Final CERCLA Five Year Review Report

For OU IV

Brookhaven National Laboratory
Upton, Long Island, New York

Prepared by:

Brookhaven National Laboratory
Environmental Management Directorate

Upton, N.Y. 11973

Prepared for :

U.S. Department of Energy
Brookhaven Area Office

September 2003

Five-Year Review Report
Brookhaven National Laboratory – Operable Unit IV
Superfund Site
Town of Brookhaven, City of Upton
Suffolk County, New York

August 29, 2003

PREPARED BY:

Environmental Restoration
Brookhaven National Laboratory
Upton, New York 11973

REGISTERED TO ISO 14001

Table of Contents

Table of Contents (Cont'd)

List of Acronyms

AGS	Alternating Gradient Synchrotron
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
AS/SVE	Air Sparging/Soil Vapor Extraction
BNL	Brookhaven National Laboratory
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSF	Central Steam Facility
DOE	Department of Energy
EPA	Environmental Protection Agency
GPR	Ground Penetrating Radar
HFBR	High Flux Beam Reactor
HWMF	Hazardous Waste Management Facility
IAG	Inter Agency Agreement
MCL	Maximum Contaminant Level
MSL	Mean Sea Level
NCP	National Contingency Plan
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and Maintenance
ORC	Oxygen Releasing Compound
OU	Operable Unit
PVC	Polyvinyl Chloride
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RESRAD	DOE Residual Radioactivity
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSD	Response Strategy Document
SCDHS	Suffolk County Department of Health Services

SDWA	Safe Drinking Water Act
SPDES	State Pollutant Discharge Elimination System
STP	Sewage Treatment Plant
SVOC	Semi-Volatile Organic Compound
TVOC	Total Volatile Organic Compound
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WCF	Waste Concentration Facility

Executive Summary

The remedy for Operable Unit (OU) IV of the Brookhaven National Laboratory (BNL) Superfund site in Upton, New York included treatment of chemically contaminated soil using soil vapor extraction, an interim remedy of fencing around the radiologically contaminated soil at the Building 650 Sump and Sump Outfall Area with institutional controls and monitoring, treatment of groundwater containing organic compounds at the most contaminated portion of the 1977 oil/solvent spill area using air sparging and soil vapor extraction, and an engineering enhancement option for groundwater as the air sparging and soil vapor extraction system alone did not achieve the desired performance levels. The final remedy for the radiologically contaminated soils is documented in the OU I Record of Decision (ROD), and includes excavation and off-site disposal of the soils that are contaminated above selected clean-up goals.

Construction of the air sparging and soil vapor extraction remediation system was initiated on June 11, 1997, and is the trigger for this Five-Year Review Report. However, the OU IV ROD states that a five-year review is not necessary since the remedy will not result in hazardous substances remaining on-site above health-based levels. The air sparging and soil vapor extraction system became operational November 17, 1997. In October 2000, a petition for system shutdown was submitted to the U.S. Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC). Approval was granted in December 2000 and the system was shut down in January 2001 (operating intermittently through August 2001). A petition for system closure was submitted to the EPA and NYSDEC in June 2002 and approved in July 2003.

The radiologically contaminated soils at the Building 650 Sump and Sump Outfall were fenced in 1995. Monitoring of the soils and groundwater associated with the Building 650 Sump and Sump Outfall was performed in accordance with the OU IV Interim Remedy Monitoring Plan for Area of Concern 6, Building 650 Sump and Outfall, 1998. The 2001 OU IV Annual Interim Remedy Monitoring Report, dated May 2002, further describes the soil and groundwater data collected from 1997-2001. Excavation of the contaminated pipeline (OU I ROD) was initiated in early 2002 and completed in July 2002. This excavation was further documented in the Building 650 Sump and Sump Outfall Closeout Report (July 2002).

The assessment of this Five-Year Review found that the remedy was constructed and implemented in accordance with the requirements of the OU IV ROD. The final remedy for the soil and groundwater (air sparging and soil vapor extraction), and the interim remedy for the radiological-contaminated soils (fencing and monitoring), has functioned as designed. The threats have been addressed and the remedy for the groundwater and soil is protective of human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Brookhaven National Laboratory Superfund Site		
EPA ID *(from WasteLAN)*: NY7890008975		
Region: 2	**State:** NY	**City/County:** Upton, Suffolk
SITE STATUS		
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): X Under Construction XOperating Complete		
Multiple OUs?* ☒ YES ☐ NO	**Construction completion date:** _ /_ /	
Has site been put into reuse? ☐ YES ☒ NO		
REVIEW STATUS		
Lead agency: ☐ EPA ☐ State ☐ Tribe ☒ Other Federal Agency (DOE)		
Author name: Gail Penny		
Author title: Remedial Project Manager	**Author affiliation:** U.S.DOE, Upton, NY	
Review period:** 6 / 11 / 1997 to 8 / 8 / 2003		
Date(s) of site inspection: Ongoing		
Type of review: ☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion)		
Review number: ☒ x 1 (first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify)		
Triggering action: ☒ Actual RA On-site Construction at OU IV ☐ Actual RA Start at OU# NA ☐ Construction Completion ☐ Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date *(from WasteLAN)*: 6 / 11 / 1997		
Due date *(five years after triggering action date)*: 6 / 30 / 2002		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

None

Statement of Protectiveness:

Based upon review conducted by Brookhaven Science Associates and the Department of Energy of the remedies of OU IV at the BNL site, it is concluded that the remedy at the OU was implemented in accordance with the requirements of the ROD and is protective of human health and the environment.

The next five-year review for OU IV will be conducted prior to June 11, 2007.

_____ _____

Michael D. Holland, Area Manager Date
Brookhaven Area Office
Department of Energy

Brookhaven National Laboratory

First Five-Year Review Report

I. Introduction

The purpose of the Five-Year Review is to determine whether the remedies at Brookhaven National Laboratory's Operable Unit IV are protective of human health and the environment. The methods, findings, and conclusions of the reviews are documented in Five-Year Review Reports. In addition, Five-Year Review Reports identify issues found during the review, if any, and identify recommendations to address them.

Brookhaven National Laboratory (BNL) is preparing this Five-Year Review Report pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

Brookhaven National Laboratory interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

Brookhaven National Laboratory's Environmental Restoration Division conducted the Five-Year Review and prepared this report regarding the remedies implemented at Operable Unit IV at the BNL site in Upton, New York.

This is the first Five-Year Review for the Brookhaven National Laboratory's Operable Unit IV. The triggering action for this statutory review is the initiation of the remedial action on June 11, 1997. The Five-Year Review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1 - Chronology of Site Events

Event	Date
BNL serves as Army Camp Upton for World Wars I and II/Operated by the Civilian Conservation Corps between wars	Through the 1940's
BNL transferred to the Atomic Energy Commission	1947
BNL transferred to the Energy Research and Development Administration	1975
BNL transferred to the Department of Energy	1977
Waste oil and solvent released from ruptured tank at the Central Steam Facility	11/26/77
BNL added to the NYSDEC's list of Inactive Hazardous Waste Sites	1980
Final listing on EPA National Priorities List	12/21/89
DOE entered an Interagency Agreement with the EPA and NYSDEC under CERCLA	5/1992
Fencing installed around the radiologically contaminated soils at the Building 650 Sump Outfall Area	1995
Remedial Investigation/Feasibility Study (RI/FS) completed for Operable Unit IV	11/1995
ROD selecting the remedy is signed	3/26/96
Initiate construction of the AS/SVE Remediation System	6/11/1997
AS/SVE Remediation System began operation	11/17/1997
Petition for shutdown of the AS/SVE Remediation System submitted to the EPA/NYSDEC	10/2000
Petition for shutdown of the AS/SVE Remediation System approved	12/2000
AS/SVE Remediation System shutdown	1/11/2001
AS/SVE Remediation System operates intermittently	Jan. – Aug. 2001
Excavation of contaminated pipeline associated with Building 650 completed (OU I)	July 2002
Petition for closure of the AS/SVE Remediation System submitted to the EPA/NYSDEC	June 2002
Petition for closure of the AS/SVE Remediation System approved by EPA/NYSDEC	July 2003

III. Background

Physical Characteristics

Brookhaven National Laboratory is located in Upton, Suffolk County, New York, near the geographic center of Long Island. The BNL property approximates a square, 3 miles on each side, comprising an area of approximately 5,265 acres (8.23 square miles). The site's terrain is gently rolling, with elevations varying between 40 and 120 feet above mean sea level (msl). The land lies on the western rim of the Peconic River watershed, with a tributary of the River rising in marshy areas in the northern part of the site. A BNL site plan is included as Attachment 1.

BNL is underlain by a mass of unconsolidated deposits that overlie gently southward sloping, relatively impermeable, crystalline bedrock. The deposits are about 2,000 feet thick in central Suffolk County. The aquifer beneath BNL is comprised of three water-bearing units: the Moraine and outwash deposits, the Magothy Formation and the Lloyd Sand Member of the Raritan Formation. These units are hydraulically connected and make up a single zone of saturation with varying physical properties extending from depth of 45 to 1,500 feet below the land surface. These three bearing units are designated as a "sole-source aquifer" by the EPA and serve as the primary source drinking water for Nassau and Suffolk Counties.

Land and Resource Use

BNL was formerly occupied by the U.S. Army as Camp Upton during World Wars I and II. Between the wars, the Civilian Conservation Corps operated the site. In 1947, the Atomic Energy Commission established BNL. The Laboratory was transferred to the Energy Research and Development Administration in 1975 and to the Department of Energy (DOE) in 1977. BNL is currently a federal facility that conducts research in physical, biomedical and environmental sciences and energy technologies.

The developed region includes the principal BNL facilities, which are near the center of the site on relatively high ground. These facilities comprise an area, of approximately 900 acres, of which 500 acres were originally developed for Army use. Outlying facilities occupy approximately 550 acres and include an apartment area, biology field, former hazardous waste management facility, sewage treatment plant, firebreaks, and a former landfill area. The groundwater aquifer underlying the site is currently used as a drinking water source.

Operable Unit IV (OU IV) is located on the east-central edge of the developed portion of the BNL site (Attachment 1). OU IV encompasses the Central Steam Facility (CSF), Reclamation Facility Building 650 Sump and Reclamation Facility Building 650 Sump Outfall, Leaking Sewer Lines, and Recharge Basin HO. Within the confines of Operable Unit IV, natural surface features are generally flat with elevations ranging from 53 feet above feet above msl to 86 feet above msl. Highly permeable, unconsolidated sands and silt generally characterize the unsaturated sedimentary deposits on the site. The depth to the water table is approximately 35 to 40 feet depending on seasonal conditions. Prevailing groundwater flow is toward the south.

History of Contamination

Operable Unit IV consists of four Areas of Concern (AOCs) including AOC-5 (Central Steam Facility), AOC-6 (Reclamation Facility Building 650 and Sump and Outfall), AOC-21 (Leaking Sewer Lines) and AOC-24D (Recharge Basin HO). An OU IV AOC location map is provided as Attachment 2. Attachments 3, 4 and 5 are also provided to show the extent of the soil and groundwater contamination within OU IV.

AOC 5 – Central Steam Facility (CSF)

The CSF heats and cools all major BNL facilities. It consists of a network of 21 aboveground receiving and mixing fuel tanks, which are connected via aboveground and underground pipelines to the boiler building (Building 610) located near the corner of Sixth Street and Cornell Avenue. The tanks are registered with the Suffolk County Department of Health Services (SCDHS), and have a Major Petroleum Facility License from the NYSDEC Division of Water Resources. AOC 5 has several subAOCs as described below**:**

1977 Oil/Solvent Spill

On November 25, 1977, approximately 23,000 to 25,000 gallons of waste oil and solvent were released from a ruptured pipe located southeast of the CSF and west of North Sixth Street (Attachment 2). The mixture was composed of 60 percent Number 6 fuel oil and 40 percent mineral spirits. The pipe ruptured when a nearby empty 5,000 gallon underground storage tank (UST), which was enclosed in a concrete structure, rose off its mount as a result of water accumulating beneath the tank, shearing the connecting lines. The spill, which covered an estimated area of 1.2 acres, was contained with sand berms and free product was recovered with portable pumps. The cleanup activities were coordinated with EPA and the steps taken were considered at that time to be appropriate by EPA. The total amount of the soil/solvent mixture that was recovered is unknown.

Former Leaching Pit

On November 6, 1989, excavation began at a location south of Building 610 to install a 1,000-gallon underground propane tank. Although the utility maps showed that there were no underground utility lines at this location, the backhoe encountered an eight-inch vitreous tile pipe approximately 3 to 4 feet below grade. A review of design drawings of Building 610, dating back to the 1950s, showed that the pipe had been connected to a Leaching Pit. The Leaching Pit was located approximately 100 feet south of the southwest corner of Building 610 (Attachment 2). The pit was installed sometime in the 1950s or 1960s to receive waste oil and wash-water from equipment cleaned inside Building 610. Further excavation revealed that the vitreous tile pipe led to a sand trap, and eventually to Building 610.

The Leaching Pit had an outside diameter of approximately 9 feet and was about 11 feet deep. Its walls were constructed of concrete cinder blocks, and the cover was a 12-inch-thick concrete slab. The cover was located approximately 1 foot below grade. The Leaching Pit contained approximately 53 inches of a thick, black, tar material similar in appearance to

Number 6 fuel oil. Excavation proceeded by removing the oil-stained concrete blocks and surrounding soil, in addition to the sand filter and piping connecting the Leaching Pit to Building 610. The estimated dimensions of the excavation were 20 feet deep by 20 feet in diameter. Clean sand and soil were placed into the hole. The soil, construction material, and tarry residue excavated from the Leaching Pit were classified as non-hazardous. Currently, an underground propane tank is located at the excavation site. The excavation and cleanup of the Leaching Pit was coordinated with the Inter Agency Agreement (IAG) agencies and was performed with oversight by NYSDEC Region I Oil Spill Division.

Former Underground Gasoline Storage Tank

In May 1990, an abandoned 550-gallon underground gasoline tank was discovered under the asphalt on the west side of Building 610 (Attachment 2). BNL records show that the tank was in operation from 1948 until approximately 1963. Excavation and inspection of the tank revealed several large rusted-out holes. Soil from beneath the tank smelled of petroleum. The contaminated soil was excavated until the organic vapor content of the remaining soil was less than 50 ppm. The depth and lateral extent of the excavation were not documented; however, approximately 12 cubic yards of soil were excavated. The hole was backfilled with clean soil under authorization from SCDHS.

CSF Fuel Unloading Areas

Fuel is unloaded at eight places around the storage tanks (Attachment 2). The unloading areas are approximately 4 square feet and are constructed of pavement, bluestone, and concrete. The secondary containments are concrete boxes. BNL has documented several small (1 to 10 gallons) surface spills of fuel oil. On three separate occasions, in 1988, 1990, and 1993, surface spills of about 60 gallons of Number 6 fuel oil were reported.

CSF Underground Piping

Four receiving tanks (1, 2, 3, and 4) are located to the west of Building 610. The tanks have a combined capacity of 1.1 million gallons. The majority of the pipelines are aboveground, and have had no history of leaking. However, there are three sections of piping leading to Building 610 that are below ground. One section is a 12-inch diameter pipe that carries Number 6 fuel oil from Tank 3 to Building 610, a distance of approximately 150 feet. Another section of pipe carries Number 6 fuel oil from Tank 1 to Building 610. The third section of underground piping connects Building 633 to both Building 610 and Tank 1. There are no documented releases from the pipes.

Drainage Area East of CSF

In September 1977, a tank truck was unloading fuel at a fuel-transfer pipe station. The valve was thought to be closed, however it was not and as a result, approximately 250 to 500 gallons of fuel were spilled. The fuel, believed to be Number 6 "Bunker C oil," caused excessive back-pressure in the pipeline and ruptured it. The fuel spilled onto the ground and entered an adjacent catch basin, with an outlet in the woods east of Building 610. The oil reportedly flowed

east along a small drainage ditch to a fence, which marks the "Gamma Field." The oil ponded in the low area, and subsequently was collected with recovery pumps. A bulldozer was used to limit the spread of the oil.

AOC-6 - Reclamation Facility Building 650 and Sump Outfall

The Reclamation Facility (Building 650) was constructed for decontamination of radiologically contaminated clothing and heavy equipment (Attachment 2). As a result, Building 650 was designed to perform wash operations both outside and inside the building. These operations date back to at least 1959, with the construction of USTs #650-1 and -2, in 1962 and USTs #650-3 and -4 in 1972. The structural integrity of the USTs had never been tested. At present, Building 650 is no longer used as a decontamination facility or laundry facility.

In the past, all soiled laundry from BNL was delivered to Building 650, where potentially radioactive laundry was segregated from routine laundry. Contaminated laundry was cleaned with dedicated equipment and the residual wash-water remained in two 2,000-gallon USTs (#650-1 and -2) until its radioactivity could be monitored. These tanks were located on the north side of the building. The contents of the tanks were classified as D-waste (a gross beta concentration greater than 90 pCi/ml). The liquid waste was emptied from the tanks about three times a year and taken to the Waste Concentration Facility (WCF) by a tank truck. Approximately six drums of sludge were removed from the tanks in 1983.

Building 650 also served as a decontamination facility for equipment contaminated with radioactivity. Equipment was steam-cleaned on a 30-foot by 30-foot concrete pad behind the north side of the building. This decontamination pad was in use by 1959, but the date of its initial operation is not known. Contaminated water ran down into a drum in the middle of a sloping pad, known as the Building 650 Sump. It was presumed that the effluent was piped into the sanitary sewer system or into holding tanks. Rinse water that was deemed to be excessively contaminated was supposed to be routed to two 2,000-gallon USTs (#650-1 and -2), designated for D-waste. Typically, however, the water was deemed clean enough to be routed to two 3,000-gallon USTs (#650-3 and -4), designed for F-waste containment (a gross beta concentration less than 90 pCi/ml). The contents of these tanks were emptied about twice a year; the waste was discharged to the Sewage Treatment Plant (STP). The laundry facility and the decontamination pad area are the only known sources of D and F waste delivered to the four tanks at Building 650.

The USTs (#650-1, -2, -3, and -4) are included under AOC 12 and were removed under Removal Action II (UST Removal Action) during the summer of 1994. Building 650 and the Sump Outfall Area were identified during aerial radiological surveys of BNL conducted in 1980, 1983, and 1990. Thus, Building 650 is also included as sub-AOC 16 under the Aerial Radioactive Monitoring System Results and was inadvertently included under OU II/VII. The investigations under OU IV satisfy all IAG activities for this AOC.

In late 1969, five curies of tritium were accidentally released into the sanitary sewer system, via the Building 650 Sump. However, this tritium was not detected at the STP. An investigation into the incident revealed that the drainage pipe from the outdoor concrete pad

behind Building 650 led to a natural depression in a wooded area about 800 feet northeast of Building 650, rather than to either the sanitary sewer system or to a waste holding tank, as had been assumed. The practice of washing radioactive equipment on the concrete pad was discontinued after the 1969 incident. The natural wooded depression is referred to as the Building 650 Sump Outfall Area; the area of radiological soil contamination is approximately 90 feet by 90 feet.

AOC-21 - Leaking Sewer Lines

The sanitary and storm sewer lines at BNL date back as far as 1917. Major repairs were made in 1940. Additional modifications have extended the sewer system to 31 miles. Many of the sewer and storm lines are composed of vitrified clay tile pipe and have undoubtedly developed cracks. In the region containing the 1977 Oil/Solvent Spill and Leaching Pit, there are approximately 1,300 feet of sanitary sewer line (Attachment 2).

The sanitary sewer main (20 inch diameter tile line) transports effluent to the STP located to the north of OU IV. Lines carrying storm water in the vicinity of the CSF discharge into a wooded area east of the CSF. The main 20 inch sanitary sewer line divides into two lines approximately 80 feet south of Tank 3. The 20 inch tile sewer line connects with Building 610, passing beneath the valve house and pumping house and then continues east along the south side of Building 610. A large 21-inch diameter line, constructed of polyvinylchloride (PVC), runs east for approximately 100 feet off the sewer main, and then continues to the northeast, passing between the locations of the Former Leaching Pit and the 1977 Oil/Solvent Spill. A third line, 6 inches in diameter, is connected to the main line at the point of division and serves Building 529.

A single sewer line runs east-west between Cornell Avenue and Building 650; it is an 8-inch line, constructed of tile. It connects to the 20 inch main east of the CSF near Building 528. Storm water from Cornell Avenue and water from several outlets at Building 650, as well as the Building 650 decontamination pad, are directed to the Building 650 Sump Outfall area, via a 15-inch line. The structural integrity of the sanitary sewer lines are known to be compromised by fractures and slippage along joints in portions of the line beneath OU IV. To address the type and extent of damage, a video camera survey of the sanitary sewer main was made in 1988. The structural integrity of the 15-inch diameter storm sewer line connecting the Building 650 Sump to the Building 650 Sump Outfall Area was not known before the remedial investigation for OU IV.

AOC-24D - Recharge Basin HO

Recharge Basin HO is located approximately 250 feet northeast of the Building 650 Sump Outfall (Attachment 2). Recharge Basin HO is the largest of five recharge basins at BNL, discharging to the water table aquifer approximately 48 percent or 1,530,000 gallons daily of all of the water that BNL uses for non-contact cooling and related purposes. Recharge Basin HO actually is two adjacent basins constructed of native material (sand and gravel) on 3.9 acres.

Since 1958, most of the water discharged to Recharge Basin HO, approximately 1,374,000 gallons per day, is single-use, non-contact cooling and process water from the Alternating Gradient Synchrotron (AGS). Water from the High Flux Beam Reactor (HFBR) also has been discharged to Recharge Basin HO since 1978. The remainder of the water (approximately 156,000 gallons per day) is multi-cycle blowdown water from the HFBR's secondary cooling system. These discharges are permitted by NYSDEC under BNL's State Pollutant Discharge Elimination System (SPDES) permit.

Water used for cooling and related processes is derived from process/potable supply wells for the entire operation of Recharge Basin HO. Poly-electrolytes and dispersant is added to the AGS cooling and process water to keep the ambient iron in solution. To control corrosion and deposition of precipitant, water at the HFBR towers was treated with inorganic polyphosphate (PO_4) and benzotriazole before 1982. Since then, the HFBR water has been treated with mercaptobenzothiozene.

Initial Response

In 1980, the BNL site was placed on New York State Department of Environmental Conservation list of Inactive Hazardous Waste Sites. Subsequently, in December 1989, BNL was placed on the United States Environmental Protection Agency's National Priories List (NPL). In May 1992, DOE entered into an Interagency Agreement (IAG) for the BNL site with the EPA and the New York State Department of Environmental Conservation under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The IAG established the framework and schedule for characterizing, assessing, and remediating the site in accordance with the requirements of CERCLA, Section 120, and the Resource, Conservation and Recovery Act (RCRA).

The BNL site has been subdivided into seven Operable Units for purposes of the IAG to ensure effective management. OU I, compromising approximately 950 acres in the southeastern part of the BNL property, includes the former Hazardous Waste Management Facility (HWMF), the Former Landfill, Chemical/Animal Pits, Glass Holes and the Current Landfill source areas. OU III was developed to address site-specific Areas of Concern, concentrating on groundwater plumes originating from the western (and central) portion of the site. OU III is bounded by BNL's northern, southern, and western property boundaries and encompasses approximately 50 percent of the total area of the Laboratory. OU III includes most of the developed region of BNL located in the central portion of the site. OU IV refers primarily to the Building 650 Sump and Sump Outfall Area as well as the Air Sparging/Soil Vapor Extraction (AS/SVE) remediation system. OUs V, VI, and II/VII mainly refer to the Sewage Treatment Plant area, the Biology Fields, and onsite contaminated soils, respectively.

The IAG identified AOC 5 - CSF, for a Remedial Investigation/Feasibility Study (RI/FS) and a Response Strategy Document (RSD) was written pursuant to the IAG. The RSD grouped AOC 5 with AOCs 6, 21, and 24-D and prioritized the OU IV RI/FS. OU IV initially included supply wells 1 and 3 (AOC 15A), however these were transferred to OU III (Engineering Change Notice #042) in September 1999. The OU IV RI was completed in December 1994, and the OU IV FS was completed in November 1995.

Basis for Taking Action

The OU IV Remedial Investigation/Risk Assessment (RI/RA) was conducted in accordance with the approved OU IV RI/FS Project Plans and was completed in 1994. The main purposes of the RI/RA were to determine the nature, magnitude, and extent of contamination in OU IV, and to characterize the potential health risks and environmental impacts of any contaminants present. The RI/RA included: (1) video camera survey of a pipeline from Building 650 to the Sump Outfall area, (2) geophysical survey, including magnetic and Ground Penetrating Radar (GPR) around several buildings within OU IV, (3) soil-vapor survey of the CSF area, (4) soil borings/soil sampling, (5) monitoring well installation and two rounds of groundwater sampling, (6) sediment sampling in the Recharge Basin HO, (7) aquifer testing in the form of slug tests, (8) analysis of soil and groundwater samples for various chemical and radiological constituents, and (9) additional radiological surface soil sampling and survey (1994) of AOC 6. The video camera survey and geophysical surveys were conducted in July 1992. Fifty-seven soil borings and 23 monitoring wells were installed during the RI/RA for OU IV.

Classification of the nature and extent of soil and groundwater contamination was based on the following Applicable or Relevant and Appropriate Requirements (ARARs), such as those for groundwater, or guidance/criteria such as cleanup goals for soils:

(1) Since the groundwater is a federally designated sole source aquifer and is classified as a source of potable water by New York State, the most restrictive of the state and federal Maximum Contaminant Levels (MCLs) were selected as ARARs for groundwater.

(2) The soil cleanup goals for protection of groundwater contained in the NYSDEC Technical Assistance Guidance Memorandum (TAGM) HWR-92-4046 entitled "NYSDEC Soil Cleanup Objectives and Cleanup Levels," November 1992, were selected for organic compounds found in soils.

(3) The cleanup goal selected for radiologically contaminated soils, with the exception of Radium-226, is the annual dose rate of 10 millirem above background, contained in the NYSDEC TAGM 4003 entitled "NYSDEC Soil Cleanup Guidelines for Radioactive Materials", September 1993. This goal, along with the assumption of a future industrial land use and an institutional control period of 50 years, was used to develop soil cleanup guidelines using the DOE Residual Radioactivity (RESRAD) computer model.

(4) Radium-226 concentrations were compared to the 5 pCi/gram generic cleanup guideline contained in DOE Order 5400.5.

Contaminants

Hazardous substances that have been released within OU IV in each media include:

Soil	**Groundwater**
Tetrachloroethylene	1,1,1-trichloroethane
Toluene	Toluene
Ethylbenzene	Ethylbenzene
Benzene	Benzene
Xylenes	Xylenes
Phthalates	Polynuclear Aeromatic Hydrocarbons (PAHs)
Polynuclear Aeromatic Hydrocarbons (PAHs)	Strontium-90
Acetone	Tritium
Chlorinated Solvents	Cesium-137
Arsenic	Gross alpha
Barium	Gross beta
Calcium	Iron
Cobalt	Manganese
Chromium	Sodium
Copper	Aluminum
Iron	
Lead	
Magnesium	
Mercury	
Nickel	
Sodium	
Vanadium	
Zinc	
Cesium-137	
Eurpoium-152	
Europium-154	
Europium-155	
Americium-241	
Cobalt-60	
Sodium-22	
Uranium-234	
Uranium-235	
Uranium-238	
Strontium-90	
Radium-225	
Plutonium-239	
Plutonium-240	
Tc-99	

Exposures to soil and groundwater are associated with significant human health risks, due to an exceedance of EPA's risk management criteria for either the average or the reasonable maximum exposure scenarios. The risks associated with exposure to the groundwater were the highest for the 1977 Oil/Solvent spill and the CSF Fuel Unloading Area (VOC and SVOC contamination), and thus remediation was required.

The OU IV ROD identifies the need for further soil and groundwater investigation for the Building 650 Sump and Outfall Areas, as radionuclide concentrations were detected in the soils above the cleanup goals. The investigation of the Building 650 Sump Outfall soils was conducted under the OU I Feasibility Study (March 1999) and showed radionuclide contamination to depths of 33 feet below land surface in the Sump Outfall Area. Soil samples collected along the storm sewer pipe from Building 650 to the Sump Outfall Area indicated no contamination above remediation goals; however, the storm sewer pipe was identified as contaminated since it was the source of the Sump Outfall contamination. The Interim Remedy Monitoring Plan, required by the OU IV ROD, requires only the implementation of institutional controls, fencing and monitoring of the contaminated soil and groundwater associated with Building 650 Sump and Outfall. The final remedy of the radiologically contaminated soils is documented in the OU I ROD and all associated activities are reported in the OU I Closeout Report.

Low concentrations of chloroform and SVOCs were detected in soil samples adjacent to the leaking sewer lines (AOC 21). Since the levels were below cleanup goals and groundwater has not been impacted, the soils adjacent to the sewer lines will not be remediated. In addition, no VOCs, SVOCs, or pesticides/PCBs were detected in the sediment samples from Recharge Basin HO, and no inorganic analytes exceeded cleanup goals. Therefore, no remediation is required (Sub-AOC 24D).

IV. Remedial Actions

Remedy Selection

The Record of Decision for Brookhaven National Laboratory's OU IV was signed on March 25, 1996. The goals of the ROD are to:

- Eliminate or minimize the threat posed to human health and the environment by preventing exposure to groundwater contaminants;

- Prevent further migration of groundwater contamination beyond its current extent; and

- Restore contaminated groundwater to Federal and State applicable or relevant and appropriate requirements (ARARs), including drinking water standards, and to a level that is protective of human health and the environment within a reasonable period of time.

The purpose of the selected remedy was to address contamination associated with a 1977 oil/solvent spill and fuel unloading area near BNL's CSF (AOC 5), and with the Reclamation Facility Building 650 Sump and Outfall area (AOC 6). The OU IV remedy consists of a

combination of treatment and institutional controls. No remediation of AOC 21 and AOC 24D was required. The selected remedy consisted of the following major components:

- Treatment of the contaminated soil using a soil vapor extraction system to collect organic contaminants in the vadose zone of the 1977 oil/spill area and fuel unloading area at the CSF AOC 5. (Alternative S-3).

- Fencing around the radiologically contaminated soil at the Building 650 Sump and Sump Outfall area (AOC 6) with institutional controls and monitoring (Alternative R-2) [until cleanup is completed under OU I ROD].

- Treatment of the groundwater contaminated with organic compounds at the most contaminated portion or "hot spot" of the 1977 oil/spill plume area (AOC 5) using a combination of soil vapor extraction and air sparging technologies (GW-6).

- An engineering enhancement option for groundwater contaminated with organic constituents may be implemented if it is decided by the DOE, EPA and NYSDEC based on the performance and monitoring data, that soil vapor extraction and air sparging alone will not achieve the desired performance levels. The performance levels were to be defined during the remedial design phase. The engineering enhancement option consisted of groundwater extraction, enhanced biodegradation, and re-injection of the groundwater and was to be used in combination with soil vapor extraction and air sparging (AOC 5).

The components of the selected remedy for contaminated groundwater, in combination with the engineering enhancement option, and for the chemically contaminated soils, are final response actions. The component of the selected remedy that addressed the radiologically contaminated soil is considered an interim action. This interim action was necessary to reduce the risk posed by potential exposure to radiologically contaminated soil at OU IV. Final remediation of these soils was evaluated in the OU I Feasibility Study (FS) and is documented in the OU I ROD.

Remedy Implementation

The selected remedy consisted of the following major components: a final action for the soils contaminated with chemicals (S-3) (AOC 5), an interim action (R-2) for radiologically contaminated soils (AOC 6), and a final remedy with a contingency option (GW-6) for groundwater contaminated with volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) (AOC 5). The following is a brief description of each of the components:

Soils Contaminated with Chemicals (S-3) (AOC 5):

For dealing with organic chemical contamination of soils, an AS/SVE system was installed to collect VOCs and some SVOCs in the vadose zone in two areas: (1) the 1977 oil/solvent spill area, particularly in the vicinity of the of the underground storage tank (UST) location, and (2) one fuel unloading area. The effectiveness of AS/SVE for remediation of soils in the source area was evaluated through the use of annual soil sampling and VOC emissions

monitoring from the AS/SVE wells.

Soil samples were collected during November 1998 from nine locations, at depths ranging from 2 to 30 feet below grade. The rationale for the soil sampling locations and depths was to match locations sampled during the Remedial Investigation (RI), (February 17, 1993) in order to allow a correlation of the data. Significant reductions in VOC concentrations were observed when compared to RI samples. Many of the samples showed none detectable, or trace level detection of VOCs, and all of the samples were below NYSDEC TAGM clean-up values. The soil analytical results are summarized in Table 1 of the "Petition to Shut-Down OU IV Air Sparge/Soil Vapor Extraction Remediation System."

The VOC/SVOC source area soil clean-up objectives were met during the first year of operation of the system. As a result, the soil sampling was discontinued and the AS/SVE system continued operating to address groundwater contamination.

Interim Action for Radiologically Contaminated Soils (R-2 (AOC 6))

To address the radiological contamination of the soils at Building 650 and the Sump Outfall area as an interim remedy, fencing, institutional control, radiological surveys and soil/groundwater monitoring was performed. The fencing of the radiologically contaminated soil areas around Building 650 and at the Sump and Outfall area was completed in the Summer of 1995 due to risk from external gamma radiation. Fencing was not required for the storm sewer pipe.

Gamma radiation levels in the soils at the Building 650 Sump Outfall area were monitored using environmental thermoluminescent dosimeters (TLDs). Environmental TLDs have a sensitivity of approximately one millirem. The TLDs were deployed on a quarterly basis by BNL and were measured by the DOE Environmental Measurements Laboratory. The TLDs were set at a height of one meter above the land surface.

Twenty-one TLDs were hung on posts at the Sump Outfall Area. The TLDs were spaced in a 20 foot grid over the contamination area, as delineated by the OU IV RI Round II gamma radiation survey. Four TLDs were placed on the fence surrounding the Sump Outfall Area to assess radiation levels at the fence line and two TLDs were placed at the “Site of the 11 International Intercomparison of Environmental Dosimeters” at BNL for background TLD measurements. The Building 650 Sump was not monitored due to the elevated background radiation levels resulting from the adjacent Radioactive Material Storage Yard (Building 650A).

Soil samples were also collected in the summer of 1996 along the storm sewer pipe from Building 650 to the Sump Outfall area. The soil samples did not indicate contamination above remediation goals. However, the storm sewer pipe is believed to be contaminated and was excavated in 2002. All remedial activities on the Building 650 Sump and Outfall, including the removal of the storm sewer pipe/associated manholes, contaminated soil and the decontamination pad, are addressed in the OU I ROD and are not covered in this Five-Year Review Report. TLD monitoring of the Sump Outfall area has ceased due to the soil excavation activities at the Building 650 Sump Outfall.

In addition to soil monitoring, the selected interim remedy R-2 implemented a groundwater monitoring program for the Building 650 Sump and Outfall Area. This monitoring was performed in Fiscal Year 1996 via temporary Geoprobe wells and permanent monitoring wells. All groundwater monitoring well sample results are reported in the OU IV Annual Interim Remedy Monitoring Report for Area of Concern 6, and the Annual BNL Groundwater Status Report.

Groundwater Contaminated with VOCs and SVOCs (GW-6) (AOC 5):

In addition to remediating the soils, the AS/SVE remediation was implemented to address the volatile and semi-volatile contaminants in the groundwater. The air-sparging portion of the remediation system strips the VOCs and SVOCs from the groundwater and forces them into a vapor phase. The soil vapor extraction system collected both the sparged air and the organics from the vadose zone.

The performance goal for OU IV groundwater is the remediation of groundwater underlying the most contaminated portions of OU IV to Maximum Contaminant Levels (MCLs) or until monitoring indicates that continued operation of the selected remedy is not producing significant further reductions in the concentrations of contaminants in soil and groundwater (OU IV RAWP, May 1997). This goal was met and petitions for system shutdown and closure were approved in December 2000 and July 2003, respectively.

The list of monitoring wells identified below shows the wells that are proposed for abandonment due to the closure of the AS/SVE system and the wells proposed for continued monitoring. In general wells were recommended for abandonment that have been below MCL's for over one year. The remaining monitoring wells will be managed under the sitewide BNL groundwater monitoring program or under the facility monitoring program. These changes will be documented in the next Environmental Monitoring Plan update for 2004. The remaining groundwater contaminants that are above MCL's will be managed to meet the cleanup goals identified in the OU III ROD. A more detailed explanation of these proposed monitoring changes is provided in Attachment 11.

Planned OU IV AOC 5 Monitoring

Well ID	Continued Post-Closure Monitoring for VOCs/semi-VOCs under OU IV AOC 5 Program	Continued Monitoring for Radionuclides under OU IV AOC 6 Program	Continued Monitoring for VOCs/semi-VOCS for MPF Program	No further Monitoring/Well Abandonment
076-02				x
076-04	x			
076-05		x		
076-06	x			
076-07		x		
076-08				x
076-09		x		
076-18			x	
076-19			x	
076-21				x
076-22		x		
076-23			x	
076-24		x		
076-178				x
076-179				x
076-180				x
076-181		x		
076-182		x		
076-183		x		
076-184		x		
076-185	x			
076-186				x

System Operation/Operation and Maintenance (O&M)

The AS/SVE Remediation System/Treatment Facility consists of a treatment control building and an activated carbon system, and is located just north of Brookhaven Avenue at North Sixth Street. The treatment facility is designed for limited automatic operation, defined as automatic equipment shutdown with manual restart.

Each area has one AS truncated leg and one SVE truncated leg, so that the system was allowed to operate in a pulsed manner. It has been demonstrated that pulsing increases remediation system efficiency. The AS systems, called Process 300 and 400, at each area consist of a two-staged rotary lobe blower with an intercooler, intake and discharge silencers, a discharge heat exchanger, and a motor-operated valve to control pulsing cycles. The SVE systems, called Process 100 and 200, at each area consist of a single-stage centrifugal blower, inlet and discharge silencers, a moisture separator, a discharge air filter, and a granular activated carbon emissions control system.

The AS/SVE system began operation in November 1997. Performance goals for soil cleanup were achieved in 1998 while performance goals were met in August 2000 for

groundwater. Subsequently, a formal petition for shutdown was submitted to EPA and NYSDEC and approval for shutdown was received in December 2000. The system was shutdown on January 10, 2001. However, following the shutdown, groundwater results were received for well 076-04 showing a rebound in several VOC parameters (indicative of fuel oil). This well is located in the area of the original fuel oil/solvent spill occurred and had prior reported VOC levels below MCLs for nearly two years. As a result of this, pulsing of the AS/SVE system was initiated on a weekly basis in February 2001. The system was pulsed for one day (approximately 24 hours of operation) each week and focused on the sparge and extraction well in the vicinity of well 076-04. During the following months, analytical results from the monthly sampling showed a decreasing trend in VOC concentrations.

In addition, the supplemental action recommended in the 2000 BNL Groundwater Status Report was performed during July 29 to July 31, 2001. The objective of this action was to further reduce any residual VOCs, primarily ethylbenzene, xylenes and trimethylbenzenes, through enhanced biodegradation processes utilizing an oxygen releasing compound (ORC). A slurry of a mixture of magnesium peroxide powder and water was injected under pressure at seven locations around well 076-04 into the ground water table. The system was shutdown on August 08, 2001 and further monitoring was continued as per OU IV Remediation Area 1 Proposed Supplemental Remedial Effort - Work Plan, May 2001.

Building 650 Sump and Outfall (AOC 6)

Soil samples were collected from two locations from the Building 650 Sump and Outfall area in 1997 and 1998. Samples were collected from 0-22 feet below land surface at the Outfall and 0-10 feet below land surface at the Sump area. All samples were analyzed for Sr-90, gross alpha and beta activity, and gamma-emitting radionuclides. Concentrations of radionuclides were low and consistent with previous investigations, thus no soil samples were collected in 1999, 2000 or 2001.

A groundwater screening survey was conducted in September 1996. Temporary wells were installed using the Geoprobe™ sampling methodology. Five temporary wells were installed at locations downgradient of the Building 650 Sump Outfall Area. Two temporary wells were installed at locations downgradient of Building 650 Sump. The groundwater screening survey samples from the temporary well locations were analyzed for gross alpha activity, gross beta activity, and gamma-emitting radionuclides.

Since monitoring wells 076-20, 076-09, and 076-10 have historically shown concentrations of gross beta activity and/or Sr-90 above typical MDAs, five temporary wells were installed downgradient of the Building 650 Sump Outfall Area. Three temporary wells were installed adjacent existing downgradient wells (076-20, 076-09, and 076-10) and two temporary wells were installed at new downgradient locations along Brookhaven Avenue. Monitoring well locations are shown in Attachment 8.

Monitoring Well Installation

Seven new monitoring wells were installed as part of the OU IV Interim Remedy Monitoring Project in 1997. The new monitoring wells were installed to complement the existing monitoring well network. Monitoring wells 076-167, 076-168, 076-169 were installed immediately downgradient of the Building 650 Sump Outfall Area (Attachment 8). The monitoring wells were installed approximately 60 feet below land surface. The locations were based on detections of gross beta activity in groundwater during the groundwater screening survey conducted in June 1996 in the vicinity of the Building 650 Sump Outfall Area.

Monitoring wells 076-262, 076-263, 076-264 and 076-265 were installed at locations downgradient where existing wells were not screened at the appropriate depths or were paired with existing wells. The monitoring wells were installed approximately 65 - 80 feet below land surface.

Monitoring wells 076-181, 076-182, 076-183, and 076-184 were installed initially as part of the groundwater monitoring well network for the OU IV Air Sparge/Soil Vapor Extraction System, however were also be included in the groundwater monitoring well network for the Building 650 Sump and Sump Outfall Area. The monitoring wells were installed approximately 50 - 95 feet below land surface.

Table 2 - Annual System Operations/O&M Costs

Not applicable.

V. Progress Since the Last Five-Year Review

This is the first Five-Year Review for Brookhaven National Laboratory's Operable Unit IV.

VI. Five-Year Review Process

Administrative Components

Members of the IAG were notified of the preparation of this Five-Year Review Report. The BNL OU IV Five-Year Review Report, for BNL's OU IV, was led by BNL's Environmental Restoration Division's Surface and Groundwater Groups. The DOE, EPA, NYSDEC, and SCHDHS reviewed this document.

Community Involvement

The public has been kept informed of the status of the OU IV project since the development of the RI/FS Work Plan in 1992, through the findings of the RI/FS and Proposed Plan in 1995, during construction and operation of the AS/SVE system from 1997 through 2001, and post-shutdown. The Community Advisory Council has also been briefed in 2002 on the status of the OU IV Five Year Review.

This Five-Year Review Report will be made available to the public once it has been made

final. Copies of this document will be available on the BNL web site and at BNL's Environmental Restoration Post-ROD Information Repositories, including the Longwood Public Library, the Mastics-Moriches-Shirley Community Library, the Brookhaven National Laboratory Research Library, and the New York City EPA Office. In addition, a public notice will be placed in the local newspapers to announce the availability of this report.

Document Review

This Five-Year Review consisted of a review of relevant documents including O&M records, annual reports and monitoring data. A list of reference documents reviewed for this report is listed in Attachment 6. Applicable groundwater cleanup standards, as listed in the OU IV Record of Decision, were also reviewed.

Data Review

Soils Contaminated with Chemicals (S-3) (AOC 5):

The source area soil clean-up objectives were met during the first year of operation of the system. As a result, the soil sampling was discontinued and the AS/SVE system continued operating groundwater contamination. The AS/SVE Remediation System Operation and Maintenance data indicate:

- The soils within the Area of Concern for Operable Unit IV AS/SVE System have met the Soil Performance Goals as outlined by the OU IV O&M Plan.

- During the third quarter 2000, removal rates from the AS/SVE system were essentially at zero (0.008 pounds/day TVOCs)

- A formal petition for shutdown was submitted to EPA and NYSDEC and approval for shutdown was received in December 2000. The system was shutdown on January 10, 2001, but maintains an operationally ready state for restart if needed. A petition for closure of the system was approved by the regulators in July 2003.

Interim Action for Radiologically Contaminated Soils (R-2) (AOC 6):

To address the radiological contamination of the soils at Building 650 and the Sump Outfall area, as an interim remedy, fencing, institutional control, radiological surveys and groundwater monitoring was performed.

Soil Monitoring (R-2)

As stated in the 1998 IRM Report for Area of Concern 6, the radionuclides found in the soil in 1997 and 1998 had low concentrations of radionuclides. Therefore, it was determined that no further annual soil sampling would be conducted in 1999, 2000, and 2001.

TLD Monitoring (R-2)

There are five years of historical TLD data for the Sump Outfall Area with the exception of locations C5, D5, E5, E4 and E3, which were installed in 1998. Attachment 7 provides a graphical representation of the historical profile of the quarterly TLD exposures. The following comparisons are presented in terms of location, TLD result, season, and/or other variables, which suggest historical, time dependent data trends:

- In 1997, 75% of the lowest TLD readings were from quarter 1, January 1997 through March 1997. Fifty percent of the highest TLD readings were from quarter 4, October 1997 through December 1997.

- In 1998, 57% of the lowest TLD readings were from quarter 2, April 1998 through June 1998. Sixty-seven percent of the highest TLD readings were from quarter 3, July1998 through September 1998.

- In 1999, 38% of the lowest TLD readings were from quarter 4, November through January 1999. Fifty-two percent of the highest TLD readings were from quarter 1, January 1999 through March 1999.

- In 2000, 48% of the lowest TLD readings were from quarter 2, April 2000 through June 2000. Thirty-three percent of the highest TLD readings were from quarter 3, July 2000 through September 2000. The maximum result at location 066-74 (A1) was observed during this quarter due to the TLD being found on the ground.

- In 2001, 90% of the lowest TLD readings were from quarter 1, January 2001 through March 2001. Seventy-six percent of the highest TLD readings were from quarter 2, April 2001 through June 2001.

In 1997, 1998, 2000, and 2001 the lowest TLD readings were observed in the winter and spring and the highest TLD readings were observed in the summer and fall. In contrast during 1999, the lowest TLD readings were observed in the fall and the highest TLD readings were observed in the winter. TLD monitoring has ceased as a result of the soil remediation and pipeline excavation activities currently in progress at the Building 650 Sump Outfall.

Groundwater Monitoring - Building 650 Sump and Outfall (R-2)

The selected remedy R-2 proposed a groundwater monitoring program. This monitoring was implemented in Fiscal Year 1996 via temporary Geoprobe wells and permanent monitoring wells. Strontium-90 and gross beta concentrations over the MCL were observed in monitoring wells local to the Building 650 Sump and Sump Outfall Area (Attachment 8). The Strontium-90 plume was moving south but shifted to a more westerly direction in late 2001 in response to increase recharge and resulting mounding to the RA V Basin resulting from the Middle Road Pump and Treat System that went on line in the fall of 2001. Groundwater monitoring associated with AOC 6 will continue under the OU I ROD. Results for each well are as follows:

Table 2 – AOC 6 Monitoring Well Data

Monitoring Well ID	Monitoring Period	Contaminant(s)	Standard (pCi/L)	Maximum Concentration (pCi/L)	Minimum Concentration (pCi/L)
066-18	1997-2001	Gross Alpha	15	0.54	0.54
		Gross Beta	50	53.2	1.94
		Sr-90	8	27	0.23
		H-3	20,000	1890	1890
		Cs-137	NA	3.51	3.51
076-13	1993-2001	Gross Alpha	15	5.3	0.88
		Gross Beta	50	110	20
		Sr-90	8	60.4	14.4
076-24	1993-2001	Gross Alpha	15	0.79	0.37
		Gross Beta	50	42.5	4.73
		Sr-90	8	17.3	2.06
076-28	1993-2001	Gross Beta	50	44.4	2.02
		Sr-90	8	20.6	0.13
		H-3	20,000	558	375
076-167	1997-2001	Gross Alpha	15	1.00	0.75
		Gross Beta	50	4.09	1.48
		Sr-90	8	< 8	< 8
076-168	1997-2001	Gross Alpha	15	5.49	0.94
		Gross Beta	50	24.3	5.39
		Sr-90	8	9.02	1.47
076-169	1997-2001	Gross Alpha	15	1.86	0.98
		Gross Beta	50	63.4	27.05
		Sr-90	8	30.9	2.37
076-263	1997-2001	Gross Beta	50	15.7	4.05
		Sr-90	8	5.35	1.56

Trends observed with respect to the Strontium-90 concentrations in the monitoring wells are as follows:

- Monitoring well 066-13 indicated an increasing trend from 1997 through February 2000 and a subsequent decreasing trend through 2001.
- Monitoring well 076-13 showed Sr-90 concentrations that were variable over time.
- Monitoring well 076-24 indicated that Sr-90 concentrations were variable through 1999, and then increased during both sampling rounds in 2000 with a subsequent decrease in 2001.
- Monitoring well 076-28 showed Sr-90 concentrations that were variable over time.
- Strontium-90 concentrations were below the MCL of 8 pCi/L for monitoring well 076-167 through the monitoring period.

- Strontium-90 was detected at 9.02 pCi/L, above the MCL of 8 pCi/L, during one sampling round (February 1998) for monitoring well 076-168.
- Monitoring well 076-169 showed Sr-90 concentrations that were variable over time.
- Strontium-90 concentrations were below the MCL of 8 pCi/L for monitoring well 076-263 through the monitoring period.

Groundwater Contaminated with VOCs and SVOCs (GW-6) (AOC 5):

In addition to remediating the soils, the AS/SVE remediation system was implemented to address the volatile and semi-volatile organic contaminants in the groundwater. Currently the groundwater underlying the most contaminated portions of OU IV are below MCLs for VOCs and SVOCs, except for two wells (076-180 and 076-185) which are downgradient and outside the area of influence of the system (Attachment 9), and therefore the groundwater performance goals as outlined by the OU IV OM & M Plan have been met. Any residual groundwater contamination above MCL's will be managed to meet the cleanup goals identified in the OU III ROD. Quarterly groundwater samples have been collected and analyzed for VOCs and SVOCs of 18 monitoring wells (076-02, 076-04 to 076-07, 076-09, 076-19, 076-21, 076-22, 076-178 through 076-186) since system start-up in November 1997 (as outlined in Section 4.2.9 of the OU IV AS/SVE O&M Plan). Three monitoring wells (076-08, 076-23 and 076-18) were included for quarterly sampling of VOCs and SVOCs in order to obtain additional information on the conditions of the groundwater in the AS area, during the second quarter of 2000. Monitoring well locations are shown in Attachment 9. Results of the groundwater samples analytical data are included in the appendix of the "Petition to Shut-Down OU IV Air Sparge/Soil Vapor Extraction Remediation System". The system was shutdown in January 2001.

Following this shutdown, groundwater results were received for well 076-04 showing a rebound in several VOC parameters (indicative of fuel oil). This well is located in the area where the original fuel oil/solvent spill occurred and had reported VOC levels below MCLs for a period of two years. In response to this, pulsing of the system was initiated on a weekly basis in February 2001. The pulsing of the system was performed one day per week (approximately 24 hours of operation) and was focused on the sparge and vent wells in the vicinity of well 076-04.

Further monitoring showed slight decrease in VOC concentration and supplemental action (enhancement of natural biodegradation process through the application of the ORC) was proposed for the summer 2001 to target the residual contamination in a more expedient and cost effective manner. The ORC was mixed with water to form a thin slurry and injected under pressure below the water table at seven locations around well 076-04 in July 2001. As a result of the ORC injection, contaminant concentrations were reduced and the system was shutdown on August 08, 2001. Monitoring of well 076-04 was conducted on a monthly basis and the other wells maintained the quarterly sampling schedule to identify any rebound in concentrations within the system's area of influence.

Monthly air samples (as outlined in Section 4.2.5 of the OU IV OM&M Plan) and gas monitoring data were collected and evaluated to predict mass removal rates and system effectiveness. A total of 35 pounds of VOCs were removed by the system.

Since the AS/SVE System has met all the criteria as outlined in the OU IV AS/SVE O&M Plan for closure, final closure and termination of formal post-closure monitoring are being recommended for the OU IV AS/SVE System. A petition for closure was submitted to the regulators in June 2002. The Petition for Closure of the AS/SVE system was approved by the EPA and DEC in July 2003. Continued monitoring of groundwater monitoring wells will continue and will be identified in the EMP Update in January 2004.

Site Inspection

Routine site inspections were conducted by BNL personnel assigned to Operable Unit IV. Review of the institutional controls are included as part of the site inspection to ensure that the use or disturbance of the contaminated soil and groundwater is prohibited until cleanup levels are achieved. These controls include the signs and fence surrounding the AS/SVE remediation area, contaminated soils map and procedure that prohibit digging or installation of structures in the soil/groundwater remediation area, and AS/SVE system maintenance in accordance with the O&M Manual. Comprehensive reviews are performed and addressed in the Sitewide Remediation Systems Operations Quarterly Reports and the Annual BNL Groundwater Status Reports. No activities were observed that would have violated the institutional controls. With the exception of the 2002 remediation/excavation effort of the contaminated sewer pipe, OU IV and the surrounding area were undisturbed, and no new uses of groundwater were observed. For the sewer pipe work that was performed in the summer of 2002, the work planning and control process includes the preparation of a Work Permit in accordance with BNLs Standards Based Management System Subject Area. The Work Permit categorizes the level of risk of the work, identifies planning and controls necessary for the job, as well as obtaining feedback and closeout of the work.

Interviews

During the routine site inspections, informal interviews were conducted with the field personnel overseeing the remedy implementation. No concerns were identified that would interfere with the implemented remedy.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

Remedial Action Performance and Monitoring Activities: The review of documents, ARARs, risk assumptions, and the results of the routine performance and environmental monitoring and site inspections indicate that the remedy is functioning as intended by the ROD. The AS/SVE remediation system was shutdown as it has achieved the remedial objectives to minimize the migration of contaminants from the soils further to the groundwater, and prevent direct contact with, or ingestion of, contaminants in soil. The effective implementation of institutional controls has prevented exposure to, or ingestion of, contaminated groundwater.

System Operations and Maintenance: A review of the system influent, midpoint, and effluent air monitoring data over the life of the remediation system indicate that the contaminants

are being captured and treated by the system to within the air permit equivalency limits. This data was reported on a quarterly basis during system operations.

Costs of System O&M: The actual annual O&M cost for maintaining the AS/SVE system was approximately 40% lower that the estimate in the OU IV ROD.

Implementation of Institutional Controls and Other Measures: The institutional controls that were implemented include prohibitions on the use or disturbance of groundwater until cleanup levels are achieved, fencing of the area, and any other activities or actions that might interfere with the implemented remedy. No activities were observed that would have violated the institutional controls. With the exception of the excavation of the Building 650 sewer pipes, the surrounding area is undisturbed, and no new uses of groundwater are observed.

Opportunities for Optimization: There were no opportunities for increased remedy efficiency observed during this review. The monitoring well network provides sufficient data to assess the progress of the VOC, SVOC and strontium-90 plumes. Current monitoring indicates that the Sr-90 plume will not leave Operable Unit IV above the MCLs. Future concerns associated with the Sr-90 plume will be addressed as part of the OU I ROD remedy. Historically, in the summer of 2001, an oxygen release compound was applied at a specific location within the AS/SVE remediation area to help enhance the natural biodegradation process and ultimately obtain the cleanup goals.

Early Indicators of Potential Remedy Problems: There did not appear to be any early-on issues other than routine system start-up concerns.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

There have been no changes in the physical conditions or exposure pathways of the site that would affect the protectiveness of the AS/SVE remedy. Groundwater elevation measurements across the site are performed on a quarterly basis and remain consistent at this area of the site. TLD monitoring of the Building 650 Sump and Outfall has ceased due to the excavation activities associated with the pipelines. All clean-up levels addressed in the OU IV ROD are still valid and have not changed.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There is no other information such as land use changes or ecological risks that calls into question the protectiveness of the remedies.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy has functioned as intended by the ROD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. There has been no changes in the

toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there have been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedies.

VIII. Issues

There are no new issues that need to be addressed.

IX. Recommendations and Follow-Up Actions

Table 3 - Recommendations and Follow-Up Actions

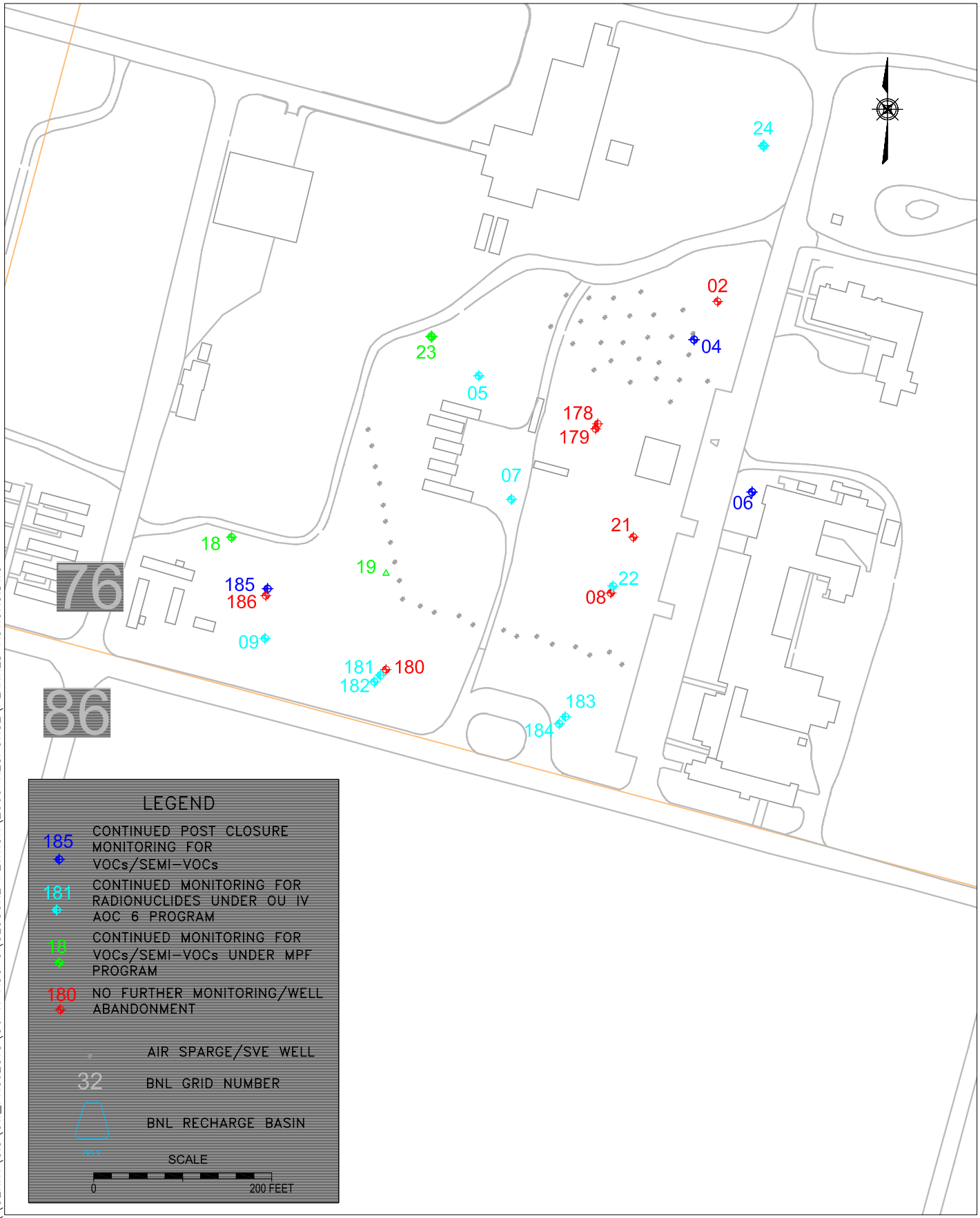
Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
				Current	Future
Obtain approval from EPA and DEC on the petition for the AS/SVE system closure	BNL	NYSDEC, EPA, DOE, SCDHS	July 2003 (A)	N	N
Continue monitoring the radiologically contaminated groundwater near the Building 650 Sump and Outfall	BNL	NYSDEC, EPA, DOE, SCDHS	Ongoing	N	Y
Continue monitoring select wells downgradient of the AS/SVE system and include in the EMP under the Sitewide and Facility Monitoring Programs	BNL	NYSDEC, EPA, DOE, SCDHS	Ongoing for monitoring and 1/04 for EMP	N	Y
Complete excavation of radiologically contaminated pipe between Building 650 and the Sump Outfall (OU I)	BNL	NYSDEC, EPA, DOE, SCDHS	July 2002 (A)	N	N
Complete preparation of the Building 650 Sump and Outfall Closeout Report, submit to regulators (OU I)	BNL	NYSDEC, EPA, DOE, SCDHS	July 2002 (A)	N	N
Complete characterization and remediation of the lead-contaminated soils at the storm-water outfall at the CSF (Not part of OU IV ROD)	BNL	NYSDEC, EPA, DOE, SCDHS	NA	N	N

X. Protectiveness Statement

The remedies have been, and are expected to be, protective of human health and the environment upon attainment of soil and groundwater cleanup goals, remediation and natural attenuation. In the interim, exposure pathways that could result in unacceptable risks are being controlled and institutional controls are preventing exposure to, or the ingestion of, contaminated soil and groundwater. All threats at the site have been addressed through the installation of fencing and warning signs, and the implementation of institutional controls, however, long-term protectiveness of the remedial action will be verified by obtaining additional groundwater samples to fully evaluate potential migration of the strontium-90 plume downgradient from the source area. Current data indicate that the strontium-90 plume remains in OU IV and that the remedy is functioning as required to achieve groundwater cleanup goals.

XI. Next Review

If required, the next Five-Year Review for Brookhaven National Laboratory's Operable Unit IV will be completed by May 2007, five years from the date of this review.



\\OERNT\GIS\GW_PROJECTS\OU IV AOC 5\CLOSURE PETITION\2003 RESPONSE\PLANNED ACTIONS.DWG

BROOKHAVEN NATIONAL LABORATORY
ENVIRONMENTAL SERVICES DIVISION

TITLE:

OU IV AOC 5 (AS/SVE) PROGRAM MONITORING WELL LOCATIONS AND PLANNED ACTIONS

DWN:	VT: HZ.:	DATE:	PROJECT NO.:
KCK	–	08/20/03	07176
CHKD:	APPD:	REV.:	NOTES:
WRD	WRD	1	–

FIGURE NO.: 1

Table 2. Summary of Volatile and Semivolatile Organic Compounds Detected in OU IV AOC 5 Wells, January 1, 2002 to Present.

Site ID	Sample Date	Analyte	Screening Level*	Value	Reporting Limit	Units	Depth	Qualifier	Method
076-02	2/12/02	Bis(2-ethylhexyl)phthalate	5	0.45	9.7	ug/L	60	J	EPA 625
076-02	2/12/02	Chloroform	7	0.45	0.5	ug/L	60	J	EPA 524.2
076-02	5/13/02	1-Methylnaphthalene	--	0.74	0.98	ug/L	60	J	EPA 625
076-02	5/13/02	2-Methylnaphthalene	--	0.36	0.98	ug/L	60	J	EPA 625
076-02	5/13/02	Acenaphthene	20	0.083	9.8	ug/L	60	J	EPA 625
076-02	5/13/02	Chloroform	7	0.72	0.5	ug/L	60		EPA 524.2
076-02	8/9/02	Chloroform	7	0.67	0.5	ug/L	60		EPA 524.2
076-02	10/31/02	Chloroform	7	1.3	0.5	ug/L	60		EPA 524.2
076-02	2/6/03	Chloroform	7	1.4	0.5	ug/L	60		EPA 524.2
076-02	5/27/03	Chloroform	7	0.51	0.5	ug/L	60		EPA 524.2
076-04	1/3/02	Ethylbenzene	5	0.56	0.5	ug/L	40		EPA 524.2
076-04	1/3/02	m/p xylene	5	1	0.5	ug/L	40		EPA 524.2
076-04	1/3/02	Naphthalene	10	1.5	0.5	ug/L	40		EPA 524.2
076-04	3/7/02	1-Methylnaphthalene	--	0.22	0.99	ug/L	40	J	EPA 625
076-04	3/7/02	2-Methylnaphthalene	--	0.2	0.99	ug/L	40	J	EPA 625
076-04	3/7/02	Acenaphthylene	--	0.22	9.9	ug/L	40	J	EPA 625
076-04	3/7/02	Bis(2-ethylhexyl)phthalate	5	0.56	9.9	ug/L	40	J	EPA 625
076-04	3/7/02	Fluoranthene	50	0.23	9.9	ug/L	40	J	EPA 625
076-04	3/7/02	m/p xylene	5	0.27	0.5	ug/L	40	J	EPA 524.2
076-04	3/7/02	Pyrene	50	0.23	9.9	ug/L	40	J	EPA 625
076-04	5/16/02	2-Chloronaphthalene	10	0.41	9.5	ug/L	40	J	EPA 625
076-04	5/16/02	Acenaphthylene	--	0.35	9.5	ug/L	40	J	EPA 625
076-04	5/16/02	Anthracene	50	0.38	9.5	ug/L	40	J	EPA 625
076-04	5/16/02	Benzo(a)pyrene	**0**	**0.33**	9.5	ug/L	40	J	EPA 625
076-04	5/16/02	Benzo(b)fluoranthene	**0.002**	**0.35**	9.5	ug/L	40	J	EPA 625
076-04	5/16/02	Benzo(k)fluoranthene	**0.002**	**0.35**	9.5	ug/L	40	J	EPA 625
076-04	5/16/02	Bis(2-ethylhexyl)phthalate	5	0.88	9.5	ug/L	40	JB	EPA 625
076-04	5/16/02	Fluoranthene	50	0.38	9.5	ug/L	40	J	EPA 625
076-04	5/16/02	Fluorene	50	0.37	9.5	ug/L	40	J	EPA 625
076-04	5/16/02	Methylene chloride	5	2	0.5	ug/L	40	B	EPA 524.2
076-04	5/16/02	Phenanthrene	50	0.43	9.5	ug/L	40	J	EPA 625
076-04	5/16/02	Pyrene	50	0.39	9.5	ug/L	40	J	EPA 625
076-04	6/6/02	Benzene, 1,2,4-trimethyl	5	0.64	0.5	ug/L	40		EPA 524.2
076-04	6/6/02	cis-1,2-Dichloroethylene	5	0.65	0.5	ug/L	40		EPA 524.2
076-04	7/8/02	Benzene, 1,2,4-trimethyl	5	0.44	0.5	ug/L	40	J	EPA 524.2
076-04	7/8/02	cis-1,2-Dichloroethylene	5	0.41	0.5	ug/L	40	J	EPA 524.2
076-04	7/8/02	Ethylbenzene	5	0.46	0.5	ug/L	40	J	EPA 524.2
076-04	7/8/02	m/p xylene	5	0.57	0.5	ug/L	40		EPA 524.2
076-04	8/9/02	Benzene, 1,2,4-trimethyl	5	1.8	0.5	ug/L	40		EPA 524.2
076-04	8/9/02	Benzene, 1,3,5-trimethyl-	5	0.47	0.5	ug/L	40	J	EPA 524.2
076-04	8/9/02	Benzene, 1-methylethyl-	--	0.37	0.5	ug/L	40	J	EPA 524.2
076-04	8/9/02	cis-1,2-Dichloroethylene	5	0.28	0.5	ug/L	40	J	EPA 524.2
076-04	8/9/02	Di-n-butyl phthalate	50	1.3	10	ug/L	40	J	EPA 625
076-04	8/9/02	Ethylbenzene	5	0.59	0.5	ug/L	40		EPA 524.2
076-04	8/9/02	m/p xylene	5	0.66	0.5	ug/L	40		EPA 524.2
076-04	8/9/02	Naphthalene	10	0.34	0.5	ug/L	40	J	EPA 524.2
076-04	8/9/02	n-Propylbenzene	5	0.33	0.5	ug/L	40	J	EPA 524.2
076-04	9/5/02	Benzene, 1,2,4-trimethyl	5	1.1	0.5	ug/L	40		EPA 524.2
076-04	9/5/02	Benzene, 1,3,5-trimethyl-	5	0.4	0.5	ug/L	40	J	EPA 524.2
076-04	9/5/02	cis-1,2-Dichloroethylene	5	0.68	0.5	ug/L	40		EPA 524.2
076-04	9/5/02	Ethylbenzene	5	0.42	0.5	ug/L	40	J	EPA 524.2
076-04	9/5/02	m/p xylene	5	0.3	0.5	ug/L	40	J	EPA 524.2
076-04	9/5/02	Naphthalene	10	0.41	0.5	ug/L	40	J	EPA 524.2
076-04	9/5/02	n-Propylbenzene	5	0.27	0.5	ug/L	40	J	EPA 524.2
076-04	10/4/02	Benzene, 1,2,4-trimethyl	**5**	**6.1**	0.5	ug/L	40		EPA 524.2
076-04	10/4/02	Benzene, 1,3,5-trimethyl-	5	2.1	0.5	ug/L	40		EPA 524.2
076-04	10/4/02	Benzene, 1-methylethyl-	--	2.1	0.5	ug/L	40		EPA 524.2
076-04	10/4/02	cis-1,2-Dichloroethylene	5	0.52	0.5	ug/L	40		EPA 524.2
076-04	10/4/02	Ethylbenzene	5	3.2	0.5	ug/L	40		EPA 524.2
076-04	10/4/02	m/p xylene	**5**	**6.2**	0.5	ug/L	40		EPA 524.2
076-04	10/4/02	Naphthalene	10	1.5	0.5	ug/L	40		EPA 524.2
076-04	10/4/02	n-Propylbenzene	5	1.4	0.5	ug/L	40		EPA 524.2
076-04	10/4/02	o-Dichlorobenzene	3	0.44	0.5	ug/L	40	J	EPA 524.2
076-04	10/31/02	Benzene, 1,2,4-trimethyl	5	0.28	0.5	ug/L	40	J	EPA 524.2

Table 2. Summary of Volatile and Semivolatile Organic Compounds Detected in OU IV AOC 5 Wells, January 1, 2002 to Present.

Site ID	Sample Date	Analyte	Screening Level*	Value	Reporting Limit	Units	Depth	Qualifier	Method
076-04	10/31/02	Benzene, 1-methylethyl-	--	0.27	0.5	ug/L	40	J	EPA 524.2
076-04	10/31/02	Bis(2-ethylhexyl)phthalate	5	1.8	9.8	ug/L	40	J	EPA 625
076-04	10/31/02	cis-1,2-Dichloroethylene	5	0.34	0.5	ug/L	40	J	EPA 524.2
076-04	10/31/02	Naphthalene	10	0.65	0.5	ug/L	40		EPA 524.2
076-04	10/31/02	Naphthalene	10	0.29	9.8	ug/L	40	J	EPA 625
076-04	12/4/02	cis-1,2-Dichloroethylene	5	0.36	0.5	ug/L	40	J	EPA 524.2
076-04	12/4/02	Naphthalene	10	0.43	0.5	ug/L	40	J	EPA 524.2
076-04	1/2/03	cis-1,2-Dichloroethylene	5	0.42	0.5	ug/L	40	J	EPA 524.2
076-04	1/2/03	Naphthalene	10	0.49	0.5	ug/L	40	J	EPA 524.2
076-04	5/22/03	Methylene chloride	5	0.35	0.5	ug/L	40	J	EPA 524.2
076-05	2/12/02	1,1,1-Trichloroethane	5	0.38	0.5	ug/L	40	J	EPA 524.2
076-05	2/12/02	cis-1,2-Dichloroethylene	5	0.5	0.5	ug/L	40		EPA 524.2
076-05	2/12/02	Tetrachloroethylene	5	0.54	0.5	ug/L	40		EPA 524.2
076-05	5/16/02	Bis(2-ethylhexyl)phthalate	5	0.46	9.7	ug/L	40	JB	EPA 625
076-05	5/16/02	Methylene chloride	5	1.8	0.5	ug/L	40	B	EPA 524.2
076-05	5/16/02	Tetrachloroethylene	5	0.8	0.5	ug/L	40		EPA 524.2
076-05	8/8/02	Tetrachloroethylene	5	0.4	0.5	ug/L	40	J	EPA 524.2
076-05	10/30/02	Tetrachloroethylene	5	0.26	0.5	ug/L	40	J	EPA 524.2
076-05	1/30/03	Methylene chloride	5	0.34	0.5	ug/L	40	J	EPA 524.2
076-05	1/30/03	Tetrachloroethylene	5	0.33	0.5	ug/L	40	J	EPA 524.2
076-05	5/23/03	Methyl tert-butyl ether	10	0.3	0.5	ug/L	40	J	EPA 524.2
076-05	5/23/03	Tetrachloroethylene	5	0.27	0.5	ug/L	40	J	EPA 524.2
076-06	2/12/02	1-Methylnaphthalene	--	22.2	0.97	ug/L	40		EPA 625
076-06	2/12/02	2-Methylnaphthalene	--	20.2	0.97	ug/L	40		EPA 625
076-06	2/12/02	Acenaphthene	20	1.5	9.7	ug/L	40	J	EPA 625
076-06	2/12/02	Benzene, 1,2,4-trimethyl	5	1.5	0.5	ug/L	40		EPA 524.2
076-06	2/12/02	Benzene, 1,3,5-trimethyl-	5	3	0.5	ug/L	40		EPA 524.2
076-06	2/12/02	Benzene, 1-methylethyl-	--	0.35	0.5	ug/L	40	J	EPA 524.2
076-06	2/12/02	Cymene	5	0.86	0.5	ug/L	40		EPA 524.2
076-06	2/12/02	Dibenzofuran	--	1.3	9.7	ug/L	40	J	EPA 625
076-06	2/12/02	Diethyl phthalate	50	1.3	9.7	ug/L	40	J	EPA 625
076-06	2/12/02	Fluorene	50	2.8	9.7	ug/L	40	J	EPA 625
076-06	2/12/02	Methylene chloride	5	0.48	0.5	ug/L	40	J	EPA 524.2
076-06	2/12/02	n-Propylbenzene	5	0.73	0.5	ug/L	40		EPA 524.2
076-06	2/12/02	Phenanthrene	50	1.4	9.7	ug/L	40	J	EPA 625
076-06	2/12/02	sec-Butylbenzene	5	0.71	0.5	ug/L	40		EPA 524.2
076-06	2/12/02	Tetrachloroethylene	5	1.2	0.5	ug/L	40		EPA 524.2
076-06	5/13/02	1-Methylnaphthalene	--	24.1	0.96	ug/L	40		EPA 625
076-06	5/13/02	2-Methylnaphthalene	--	13.1	0.96	ug/L	40		EPA 625
076-06	5/13/02	Acenaphthene	20	2.1	9.6	ug/L	40	J	EPA 625
076-06	5/13/02	Benzene, 1,2,4-trimethyl	5	4.8	0.5	ug/L	40		EPA 524.2
076-06	5/13/02	Benzene, 1,3,5-trimethyl-	**5**	**10.4**	0.5	ug/L	40		EPA 524.2
076-06	5/13/02	Benzene, 1-methylethyl-	--	1.1	0.5	ug/L	40		EPA 524.2
076-06	5/13/02	Cymene	5	2.8	0.5	ug/L	40		EPA 524.2
076-06	5/13/02	Dibenzofuran	--	2.1	9.6	ug/L	40	J	EPA 625
076-06	5/13/02	Fluorene	50	4	9.6	ug/L	40	J	EPA 625
076-06	5/13/02	n-Butylbenzene	5	2.8	0.5	ug/L	40		EPA 524.2
076-06	5/13/02	n-Propylbenzene	5	2.7	0.5	ug/L	40		EPA 524.2
076-06	5/13/02	Phenanthrene	50	0.98	9.6	ug/L	40	J	EPA 625
076-06	5/13/02	tert-Butylbenzene	5	1.1	0.5	ug/L	40		EPA 524.2
076-06	5/13/02	Tetrachloroethylene	5	2.4	0.5	ug/L	40		EPA 524.2
076-06	8/9/02	1-Methylnaphthalene	--	15.2	0.96	ug/L	40		EPA 625
076-06	8/9/02	2-Methylnaphthalene	--	4.2	0.96	ug/L	40		EPA 625
076-06	8/9/02	Acenaphthene	20	1.8	9.6	ug/L	40	J	EPA 625
076-06	8/9/02	Benzene, 1,2,4-trimethyl	**5**	**5.8**	0.5	ug/L	40		EPA 524.2
076-06	8/9/02	Benzene, 1,3,5-trimethyl-	**5**	**9.1**	0.5	ug/L	40		EPA 524.2
076-06	8/9/02	Benzene, 1-methylethyl-	--	1.4	0.5	ug/L	40		EPA 524.2
076-06	8/9/02	Cymene	5	2.8	0.5	ug/L	40		EPA 524.2
076-06	8/9/02	Dibenzofuran	--	1.5	9.6	ug/L	40	J	EPA 625
076-06	8/9/02	Fluorene	50	3	9.6	ug/L	40	J	EPA 625
076-06	8/9/02	n-Propylbenzene	5	2.6	0.5	ug/L	40		EPA 524.2
076-06	8/9/02	Tetrachloroethylene	5	2.4	0.5	ug/L	40		EPA 524.2

Table 2. Summary of Volatile and Semivolatile Organic Compounds Detected in OU IV AOC 5 Wells, January 1, 2002 to Present.

Site ID	Sample Date	Analyte	Screening Level*	Value	Reporting Limit	Units	Depth	Qualifier	Method
076-06	10/29/02	Benzene, 1,2,4-trimethyl	5	2	0.5	ug/L	40		EPA 524.2
076-06	10/29/02	Benzene, 1,3,5-trimethyl-	**5**	**5.1**	0.5	ug/L	40		EPA 524.2
076-06	10/29/02	Benzene, 1-methylethyl-	--	0.41	0.5	ug/L	40	J	EPA 524.2
076-06	10/29/02	Cymene	5	2.2	0.5	ug/L	40		EPA 524.2
076-06	10/29/02	n-Propylbenzene	5	1.1	0.5	ug/L	40		EPA 524.2
076-06	10/29/02	Tetrachloroethylene	5	2.6	0.5	ug/L	40		EPA 524.2
076-06	1/30/03	Benzene, 1,3,5-trimethyl-	5	0.7	0.5	ug/L	40		EPA 524.2
076-06	1/30/03	Cymene	5	0.77	0.5	ug/L	40		EPA 524.2
076-06	1/30/03	Methylene chloride	5	0.36	0.5	ug/L	40	J	EPA 524.2
076-06	1/30/03	n-Propylbenzene	5	0.31	0.5	ug/L	40	J	EPA 524.2
076-06	1/30/03	sec-Butylbenzene	5	0.48	0.5	ug/L	40	J	EPA 524.2
076-06	1/30/03	Tetrachloroethylene	5	1.4	0.5	ug/L	40		EPA 524.2
076-06	5/27/03	Benzene, 1,2,4-trimethyl	5	0.33	0.5	ug/L	40	J	EPA 524.2
076-06	5/27/03	Benzene, 1,3,5-trimethyl-	5	0.52	0.5	ug/L	40		EPA 524.2
076-06	5/27/03	Tetrachloroethylene	5	0.39	0.5	ug/L	40	J	EPA 524.2
076-07	2/11/02	Bis(2-ethylhexyl)phthalate	5	1.1	9.9	ug/L	60	J	EPA 625
076-07	5/16/02	Bis(2-ethylhexyl)phthalate	5	0.51	9.8	ug/L	60	JB	EPA 625
076-07	5/16/02	Methylene chloride	5	1.7	0.5	ug/L	60	B	EPA 524.2
076-07	2/12/03	Chloroform	7	0.28	0.5	ug/L	60	J	EPA 524.2
076-07	2/12/03	Methylene chloride	5	0.26	0.5	ug/L	60	J	EPA 524.2
076-07	5/23/03	Chloroform	7	0.26	0.5	ug/L	60	J	EPA 524.2
076-07	5/23/03	Methyl tert-butyl ether	10	0.31	0.5	ug/L	60	J	EPA 524.2
076-08	2/11/02	1-Methylnaphthalene	--	0.33	0.98	ug/L	40	J	EPA 625
076-08	2/11/02	2-Chloronaphthalene	10	0.28	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	2-Methylnaphthalene	--	0.29	0.98	ug/L	40	J	EPA 625
076-08	2/11/02	Acenaphthene	20	0.29	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Acenaphthylene	--	0.26	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Anthracene	50	0.32	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Benzo(a)pyrene	**0**	**0.24**	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Benzo(b)fluoranthene	**0.002**	**0.31**	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Benzo(k)fluoranthene	**0.002**	**0.36**	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Bis(2-ethylhexyl)phthalate	5	0.63	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Chrysene	**0.002**	**0.32**	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Dibenzo(a,h)anthracene	--	0.26	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Diethyl phthalate	50	1.4	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Fluoranthene	50	0.29	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Fluorene	50	0.32	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Phenanthrene	50	0.37	9.8	ug/L	40	J	EPA 625
076-08	2/11/02	Pyrene	50	0.34	9.8	ug/L	40	J	EPA 625
076-08	5/13/02	Acenaphthene	20	0.071	9.6	ug/L	40	J	EPA 625
076-08	1/31/03	Methylene chloride	5	0.35	0.5	ug/L	40	J	EPA 524.2
076-08	5/23/03	Tetrachloroethylene	5	0.43	0.5	ug/L	40	J	EPA 524.2
076-09	2/12/02	Chloroform	7	0.36	0.5	ug/L	60	J	EPA 524.2
076-09	5/14/02	Chloroform	7	0.4	0.5	ug/L	60	J	EPA 524.2
076-09	8/8/02	Chloroform	7	0.34	0.5	ug/L	60	J	EPA 524.2
076-09	10/30/02	Chloroform	7	0.33	0.5	ug/L	60	J	EPA 524.2
076-09	2/6/03	Chloroform	7	0.36	0.5	ug/L	60	J	EPA 524.2
076-09	5/22/03	Toluene	5	0.29	0.5	ug/L	60	J	EPA 524.2
076-178	5/16/02	Benzene, 1-methylethyl-	--	1.1	0.5	ug/L	25		EPA 524.2
076-178	5/16/02	Bis(2-ethylhexyl)phthalate	5	0.72	9.9	ug/L	25	JB	EPA 625
076-178	5/16/02	Naphthalene	10	2	0.5	ug/L	25		EPA 524.2
076-178	5/16/02	Naphthalene	10	1.5	9.9	ug/L	25	J	EPA 625
076-178	5/16/02	n-Propylbenzene	5	0.95	0.5	ug/L	25		EPA 524.2
076-178	5/16/02	o-Dichlorobenzene	3	0.39	0.5	ug/L	25	J	EPA 524.2
076-178	5/16/02	sec-Butylbenzene	5	0.49	0.5	ug/L	25	J	EPA 524.2
076-178	1/31/03	1,2,4-Trichlorobenzene	5	0.3	0.5	ug/L	25	J	EPA 524.2
076-178	1/31/03	Benzene, 1-methylethyl-	--	1.6	0.5	ug/L	25		EPA 524.2
076-178	1/31/03	Chloroform	7	0.27	0.5	ug/L	25	J	EPA 524.2

Table 2. Summary of Volatile and Semivolatile Organic Compounds Detected in OU IV AOC 5 Wells, January 1, 2002 to Present.

Site ID	Sample Date	Analyte	Screening Level*	Value	Reporting Limit	Units	Depth	Qualifier	Method
076-178	1/31/03	cis-1,2-Dichloroethylene	5	0.59	0.5	ug/L	25		EPA 524.2
076-178	1/31/03	Methylene chloride	5	0.34	0.5	ug/L	25	J	EPA 524.2
076-178	1/31/03	Naphthalene	10	1.5	9.8	ug/L	25	J	EPA 625
076-178	1/31/03	Naphthalene	10	2.1	0.5	ug/L	25		EPA 524.2
076-178	1/31/03	n-Propylbenzene	5	1.6	0.5	ug/L	25		EPA 524.2
076-178	1/31/03	o-Dichlorobenzene	3	0.61	0.5	ug/L	25		EPA 524.2
076-178	5/27/03	Benzene, 1-methylethyl-	--	0.7	0.5	ug/L	25		EPA 524.2
076-178	5/27/03	Chloroform	7	0.43	0.5	ug/L	25	J	EPA 524.2
076-178	5/27/03	Naphthalene	10	0.26	9.9	ug/L	25	J	EPA 625
076-178	5/27/03	o-Dichlorobenzene	3	0.52	0.5	ug/L	25		EPA 524.2
076-178	5/27/03	o-Dichlorobenzene	3	0.47	9.9	ug/L	25	J	EPA 625
076-179	5/16/02	Bis(2-ethylhexyl)phthalate	5	0.36	9.8	ug/L	65	JB	EPA 625
076-179	5/16/02	Chloroform	7	0.37	0.5	ug/L	65	J	EPA 524.2
076-179	5/16/02	Methylene chloride	5	1.6	0.5	ug/L	65	B	EPA 524.2
076-179	8/8/02	Chloroform	7	0.33	0.5	ug/L	65	J	EPA 524.2
076-179	10/31/02	Chloroform	7	0.32	0.5	ug/L	65	J	EPA 524.2
076-179	1/31/03	Chloroform	7	0.51	0.5	ug/L	65		EPA 524.2
076-179	1/31/03	Methylene chloride	5	0.37	0.5	ug/L	65	J	EPA 524.2
076-179	5/27/03	Chloroform	7	0.41	0.5	ug/L	65	J	EPA 524.2
076-18	2/12/02	Methylene chloride	5	0.41	0.5	ug/L	30	J	EPA 524.2
076-18	5/14/02	Bis(2-ethylhexyl)phthalate	**5**	**9.7**	9.7	ug/L	30	J	EPA 625
076-18	1/31/03	1,2,3-Trichlorobenzene	5	1.1	0.5	ug/L	30		EPA 524.2
076-18	1/31/03	1,2,4-Trichlorobenzene	5	0.97	0.5	ug/L	30		EPA 524.2
076-18	1/31/03	Benzene, 1,2,4-trimethyl	5	0.28	0.5	ug/L	30	J	EPA 524.2
076-18	1/31/03	Cymene	5	0.38	0.5	ug/L	30	J	EPA 524.2
076-18	1/31/03	Hexachlorobutadiene	**0.5**	**0.54**	0.5	ug/L	30		EPA 524.2
076-18	1/31/03	m-Dichlorobenzene	3	0.36	0.5	ug/L	30	J	EPA 524.2
076-18	1/31/03	Naphthalene	10	0.61	0.5	ug/L	30		EPA 524.2
076-18	1/31/03	n-Butylbenzene	5	0.45	0.5	ug/L	30	J	EPA 524.2
076-18	1/31/03	o-Dichlorobenzene	3	0.34	0.5	ug/L	30	J	EPA 524.2
076-18	1/31/03	p-Dichlorobenzene	3	0.35	0.5	ug/L	30	J	EPA 524.2
076-18	1/31/03	sec-Butylbenzene	5	0.29	0.5	ug/L	30	J	EPA 524.2
076-18	1/31/03	tert-Butylbenzene	5	0.28	0.5	ug/L	30	J	EPA 524.2
076-18	4/15/03	Methylene chloride	**5**	**12**	1	ug/L	30	B	E624
076-180	2/12/02	cis-1,2-Dichloroethylene	5	0.53	0.5	ug/L	40		EPA 524.2
076-180	2/12/02	Tetrachloroethylene	5	0.45	0.5	ug/L	40	J	EPA 524.2
076-180	5/14/02	cis-1,2-Dichloroethylene	5	0.34	0.5	ug/L	25	J	EPA 524.2
076-180	5/14/02	Tetrachloroethylene	5	0.53	0.5	ug/L	25		EPA 524.2
076-180	8/7/02	cis-1,2-Dichloroethylene	5	0.82	0.5	ug/L	25		EPA 524.2
076-180	8/7/02	Tetrachloroethylene	5	0.55	0.5	ug/L	25		EPA 524.2
076-180	10/30/02	cis-1,2-Dichloroethylene	5	0.64	0.5	ug/L	25		EPA 524.2
076-180	10/30/02	Tetrachloroethylene	5	0.66	0.5	ug/L	25		EPA 524.2
076-180	1/31/03	Tetrachloroethylene	5	0.33	0.5	ug/L	25	J	EPA 524.2
076-180	5/22/03	Methylene chloride	5	0.34	0.5	ug/L	25	J	EPA 524.2
076-180	5/22/03	Tetrachloroethylene	5	0.3	0.5	ug/L	25	J	EPA 524.2
076-181	8/7/02	Di-n-butyl phthalate	50	1.4	10	ug/L	65	J	EPA 625
076-181	5/22/03	Methyl tert-butyl ether	10	0.42	0.5	ug/L	65	J	EPA 524.2
076-181	5/22/03	Methylene chloride	5	0.32	0.5	ug/L	65	J	EPA 524.2
076-182	5/14/02	Chloroform	7	0.26	0.5	ug/L	85	J	EPA 524.2
076-182	8/7/02	Chloroform	7	0.35	0.5	ug/L	85	J	EPA 524.2
076-182	5/22/03	Chloroform	7	0.58	0.5	ug/L	85		EPA 524.2
076-182	5/22/03	Methylene chloride	5	0.31	0.5	ug/L	85	J	EPA 524.2
076-183	2/11/02	Bis(2-ethylhexyl)phthalate	5	0.59	9.6	ug/L	40	J	EPA 625
076-183	5/13/02	Tetrachloroethylene	5	0.7	0.5	ug/L	25		EPA 524.2

Table 2. Summary of Volatile and Semivolatile Organic Compounds Detected in OU IV AOC 5 Wells, January 1, 2002 to Present.

Site ID	Sample Date	Analyte	Screening Level*	Value	Reporting Limit	Units	Depth	Qualifier	Method
076-183	8/7/02	Methyl chloride	5	0.35	0.5	ug/L	25	J	EPA 524.2
076-183	8/7/02	Tetrachloroethylene	5	0.26	0.5	ug/L	25	J	EPA 524.2
076-183	10/29/02	Tetrachloroethylene	5	1.1	0.5	ug/L	25		EPA 524.2
076-184	2/11/02	Chloroform	7	0.34	0.5	ug/L	65	J	EPA 524.2
076-184	5/13/02	Chloroform	7	0.44	0.5	ug/L	65	J	EPA 524.2
076-184	8/7/02	Chloroform	7	0.36	0.5	ug/L	65	J	EPA 524.2
076-184	10/29/02	Chloroform	7	0.39	0.5	ug/L	65	J	EPA 524.2
076-184	2/11/03	Chloroform	7	0.4	0.5	ug/L	65	J	EPA 524.2
076-184	2/11/03	Methylene chloride	5	0.49	0.5	ug/L	65	J	EPA 524.2
076-185	2/12/02	Methylene chloride	5	0.61	0.5	ug/L	25		EPA 524.2
076-185	2/12/02	Tetrachloroethylene	5	0.57	0.5	ug/L	25		EPA 524.2
076-185	5/14/02	1,1,1-Trichloroethane	5	0.35	0.5	ug/L	25	J	EPA 524.2
076-185	5/14/02	cis-1,2-Dichloroethylene	**5**	**26.6**	0.5	ug/L	25		EPA 524.2
076-185	5/14/02	Tetrachloroethylene	5	3.4	0.5	ug/L	25		EPA 524.2
076-185	5/14/02	Trichloroethylene	5	0.82	0.5	ug/L	25		EPA 524.2
076-185	8/7/02	cis-1,2-Dichloroethylene	**5**	**5.6**	0.5	ug/L	25		EPA 524.2
076-185	8/7/02	Tetrachloroethylene	5	1.3	0.5	ug/L	25		EPA 524.2
076-185	8/7/02	Trichloroethylene	5	0.26	0.5	ug/L	25	J	EPA 524.2
076-185	10/30/02	1,1,1-Trichloroethane	5	0.46	0.5	ug/L	25	J	EPA 524.2
076-185	10/30/02	cis-1,2-Dichloroethylene	**5**	**19.7**	0.5	ug/L	25		EPA 524.2
076-185	10/30/02	Tetrachloroethylene	**5**	**5.9**	0.5	ug/L	25		EPA 524.2
076-185	10/30/02	Trichloroethylene	5	1.1	0.5	ug/L	25		EPA 524.2
076-185	1/31/03	1,1,1-Trichloroethane	5	0.35	0.5	ug/L	25	J	EPA 524.2
076-185	1/31/03	cis-1,2-Dichloroethylene	**5**	**19.3**	0.5	ug/L	25		EPA 524.2
076-185	1/31/03	Tetrachloroethylene	5	4.5	0.5	ug/L	25		EPA 524.2
076-185	1/31/03	Trichloroethylene	5	0.81	0.5	ug/L	25		EPA 524.2
076-185	5/22/03	cis-1,2-Dichloroethylene	5	1.7	0.5	ug/L	25		EPA 524.2
076-185	5/22/03	Tetrachloroethylene	5	1	0.5	ug/L	25		EPA 524.2
076-186	2/12/02	1-Methylnaphthalene	--	0.29	0.98	ug/L	65	J	EPA 625
076-186	2/12/02	2-Chloronaphthalene	10	0.25	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	2-Methylnaphthalene	--	0.26	0.98	ug/L	65	J	EPA 625
076-186	2/12/02	Acenaphthylene	--	0.25	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	Anthracene	50	0.34	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	Benzo(b)fluoranthene	**0.002**	**0.32**	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	Benzo(k)fluoranthene	**0.002**	**0.31**	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	Bis(2-ethylhexyl)phthalate	5	0.92	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	Chloroform	7	0.29	0.5	ug/L	65	J	EPA 524.2
076-186	2/12/02	Chrysene	**0.002**	**0.35**	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	Diethyl phthalate	50	1.3	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	Fluoranthene	50	0.25	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	Fluorene	50	0.28	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	Methylene chloride	5	0.28	0.5	ug/L	65	J	EPA 524.2
076-186	2/12/02	Naphthalene	10	0.28	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	Phenanthrene	50	0.36	9.8	ug/L	65	J	EPA 625
076-186	2/12/02	Pyrene	50	0.35	9.8	ug/L	65	J	EPA 625
076-186	5/14/02	Chloroform	7	0.3	0.5	ug/L	65	J	EPA 524.2
076-186	8/7/02	Chloroform	7	0.3	0.5	ug/L	65	J	EPA 524.2
076-186	8/7/02	Methyl chloride	5	0.5	0.5	ug/L	65		EPA 524.2
076-186	10/30/02	Chloroform	7	0.28	0.5	ug/L	65	J	EPA 524.2
076-186	1/31/03	1,2,3-Trichlorobenzene	5	0.32	0.5	ug/L	65	J	EPA 524.2
076-186	1/31/03	1,2,4-Trichlorobenzene	5	0.32	0.5	ug/L	65	J	EPA 524.2
076-186	1/31/03	Chloroform	7	0.39	0.5	ug/L	65	J	EPA 524.2
076-186	5/22/03	Chloroform	7	0.56	0.5	ug/L	65		EPA 524.2
076-186	5/22/03	Methylene chloride	5	0.32	0.5	ug/L	65	J	EPA 524.2
076-19	2/12/02	cis-1,2-Dichloroethylene	5	0.9	0.5	ug/L	30		EPA 524.2
076-19	2/12/02	Methylene chloride	5	0.29	0.5	ug/L	30	J	EPA 524.2
076-19	4/11/02	1,2-Dichloroethene	**5**	**16**	1	ug/L	30		E624
076-19	4/11/02	Tetrachloroethylene	5	1.5	1	ug/L	30		E624

Table 2. Summary of Volatile and Semivolatile Organic Compounds Detected in OU IV AOC 5 Wells, January 1, 2002 to Present.

Site ID	Sample Date	Analyte	Screening Level*	Value	Reporting Limit	Units	Depth	Qualifier	Method
076-19	5/16/02	Bis(2-ethylhexyl)phthalate	5	0.3	9.8	ug/L	30	JB	EPA 625
076-19	5/16/02	cis-1,2-Dichloroethylene	5	0.69	0.5	ug/L	30		EPA 524.2
076-19	5/16/02	Methylene chloride	5	2.1	0.5	ug/L	30	B	EPA 524.2
076-19	10/8/02	Acetone	50	4	5	ug/L	30	J	E624
076-19	4/16/03	Methylene chloride	**5**	**11**	1	ug/L	30	B	E624
076-21	5/13/02	Fluoranthene	50	9.4	9.4	ug/L	35.2	J	EPA 625
076-21	1/31/03	Methylene chloride	5	0.36	0.5	ug/L	35.2	J	EPA 524.2
076-22	5/13/02	1-Methylnaphthalene	--	0.35	0.96	ug/L	57	J	EPA 625
076-22	5/13/02	2-Chloronaphthalene	10	0.35	9.6	ug/L	57	J	EPA 625
076-22	5/13/02	2-Methylnaphthalene	--	0.32	0.96	ug/L	57	J	EPA 625
076-22	5/13/02	Acenaphthylene	--	0.28	9.6	ug/L	57	J	EPA 625
076-22	5/13/02	Anthracene	50	0.33	9.6	ug/L	57	J	EPA 625
076-22	5/13/02	Fluoranthene	50	0.36	9.6	ug/L	57	J	EPA 625
076-22	5/13/02	Fluorene	50	0.36	9.6	ug/L	57	J	EPA 625
076-22	5/13/02	Phenanthrene	50	0.37	9.6	ug/L	57	J	EPA 625
076-22	8/9/02	Methyl chloride	5	0.86	0.5	ug/L	57		EPA 524.2
076-22	10/29/02	1-Methylnaphthalene	--	16.4	0.97	ug/L	57		EPA 625
076-22	10/29/02	2-Methylnaphthalene	--	9.7	0.97	ug/L	57		EPA 625
076-22	10/29/02	Acenaphthene	20	1.7	9.7	ug/L	57	J	EPA 625
076-22	10/29/02	Dibenzofuran	--	1.4	9.7	ug/L	57	J	EPA 625
076-22	10/29/02	Fluorene	50	3	9.7	ug/L	57	J	EPA 625
076-22	10/29/02	Phenanthrene	50	0.94	9.7	ug/L	57	J	EPA 625
076-22	2/11/03	Chloroform	7	0.31	0.5	ug/L	57	J	EPA 524.2
076-22	2/11/03	Methylene chloride	5	0.44	0.5	ug/L	57	J	EPA 524.2
076-23	2/12/02	1-Methylnaphthalene	--	0.24	0.97	ug/L	39	J	EPA 625
076-23	2/12/02	2-Chloronaphthalene	10	0.24	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	2-Methylnaphthalene	--	0.22	0.97	ug/L	39	J	EPA 625
076-23	2/12/02	Acenaphthene	20	0.24	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	Acenaphthylene	--	0.21	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	Anthracene	50	0.28	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	Benzo(b)fluoranthene	**0.002**	**0.24**	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	Benzo(k)fluoranthene	**0.002**	**0.35**	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	Bis(2-ethylhexyl)phthalate	5	0.53	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	Chrysene	**0.002**	**0.28**	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	cis-1,2-Dichloroethylene	5	4	0.5	ug/L	39		EPA 524.2
076-23	2/12/02	Diethyl phthalate	50	1.3	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	Fluoranthene	50	0.24	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	Fluorene	50	0.26	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	Methylene chloride	5	0.63	0.5	ug/L	39		EPA 524.2
076-23	2/12/02	Naphthalene	10	0.24	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	Pyrene	50	0.29	9.7	ug/L	39	J	EPA 625
076-23	2/12/02	Tetrachloroethylene	5	3.3	0.5	ug/L	39		EPA 524.2
076-23	2/12/02	Trichloroethylene	5	0.3	0.5	ug/L	39	J	EPA 524.2
076-23	5/13/02	1,1,1-Trichloroethane	5	0.3	0.5	ug/L	39	J	EPA 524.2
076-23	5/13/02	cis-1,2-Dichloroethylene	5	1.6	0.5	ug/L	39		EPA 524.2
076-23	5/13/02	Tetrachloroethylene	5	3.2	0.5	ug/L	39		EPA 524.2
076-23	5/13/02	Trichloroethylene	5	0.35	0.5	ug/L	39	J	EPA 524.2
076-23	8/9/02	cis-1,2-Dichloroethylene	5	0.57	0.5	ug/L	39		EPA 524.2
076-23	8/9/02	Tetrachloroethylene	5	1.5	0.5	ug/L	39		EPA 524.2
076-23	10/31/02	Tetrachloroethylene	5	1	0.5	ug/L	39		EPA 524.2
076-23	1/30/03	Methylene chloride	5	0.36	0.5	ug/L	39	J	EPA 524.2
076-23	1/30/03	Tetrachloroethylene	5	0.86	0.5	ug/L	39		EPA 524.2
076-23	5/23/03	Diethyl phthalate	50	1	9.6	ug/L	39	J	EPA 625
076-23	5/23/03	Tetrachloroethylene	5	0.62	0.5	ug/L	39		EPA 524.2
076-24	2/11/03	Methylene chloride	5	0.47	0.5	ug/L	40	J	EPA 524.2
076-24	5/22/03	Methylene chloride	5	0.32	0.5	ug/L	40	J	EPA 524.2

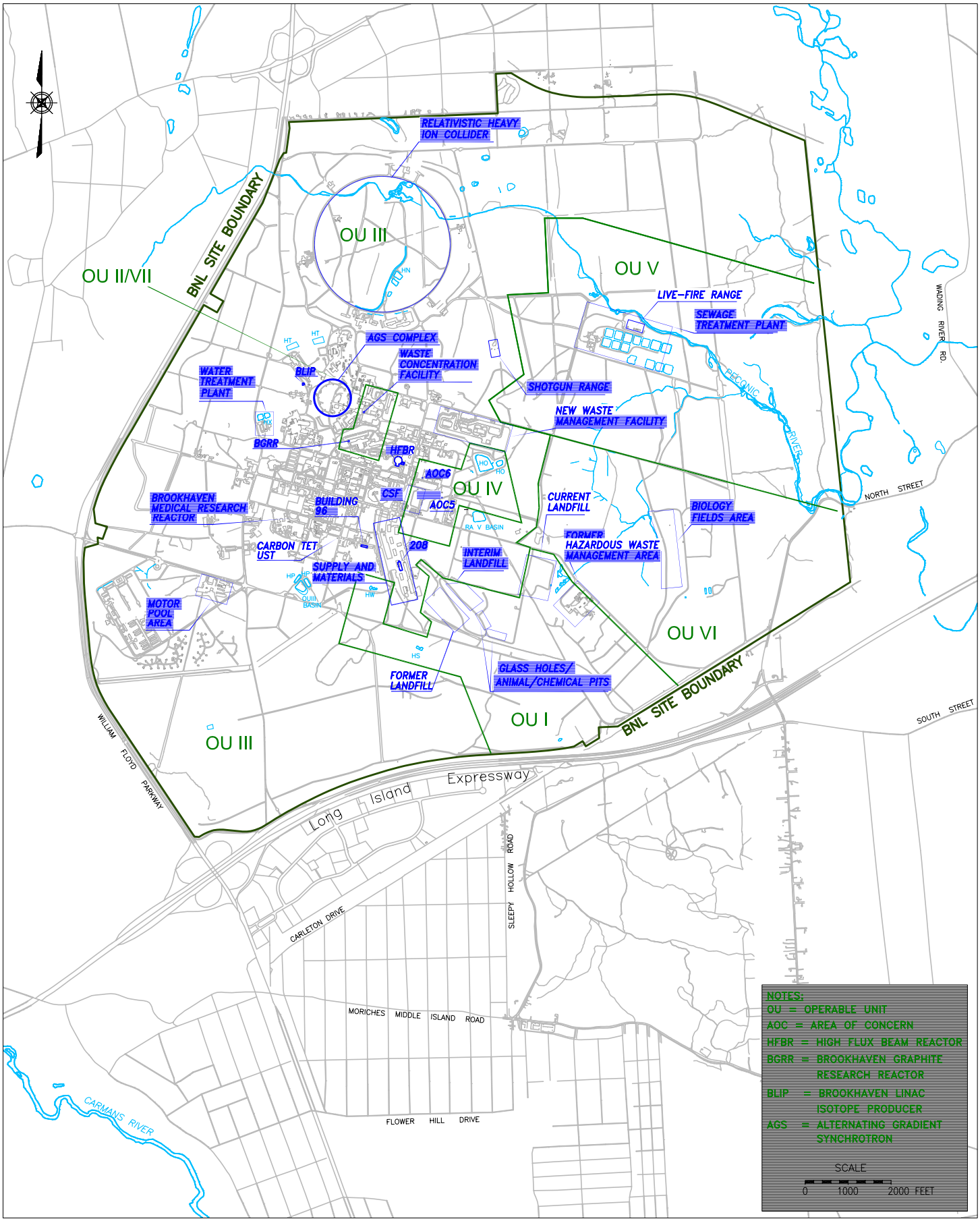
ug/L - Micrograms per liter.

Table 2. Summary of Volatile and Semivolatile Organic Compounds Detected in OU IV AOC 5 Wells, January 1, 2002 to Present.

Site ID	Sample Date	Analyte	Screening Level*	Value	Reporting Limit	Units	Depth	Qualifier	Method

J - Estimated value.

* Screening levels are based on New York State Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998



\\OERNT\GIS\GW_PROJECTS\CERCLA 5 YEAR REVIEW\OU IV\SITE MAP.DWG

BROOKHAVEN NATIONAL LABORATORY
ENVIRONMENTAL SERVICES DIVISION

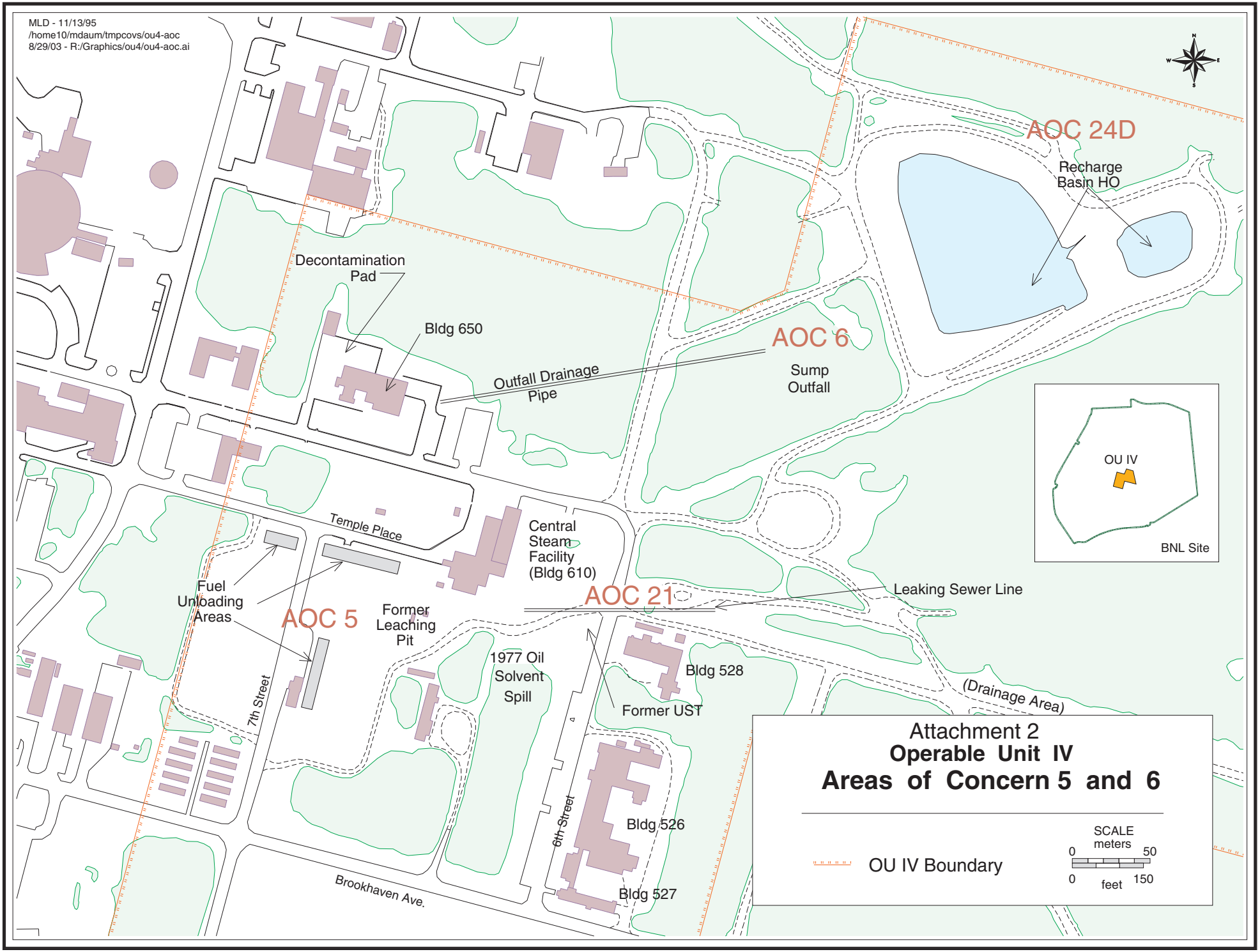
TITLE:

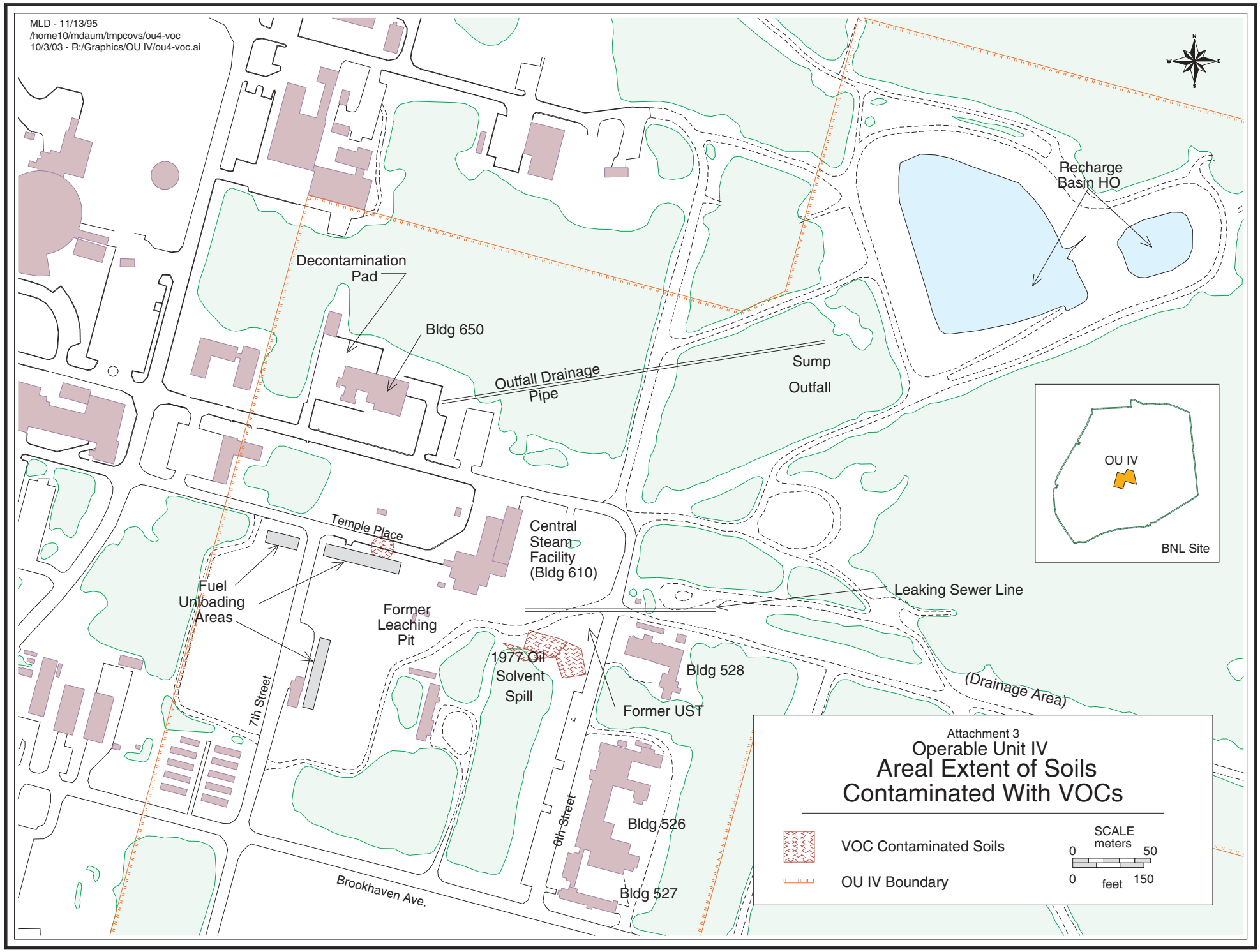
SITE PLAN

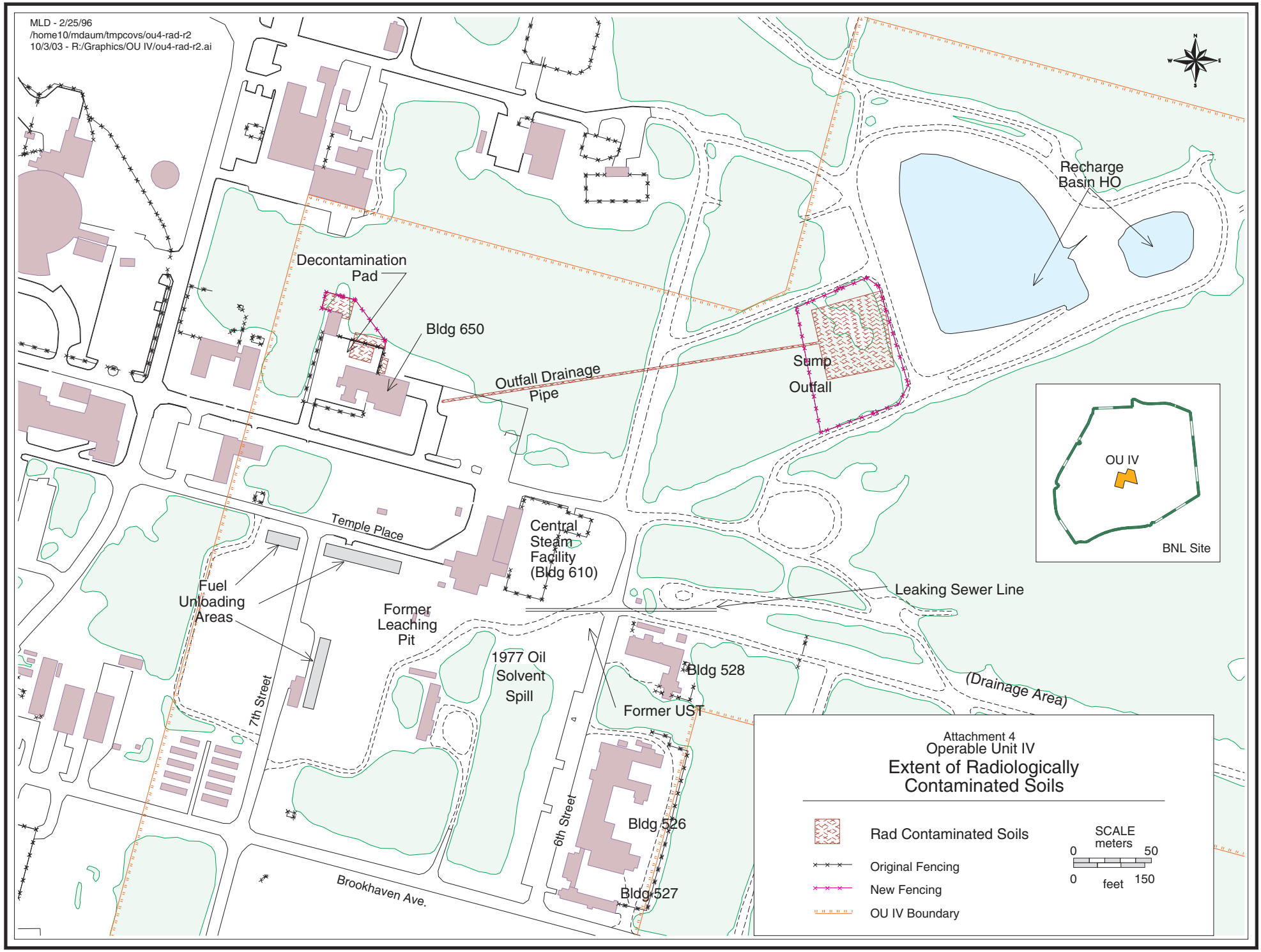
CERCLA 5 YEAR REVIEW REPORT
OU IV

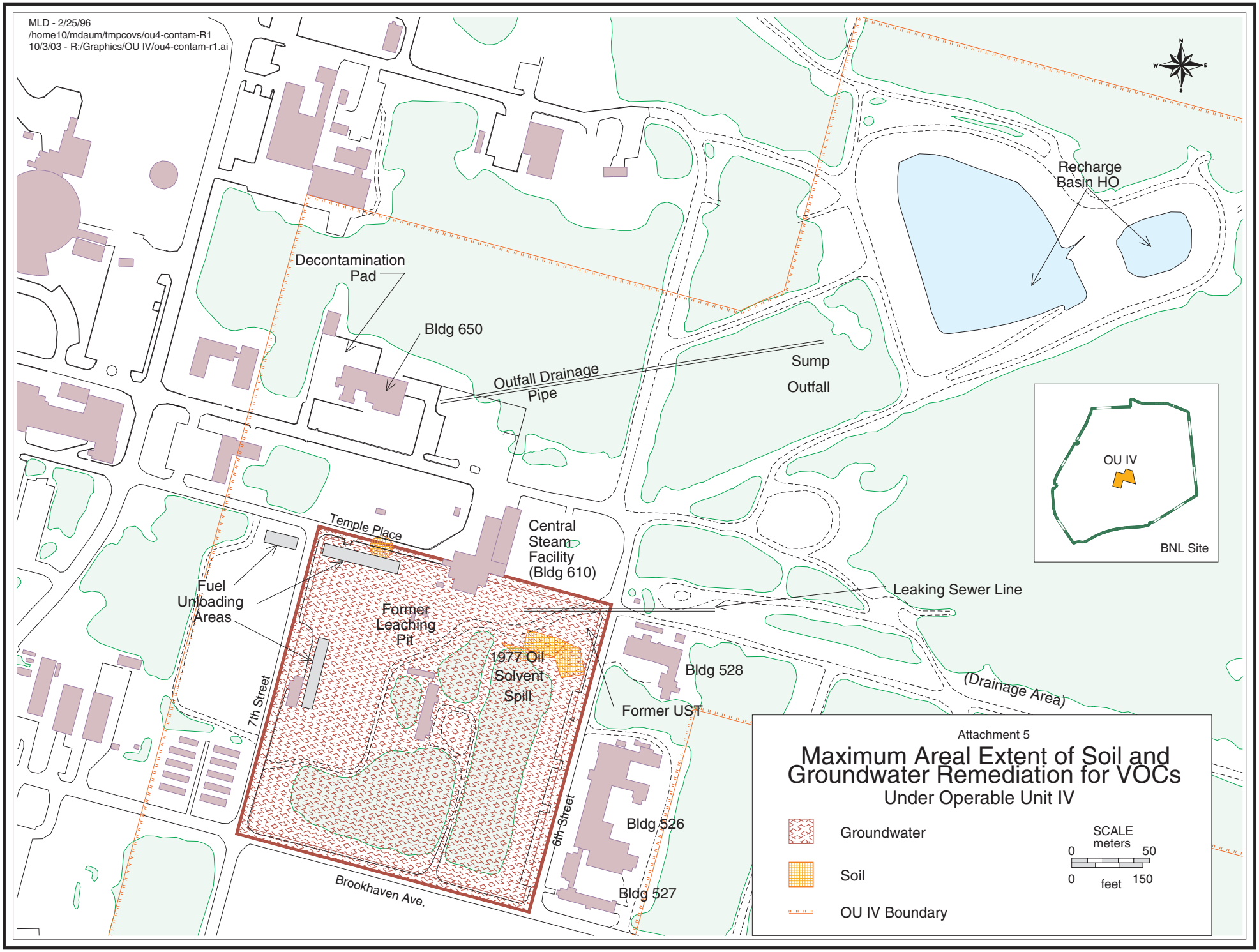
DWN:	VT: HZ.:	DATE:	PROJECT NO.:
KCK	–	6/7/01	07176
CHKD:	APPD:	REV.:	NOTES:
WRD	WRD	0	–

FIGURE NO.: Attachment 1


MLD - 11/13/95
/home10/mdaum/tmpcovs/ou4-aoc
8/29/03 - R:/Graphics/ou4/ou4-aoc.ai
AOC 24D
Recharge Basin HO
Decontamination Pad
Bldg 650
AOC 6
Sump Outfall
Outfall Drainage Pipe
OU IV
BNL Site
Temple Place
Central Steam Facility (Bldg 610)
Fuel Unloading Areas
AOC 5
Former Leaching Pit
AOC 21
Leaking Sewer Line
1977 Oil Solvent Spill
Bldg 528
Former UST
(Drainage Area)
7th Street
6th Street
Bldg 526
Bldg 527
Brookhaven Ave.
Attachment 2
Operable Unit IV
Areas of Concern 5 and 6
OU IV Boundary
SCALE
meters
0
50
0
feet
150


MLD - 11/13/95
/home10/mdaum/tmpcovs/ou4-voc
10/3/03 - R:/Graphics/OU IV/ou4-voc.ai
Recharge Basin HO
Decontamination Pad
Bldg 650
Outfall Drainage Pipe
Sump Outfall
OU IV
BNL Site
Temple Place
Central Steam Facility (Bldg 610)
Fuel Unloading Areas
Former Leaching Pit
Leaking Sewer Line
1977 Oil Solvent Spill
Bldg 528
Former UST
(Drainage Area)
7th Street
6th Street
Bldg 526
Bldg 527
Brookhaven Ave.
Attachment 3
Operable Unit IV
Areal Extent of Soils Contaminated With VOCs
VOC Contaminated Soils
OU IV Boundary
SCALE
meters
0
50
0
feet
150


MLD - 2/25/96
/home10/mdaum/tmpcovs/ou4-rad-r2
10/3/03 - R:/Graphics/OU IV/ou4-rad-r2.ai
Recharge Basin HO
Decontamination Pad
Bldg 650
Outfall Drainage Pipe
Sump Outfall
OU IV
BNL Site
Temple Place
Central Steam Facility (Bldg 610)
Fuel Unloading Areas
Former Leaching Pit
1977 Oil Solvent Spill
Leaking Sewer Line
Bldg 528
(Drainage Area)
Former UST
7th Street
6th Street
Bldg 526
Bldg 527
Brookhaven Ave.
Attachment 4
Operable Unit IV
Extent of Radiologically Contaminated Soils
Rad Contaminated Soils
Original Fencing
New Fencing
OU IV Boundary
SCALE
meters
0
50
0
feet
150


MLD - 2/25/96
/home10/mdaum/tmpcovs/ou4-contam-R1
10/3/03 - R:/Graphics/OU IV/ou4-contam-r1.ai
Recharge Basin HO
Decontamination Pad
Bldg 650
Outfall Drainage Pipe
Sump Outfall
OU IV
BNL Site
Temple Place
Central Steam Facility (Bldg 610)
Fuel Unloading Areas
Former Leaching Pit
1977 Oil Solvent Spill
Leaking Sewer Line
Bldg 528
(Drainage Area)
Former UST
7th Street
6th Street
Bldg 526
Bldg 527
Brookhaven Ave.
Attachment 5
Maximum Areal Extent of Soil and Groundwater Remediation for VOCs
Under Operable Unit IV
Groundwater
Soil
OU IV Boundary
SCALE
meters
0
50
0
feet
150

ATTACHMENT 6

List of Documents Reviewed

Arcadis Geraghty & Miller, Inc., OU IV, AOC 6 - Building 650 Sump and Sump Outfall Historic Groundwater Data Report, March 2000

Arcadis Geraghty & Miller, Inc., Groundwater Flow Analysis & Tritium Transport Modeling for the 650 Reclamation Facility Sump Area, 1999

Brookhaven National Laboratory, Environmental Restoration Division, 2000 Groundwater Sampling and Analysis Program

Brookhaven National Laboratory, Environmental Restoration Division, Operable Unit IV Air Sparge/Soil Vapor Extraction System Operation, Maintenance & Monitoring Plan, May 3, 1999

Brookhaven National Laboratory, Environmental Restoration Division, Operable Unit IV Air Sparge/Soil Vapor Extraction System 1997-1998 Annual Report

Brookhaven National Laboratory, Environmental Restoration Division, Operable Unit IV Air Sparge/Soil Vapor Extraction System 1999 Annual Report

Brookhaven National Laboratory, Environmental Restoration Division, Petition to Shutdown OU IV Air Sparge/Soil Vapor extraction Remediation System, September 2000

Brookhaven National Laboratory, Environmental Restoration Division, OU IV Remediation Area 1 Proposed Supplemental Remedial Effort - Work Plan, May 2001

Brookhaven National Laboratory, Groundwater Protection Contingency Plan, March 22, 2000

Brookhaven National Laboratory, Environmental Monitoring Plan 2000, March 31, 2000

Brookhaven National Laboratory, Environmental Monitoring QAPP, April 3, 2000

Brookhaven National Laboratory, Historical Use of Decontamination Agents at the Building 650 Reclamation Facility and the Potential Role of Complexants in the Mobilization of Radionuclides in the Subsurface Environment, April 2000

Brookhaven National Laboratory, Interim Remedy Monitoring Plan for Area of Concern 6 Building 650 Sump and Sump Outfall Area, April 9, 1998

Brookhaven National Laboratory, OU IV IRM Report for Area of Concern 6, Building 650 Reclamation Facility Sump and Sump Outfall 1997, November 2, 1998
Brookhaven National Laboratory, OU IV IRM Report for Area of Concern 6, Building 650 Reclamation Facility Sump and Sump Outfall 1998, March 31, 1999

Brookhaven National Laboratory, OU IV IRM Report for Area of Concern 6, Building 650 Reclamation Facility Sump and Sump Outfall 1999, November 3, 2000

Brookhaven National Laboratory, OU IV IRM Report for Area of Concern 6, Building 650 Reclamation Facility Sump and Sump Outfall 2000, April 19, 2001

Brookhaven National Laboratory, OU IV IRM Report for Area of Concern 6, Building 650 Reclamation Facility Sump and Sump Outfall 2001, May 23, 2002

CDM, Historical Groundwater/Contamination Flow Analysis for the Building 650 Outfall Area, July 23, 1997

CDM, Operable Unit I Feasibility Study, March 1999

CDM, Operable Unit IV Feasibility Study, November 1995

CDM, Operable Unit IV Remedial Investigation/Risk Assessment, December 1994

Divirka and Bartilucci, Health and Safety Plan for Sitewide Groundwater Monitoring, March 1999

Environmental Restoration Division, Operable Unit IV Area of Concern 6 Building 650 Reclamation Facility Sump and Sump Outfall Area Interim Remedy Groundwater Screening Survey Report, June 22, 1999

Environmental Restoration Division, Project Procedures Manual

Environmental Restoration Division, Quality Assurance Manual

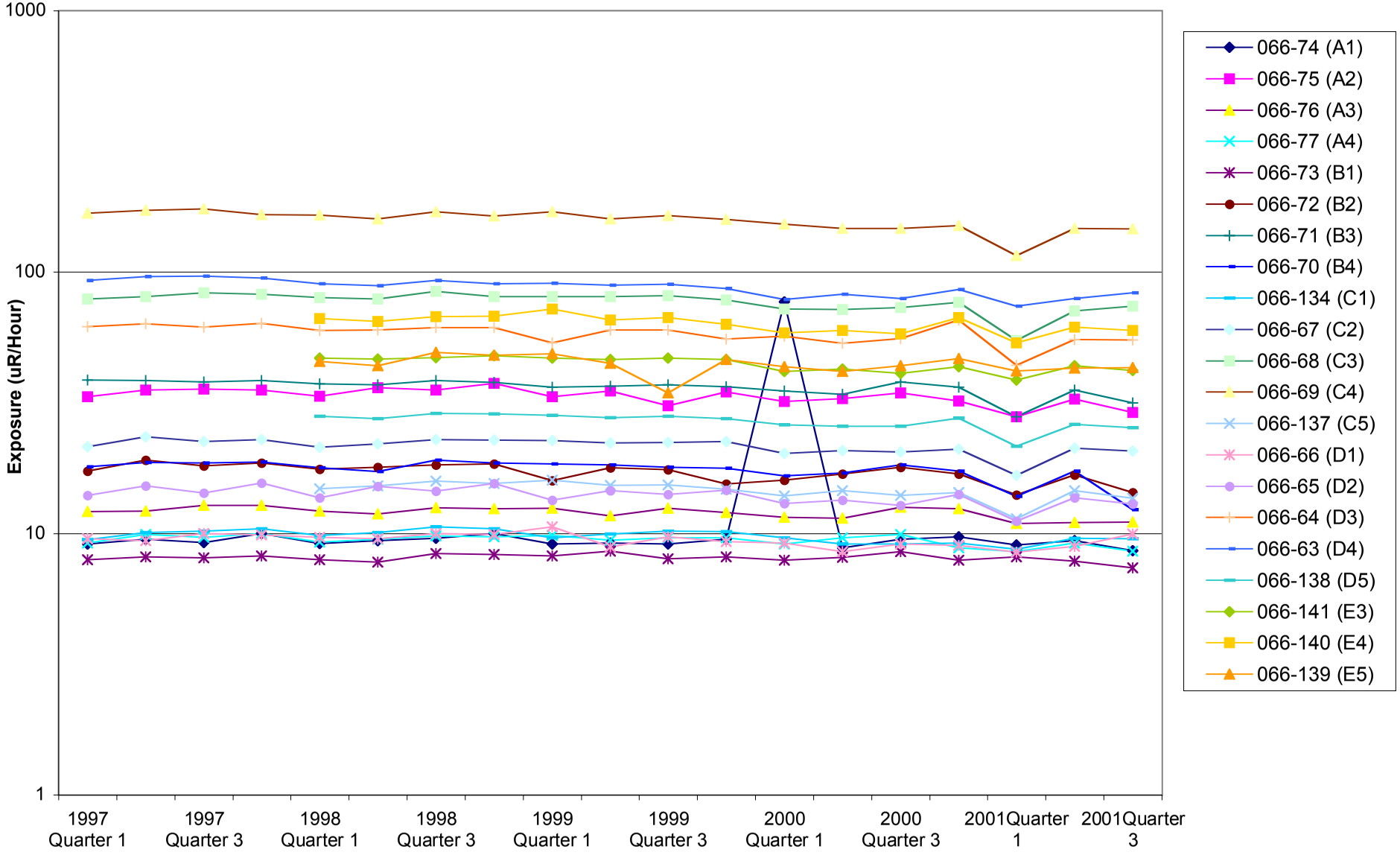
Environmental Restoration Division, Operable Unit IV Area of Concern 6 Building 650 Reclamation Facility Sump and Sump Outfall Area Interim Remedy Groundwater Screening Survey Work Plan/Sampling and Analysis Plan, March 15, 1999

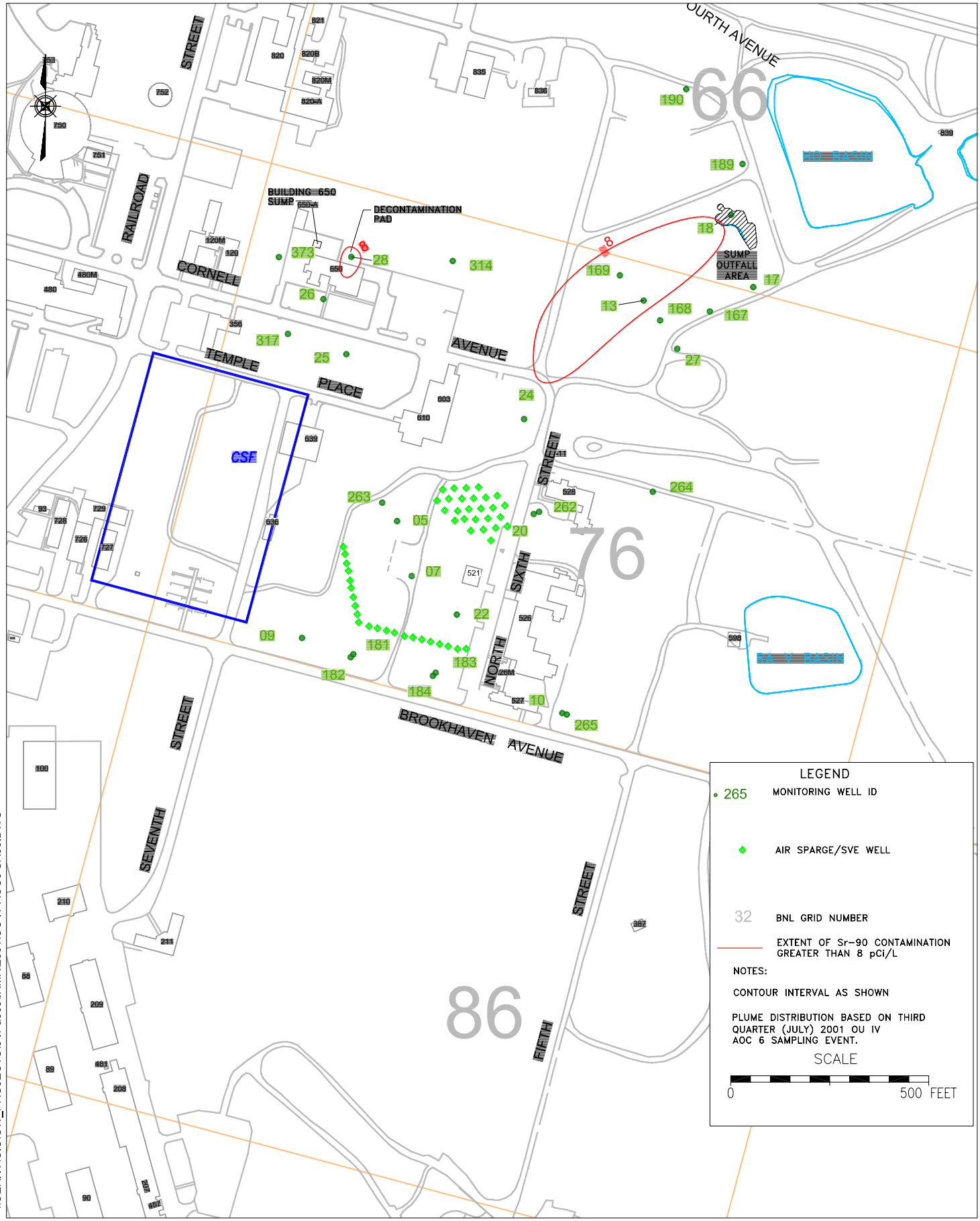
IT Corp., Operable Unit III Feasibility Study Report, Appendix F B Operable Units I/IV Groundwater Investigation Report, March 1, 1999

Office of Environmental Restoration, Operable Unit IV Record of Decision, March 1996

Office of Environmental Restoration, Operable Unit I Record of Decision, August 1999

Attachment 7
Environmental TLD Exposure Versus Time





\\OERNT\GIS\GW_PROJECTS\o iv aoc6\RMR\2001\OU IV AOC6 SR90.DWG

BROOKHAVEN NATIONAL LABORATORY
ENVIRONMENTAL SERVICES DIVISION

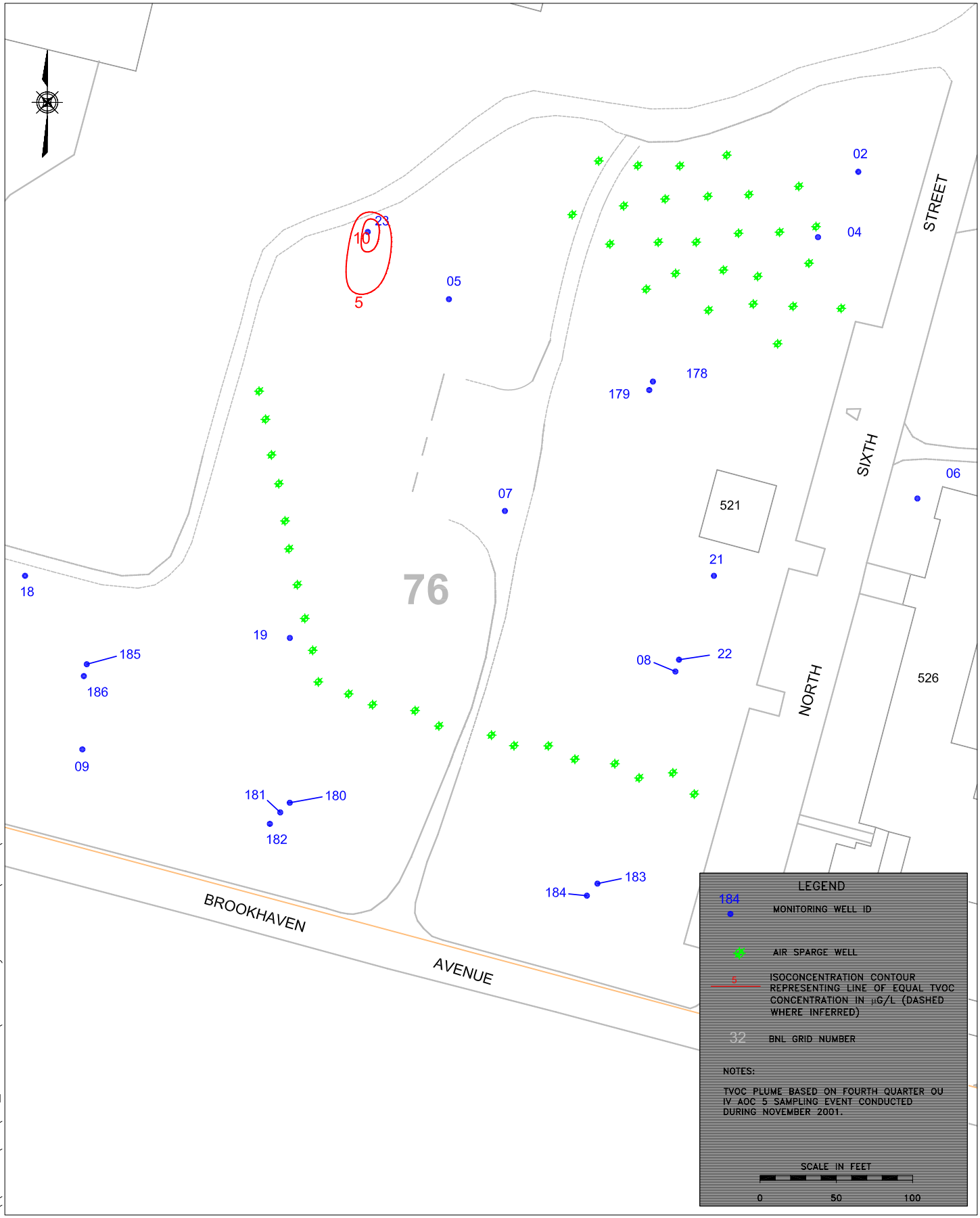
TITLE:

OU IV AOC 6
Sr-90 MONITORING WELL NETWORK

CERCLA 5 YEAR REVIEW REPORT
OU IV

DWN:	VT: HZ.:	DATE:	PROJECT NO.:
KCK	–	04/02/02	07176
CHKD:	APPD:	REV.:	NOTES:
WRD	WRD	1	–

FIGURE NO.: Attachment 8



\\OERNT\GIS\GW_PROJECTS\cercla 5 year review\ou iv\ou 4 aoc 5 tvoc.DWG

BROOKHAVEN NATIONAL LABORATORY
ENVIRONMENTAL SERVICES DIVISION

TITLE:

OU IV AOC 5
TVOC MONITORING WELL NETWORK

CERCLA 5 YEAR REVIEW REPORT
OU IV

DWN:	VT: HZ.:	DATE:	PROJECT NO.:
KCK	–	05/08/02	07176
CHKD:	APPD:	REV.:	NOTES:
WRD	VJR	1	–

FIGURE NO.: Attachment 9

Attachment 10

Planned Community Participation Activities for the CERCLA OU IV Five-Year Review:

• Submit draft Five Year Review Report to EPA/DEC for Review	6/30/02 (A)
• Brief Community Advisory Council	9/12/02 (A)
• Receive EPA/DEC comments on Report	7/01/03 (A)
• Issue Final Report	9/30/03
• Publish public notice in local newspapers	10/15/03
• Submit Report to Post ROD Information Repositories for public availability and on BNL web site	10/15/03
• Issue Cleanupdate article	Fall 2003
• Brief Brookhaven Executive Roundtable	Fall 2003
• Brief Community Advisory Council	Fall 2003

Attachment 11

Proposed OU IV Post Closure Groundwater Monitoring

The OU IV AOC 5 (AS/SVE) Monitoring Program consisted of a network of twenty-two wells. Nine of these twenty-two wells are also part of the OU IV AOC 6 (Building 650 Sump Outfall) Monitoring program as shown in Table 1. The OU IV AOC 6 Program monitors radionuclide contamination (primarily Sr-90) migrating south-southwest from the former sump outfall.

Table 1. OU IV AOC 5 and AOC 6 Monitoring Program Overlap

Well ID	OU IV AOC 5 Program	OU IV AOC 6 Program
076-02	X	
076-04	X	
076-05	X	X
076-06	X	
076-07	X	X
076-08	X	
076-09	X	X
076-18	X	
076-19	X	
076-21	X	
076-22	X	X
076-23	X	
076-24	X	X
076-178	X	
076-179	X	
076-180	X	
076-181	X	X
076-182	X	X
076-183	X	X
076-184	X	X
076-185	X	
076-186	X	

Well locations are shown on Figure 1 and a summary of VOC and Semi-VOC detections since January 1, 2002 is included as Table 2. The following is a summary of the current status and post-closure plans for the OU IV AOC 5 (AS/SVE) monitoring wells:

076-02

This well is located immediately upgradient of the site of the 1977 fuel oil/solvent spill. The only contaminant detected in samples from this well during the past year has been chloroform at concentrations less than 2 _g/L. Chloroform is a common laboratory contaminant. The MCL for chloroform is 5 _g/L. There have been several estimated detections of semi-VOCs in this well, all of which were barely above detectable levels.

Due to the absence of any significant contamination sampling will be terminated and this well will be abandoned.

076-04

This well is located in the area of the 1977 fuel oil/solvent spill and has historically contained the highest VOC concentrations in this area, primarily BTEX compounds. Following shutdown of the AS/SVE system in January 2001 a rebound of several VOC parameters was observed following a period of approximately two years during which VOC levels remained below MCLs. System pulsing, followed by enhanced biodegradation using an oxygen release compound (ORC), was performed between February and July 2001. Subsequent to these supplemental actions, VOC concentrations decreased in this well to below MCLs with the exception of detections of 1,2,4-tri methyl-benzene (6 _g/L) and m/p xylene (6 _g/L) in October 2002. Subsequent sampling has been non-detect for these parameters. There have been several detections of semi-VOCs [naphthalene, bis (2-ethylhexyl) phthalate] at or just below detection limits since 2001. This well will continue to be monitored for VOCs and semi-VOCs for the next year. If concentrations remain below MCLs for a one-year period, the sampling frequency will be reduced to semi-annual for a period of up to five years.

076-05

This well is located along the western perimeter of the 1977 spill and is also monitored under the OU IV AOC 6 Program. There have been no detections of VOCs or semi-VOCs above MCLs since February 2000. Monitoring of this well for organic compounds will be terminated. This well is in the vicinity of the leading edge of a strontium-90 plume originating from the Building 650 Sump Outfall. The well will continue to be monitored on a semi-annual basis for radionuclides as strontium-90 has been detected up to 4 pCi/L during the past year.

076-06

This well is located along the eastern perimeter of the 1977 spill. Historical VOCs and semi-VOCs have been detected at concentrations below MCLs including 2-methylnaphthalene, cymene, n-butylbenzene, n-propylbenzene, and tetrachloroethylene. 1,2,4-Trimethyl benzene was detected at concentrations exceeding the MCL of 5 _g/L during 2002. This compound was not detected during the first round 2003 sampling. Due to the continued presence of VOCs exceeding MCLs this well will continue to be sampled for VOCs and semi-VOCs for the next year. If concentrations remain below MCLs for a one-year period, the sampling frequency will be reduced to semi-annual for a period of up to five years.

076-07

This well is located southeast of the 1977 spill area. There have been no detections of VOCs or semi-VOCs above MCLs since sampling began in 1997. Sampling of this well for organic compounds will be terminated. This well will continue to be monitored semi-annually for radionuclides as part of the OU IV AOC 6 Program.

076-08
This well is located south of the 1977 spill area. There have been no detections of VOCs or semi-VOCs above MCLs since sampling began in 1997. Sampling of this well for organic compounds will be terminated and the well abandoned.

076-09
This well is located immediately north of Brookhaven Avenue and downgradient of the AS/SVE capture zone. There have been no detections of VOCs or semi-VOCs since February 2000, when cis-1,2-dicloroethylene was detected above the MCL of 5 _g/L at 5.2 _g/L. Contaminants migrating downgradient from this vicinity will ultimately be captured by the OU III Middle Road Pump and Treat system. Sampling of this well for organic compounds will be terminated however, this well will continue to be sampled semi-annually for radionuclides as part of the OU IV AOC 6 Program.

076-18
This well is located to the southeast of the 1977 spill and is also monitored as part of the Major Petroleum Facility (MPF) monitoring program. The only VOC or semi-VOC detection exceeding MCLs was bis (2-ethylhexyl) phthalate for one round in 2001 and one of the two 2002 rounds. This compound was not detected during the first round of 2003. Bis (2-ethylhexyl) phthalate is a common laboratory contaminant. This well will continue to be monitored for VOCs and semi-VOCs semi-annually as part of the MPF monitoring program.

076-19
This well is located to the southeast of the 1977 spill and is also monitored as part of the Major Petroleum Facility monitoring program. The only VOC or semi-VOC detection exceeding MCLs since 1999 was 16 _g/L of 1,2-dichloroethene in April 2002. There have been no subsequent detections of 1,2-dichloroethene in this well. This well will continue to be monitored for VOCs and semi-VOCs semi-annually as part of the MPF monitoring program.

076-21
This well is located south of the 1977 spill. There have been no VOC or semi-VOC detections exceeding MCLs since 2000. Sampling of this well for organic compounds will be terminated and the well abandoned.

076-22
This well is located south of the 1977 spill and is also sampled for radionuclides under the OU IV AOC 6 Program. There have been no VOC or semi-VOC detections exceeding MCLs since 2000. Sampling of this well for organic compounds will be terminated however, the well will continue to be sampled semi-annually for radionuclides.

076-23
This well is located to the east of the 1977 spill and is also downgradient of suspected VOC source areas in the vicinity of the Central Steam Facility and the MPF. This well is also sampled for VOCs and semi-VOCs as part of the MPF Monitoring Program. There have been no VOC or semi-VOC detections exceeding MCLs since November 2001. The well will continue to be sampled semi-annually for VOCs and semi-VOCs as part of the MPF Monitoring Program.

076-24
This well is located upgradient of the 1977 spill. There have been no detections of VOCs or semi-VOCs in this well historically. The well is also part of the OU IV AOC 6 Program and will continue to be monitored for radionuclides semi-annually under this program.

076-178
This well is located south of the 1977 spill area and is clustered with 076-179. There have been no VOC or semi-VOC detections exceeding MCLs since 1998. Sampling of this well for organic compounds will be terminated and the well abandoned.

076-179
This well is located south of the 1977 spill area and is clustered with 076-178. There have been no VOC or semi-VOC detections exceeding MCLs since 1998. Sampling of this well for organic compounds will be terminated and the well abandoned.

076-180
This well is located south-southwest of the 1977 spill and is clustered with wells 076-181 and 076-182. There have been no detections of VOCs or semi-VOCs in this well exceeding MCLs since June 2000. Sampling of this well for organic compounds will be terminated and the well abandoned.

076-181
This well is located south-southwest of the 1977 spill and is clustered with wells 076-180 and 076-182. It is also sampled for radionuclides under the OU IV AOC 6 Program. The only VOC or semi-VOC detections in this well exceeding MCLs were for bis (2-ethylhexyl) phthalate during the two 2001 sampling rounds. This compound has not been detected since that time. Sampling of this well for organic compounds will be terminated however, the well will continue to be sampled semi-annually for radionuclides.

076-182
This well is located south-southwest of the 1977 spill and is clustered with wells 076-180 and 076-181. It is also sampled for radionuclides under the OU IV AOC 6 Program. There have been no VOC or semi-VOC detections in these wells exceeding MCLs since 2000. Sampling of this well for organic compounds will be terminated however, the well will continue to be sampled semi-annually for radionuclides.

076-183
This well is clustered with 076-184 and is located immediately north of Brookhaven Avenue. It is also sampled for radionuclides under the OU IV AOC 6 Program. The only VOC or semi-VOC detection exceeding MCLs since 1997 was a single detection of bis (2-ethylhexyl) phthalate in 2000. This compound was not detected prior to this occurrence or since. Sampling of this well for organic compounds will be terminated however, the well will continue to be sampled semi-annually for radionuclides.

076-184
This well is clustered with 076-183 and is located immediately north of Brookhaven Avenue. It is also sampled for radionuclides under the OU IV AOC 6 Program. The only VOC or semi-VOC detection exceeding MCLs since 1997 was a single detection of bis (2-ethylhexyl) phthalate in 1999. This compound was not detected prior to this occurrence or since. Sampling of this well for organic compounds will be terminated however, the well will continue to be sampled semi-annually for radionuclides.

076-185
This well is clustered with 076-186 and is located to the southeast of the 1977 spill and south of the MPF and Central Steam Facility. The well is downgradient of the AS/SVE system capture zone. cis-1,2-dichloroethylene has been detected in this well at concentrations ranging up to 26 ug/L. Contaminants migrating downgradient from this vicinity will ultimately be captured by the OU III Middle Road Pump and Treat system. This well will continue to be monitored for VOCs on a semiannual basis.

076-186
This well is clustered with 076-185 and is located southeast of the 1977 spill and south of the MPF and Central Steam Facility. The well is downgradient of the AS/SVE system capture zone. There have been no VOCs detected exceeding MCLs since February 2000. Several semi-VOCs were detected during the February 2002 sampling round but were not detected previously or since that time. Sampling of this well for organic compounds will be terminated and the well abandoned.

A summary of plans for OU IV AOC 5 (AS/SVE) monitoring wells is provided in Table 3.

Table 3. Planned OU IV AOC 5 Monitoring

Well ID	Continued Post-Closure Monitoring for VOCs/semi-VOCs under OU IV AOC 5 Program	Continued Monitoring for Radionuclides under OU IV AOC 6 Program	Continued Monitoring for VOCs/semi-VOCS for MPF Program	No further Monitoring/Well Abandonment
076-02				x
076-04	x			
076-05		x		
076-06	x			
076-07		x		
076-08				x
076-09		x		
076-18			x	
076-19			x	
076-21				x
076-22		x		
076-23			x	
076-24		x		
076-178				x
076-179				x
076-180				x
076-181		x		
076-182		x		
076-183		x		
076-184		x		
076-185	x			
076-186				x