	ND	ND	0	6

Table 4.70 Non-Radiological Analysis of Fish Tissue for 2002 at Location LUM 4.5

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Lipids	%	1.11	3.83	1.95	5	5
PCB-1016	ug/kg	ND	ND	ND	0	6
PCB-1221	ug/kg	ND	ND	ND	0	6
PCB-1232	ug/kg	ND	ND	ND	0	6
PCB-1242	ug/kg	ND	ND	ND	0	6
PCB-1248	ug/kg	51.3	176	103	6	6
PCB-1254	ug/kg	ND	ND	ND	0	6
PCB-1260	ug/kg	66.2	214	134	6	6
PCB-1268	ug/kg	ND	ND	ND	0	6

Table 4.71 Non-Radiological Analysis of Fish Tissue for 2002 at Location LUM 5.0

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Lipids	%	1.1	5.54	2.23	6	6
PCB-1016	ug/kg	ND	ND	ND	0	6
PCB-1221	ug/kg	ND	ND	ND	0	6
PCB-1232	ug/kg	ND	ND	ND	0	6
PCB-1242	ug/kg	ND	ND	ND	0	6
PCB-1248	ug/kg	17.4	137	86.2	6	6
PCB-1254	ug/kg	ND	ND	ND	0	6
PCB-1260	ug/kg	13.6	223	121	6	6
PCB-1268	ug/kg	ND	ND	ND	0	6

Fish Tissue Non-Radiological Data

Table 4.72 Non-Radiological Analysis of Fish Tissue for 2002 at Location BBM 6.2

Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Lipids	%	2.02	2.02	2.02	1	1
PCB-1016	ug/kg	ND	ND	ND	0	1
PCB-1221	ug/kg	ND	ND	ND	0	1
PCB-1232	ug/kg	ND	ND	ND	0	1
PCB-1242	ug/kg	ND	ND	ND	0	1
PCB-1248	ug/kg	42.5	42.5	42.5	1	1
PCB-1254	ug/kg	ND	ND	ND	0	1
PCB-1260	ug/kg	181	181	181	1	1
PCB-1268	ug/kg	ND	ND	ND	0	1

Table 4.73 Non-Radiological Analysis of Fish Tissue for 2002 at Location MAM 8.6

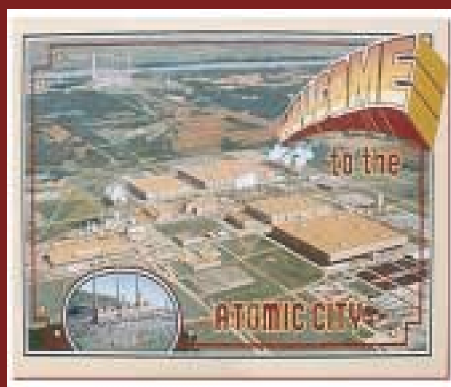
Analysis	Units	Minimum	Maximum	Average	Count Detects	Count Samples
Lipids	%	1.65	3.49	2.14	6	6
PCB-1016	ug/kg	ND	ND	ND	0	6
PCB-1221	ug/kg	ND	ND	ND	0	6
PCB-1232	ug/kg	ND	ND	ND	0	6
PCB-1242	ug/kg	ND	ND	ND	0	6
PCB-1248	ug/kg	ND	13.9	7.88	2	6
PCB-1254	ug/kg	ND	ND	ND	0	6
PCB-1260	ug/kg	ND	ND	ND	0	6
PCB-1268	ug/kg	ND	ND	ND	0	6

BJC/PAD-543/V3
Volume III

PADUCAH SITE

Annual Site Environmental Report Summary

2002



50 Years of Commitment

Preface

This report summarizes the information found in the Paducah Annual Site Environmental Report for 2002, BJC/PAD-543. The U. S. Department of Energy requires an annual site environmental report that presents the results from various environmental monitoring programs and activities carried out during the year. This summary report is written so that it can be easily understood and educate the reader about mission, goals, and activities of the Department of Energy at Paducah. It is a brief summary of 2002 activities, including environmental monitoring, clean-up activities, accomplishments, and general information. This report also interprets some of the data contained in the 2002 Annual Site Environmental Report. The data presented is a subset of the data found in the Annual Site Environmental Report Volumes I and II. More information can be found in the Paducah Annual Site Environmental Report for 2002, BJC/PAD-543, Bechtel Jacobs Company, LLC, Paducah, KY.

You are encouraged to comment on the content of this report, as well to make suggestions for future documents. Please send your comments and suggestions to:

Paducah Site Office
U. S. Department of Energy
P. O. Box 1410
Paducah, KY 42002
Phone: (270) 441-6800
Fax: (270) 441-6801

On October 18, 1950, the U.S. Atomic Energy Commission approved the site of the former Kentucky Ordinance Works as the location for a new facility in the nation's rapidly growing nuclear production complex. Construction of the Paducah Gaseous Diffusion Plant, fifteen miles west of the City of Paducah, brought sudden change to the community. The local population doubled as the construction work force arrived, retail sales rose from $44 million in 1950 to $94 million in 1953, and school enrollment rose from 8,000 to 12,000 in the same period.

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Commitment to Community Development


The Paducah Sun-Democrat

AEC To Build A-Plant At KOW Site

Chinese Reds Drive Into UN Beachhead

Building Force Of 10,000 May Be Required

Cost Set At $500,000,000; 1,600 Permanent Jobs Expected

Before World War II (prior to 1939), the land now occupied by the United States Department of Energy (DOE) and the Paducah Gaseous Diffusion Plant (PGDP) was used primarily for agricultural purposes. Early during the war, thousands of acres were assembled for construction of the Kentucky Ordnance Works, which was operated by the Atlas Powder Company until the end of the war. In October 1950, President Harry Truman directed the Atomic Energy Commission to begin expanding production of atomic weapons. One way of expanding production was to construct and begin operating a new gaseous diffusion plant. Paducah was a candidate for the location because of a plentiful water source, well-developed transportation systems, inexpensive power from the Tennessee Valley Authority, and access to fuel from regional coal mines. Former Paducah native, Vice President Alben Barkley, also played a major role in the plant site selection.

On October 18, 1950, the Atomic Energy Commission approved the Paducah Site for uranium enrichment operations. On December 14, 1950, the Atomic Energy Commission publicly announced that it was building a gaseous diffusion plant for uranium enrichment in Paducah. Construction of the PGDP began in 1951. The $500 million project occupied over 7000 acres at that time and included the former site of the Kentucky Ordnance Works.

The construction of the plant took place on a 750-acre tract of land, located 15 miles west of Paducah. The population of Paducah almost doubled in two years, creating problems with housing, traffic control, recreational opportunities, education, and medical care. In the first year of the construction, about 2,500 housing units were built and more than 20,000 workers located here for the plant's construction, which took more than three years to complete.

C-300 Control Center building under contruction.

Although construction of the plant was not completed until 1954, uranium enrichment production began in 1952. Today, the plant's mission has not changed and the original facilities are still in operation, with substantial upgrading and refurbishment.

Today, the Paducah Site property includes 3,556 acres of which 748 are within PGDP security fence. The DOE began leasing some of its facilities to the United States Enrichment Corporation (USEC) on July 1, 1993. At that time, USEC took over the mission of uranium enrichment. USEC was established in October 1992 by the National Energy Policy Act. Under the terms of the lease agreement, USEC assumed responsibility for environmental compliance activities directly associated with current uranium enrichment operations. USEC performs environmental sampling related to the operation of the uranium enrichment facilities. However, USEC data are not presented in this summary report. The DOE annual site reports included only data that were generated by DOE and its subcontractors for compliance or surveillance of DOE activities.

The DOE retains responsibility for the environmental cleanup activities, the legacy waste management, and the management of the Paducah facilities not leased to USEC. The legacy waste management includes waste inventories predating July 1, 1993.

The DOE and its contractors employ approximately 600 employees who work on various clean-up and waste management projects. The managing and integrating contractor, Bechtel Jacobs Company LLC (BJC), implements many of the DOE activities to restore the environment at the Paducah Site. BJC and DOE are committed to community development by providing both corporate and individual support to local agencies and charities, educational institutions, and business organizations.

BJC financial support activities.

(Paducah Community College former president, Len O'Hara [left] and BJC Manager of Projects, Gordon Dover [right])

Timeline of Events at PGDP

1951-1954
Construction of PGDP as the second gaseous diffusion plant in the United States. Oak Ridge, Tennessee, was first and Portsmouth, Ohio, third.


The Paducah Sun-Democrat
AEC To Build A-Plant At KOW Site
Building Force Of 10,000 May Be Required

1952
Enriched uranium hexafluoride production begins. First cylinders of depleted uranium hexafluoride generated and stored inside the PGDP security fence.

1952-1984
Union Carbide Corporation manages and operates the Paducah and Oak Ridge gaseous diffusion plants under federal contract.

1979
Waste Management function established at Paducah.

1984
Martin Marietta Energy Systems Inc. becomes management and operating contractor for DOE facilities at Paducah and Oak Ridge (Portsmouth added in 1986).

1988
Contaminated groundwater was discovered outside the DOE Property Boundary. DOE policy of extending water lines to homes in area begins.

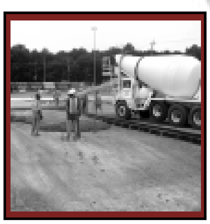
1989-1990
Creeks and ditches near the plant are posted to restrict public access. Expanded network of groundwater monitoring wells begins. First major site investigation begins to determine nature and extent of contamination outside the PGDP security fence.

1990
Second phase of sitewide investigation begins to further determine nature and extent of contamination outside the PGDP security fence.

1993
DOE leases enrichment production facilities to USEC. Plant ends use of the degreasor trichloroethene, the primary groundwater contaminant. DOE opens the Environmental Information Center in the West Kentucky Technology Park at Kevil.

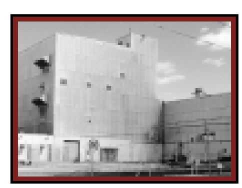
1995
Groundwater treatment begins to remove trichloroethene and technetium-99. The Environmental Protection Agency adds PGDP to its Superfund National Priorities List. Re-routing the treatment of flow in the plant's North South Diversion Ditch begins.

1997
Concrete cylinder yards built; tons of contaminated concrete, soil and gravel removed; cleanup actions completed around closed landfill; new solid waste contained landfill constructed. Paducah Area Community Reuse Organization chartered.



1998
Completed Federal Facility Agreement with state and federal regulators for long-term cleanup plan; made major strides in waste treatment and disposal. DOE awards Management and Integration contract to BJC. USEC privatizes.

2000
Continued operation of the Lasagna™ technology. Removal of Drum Mountain. Initiation of the Rubble Pile Removal project.

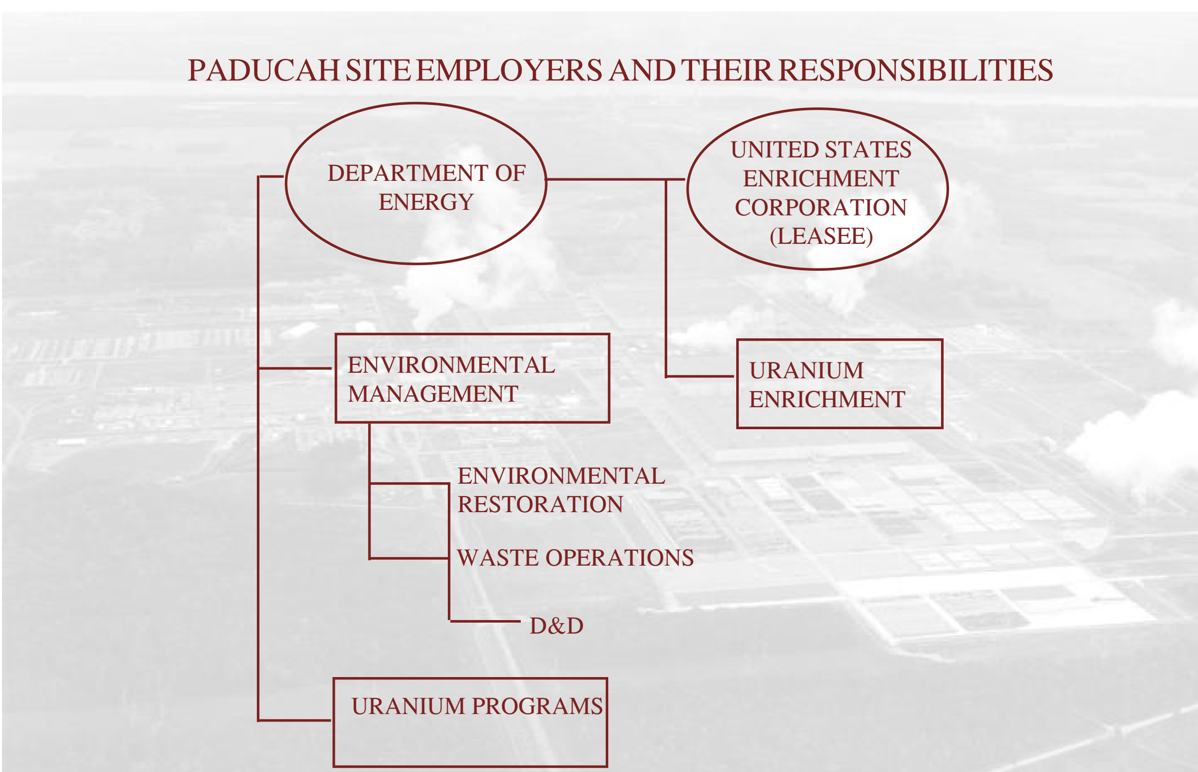


2002
Implementation of Six-Phase Heat Treatability Study for Groundwater and Soil Remediation near the C-400 Building. Succesfully completed Lasagna™ treatment. Continued progress toward C-410 D&D, initiated Scrap Metal and North-South Diversion Ditch (NSDD) Removal/Remedial activities.

Commitment to Program Missions

The following two major programs are operated by the DOE at the Paducah Site: (1) Enviornmental Management and 2) Uranium Programs. Environmental Restoration, Waste Operations and Decontamination and Decommissioning (D&D) are projects under the Enviromental Management Program. The program/project missions are described below.

Program/Project	Mission
Environmental Restoration	Ensure that releases from past operations and waste management at the Paducah Site are investigated and that appropriate remedial action is taken for protection of human health and the environment.
Waste Operations	Characterize and dispose of the legacy waste stored on-site in compliance with various agreements between DOE and the regulatory agencies. This includes DOE Material Storage Areas (DMSAs).
D&D	A subset of the Environmental Restoration and Waste Management projects that will disposition surplus facilities and prepare materials or waste for disposal.
Uranium Programs	Maintain safe, compliant storage of the DOE depleted Uranium Hexafluoride (DUF_6) inventory, pending final disposal of the material, and to manage facilities and grounds not leased to USEC.



Commitment to Environmental Compliance

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

RCRA is a law that requires a permit to manage hazardous waste. PGDP received a RCRA permit on August 19, 1991, that must be renewed every ten years. DOE submitted a hazardous waste permit renewal application to the Kentucky Division of Waste Management (KDWM) on February 21, 2001. On September 28, 2001, KDWM requested additional information. A revised permit application was submitted in February 2002. DOE is awaiting the issuance of a new permit and continues to operate under the expired permit.

DOE received five notices of violation (NOVs) during 2002 from the KDWM. The table below lists the dates and the violations. Corrective actions outlined in the NOVs have been completed for all five violations. The four NOVs related to the hazardous waste allegedly stored for more than 90 days were a result of DOE reporting these instances to KDWM.

RCRA NOVs Received in 2002.

Date	Alleged Violation
January18, 2002	Hazardous waste that had been stored for more than 90 days without a permit – DMSAs and other areas
February 28, 2002	Hazardous waste that had been stored for more than 90 days without a permit – DMSAs
March 11, 2002	Hazardous waste that had been stored for more than 90 days without a permit – DMSAs
November 12, 2002	Hazardous waste that had been stored for more than 90 days without a permit – DMSAs
November 12, 2002	Deficiencies relating to the RCRA Operating Records
November 12, 2002	Unpermitted storage of hazardous waste – C-746-U Landfill
November 12, 2002	Unpermitted storage of hazardous waste – C-746-S&T Landfills

RCRA SOLID WASTE MANAGEMENT

The Paducah Site disposes of a portion of its solid waste at its on-site contained landfill facility, C-746-U. Construction of the C-746-U Landfill began in 1995 and was completed in 1996. The operation permit was received from KDWM in November 1996. Disposal of waste at the landfill began in February 1997. The C-746-U Landfill operated from February 1997 through October 1999 and received approximately 16,000 tons of solid waste. In November 1999, waste acceptance activities at the C-746-U Landfill were suspended by KDWM for all waste streams with the exception of wastes classified as "no rad added." DOE began preparation of an Environmental Assessment for the Implementation of the Authorized Limits Process for Waste Acceptance at the C-746-U Landfill, Paducah Kentucky DOE/EA-1414 in September 2000. DOE issued a Finding of No Significant Impacts on August 6, 2002.

Additional problems were identified in late 2000 regarding potential corrosion problems in the monitoring wells (MWs) surrounding the C-746-U Landfill. Activities were initiated to replace MWs at the landfill in late 2001 and completed in 2002. After completion of the environmental assessment (EA) in August 2002 and installation and sampling of the new MWs, the landfill resumed disposal operations in November 2002 with KDWM approval.

In lieu of disposing of office waste at the C-746-U Landfill, office waste generated by DOE and its contractors at the plant site is taken off-site for disposal. Commercial Waste Incorporated in Mayfield, Kentucky, provides off-site disposal of the office waste. A recycling program exists for office waste that is generated off the plant site.

DOE received two NOVs dated November 12, 2002, for the active C-746-U and inactive C-746-S and C-746-T landfills. These NOVs alleged the unpermitted disposal of hazardous waste. DOE responded to the NOVs and is talking with KDWM on the appropriate corrective actions.

UNDERGROUND STORAGE TANKS (UST)

In April 2002 a previously unknown UST was discovered during refurbishment of cylinder storage yard C-745-K. KDWM was notified of the discovery. The UST was removed and clean closure for the site was obtained. DOE is responsible for 16 of the 18 site USTs that have been reported to KDWM in accordance with regulatory notification requirements. USEC is responsible for the other 2 USTs. Of DOE's 16 USTs, none are currently in use. Five have been removed from the ground, eight have been filled in place with inert material, one (C-611-1) was "clean closed in place", and two were determined not to exist. At the end of 2002, one DOE UST (UST #5) had not met all regulatory requirements necessary to achieve permanent "clean" closure. Closure activities for this UST continued into 2003.

NATIONAL ENVIRONMENTAL POLICY ACT

In 2002, DOE completed preparation of two Environmental Assessments (EAs). The *Environmental Assessment for the Implementation of the Authorized Limits Process for Waste Acceptance at the C-746-U Landfill, Paducah, Kentucky*, DOE/EA-1414, was completed when DOE issued a Finding of No Significant Impacts on August 6, 2002. This EA addressed the criteria that DOE will use to determine what waste may be disposed in the landfill.

The second EA completed was Waste Disposition Activities at the Paducah Site, DOE/EA-1339. A Finding of No Significant Impacts was issued on November 5, 2002. This EA addressed waste management activities and the impacts of shipping the waste to off-site disposal facilities.

In addition, numerous minor activities for routine maintenance, small-scale facility modifications, and site characterization were within the scope of previously approved proposals that were determined to be a Categorical Exclusion (CX). The Paducah DOE Site Office and the DOE Oak Ridge Operations Office NEPA compliance officer approve and monitor the internal applications of previously approved CX determinations.

Commitment to Environmental Compliance (Cont.)

CLEAN AIR ACT COMPLIANCE STATUS

The Paducah Site had two air emissions point sources in 2002. The Northwest Plume Groundwater System and the Northeast Plume Containment System are interim remedial actions (IRAs) under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for the containment of groundwater contamination at the Paducah Site. These separate facilities remove trichloroethene (TCE) contamination from the groundwater by air stripping. At the Northwest Plume Groundwater System, the TCE-laden air passes through carbon filtration, which removes much of the TCE. Technetium-99 (^{99}Tc) is removed by an ion exchange unit. At the Northeast Plume Containment System, a cooling tower system acts as an air stripper for TCE. The air streams for both systems are then released to the atmosphere where the remaining TCE naturally breaks down.

KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMITS

KPDES Permit No. KY0004049 applies to the following four DOE outfalls: 001, 015, 017, and 019. Outfall 001 had three permit exceedences during 2002 for chronic toxicity. These toxicity exceedences were reported to KDOW on December 11, 2002. Efforts to determine the cause will continue in 2003.

TOXIC SUBSTANCES CONTROL ACT

The Uranium Enrichment (UE) TSCA FFCA between the Environmental Protection Agency (EPA) and DOE was signed in February 1992. To meet the compliance goals at the Paducah Site, the UE TSCA FFCA is frequently revised and updated. Under this agreement, action plans have been developed and implemented for removal and disposal of PCB material at the Paducah Site. As part of this program during 2002, ninety-seven capacitors were removed from service. The adjacent table shows progress of removal of capacitors as well as a summary of PCB items in service at the Paducah Site at the end of 2002.

DOE shipped nineteen transformers for disposal on November 13, 15, and 18-22, 2002, to an offsite disposal facility.

These activities are conducted in accordance with the TSCA FFCA agreement schedule.

Summary of PCBs and PCB items in service at the end of 2002

Type	Number in Service	Volume (gal)	PCBs (kg)
PCB Transformers	66	95,256	277,152
PCB Contaminated Transformers	9	2,299	0.95
PCB Contaminated Electrical Equipment	7	2,094	1.13
PCB Capacitors	682		
PCB Open Systems	3	235	10.90

Removed from service for disposal during CY 2002

Type	Number Removed	Volume (gal)	PCBs (kg)
PCB Capacitors	97	298.8*	952.30

* assumed 540,000 ppm PCB, 13 lbs/gal

Commitment to Waste Removal

The Paducah Site Waste Operations Program directs the safe treatment, storage, and disposal of waste generated before July 1, 1993 (i.e., legacy waste), and waste from current DOE activities. The primary objective of the program is to ensure that wastes do not migrate into the environment. Requirements for meeting waste management regulatory objectives are varied and complex because of the variety of waste streams generated by DOE activities. The goal, however, is to comply with all current regulations while planning cleanup actions that will comply with anticipated future regulations. DOE off-site waste shipments in 2002 are provided in the table below.

Waste shipments during 2002

- February - Shipped 232,246 pounds of low-level waste to Nevada Test Site
- April – Shipped 9,848 pounds of RCRA mixed waste to Perma-Fix
- May – Shipped 64,427 pounds of recyclable material
- June – Shipped 40,412 pounds of RCRA waste to ONYX
- May – Shipped 251 pounds of RCRA waste to ONYX and Safety Kleen
- August – Shipped 21,647 pounds of TSCA mixed waste to the TSCA Incinerator
- September – Shipped 19,061 pounds of PCB mixed waste to the TSCA Incinerator
- October – Shipped 154 pounds of RCRA waste to Chem Waste Management
- November – Shipped 132,907 pounds of RCRA mixed waste to Perma-Fix facilities
- November – Shipped 163,264 pounds of PCB mixed waste to Waste Control Specialists
- December – Shipped 268,473 pounds of low-level waste to Nevada Test Site

The waste classification under RCRA for groundwater and soils associated with historical TCE disposal was re-evaluated, and in February, the determination was made that those environmental media that contains TCE from degreasing operations would be considered a listed waste (F001 and U228). As a result, an evaluation was initiated and continues to determine impacts from historical waste management activities. DOE suspended off-site shipments that had the potential to be reclassified as RCRA-listed waste.

WASTE MINIMIZATION/POLLUTION PREVENTION (WM/PP)

Recycling efforts in 2002 included 11.5 metric tons (mt) (25,346 pounds) of office paper; 0.5 mt (1102 pounds) of aluminum cans; 0.91 mt (2000 pounds) of telephone books; 0.26 mt (573 pounds) of printer and fax toner cartridges; 0.71 mt (1560 pounds) used motor oil; carbon used in the Northwest Plume Groundwater Treatment Facility; used computer equipment; and reuse of gravel generated from reconstruction of cylinder storage yards. Additional accomplishments of the WM/PP Program included continued use of micropurging techniques in groundwater sampling to reduce wastewater volume and transferring unused chemicals and materials to other programs for re-use. The recycling of nickel cadmium batteries and fluorescent light bulbs continues to reduce the volume of hazardous wastes generated at the site. The site also has converted to Philips Greens™ fluorescent bulbs that are not hazardous when disposed. The Lasagna project that was completed in 2002 received the 2002 Pollution Prevention Waste Minimization Award for DOE-Oak Ridge Operations. The project resulted in the in situ treatment of more than of 10,000 cubic yards of soil that otherwise would have required excavation and disposal.

Commitment to D&D and DMSA Cleanup

DECONTAMINATION AND DECOMMISSIONING

D&D is conducted for facilities and other structures contaminated with radiological and hazardous material. Facilities are accepted for D&D when they are no longer required to fulfill a site mission. Legacy contamination on the structure, floors, walls, and equipment could be released to the environment if not appropriately managed in the near term and ultimately removed. The D&D Project includes two major facilities comprising approximately 46,450 m^2 (500,000 ft^2). These facilities are the C-340 Metal Reduction Plant complex, where UF_6 was converted to uranium metal and hydrogen fluoride, and the C-410 Feed Plant complex, where uranium trioxide (UO_3) was converted to UF_6. Contaminants at these facilities include depleted uranium, natural uranium and transuranic radionuclides, UF_4, PCBs, asbestos, and lead paint. Current focus is on the C-410 Feed Plant complex. Other facilities are included in the D&D program. However, they are not undergoing major D&D actions at this time.

Development of CERCLA documentation for a non-time critical removal action for removal and disposal of piping, process equipment, and stored materials from the C-410/C-420 Feed Plant complex was initiated in 2001 and was completed in 2002. The regulatory agencies approved an engineering evaluation/cost estimate in 2001 and held a public meeting to discuss the project in January 2002. The regulators approved the Action Memorandum in June 2002. The Removal Action Work Plan was submitted to the regulators in 2002.

Accomplishments in 2002 at the C-410/C-420 complex included the following.

- Completion of isolation of water lines entering the C-410/C-420 complex.
- Continued building maintenance, general building cleanup, and decontamination in preparation for initiation of D&D,
- Removal and staging of equipment and material and decontamination of areas of the C-410/ C-420 complex that will be used as staging areas or work areas during D&D operations.
- Began preparations for transfer of surplus fluorine generating cells and equipment to a private company for reuse, avoiding waste disposal costs. The Paducah Area Community Reuse Organization, a DOE-community economic development organization, served as a broker for the arrangement.
- Completion of removal and packaging of a sulfuric acid tank (see figure on page 10) at an outside DMSA as part of a Time-Critical Removal Action.

Sulfuric acid tank removal.

DOE MATERIAL STORAGE AREAS

DMSAs are areas at PGDP containing material and equipment that are undergoing a characterization process to comply with potential Nuclear Criticality Safety, RCRA, TSCA, and solid waste concerns. Originally included with the PGDP facilities leased to USEC, DOE accepted the return of the DMSAs from USEC on December 31, 1996, to facilitate Nuclear Regulatory Commission certification of PGDP. The 160 DMSAs are now non-leased areas located inside buildings leased to USEC or are located in outdoor areas.

In April 2001 DOE issued a DMSA work plan, *PGDP Department of Energy Material Storage Area Characterization / Remediation Plan* (BJC/PAD-186/R4) that presented a 5-year project schedule commencing January 1, 2001, to complete characterization of material in the 160 DMSAs. As of the end of 2002, characterization reports were completed on 26 DMSAs, field characterization was completed on 39 DMSAs, and field characterization was underway on 24 DMSAs. DMSA fieldwork gives priority to DMSAs located outside or those that may contain hazardous waste. Lower priority DMSAs are addressed while sampling and analysis results from higher priority locations are prepared in order to achieve maximum efficiency in field operations. The characterization reports completed as of the end of 2002 determined that less than one-tenth of one percent by volume of the material and equipment characterized could be classified as hazardous waste. DOE notifies the Commonwealth of Kentucky when hazardous waste is identified during DMSA field activities.

The Kentucky Natural Resources and Environmental Protection Cabinet filed an administrative complaint in October 2001 regarding the enforcement of NOVs for various alleged violations of Kentucky's delegated hazardous waste management program regulations. Most of these NOVs alleged the failure to characterize materials in DMSAs at PGDP or the unpermitted storage of hazardous waste in DMSAs. In June 2002, mediation on the administrative complaint was postponed pending discussions between DOE and Kentucky officials regarding DMSAs and accelerated cleanup strategies at PGDP. Resolution on the administrative complaint issue was still pending as of the end of 2002. See Section 2 for more information on NOVs at DMSAs.

Commitment to Restoration

PGDP has numerous Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) that require further investigation and potential remediation. Complex sites with multiple environmental releases, such as PGDP can be divided into smaller areas for separate remedial investigations/ feasibility studies (RI/FS), as opposed to conducting a single, site-wide RI/FS. These smaller, individual study areas, referred to as operable units (OUs) or Waste Area Groups (WAGs) under the Federal Facility Agreement (FFA), typically contain a limited number of SWMUs/AOCs grouped together based on certain criteria.

The SWMUs and AOCs requiring an RI/FS were initially segregated into 30 WAGs based on the specified characteristics, and then prioritized for cleanup according to their contributions to off-site contamination.

As site conditions were better understood through WAG investigations, the DOE, EPA, and the Commonwealth of Kentucky grouped the WAGs more broadly, thereby providing the framework to more effectively integrate, focus, and prioritize response actions across the site. These data and other process knowledge were used to develop site conceptual models for each of the contamination source areas to support the further consolidation of the WAGs into larger operable units. Source areas that were suspected as primary contributors of contamination to a specific environmental media and/or exposure pathway were grouped under the same OU. The following five OUs were identified:

(1) Groundwater OU,

(2) Surface Water OU,

(3) Burial Grounds OU,

(4) Soils OU, and

(5) D&D OU.

Once the five OUs are fully studied, a comprehensive site-wide OU (CSOU) will be evaluated. The scope of the CSOU will include a comprehensive site-wide baseline risk assessment to evaluate any residual risk remaining at the site after completion of the five OUs, and the cumulative effects from all media. In February 2002, DOE Headquarters, in conjunction with Site Offices within the DOE Environmental Management (EM) Program, performed, at the direction of the Assistant Secretary for Environmental Management, a Top-to-Bottom Review of the EM Program. The project team was tasked with performing a programmatic review of the EM program and its management systems with the goal of quickly and markedly improving program performance. The findings of this review were documented in *A Review of the Environmental Management Program, United States Department of Energy*, February 4, 2002. In order to improve the program, a number of recommendations were suggested. These recommendations were designed to focus the EM Program on reducing risk to the public health, workers, and the environment in an accelerated manner. The DOE Paducah Site management also worked in 2002 with the Commonwealth of Kentucky, the EPA, and other stakeholders to implement these recommendations.

2002 REMEDIAL ACTIVITIES

Accomplishments
• Successfully completed the implementation of Lasagna™ technology as the selected remedial alternative for reducing the concentration of TCE in SWMU 91.
• Initiated Six Phase Heating treatability study adjacent to the C-400 Cleaning Building.
• Continued operation of the Northwest and Northeast Plume Groundwater treatment systems.
• Installed 35 new groundwater monitoring wells at the C-746-S, T, and U Landfills to upgrade the existing monitoring systems. Also, abandoned 10 monitoring wells from the old network at the C-746-U landfill.
• Completed initial site assessment for a possible CERCLA Waste Disposal Cell.
• Completed construction of the Storm Water Control Facility for the Scrap Yards.
• Completed soil removal action at petroleum spill site.

Installation of piping at the North-South Diversion Ditch.

Six-Phase Treatability Study system installation.

Scrap yard storm water control basin.

Commitment to Cylinder Management

DEPLETED URANIUM HEXAFLUORIDE CYLINDER PROGRAM

DUF_6 is a product of the uranium enrichment process. A solid at ambient temperatures, DUF_6 is stored in large metal cylinders. At the end of 2001, the Paducah Site managed an inventory of 37,895 cylinders (most containing DUF_6) stored in outdoor facilities commonly referred to as cylinder storage yards.

The mission of the DUF_6 Cylinder Program is to safely store the DOE-owned DUF_6 inventory until its ultimate disposition. DOE has an active cylinder management program that includes cylinder and cylinder yard maintenance, routine inspections, cylinder yard improvement construction, and other programmatic activities such as cylinder corrosion studies. The Program maintains a cylinder inventory database, which serves as a repository for all cylinder inspection data.

In 1996 DOE began implementation of measures to improve the safety of DUF_6 cylinder storage at PGDP. Since 1996 DOE has upgraded the quality of the cylinder yards to maintain the integrity of the stored cylinders (see figure on page 14). Cylinders have been removed from ground contact and fewer cylinders are stored in each yard, resulting in easier access for inspections to detect cylinder corrosion or leaks. As the number of cylinders stored in each yard has decreased, the construction of new cylinder yards has been required to accommodate existing cylinders and to plan for the storage of newly generated cylinders. Since 1996 DOE has completed construction of five new cylinder yards (see table on page 14).

On April 15, 1999, DOE issued the *Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride*, in response to the Defense Nuclear Facilities Safety Board's request to analyze alternative chemical forms for the storage of DUF_6. As a result of this study, in 2002 DOE selected Uranium Disposition Services, LLC, to design, build, and operate facilities at Paducah and Portsmouth, Ohio, that will convert the inventory of DUF_6 to triuranium octoxide (U_3O_8), a more stable form of uranium that is suitable for disposal or reuse. It is anticipated that conversion facilities will be operational by 2006.

PGDP 50TH ANNIVERSARY
TVA • EEI • Honeywell • USEC • DOE • BJC

DUF_6 cylinder storage yard construction.

Cylinder yards constructed at PGDP since 1996.

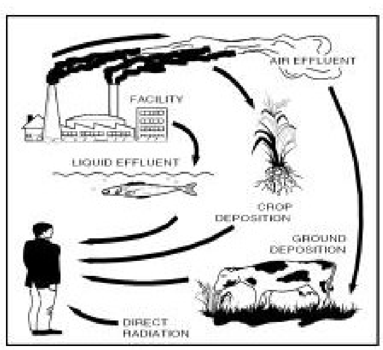
Cylinder Yard	Size	Year of Completion
C-745-T	470,000 ft^2	1998
C-745-L (South)	108,000 ft^2	2000
C-745-K (North)	120,945 ft^2	2002
C-745-K (South)	63,152 ft^2	2002
C-745-M	118,531 ft^2	2002

Radiation - What is it?

It comes from outer space, the ground, and even from within our own bodies. Radiation is all around us and has been present since the birth of this planet. It is found in the food we eat. Even our own bodies give off some radiation. Naturally occurring radioactive materials were discovered in 1896. Less than 50 years later, the physicist Enrico Fermi split the atom, producing the first sustainable nuclear chain reaction. Today, both man-made and natural radiation are part of our lives. We use radioactive materials for beneficial purposes, such as generating electricity and diagnosing and treating medical problems. For example, more than 200 million X-rays are performed in America every year. Over 80 percent of our exposure to radiation comes from natural sources. Our own bodies, which contain the radioactive element potassium, account for 11 percent of our total exposure. Consumer products make up another 3 percent of our exposure to radiation. The average annual radiation exposure for a person living in the United States is 360 millirem.

Though radiation offers many benefits, exposure to it can also threaten our health, and the quality of our environment. We cannot eliminate radiation from our environment. We can, however, reduce our risks by controlling our exposure to it. Because radiation is a carcinogen it can cause cancer if the exposure is great enough. In this respect, it is similar to many hazardous chemicals found in the environment that can cause cancer. It may also cause other adverse health effects, including genetic defects in the children of exposed parents or mental retardation in the children of mothers exposed during pregnancy. However, the risk of developing cancer due to radiation exposure is much higher than the risk of these other effects. Much of our knowledge about the risks from radiation is based on studies of over 100,000 survivors of the atomic bombs at Hiroshima and Nagasaki. In these studies, which have continued over the last 50 years, scientists have been able to observe the effects of a wide range of radiation doses, including doses comparable to an average person's lifetime dose from naturally occurring background radiation (about 20,000 millirem). We have learned many things from these studies. The most important are:

- The higher the radiation dose a person receives, the greater the chance of developing cancer.
- It is the chance of cancer occurring, not the kind or severity of cancer, that increases as the radiation dose increases.
- Most cancers do not appear until many years after the radiation dose is received (typically 10 to 40 years).

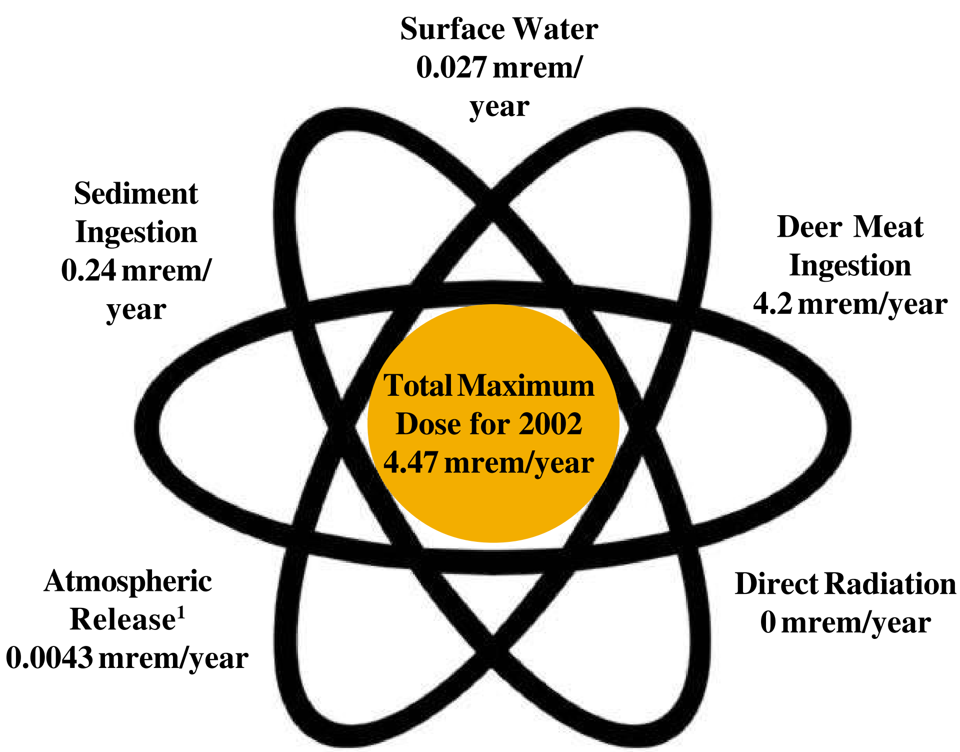


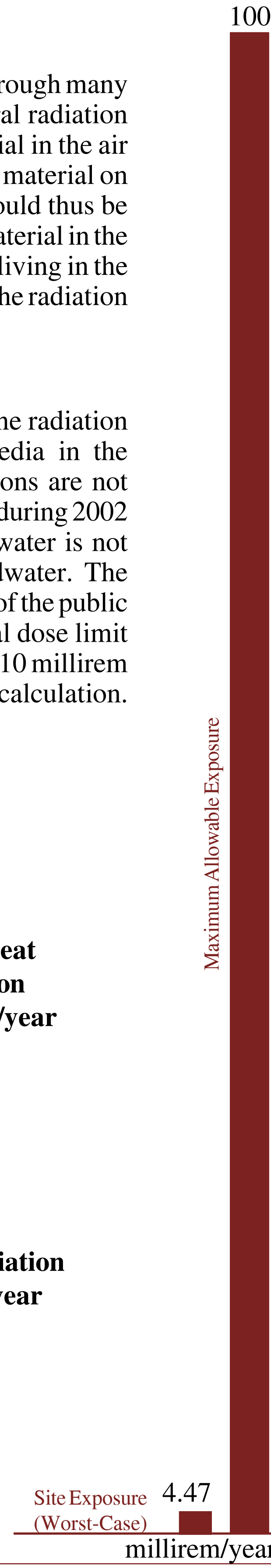
Possible radiation pathways.

2002 Paducah Site Dose

Radiation and radioactive material in the environment can reach people through many routes. Potential routes for radiation are referred to as pathways. Several radiation pathways are shown in the figure below. For example, radioactive material in the air could fall on a pasture. Cows could then eat the grass, and the radioactive material on the grass would show up in the cow's milk. People drinking the milk would thus be exposed to this radiation. Or, people could simply inhale the radioactive material in the air. The same events could occur with radioactive material in water. Fish living in the water would be exposed. People eating the fish would then be exposed to the radiation in the fish. Or, people swimming in the water would be exposed.

The figure below shows the DOE's maximum potential contribution to the radiation dose that a person could receive from being exposed to various media in the environment around the Paducah Site (potential USEC dose contributions are not included) for 2002. The dose is calculated based on monitoring conducted during 2002 of media such as air, surface water, sediment, and deer meat. Groundwater is not included because residents living near the site are not drinking the groundwater. The worst-case combined (internal and external) dose to an individual member of the public was calculated at 4.47 millirem. This level is well below the DOE annual dose limit of 100 millirem/year to members of the public and below the EPA limit of 10 millirem airborne dose to the public. The dose chart shows all media used for the calculation.





[1]DOE source emissions were from the Northwest Plume and Scrap Metal Removal.

Commitment to Environmental Monitoring

DOE performs environmental monitoring at the Paducah Site to comply with applicable laws and regulations, to identify trends, and contribute to environmental awareness. Effluent monitoring and environmental surveillance monitoring are two ways environmental monitoring are performed. Effluent monitoring (which is that monitoring required by environmental regulations) is performed, by collecting and analyzing samples, of discharges from the plant into the air and water. Surveillance monitoring (which is monitoring that the DOE performs to evaluate its impacts on the environment) is performed by collecting and analyzing samples of environmental media to measure the concentration of contaminants. The information obtained from these two types of environmental monitoring are used to determine the effects of the operations at the DOE facilities on the environment.

Fish community sampling.

WHAT ENVIRONMENTAL MEDIA ARE SAMPLED?

Routine sampling is performed on several different media: air, groundwater, sediment, surface water, fish, and deer. When a need for sampling is identified, other types of samples may be collected under special one-time studies. In 2002, approximately 1200 samples were collected. The different media are discussed in the text on the following pages, providing some detail of what is sampled, the results of sampling during 2002, and the relative effect on the dose calculation from the environmental media based on the results. In most cases contaminants that are specific to the plant site are discussed in detail, such as uranium, ^{99}Tc, TCE, and polychlorinated biphenyls (PCBs).

Air and Direct Radiation Monitoring

WHY IS AIR SAMPLED?

Air is required to be sampled by the Clean Air Act, DOE Order 5400.1, and DOE Order 5400.5 to ensure the facility is in compliance with limits established by the Clean Air Act and to ensure that workers and the members of the public are protected from unallowable exposure to radiation.

WHAT CONTAMINANTS OF CONCERN ARE ANALYZED?

Radionuclides known to be emitted from the site, are analyzed.

WHAT ENVIRONMENTAL MONITORING IS PERFORMED?

DOE monitors specific sources of contamination such as systems emitting radionuclides. The Radiation/Environmental Monitoring Section of the Radiation Health and Toxic Agents Branch of the Department for Public Health of the Kentucky Cabinet for Health Services through a grant funded by DOE monitors ambient air for radionuclides. Thermoluminescent dosimeters are used to monitor the dose that may be given by radioactivity at or near the plant site.

DOE had two sources of airborne radionuclides in 2002. These sources were the Northwest Plume Groundwater System and the Scrap Yard Removal Project. The amount of radionuclides emitted were calculated or determined based on sampling data and emission factors. Based on the radionuclide results, the dose from these projects to the maximally exposed individual through emissions to the air was calculated to be ***approximately 0.0043 millirem/year in 2002***. DOE sources of air discharges for contaminants other than radionuclides were the Northwest Plume Groundwater System and the Northeast Plume Groundwater System. These systems combined removed 3559 pounds (1.8 tons) of TCE from the groundwater through the use of air stripping processes.

DOE utilized ambient air monitoring data to verify insignificant levels of radionuclides in off-site ambient air. Ambient air data are collected at ten sites surrounding the plant in order to measure radionuclides emitted from Paducah Site sources including fugitive emissions. Results indicated that radionuclides emitted in the air emissions were at or below background at the sampling locations. The dose to the maximally exposed individual member of the public (the neighbor living closest to the PGDP security fence) from the DOE operations did not vary statistically from background and was essentially zero.

On a quarterly basis, environmental thermoluminescent dosimeters are located at 46 locations in and around PGDP or at background locations. Monitoring results indicate that nine locations out of 46 were consistently above background levels. These locations were all at or near the PGDP security fence in the vicinity of UF_6 cylinder storage yards. For purposes of this ASER Summary, an additional potential receptor was considered. In a very conservative exposure scenario, this receptor is assumed to be exposed to the location at TLD-14, which represents the closest location that would be accessible to the public in 2002. This location is near Harmony Cemetery located north of the plant security fence and south of Ogden Landing Road. This location resulted in external radiation exposures below background. This means that the dose was zero.

Surface Water and Sediment Monitoring

WHY ARE SURFACE WATER AND SEDIMENT SAMPLED?

Surface water and sediment are required to be sampled by the Clean Water Act and DOE Orders 5400.1 and 5400.5 to ensure protection of the environment and the public.

WHAT CONTAMINANTS OF CONCERN ARE ANALYZED?

Contaminants found at the plant site such as uranium and ^{99}Tc are analyzed. Other contaminants analyzed are chlorine, PCBs, TCE, acute and chronic toxicity, hardness, oil and grease, phosphorus, and various metals. Radionuclides are typically measured against the Derived Concentration Guide (DCG), which is the concentration of a radionuclides in air or water that, under conditions of continuous exposure for one year by one exposure mode would result in an effective dose equivalent of 100 millirem.

WHAT ENVIRONMENTAL MONITORING IS PERFORMED?

The Kentucky Pollutant Discharge Elimination System permit requires sampling of surface water discharges (also called outfalls) to be performed throughout each month. The Department of Energy has four outfalls that are monitored. These are Outfalls 001, 015, 017, and 019. Outfall 001 had three permit exceedences during 2002 for chronic toxicity. Under the Resource Conservation and Recovery Act permit, surface water runoff is monitored at the C-746-S&T Landfills and the C-746-U Landfill. No unusual data results were identified in 2002.

In addition to the permit required monitoring, DOE samples 39 surface water locations and 20 sediment locations upstream and downstream on Bayou Creek, downstream on Little Bayou Creek, in the Ohio River, and at a nearby stream, Massac Creek. In 2002, additional locations in Little Bayou Creek were added as part of the sampling program to address upwellings of groundwater in the Little Bayou Creek bed. Six locations, known as seeps, were chosen to sample each quarter to trend and observe changes in data. These locations are located downstream of the plant site approximately half-way between the site and the Ohio River.

RADIONUCLIDES IN SURFACE WATER

Uranium and ^{99}Tc at each outfall monitoring location is compared with the corresponding DCG and is presented as a percentage. The average concentrations at all outfalls were small percentages of the corresponding DCG. The average concentration of uranium being discharged to Outfall 015 was 7% of the DCG. The average concentration of uranium being discharged to Outfalls 001, 017, and 019 was less than 1% of the DCG. Outfall 015 received runoff from the uranium burial ground with small quantities of surface contamination from uranium compounds. Runoff from the burial ground is suspected as responsible for the elevated uranium concentrations associated with Outfall 015. ^{99}Tc averages for 2002 for all four outfalls were well below 0.1% of the DCG.

^{99}Tc concentrations were elevated in downstream creek locations with the highest concentrations found downstream at the convergence of Little Bayou Creek and Bayou Creek. The locations with elevated results are downstream of the seep sites. However, these concentrations are well below the EPA drinking water standard of 900 pCi/L. Cesium-137 (^{137}Cs), Cobalt-60 (^{60}Co), Neptunium-237 (^{237}Np), Plutonium-238/239 ($^{238/239}$Pu), Potassium-40 (^{40}K), Thorium-228 (^{228}Th), Thorium-230, (^{230}Th), Thorium-232 (^{232}Th), and Uranium-235 (^{235}U), were not found in significant concentrations at any sampled location in 2002 when compared with DCGs. Americium-241 (^{241}Am) was only found above the DCG upstream of the PGDP discharges in the Ohio River, which is unaffected by plant operations. Uranium-234 (^{234}U), Uranium-238 (^{238}U), were elevated compared to 10% DCGs near the plant site on both Bayou Creek and Little Bayou Creek. These were also elevated downstream in both creeks and at the C-746-K Landfill. All other concentrations of radionuclides in effluents at the Paducah Site were far below DCGs.

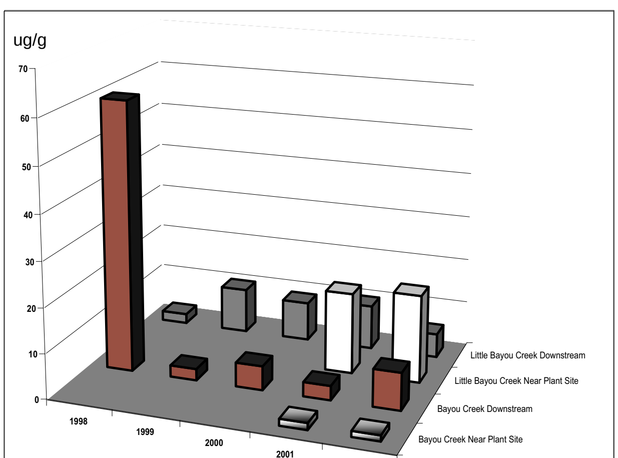
Surface-water pathway dose was calculated for an individual assumed to consume water from the public drinking water supply at Cairo, Illinois. Cairo is the closest drinking water system that uses water downstream of PGDP effluents. The radionuclide that was detected in Cairo was ^{99}Tc. ^{99}Tc was only detected in one out of four sampling events. During the sampling event, ^{99}Tc was also detected in the background location in Massac Creek. ***The net exposure to the maximally exposed receptor from the Paducah Site based on theoretical assumptions was 0.027 mrem.***

RADIONUCLIDES IN SEDIMENT

In general the location with the highest readings for all radionuclides is the NSDD. Remediation activities are underway due to the potential risk and access to this area is limited. ***The estimated worst-case dose above background from sediment ingestion at this location was 0.24 mrem.*** Uranium activity is elevated in Little Bayou Creek and Bayou Creek near the plant site and downstream. The levels are similar to those seen in 2001. ^{99}Tc levels are elevated on Bayou Creek near the plant site, and also downstream on Little Bayou Creek. The downstream location on Little Bayou Creek corresponds with the areas near the seep sites mentioned previously.

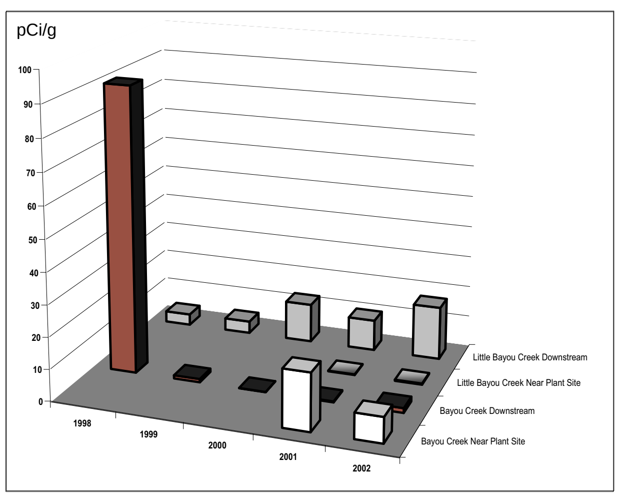
The figures below show no significant change in uranium or ^{99}Tc concentrations in sediment over the past five years; with the exception of the anomaly that was reported in 1998. New locations were added in 2001. No bars are present for the new locations for years 1998-2000. The higher ^{99}Tc concentrations downstream Little Bayou Creek correspond with seep locations discussed previously.

Five year uranium concentration in sediment.



Note: Averages were calculated using only uranium data and analyzed by a radiochemical method.

Five year ^{99}Tc concentration in sediment.



Surface Water and Sediment Monitoring (Cont.)

NONRADIOLOGICAL PARAMETERS IN SURFACE WATER

The only results of significance compared to background data were TCE results identified near the plant site and downstream of Little Bayou Creek at an average concentration of 57.5 and 12.2 mg/L, respectively. Also included is the Little Bayou Creek seep data with the highest average 145 mg/L.

Although detected at very low levels, PCB aroclors were detected in 2002 near the plant site on both Bayou and Little Bayou creeks. There were no detections of PCB in surface water in 2001.

NONRADIOLOGICAL PARAMETERS IN SEDIMENT

The table below shows an average value of detections for locations within the area group for specific parameters. Selected parameters are those that whose differences between upstream (or background) and downstream and have potential impacts on the receiving streams. Barium, beryllium, chromium, and nickel showed the most variation between sites for metals. Chromium was identified in the NSDD at 48.1 mg/kg and near the plant site on Little Bayou Creek at 51.2 mg/kg. Arsenic was found near the C-746-K Landfill and in Little Bayou Creek and Bayou Creek near the plant site. Zinc was found at all locations; however, the highest level was found in the NSDD.

A pesticide, 2,4-Dichlorodiphenyl-dichloroethylene, was found in Little Bayou Creek and the NSDD. PCBs were found in the NSDD, Little Bayou Creek near the plant site and downstream, and in Bayou Creek. This year they were also found in the C-746-K Landfill area. PCB-1254 and PCB-1260 were the most abundant aroclors.

Selected routine nonradiological sediment surveillance results (average concentrations).

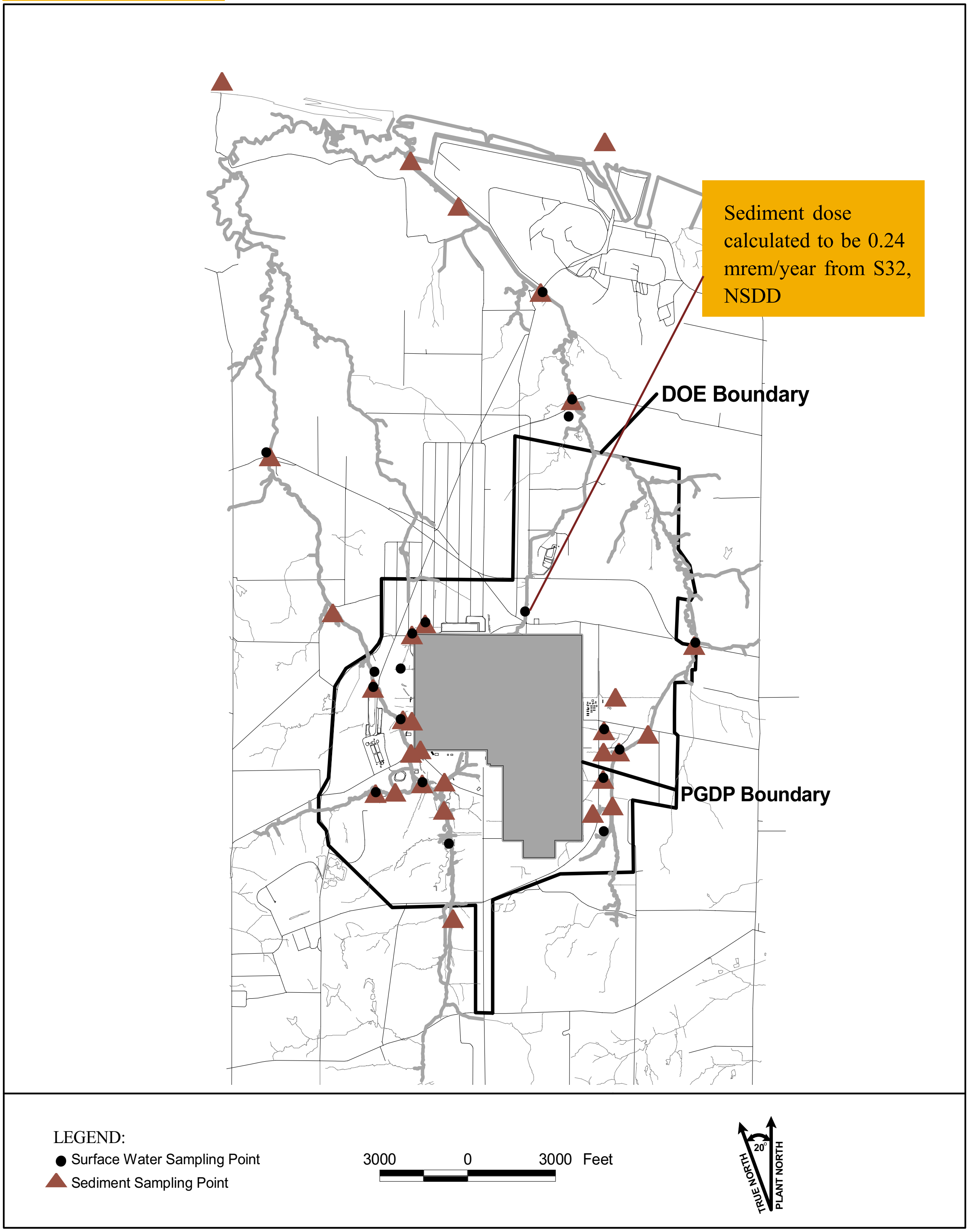
Parameter (mg/kg)	Upstream Bayou[1]	Bayou Near Site[2]	Down-stream Bayou[3]	Upstream Little Bayou[4]	Little Bayou Near Site[5]	Down-stream Little Bayou[6]	C-746-K Landfill[7]	NS Ditch[8]	Massac Creek[9]
Arsenic (mg/kg)	ND	6.14	ND	ND	6.89	ND	ND	ND	ND
Barium (mg/kg)	30.8	43.8	33.3	68.4	54.4	24.5	37.7	50.2	40
Beryllium (mg/kg)	0.592	0.603	ND	0.547	0.57	ND	0.59	ND	ND
Chromium (mg/kg)	7.15	17	9.12	12.1	51.2	36.5	11	48.1	5.34
Nickel (mg/kg)	ND	8.65	ND	6.25	5.58	6.08	5.96	23.5	ND
Potassium (mg/kg)	ND	347	288	295	289	258	339	452	270
Vanadium (mg/kg)	13.5	16	12.2	23	18.7	9.65	16.7	15.6	11.2
Zinc (mg/kg)	12.8	27.9	21.1	26.7	55.2	25.2	24.4	84.8	16.9
2,4-DDE (µg/kg)	ND	ND	ND	ND	13.5	ND	ND	54	ND
PCB-1254 (µg/kg)	ND	115	ND	ND	568	160	100	555	ND
PCB-1260 (µg/kg)	ND	ND	ND	ND	240	ND	ND	370	ND

Note: The result presented in the table is the average value for the locations within the area grouping.
ND – Not Detected
NS Ditch – North-South Diversion Ditch
The following footnotes correspond with column titles in the above table. These are grouping of sample locations in the area described in the title.
1 = S20
2 = C612, C616, S1, S31, K001, K006
3 = S33
4 = S1
5 = S30, S2, K010, K012
6 = LBCN1, S27, S34
7 = C746KUP, C746KTB2
8 = S32
9 = S28

Surface Water and Sediment Monitoring

Surface Water dose calculated to be 0.027 mrem/year from L306, Cairo, Il.

Sediment dose calculated to be 0.24 mrem/year from S32, NSDD



Biological Monitoring

WHY ARE DEER SAMPLED?

Deer are required to be sampled by DOE Order 5400.5. Deer living within the West Kentucky Wildlife Management Area are harvested and sampled annually to determine if any risk is present to the person or persons consuming the deer. Deer are analyzed for radionuclides, metals, and PCBs.

WHAT ENVIRONMENTAL MONITORING IS PERFORMED?

In 2002, five deer from the West Kentucky Wildlife Management Area (which is located on land around the Paducah Gaseous Diffusion Plant) and one deer from the Stewart Island Habitat Restoration in Livingston County, Kentucky were harvested. Bone, fat, kidney, liver, muscle, and thyroid were the different types of deer tissue that were sampled and analyzed. Liver and muscle are considered edible by deer hunters, and therefore, are evaluated for radiological risk. In bone, muscle, and liver, radionuclides were detected in deer from the West Kentucky Wildlife Management Area. All results for strontium in bone and technetium-99 in thyroid were non-detectable. Based on the radionuclide results, the worst-case dose was calculated to be **4.2 millirem/year.** The overall maximum allowable dose is 100 millirem per year. In 2002, PCBs were detected in fat at a maximum concentration of 46 parts per billion (ppb) in the West Kentucky Wildlife Management Area. PCBs were also detected in the background deer. The Food and Drug Administration Action Limit for red meat is 3000 ppb.

Radiological parameters and PCBs detected in deer tissue.

	Parameter	Deer 1	Deer 2	Deer 3	Deer 4	Deer 5	Deer (Background)
PCBs	PCB-1260	ND	29	ND	20	18	34
(ppb)	PCB-1268	46	ND	40	57	ND	ND
Rads*	Thorium-230 (Bone)	0.11	ND	ND	0.12	ND	ND
(pCi/g)	Thorium-230 (Liver)	ND	0.14	ND	ND	ND	ND
	Thorium-230 (Muscle)	0.11	ND	ND	ND	ND	ND
	Uranium-233/234 (Bone)	ND	ND	ND	0.18	ND	ND
	Uranium-234 (Bone)	ND	ND	ND	ND	3.4	ND
	Uranium-234 (Liver)	0.25	ND	ND	ND	ND	ND
	Uranium-235 (Bone)	ND	ND	ND	ND	0.16	ND
	Uranium-238 (Bone)	ND	ND	ND	ND	0.57	ND

ND - Non Detect
* - Other radionuclides were analyzed but not detected in any deer.

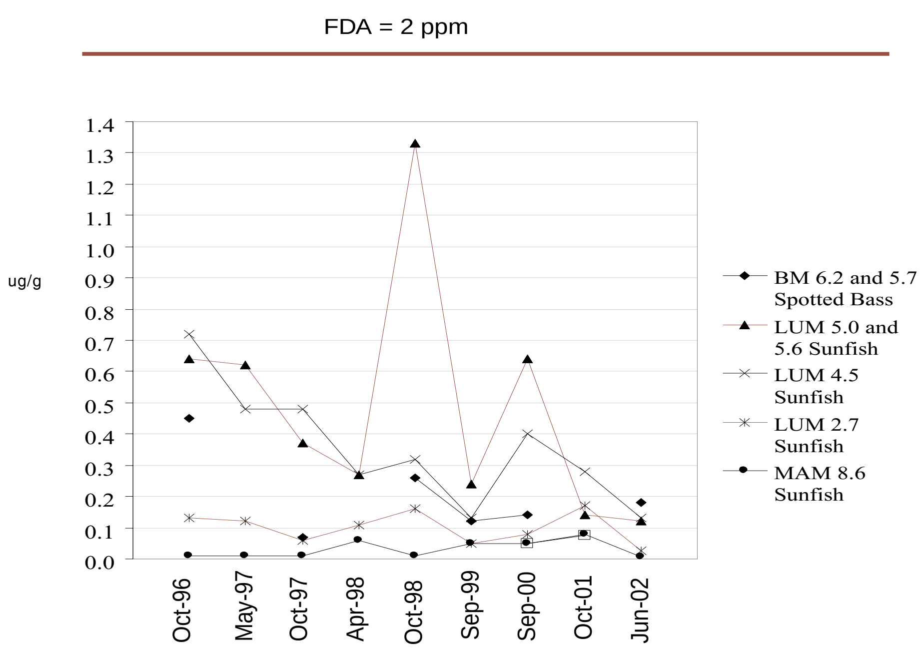
WHY ARE FISH SAMPLED?

Fish are sampled as part of the Watershed Monitoring Plan, under the Kentucky Pollutant Discharge Elimination System Permit and DOE Order 5400.1. The purpose of this sampling is to determine whether the discharges from PGDP are adversely affecting the fish and its environment. Analyses obtained on fish include PCBs, percent lipids (or percentage of fat), and other ecological information.

WHAT ENVIRONMENTAL MONITORING IS PERFORMED?

Samples at several locations on Bayou Creek, Little Bayou Creek, and Massac Creek, a nearby stream, were collected for fish and other ecological information. PCB concentrations were detected in fish tissue in all three creeks. The mean concentrations of PCBs have varied over the past five years and have consistently been elevated above the background level. The FDA Action limit for fish is 2 ppm. All results in 2002 were below this value for fish collected near the plant site. Overall, there is a general down trend with a flattening profile for the locations monitored on Little Bayou Creek.

AVERAGE CONCENTRATION OF PCBs IN FISH FROM BAYOU AND LITTLE BAYOU CREEKS NEAR THE PADUCAH SITE



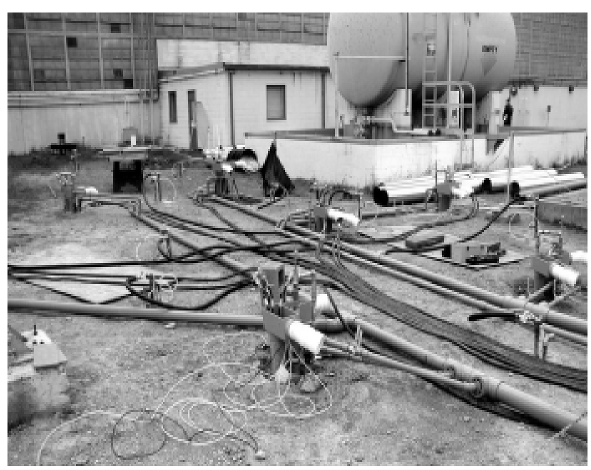
Groundwater Monitoring

Monitoring and protection of groundwater resources at the Paducah Site are required by federal and state regulations and by DOE orders. Federal groundwater regulations generally are enacted and enforced by EPA. When off-site groundwater contamination from the Paducah Site was discovered in 1988, the EPA Region IV and DOE entered into an Administrative Consent Order (ACO). DOE provided an alternate water supply to affected residents. Under CERCLA, DOE is required also to determine the nature and extent of off-site contamination through sampling of potentially affected wells and a comprehensive site investigation.

A site investigation, completed in 1991, determined off-site contaminants in the Regional Gravel Aquifer to be TCE (commonly used as an industrial degreasing solvent) and technetium-99 (a fission byproduct contained in nuclear power reactor returns that were brought on-site several years ago for re-enrichment.) The practice of re-enriching reactor returns was discontinued in 1976.

Investigations of the on-site source areas of TCE at the Paducah Site are ongoing. A common degreasing agent, TCE is a dense nonaqueous phase liquid (DNAPL) with typically low solubility in water. DNAPLs either sink to the bottom of aquifers or come to rest on a less-permeable layer within an aquifer, forming pools. These DNAPL pools form a continuous source for dissolved-phase contamination (plumes) that are migrating off-site toward the Ohio River. Pools of DNAPL are extremely difficult to clean up. The Six-Phase Heating Treatability Study began in 2002 with the objective to evaluate the performance of the Six-Phase Heating technology to remove TCE from the source area near the C-400 building. The area around the C-400 building is the primary source of TCE contamination in groundwater at the PGDP. In addition, DOE continued two pump-and-treat systems at Paducah to treat TCE contamination. The pump-and-treat system installed northwest of the plant also treats the highest concentrations of dissolved technetium-99 in the groundwater.

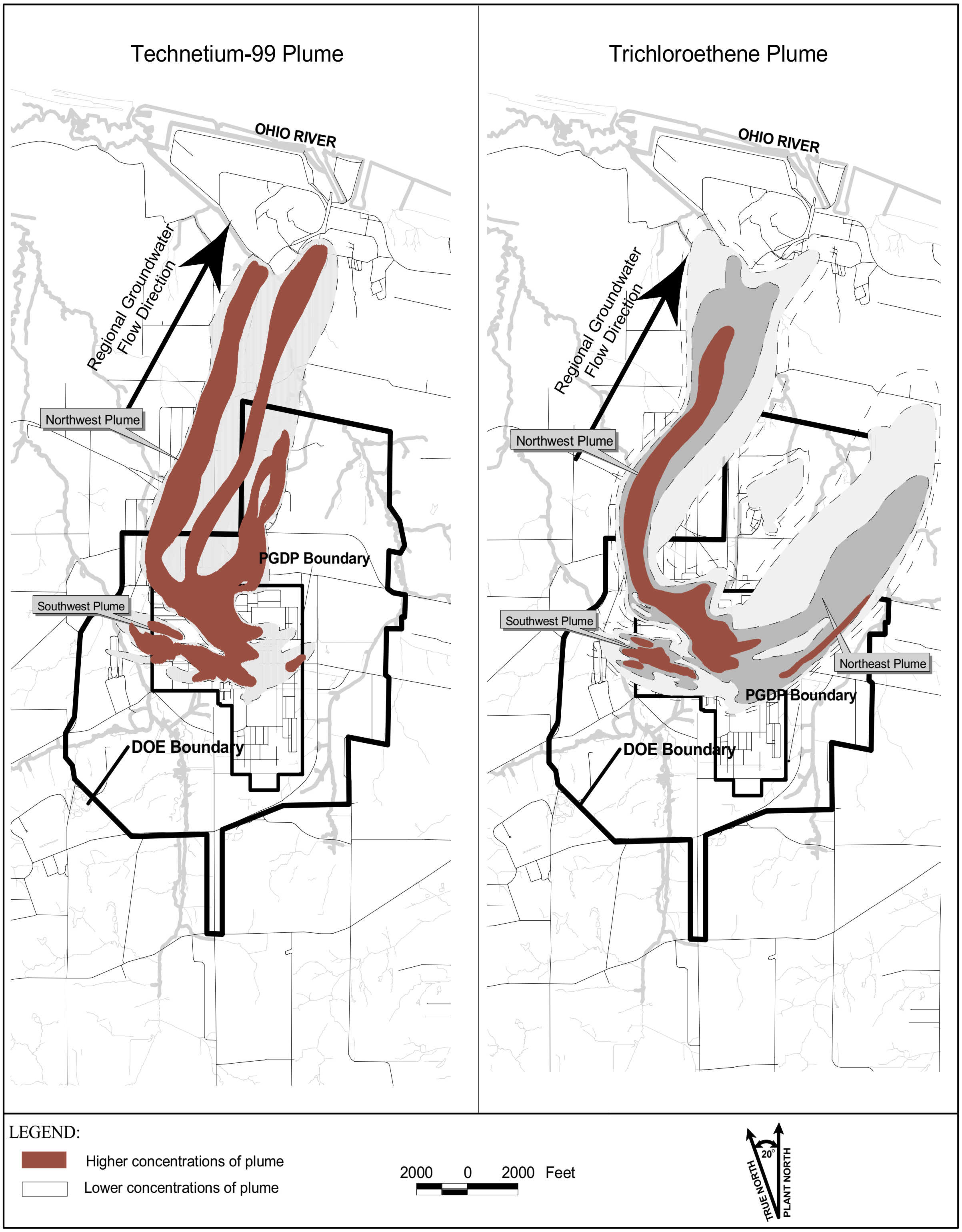
Continued groundwater monitoring identifies the extent of contamination, predicts the possible fate of the contaminants, and determines the movement of groundwater near the plant. Calendar year (CY) 2002 plume maps (see figure on next page) continue the basic interpretation as shown for the CY 2001 report. Revisions for CY 2002 reflect the following: (1) increasing TCE trends in MWs at C-404 and C-720, (2) the consideration of seeps to Little Bayou Creek, and (3) the installation of new MWs at the C-746-S&T and C-746-U Landfill areas.



Six-Phase Treatability Study system.

Groundwater monitoring at Paducah complies with one or more federal or state regulations and permit conditions and includes perimeter exit pathway monitoring and off-site water well monitoring. Scheduled sampling continues for more than 180 MWs and residential wells.

Paducah Site Groundwater Plumes



Construction - 1950s...

Operations through the Years

...DOE Today

50TH PGDP ANNIVERSARY

Public Involvement and Information

DOE Environmental Information Center. The public has access to Administrative Records and programmatic documents at the DOE Environmental Information Center located at the Barkley Centre, 115 Memorial Drive, Paducah, Kentucky. It is open Monday through Friday from 9 a.m. to 5 p.m. The telephone number is (270) 554-6979. Information on the Environmental Information Center can be found at http://www.bechteljacobs.com/p_eic/p_eic.htm.

Citizens Advisory Board. The PGDP Citizens Advisory Board (CAB), a Site Specific Advisory Board chartered by DOE under the Federal Advisory Committees Act, completed its sixth full year of operation in September 2002. During the year, the CAB held 11 regular meetings and one retreat. All meetings are open to the public and publicly advertised. In 2002, the CAB had 18 voting members, four ex-officio members, a Deputy Designated Federal Official, and a Federal Coordinator. The Paducah CAB consists of individuals with diverse backgrounds and interests. It meets monthly to focus on early citizen participation in environmental cleanup priorities and related issues at the DOE facility. The Paducah CAB participates only in activities that are governed by DOE. Information on the CAB can be found on the World Wide Web at http://www.oro.doe.gov/pgdpssab. The office phone number is (270) 554-3004.

ADDITIONAL INFORMATION

Additional information concerning DOE activities at PGDP can be found on the World Wide Web at:

http://www.oro.doe.gov/Paducah reaches the local DOE
http://www.energy.gov reaches the United States DOE
http://www.bechteljacobs.com is the public Bechtel Jacobs Company
http://www.epa.gov/region4/ is the Environmental Protection Agency Region IV
http://publichealth.state.ky.us/radiation is the Kentucky Radiation Health and Toxic Agents Control Branch
http://www.nr.state.ky.us/nrepc/dep/waste/dwmhome.htm reaches the Kentucky Department for Environmental Protection, Waste Management Branch
http://www.kdfwr.state.ky.us reaches the Kentucky Department of Fish and Wildlife Resources

Environmental Information Center.

ADDITIONAL READING MATERIALS

These documents are available at the DOE Environmental Information Center:

Paducah Site Environmental Monitoring Plan, BJC/PAD-285, Bechtel Jacobs Company, LLC, Paducah, KY.

Paducah Site Annual Site Environmental Report for Calendar Year 2002, BJC/PAD-543, Bechtel Jacobs Company, LLC, Paducah, KY.

Trichloroethene and Technetium-99 Groundwater Contamination in the Regional Gravel Aquifer for Calendar Year 2002 at the Paducah Gaseous Diffusion Plant, Paducah Kentucky, BJC/PAD-169/R3, Bechtel Jacobs Company, LLC, Paducah, KY.

Ionizing Radiation Exposure of the Population of the United States, NCRP Report No. 93, National Council on Radiation Protection and Measurements, Washington, D.C.

Paducah Annual Site Environmental Report 2002 Summary