U. S. DEPARTMENT OF ENERGY

BROOKHAVEN NATIONAL LABORATORY

OPERABLE UNIT VI

RECORD OF DECISION

December 15, 2000

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I. DECLARATION OF THE RECORD OF DECISION

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OPERABLE UNIT VI
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Operable Unit (OU) VI soils and groundwater at the Brookhaven National Laboratory (BNL) site in Upton, New York. Operable Unit VI includes the Experimental Agricultural Fields and the Ethylene Dibromide (EDB) Groundwater Plume Area.

This remedial action was selected in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA) (hereinafter jointly referred to as CERCLA), and is consistent, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the BNL site.

The State of New York concurs with the selected remedial action.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a potential threat to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This operable unit is one of six operable units at the BNL site for which remedies have been or will be selected. The purpose of this remedy is to address EDB contamination in groundwater in Operable Unit VI (also known as Area of Concern (AOC) 28) and soils in the Experimental Agricultural Fields (AOC 8). Cleanup levels have been established that meet regulatory standards. The cleanup objectives for Operable Unit III were also adopted for Operable Unit VI. These are to meet the drinking water standards in groundwater for EDB; complete the groundwater cleanup in a timely manner, which is 30 years or less for the Upper Glacial Aquifer; and prevent or minimize the further migration of EDB in groundwater.

The selected remedy for AOC 28 consists of a combination of Alternatives 3 and 4 described in the OU VI Focused Feasibility Study and includes the following major components:

- Public water service was provided by the U.S. Department of Energy (DOE) to all developed properties in the vicinity of EDB contaminant migration. In response to concerns expressed by the Town of Brookhaven, elected officials and concerned citizens, DOE also provided public water to the area bounded on the north by North Street, on the east by Wading River Road, on the south by Sunrise Highway, and on the west by Sleepy Hollow Drive to Moriches-Middle Island Road to Cranford Boulevard. This action was taken to give residents additional confidence in the quality of their drinking water.

- The selected remedy includes active remediation involving the extraction of EDB contaminated groundwater and subsequent treatment with activated carbon. Groundwater data, updated information on cost effectiveness and regulatory feedback obtained since publication of the Focused Feasibility Study and Proposed Remedial Action Plan in 1996 have indicated the need for an active remediation system. Details of the system, such as the exact number and location of extraction wells, will be developed during the design phase. If an assessment and evaluation indicates that continued operation of the components of the selected remedy is not producing further reductions in the concentrations of contaminants in groundwater, the DOE, New York State Department of Environmental Conservation (NYSDEC) and U.S. Environmental Protection Agency (EPA) will evaluate whether discontinuance of the remedy is warranted or if modification and/or augmentation of the treatment system is needed to ensure that cleanup objectives are met.

- Implementation of a groundwater monitoring program to monitor and verify the cleanup of EDB with time.

- Suffolk County Department of Health Services private water system standards (Article 4 of the Suffolk County Sanitary Code) prohibit the installation of additional residential wells where public water mains exist. Suffolk County private water system requirements will also help limit the installation of new private wells in the undeveloped area where groundwater contains EDB. To ensure that private supply wells are not installed in areas where land contains groundwater contaminated with or threatened by EDB from BNL that is above the drinking water standard, DOE and BNL will continue to monitor the development of the undeveloped property in Operable Unit VI. In the unlikely event that: 1) the land is developed as separate parcels according to the present tax map, 2) the land contains groundwater contaminated with or threatened by EDB from BNL that is above the drinking water standard, and 3) the installation of individual private supply wells for separate parcels is allowed, DOE will provide public water to these separate parcels.

- Institutional controls will be implemented on the BNL property to prevent use of contaminated groundwater in the Operable Unit VI area.

Soils in the Experimental Agricultural Fields (AOC 8) do not pose an unacceptable risk to human health and the environment and remedial action is not required. Remediation of sediments in the Upland Recharge/Meadow Marsh area of AOC 8 is documented in the Operable Unit I Record of Decision.

The components of the selected remedy are final response actions.

DECLARATION

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. The components of the selected remedy utilize permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining in groundwater above health-based levels for a period of time, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

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Date 3-9-01

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III. RESPONSIVENESS SUMMARY

LIST OF ACRONYMS

LIST OF ACRONYMS

AGS	Alternating Gradient Synchrotron
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CERCLA	Comprehensive Environmental Response Compensation & Liability Act
CSF	Central Steam Facility
DCA	1,2-Dichloroethane
DOE	United States Department of Energy
DOT	United States Department of Transportation
DWS	Drinking Water Standard
EDB	Ethylene dibromide
EPA	United States Environmental Protection Agency
ERD	BNL Environmental Restoration Division
FS	Feasibility Study
HEAST	Health Effects Assessment Summary Tables
HFBR	High Flux Beam Reactor
IAG	Interagency Agreement
IRIS	Integrated Risk Information System
LLW	Low Level Radioactive Waste
MCL	Maximum Contaminant Level
MSL	Mean Sea Level
MTBE	Methyl-tert-butyl-ether
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated biphenyls
pCi/gram	PicoCuries per gram
ppb	Parts per billion
ppm	Parts per million
PRAP	Proposed Remedial Action Plan
PVC	Polyvinyl Chloride
RA	Risk Assessment
RAGS	Risk Assessment Guidance for Superfund
RESRAD	Residual Radioactive Material Guideline Computer Code

II. DECISION SUMMARY

1. SITE NAME, LOCATION, AND DESCRIPTION

Brookhaven National Laboratory (BNL) is a federal facility owned by the U.S. Department of Energy (DOE). BNL conducts research in physical, biomedical and environmental sciences and energy technologies.

BNL is located in Upton, Suffolk County, New York, about 60 miles east of New York City, near the geographic center of Long Island. The following are the distances to neighboring communities from BNL: Patchogue 10 miles west-southwest, Bellport 8 miles southwest, Center Moriches 7 miles southeast, Riverhead 13 miles east, Wading River 7 miles north-northeast, and Port Jefferson 11 miles northwest.

The BNL property is an irregular polygon that is roughly square, and each side is approximately 2.5 miles long. The site consists of 5,321 acres. The developed portion includes the principal facilities located near the center of the site. These facilities are contained in an area of approximately 900 acres, 500 acres of which were originally developed for U. S. Army use. The remaining 400 acres are occupied for the most part by various large research machine facilities. Outlying facilities occupy approximately 550 acres and include an apartment area, biology fields, former Hazardous Waste Management Area, Sewage Treatment Plant (STP), firebreaks, and the Landfill Area. The remainder is undeveloped. The site terrain is gently rolling, with elevations varying between 40 to 120 feet above sea level. The land lies on the western rim of the shallow Peconic River watershed, with a tributary of the river rising in marshy areas in the northern section of the tract.

The sole source aquifer beneath BNL has three water-bearing units: the moraine and outwash deposits known as the Glacial Aquifer, 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 a depth of 45 to 1,500 feet below the land surface. These three water bearing units are designated as a "sole source aquifer" by the United States Environmental Protection Agency (EPA) and serve as the primary source of drinking water for Nassau and Suffolk Counties.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The BNL site, formerly Camp Upton, was occupied by the U.S. Army during World Wars I and II. Between the wars, the site was operated by the Civilian Conservation Corps. It was transferred to the Atomic Energy Commission in 1947, to the Energy Research and Development Administration in 1975 and to DOE in 1977.

In 1980, the BNL site was placed on New York State's Department of Environmental Conservation (NYSDEC) list of Inactive Hazardous Waste Sites. On December 21, 1989, the BNL site was included on the EPA's National Priorities List (NPL) because of soil and groundwater contamination that resulted from past BNL operations. Subsequently, the EPA, NYSDEC, and DOE entered into a Federal Facilities Agreement (herein referred to as the

Interagency Agreement, IAG) that became effective in May 1992 (Administrative Docket Number: II-CERCLA-FFA-00201). The IAG identified Areas of Concern (AOCs) that were grouped into Operable Units (OUs) to be evaluated for response actions. The IAG requires the conduct of a Remedial Investigation /Feasibility Study (RI/FS) for Operable Unit VI (OU VI), to meet CERCLA requirements. Cleanup actions at the BNL site will be conducted pursuant to CERCLA, 40 CFR Part 300.

BNL's Final Response Strategy Document (SAIC, 1992) grouped the identified areas of concern into seven operable units. Several operable units were subsequently combined. Remedial investigations and risk assessments were conducted to evaluate the nature and extent of contamination, and potential risks associated with the Areas of Concern addressed in this Record of Decision. A description of the Operable Units is contained in Table 1 and they are shown in Figure 1.

Operable Unit VI, comprised of approximately 340 acres, is located along BNL's southeastern boundary (Figure 1), immediately northeast of Operable Unit I (OU I). Operable Unit VI is a relatively undeveloped section of the BNL facility, containing large wooded tracts and few structures. In addition to pine forests, OU VI contains cultivated field and forest plots that have been and continue to be used for agricultural research. OU VI contains two areas of concern: Experimental Agricultural Fields (AOC 8) and the Ethylene Dibromide (EDB) Groundwater Plume Area (AOC 28).

A brief history of each AOC within OU VI is provided in Table 2.

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

A Community Relations Plan was finalized for the BNL site in September 1991. In accordance with this plan and CERCLA Section 113 (k) (2)(B)(I-v) and 117, the community relations program focused on public information and involvement. A variety of activities were used to provide information and to seek public participation. The activities included: compilation of a stakeholders mailing list, community meetings, availability sessions, site tours and the development of fact sheets. An Administrative Record, documenting the basis for the selection of removal and remedial actions at the BNL site, has been established and is maintained at the local libraries listed below. The libraries are:

Longwood Public Library
800 Middle Country Road
Middle Island, NY 11953

Mastics-Moriches-Shirley Library
301 William Floyd Parkway
Shirley, NY 11967

Brookhaven National Laboratory
Research Library
Bldg. 477A
Upton, NY 11973

The Administrative Record is also maintained at the EPA's Region II Administrative Records Room at 290 Broadway, New York, New York, 10001-1866.

The OU I/VI Remedial Investigation/Risk Assessment (RI/RA) report, the Focused Feasibility Study (FFS) report and the Proposed Remedial Action Plan (PRAP) were released to the public for comment on July 29, 1996 (RI) and October 3, 1996 (FFS, PRAP), respectively. The public comment period for the FFS and PRAP documents was held from October 3, 1996 to November 15, 1996.

On November 13, 1996, BNL and DOE conducted a public meeting at the Dayton Avenue school in Manorville to inform interested citizens about the Superfund process, to review current and planned remedial activities for OU VI, and to respond to any questions.

Responses to the comments received at the public meeting and in writing during the public comment period are included in the Responsiveness Summary (Section III).

In 2000, the proposed cleanup remedy was changed to active treatment by carbon adsorption. A fact sheet PRAP, giving the details of this changed proposal, was mailed to 2,550 homes on the Community Involvement mailing list. This fact sheet and newspaper ads published in Suffolk Life and Newsday announced an information session that was held on August 8, 2000 in the Manorville Fire House. This session was also announced on the Environmental Restoration Division (ERD) web site. A public comment period was held from July 24 to August 24, 2000.

Level of Community Support for the Proposed Alternative

Based on comments received during the 1996 public comment period, DOE and BNL believed that the public and local elected officials were in general agreement with the originally proposed remedial alternative (number 3), which provides public water and continues to monitor the natural attenuation of the EDB in the potentially impacted area. There were no comments indicating a preference for additional active remediation of the EDB contaminants such as pump and treat or enhanced biodegradation. The projected dilution of the EDB by natural attenuation seemed to be acceptable to the public and elected officials. However, at that time, EDB concentrations were lower than those found after the publication of the PRAP. There were also no comments regarding additional remediation to be performed at the Biology Fields source area.

Significant comments were received on the proposed extent of DOE's public water hookup area. Most members of the public who commented expressed the desire to extend the hookup area to the south and to the east of its proposed location due to the perception that drinking water supplies were at risk in these areas from the EDB Plume.

Based on comments received during the 2000 public comment period, DOE and BNL believe that the public and local elected officials support the proposed remedial alternatives, including active treatment of the EDB Plume by groundwater extraction and treatment with carbon filters.

Changes in the Remedy Presented in the FS and the PRAP

The following modifications were made to the preferred remedial alternative based on the concerns and input of the public, elected officials, and regulators, as well as on data collected after the remedial investigation and publication of the 1996 PRAP.

- Based on new data from additional monitoring wells installed since the publication of the 1996 PRAP, updated information on cost effectiveness and regulatory feedback, an active remediation system has been added to the remedy that will be implemented because natural attenuation alone will not meet the Remedial Action Objectives. This new information is contained in several documents: BNL Quarterly Monitoring Reports through December 1999, the Operable Unit VI Work Plan for Long-Term Monitoring (February 22, 1999) and the Operable Unit VI Contingency Remedy Report (February 2000), which are available in the Administrative Record.

- The area connected to the public water system was expanded in response to the concerns of the public and elected officials. DOE provided public water to the area bounded on the north by North Street, on the east by Wading River Road, on the south by Sunrise Highway, and on the west by Sleepy Hollow Drive to Moriches-Middle Island Road to Cranford Boulevard.

Summary of Community Participation Activities for Operable Unit VI

The OU I/VI RI/RA Report was made available to the public and submitted to the Administrative Record on June 27, 1996. The public comment period began on July 29, 1996 and ended on September 30, 1996. This period reflects a 30-day extension, which was requested by the Environmental Advocates of Long Island office.

In mid-August 1996, the community relations activities for OU VI began. These activities included extensive door-to-door canvassing to approximately 90 residences, briefings to 16 elected officials, and mailings. Follow-up visits and phone contacts continued throughout the summer and into the fall.

DOE issued several press releases in August announcing the off-site EDB contamination and the public water hookups. Also, application packages were mailed to residents in the hookup area. Additionally, two summary sheets, "EDB In Groundwater, Operable Unit VI" and "Operable Unit VI Focused Feasibility Study and Proposed Remedial Action Plan" were produced and distributed to the BNL Community Involvement mailing list on August 12, 1996 and November 4, 1996, respectively.

On September 24, 1996, the Action Memorandum for OU VI Public Water Hookups was submitted to the Administrative Record. Following this document, two additional OU VI documents, the FFS and PRAP, were made available to the public and submitted to the Administrative Record on October 3, 1996. The public comment period for these two documents was October 3, 1996 through December 6, 1996.

Poster sessions played an important part in the community participation activities. These allowed the community and other interested people to meet informally with project managers and representatives from the regulatory agencies and express their concerns about Operable Unit VI. Two poster sessions were held at the Manorville Fire House on September 25, 1996 and October 5, 1996. A poster session was also held prior to the November 13, 1996 public meeting.

Another avenue for community relations was the sharing of information at local civic meetings. In particular, a presentation regarding OU VI was given to the Manorville Taxpayers Association on October 3, 1996.

These activities preceded the November 13, 1996 public meeting, which was another opportunity for the community and general public to comment on and ask questions about the above documents and the public water hookups. In response to public requests, the meeting was held in the community at the Dayton Avenue School in Manorville. Approximately 120 people were in attendance and many shared their concerns and asked questions of the eight member panel which included representatives from BNL, DOE, EPA, NYSDEC, New York State Department of Health (NYSDOH), and the Suffolk County Department of Health Services (SCDHS). A transcript was made of the meeting, which is included in the Administrative Record.

In 2000, the proposed cleanup remedy was changed to active treatment by groundwater extraction and carbon adsorption, followed by re-injection at concentrations less than the MCL. A fact sheet PRAP giving the details of this changed proposal, titled "Operable Unit VI Groundwater Cleanup," was produced and distributed. This fact sheet was mailed to 2,550 homes on the Community Involvement mailing list.

Both the fact sheet PRAP and newspaper ads published in Suffolk Life and Newsday announced an information session that was held on August 8, 2000 in the Manorville Fire House. This session was also announced on the ERD web site. A public comment period was held from July 24 to August 24, 2000. A presentation on OU VI was provided to the Community Advisory Council (CAC) on August 10, 2000.

A chronological summary of the significant community participation activities to date for OU VI is included in the Responsiveness Summary.

4. SCOPE AND ROLE OF OPERABLE UNIT RESPONSE ACTION

This Record of Decision selects remedial actions for Operable Unit VI including soil in AOC 8 and AOC 28. Ethylene Dibromide (EDB) contaminated groundwater in AOC 28 is the

principal threat addressed. EDB contaminated groundwater poses a risk to human health and the environment from potential exposure to contaminated drinking water and through continued migration of contaminants in the sole source aquifer. The remedial action for contaminated sediments in AOC 8 is addressed in the Operable Unit I Record of Decision.

Conducting this remedial action under OU VI is part of BNL's overall response strategy and is expected to be consistent with any planned future actions at the other Operable Units, which are in different phases of the CERCLA process.

5. SUMMARY OF SITE CHARACTERISTICS

The following sections summarize the site characteristics of the Areas of Concern addressed by this Record of Decision. Various investigations were undertaken to evaluate the nature and extent of contamination. A combination of investigation approaches was used including radiation surveys, soil vapor surveys, soil borings/soil sampling, monitoring well installation and groundwater sampling, groundwater modeling and geophysical investigations.

5.1 Area of Concern 28 – EDB Contaminated Groundwater

The Remedial Investigation and Risk Assessment (CDM Federal 1996) confirmed that the only significant contaminant of concern in OU VI groundwater is EDB. EDB has been detected in on-site and off-site groundwater at concentrations exceeding the NYS drinking water standard during a series of investigations and routine monitoring conducted from 1992 through 2000. The maximum concentration detected is 6 ug/l in an off-site permanent monitoring well 000-173 (BNL 1999e). Based on a review of historical data and contaminant transport modeling, the most probable source of EDB contamination detected within OU VI, at the site boundary, and south of North Street is the Biology Fields area. The current configuration of the plume is shown in Figure 2.

The OU VI groundwater flow and transport model described in the Long-term Monitoring Work Plan was calibrated for both flow and contaminant transport with the current data, ending November 1999. When natural attenuation only is assumed, the model suggests that the EDB plume will migrate beyond Sunrise Highway and into the Magothy aquifer and will persist for approximately 40 years (BNL, 2000a).

5.2 Area of Concern 8 - Experimental Agricultural Fields

AOC 8 consists of the Upland Recharge/Meadow Marsh area, the Biology Fields, and the Gamma Field as shown in Figure 3. These areas were used to conduct a variety of research including the ability of various ecosystems to treat sewage and the effects of acid precipitation and radiation on agricultural crops. These uses have resulted in the application of pesticides (e.g. EDB at the Biology Fields to sterilize soil) and sewage reported to contain contaminants. Additional information on these areas is contained in Table 2.

As part of the Remedial Investigation conducted in 1994, surface and subsurface soil samples were collected and analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides/PCBs, herbicides, ethylene dibromide (EDB), metals and radionuclides. Based on employee interviews, EDB was applied to the soils in the Biology Fields in the 1970s. The contaminant of concern in groundwater, EDB, was not detected in any soil samples, indicating that the soils are no longer a source of contamination. This is expected since EDB is highly soluble and mobile and would not remain long in soils.

The Remedial Investigation and Risk Assessment (CDM Federal 1996a) concluded that contaminants in soils in this AOC did not pose an unacceptable risk to human health and the environment and that no remedial action was required. Sediments in the Upland Recharge/Meadow Marsh area were found to contain elevated levels of metals that posed a potential ecological risk to the Tiger Salamander, a New York State endangered species. Additional sampling and evaluations were performed. Contaminated sediments will be removed and the wetland reconstructed as documented in the Operable Unit I Record of Decision (DOE 1999).

6. SUMMARY OF SITE RISKS

A baseline risk assessment was done to estimate the human health and ecological risks that could result from exposure to contaminants in OU VI if no additional remediation is performed. Present and future potential exposures to chemical and radiological contaminants in soil and groundwater were evaluated. Findings of the risk assessment are documented in the OU I/VI RI/RA Report (CDM Federal, 1996a).

6.1 Human Health Risks

A four-step process was used for assessing OU VI-related human health risks for a reasonable maximum-exposure scenario: *Hazard Identification* - identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration. *Exposure Assessment* - estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., contaminated well water) by which humans potentially are exposed. *Toxicity Assessment* - determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response). *Risk Characterization* - combines the outputs of the exposure and toxicity assessments to provide a quantitative (e.g., one-in-one-million excess cancer risk) assessment of OU VI-related risks.

Human Health risks were evaluated for exposures to radiological and chemical contaminants of concern. The chemical Risk Assessment addressed the risk of cancer and non-carcinogenic toxicity. The health risk of concern from radionuclides is cancer.

Current federal guidelines for acceptable exposures are 1) an individual lifetime excess carcinogenic risk in the range of a one-in-ten-thousand ($1x10^{-4}$) to one-in-a-million ($1x10^{-6}$), and 2) a maximum Hazard Index equal to 1.0 for non-carcinogenic effects. A Hazard Index greater than 1.0 indicates a potential for non-carcinogenic effects.

6.1.1 Identification of Contaminants of Concern

Chemicals of potential concern were selected based on EPA guidance. Contaminants evaluated in the risk assessment exceed screening levels based on their degree of toxicity, concentration, frequency of detection, chemical properties important to potential release, transport and exposure, and significant exposure routes. Table 2 includes the primary contaminants of concern.

6.1.2 Exposure Assessment

Present and potential future-use scenarios were quantitatively evaluated for the following receptor populations:

Present-Use Scenarios

Under present site conditions, risks to area residents (trespassers) in OU VI (Upland Recharge/Meadow Marsh, Biology Fields, and Gamma Field) were quantitatively evaluated for exposure to surface soil and sediment via ingestion and dermal contact.

Future-Use Scenarios

Under potential future site conditions, risks to area residents (trespassers), residents, site workers, and construction workers in OU VI were quantitatively evaluated for surface and subsurface soil. Exposures to subsurface soil were assumed to occur under a short-term (1 year) period of excavation. The exposure routes selected for evaluation included ingestion, dermal contact, and inhalation of suspended particulates. Risks to area residents (trespassers) for exposure to sediments via ingestion and dermal contact were also quantitatively evaluated.

The groundwater scenarios quantitatively evaluated included ingestion and inhalation of VOCs during future on-site residential use of groundwater and ingestion of groundwater from on-site commercial wells by site workers and construction workers.

The environmental matrices evaluated in the risk assessment included:

- Surface soil
- Subsurface soil
- Surface water
- Sediment
- Groundwater

6.1.3 Toxicity Assessment

The toxicity assessment consisted of presenting toxicological properties of the selected chemicals of potential concern using the most current toxicological human health effects data. Many carcinogenic slope factors and reference doses used in this assessment were obtained from

EPA's Integrated Risk Information System (IRIS) database. Slope factors and reference doses/concentrations not available on IRIS were obtained from EPA's second most current source of toxicity information, Health Effects Assessment Summary Tables (HEAST). The determination of the potential health hazards associated with exposure to non-carcinogens was made by comparing the estimated chronic or subchronic daily intake of a chemical with the RfD. Several contaminants could not be quantitatively evaluated in this risk assessment due to the lack of established toxicity values. These were qualitatively evaluated. The toxicity values used in the risk assessment are presented in the RI/RA Report for OU I/VI (CDM 1996a).

6.1.4 Risk Characterization

Using data collected in the Remedial Investigation, no media in OU VI except groundwater present unacceptable carcinogenic risks from present or future chemical exposure. For OU VI groundwater, future residential carcinogenic risks were 2.7×10^{-4} for adults (2.7 in 10,000) and 1.6×10^{-4} (1.6 in 10,000) for children for the ingestion of on-site groundwater and were largely due to EDB. A quantitative risk assessment was not performed for off-site groundwater because most of the available data is of screening level quality. The maximum reported concentration off-site was 6 µg/L. Based on this concentration (which is 21.4 times that used in the Risk Assessment), the maximum risks for adults and children ingesting off-site groundwater are 5.8×10^{-3} (5.8 in one thousand) and 3.4×10^{-3} (3.4 in one thousand), respectively.

No media in any OU VI AOC except groundwater presented noncarcinogenic hazards. For groundwater, the target level of one was exceeded for most residential future use scenarios when combined concentrations of metals (e.g. aluminum, manganese, etc.) were considered. However, the hazard quotients for all individual compounds were less than one.

6.2 Ecological Risk Assessment

A preliminary screening of ecological risk was performed for the OU VI AOCs. (CDM, 1996a). This screening indicated the need for additional assessment in the ponded areas of the Upland Recharge/Meadow Marsh area which are a breeding habitat for the Tiger Salamander, a New York State endangered species. This was conducted separate from the activities in this ROD and the remediation of sediments for AOC 8 is addressed in the OU I ROD.

The Gamma Field and Biology Fields were not considered as valuable habitat to wildlife due to its fence, lack of water, the amount of human disturbance, and the presence of more desirable habitat adjacent to it.

7. OBJECTIVES FOR REMEDIAL ACTIONS

The following sections identify the basis for taking remedial actions, the objectives of the remedial actions and the cleanup goals selected.

7.1 Basis for Response

The actual or threatened releases of hazardous substances from OU VI may present an

imminent and substantial endangerment to public health, welfare or the environment if they are not addressed by implementing the remedial actions selected in this Record of Decision. The principal threat in this operable unit is EDB contaminated groundwater.

7.2 Objectives of the Remedial Actions

The following remedial action objectives were established in the FFS for the EDB contaminated groundwater:

- Protect public health and the sole source aquifer.
- Continue to collect the data needed to characterize off-site contamination downgradient of OU VI and on-site contamination downgradient of the Biology Fields.

To ensure the protection of public health, public water service was provided as a removal action in 1996 to all developed properties in the vicinity of the EDB groundwater plume as shown in Figure 4.

The following remedial objectives were also adopted in the Contingency Remedy Evaluation Report based on the updated data collected, evaluations performed and regulatory feedback:

- Meet the drinking water standards in groundwater for EDB.
- Complete the cleanup of the groundwater in a timely manner. For the Upper Glacial Aquifer this goal is 30 years or less.
- Prevent or minimize further migration of EDB in groundwater vertically and horizontally.

7.3 Cleanup Goals

The cleanup goals selected for EDB is the state drinking water standard, i.e. the Maximum Contaminant Level (MCL), of 0.05 µg/l.

8. DESCRIPTION OF ALTERNATIVES

Section 121 of CERCLA requires that each selected site remedy protect human health and the environment, is cost effective, complies with other statutory laws, and use permanent solutions, alternative treatment technologies, and resource recovery alternatives as fully as practicable. In addition, the statute includes a preference for treatment as a principal element for reducing the toxicity, mobility, or volume of the hazardous substances.

The OU VI FFS Report evaluates, in detail, four remedial alternatives for addressing the EDB contamination in groundwater. The numbering of alternatives in this ROD corresponds to the numbering in the FFS Report. An updated evaluation of Alternatives 2 and 4 was performed after the FFS was finalized to incorporate more recent data and the results are presented in the Contingency Remedy Evaluation Report (BNL, February 2000) as well as in Quarterly Monitoring Reports (BNL 1999b-e).

The remedial alternatives are described below:

ALTERNATIVE NO. 1 - NO ACTION

Capital Cost:	$ 37,700
Total O&M Cost (present worth):	$ 71,900
Total Present Worth Cost:	$109,600

Under this alternative, there would be no further action beyond monitoring of existing wells on-site and off site, including private wells. EDB contaminated groundwater would be allowed to naturally attenuate as it migrates off site. Monitoring of existing wells would be performed once in five years.

ALTERNATIVE NO. 2 - NATURAL ATTENUATION WITH ADDITIONAL MONITORING

	FFS:	Updated Costs:
Capital Cost:	$ 539,200	$ 720,000
Total O&M Cost (Present Worth)	$1,278,400	$2,230,000
Total Present Worth Cost:	$1,817,600	$2,950,000

This alternative includes natural attenuation with on-site institutional controls and additional groundwater monitoring within and downgradient of OU VI. EDB contaminated groundwater would be allowed to naturally attenuate. Groundwater monitoring would be implemented to monitor the migration and attenuation of EDB with time, and additional groundwater characterization will be performed. On-site institutional controls would be implemented to prevent on-site use of contaminated groundwater. The Updated Costs for this alternative reflect the more recent analyses contained in the Contingency Remedy Evaluation Report that included groundwater data collected and modeling performed after the FFS was prepared.

ALTERNATIVE NO. 3 - RESIDENTIAL CONNECTIONS TO PUBLIC WATER SUPPLY

Capital Cost:	$1,340,600
Total O&M Cost (Present Worth):	$ 159,000
Total Present Worth Cost:	$1,500,100

The connection of downgradient residential homes to the public water eliminates the potential human exposure to EDB contaminated groundwater. The public water hookup portion of this alternative was completed in 1996 as an accelerated removal action and involved the installation of force mains, meters, valves, and supply lines to homes. Force mains were installed from Rosewood Drive along South Street, Weeks Avenue to Victoria Lane, North Weeks Avenue, Calendar Road, Douglas Lane, Victoria Lane, and North Street. The hookup area was substantially expanded in 1997 (see Figure 4). In addition, Suffolk County private water system requirements require connection to public water supply wherever water mains are available. Also, EDB-contaminated groundwater would be allowed to naturally attenuate as it continues to migrate off site. A groundwater monitoring program would be initiated to evaluate the migration and progress of natural attenuation of EDB.

ALTERNATIVE NO. 4 - REMEDIATE OU VI EDB PLUME TO CLEANUP GOALS VIA EXTRACTION AND CARBON ADSORPTION

	FFS:	Updated Costs:
Capital Cost:	$5,110,000 - 5,287,300	$1,260,000
Total O&M Costs (Present Worth):	$3,647,500 - 5,177,100	$ 980,000
Total Present Worth Cost:	$8,757,500 -10,464,400	$2,240,000

In 1996, alternative 4 stated that EDB contaminated groundwater would be extracted from the aquifer, treated, and discharged to a new recharge basin upgradient of OU VI on the BNL site. Extraction would occur off site near the leading edge of the EDB plume. Since the 1996 position of the leading edge of EDB contamination was not precisely known, three extraction scenarios were evaluated.

Extracted groundwater would be treated by carbon adsorption for removal of VOCs prior to being pumped back to the BNL site for discharge to a recharge basin. Estimated levels of iron and manganese at depth within the capture zone may be sufficiently high to require metals removal to prevent fouling of the carbon adsorption unit. Additional on-site and off-site monitoring would be implemented to determine the effectiveness of the groundwater remedial action and address the need for additional characterization of EDB contamination. Spent carbon would be regenerated and reused and dewatered sludge/solids would be disposed off site.

The Updated Costs for this alternative reflect the more recent analyses contained in the Contingency Remedy Evaluation Report that included groundwater data collected and modeling performed after the FFS was prepared. These analyses evaluated modified extraction and treatment systems that involve discharge of the treated water into injection wells just south of the plume as opposed to pumping the treated water back to the BNL site. This re-analysis resulted in a substantially lower cost for active remediation than was previously estimated.

9. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The CERCLA guidance requires that each remedial alternative be compared according to nine criteria. Those criteria are subdivided into three categories:

Threshold criteria that relate directly to statutory findings and must be satisfied by each chosen alternative (overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements); Primary balancing criteria that include long- and short-term effectiveness, implementability, reduction of toxicity, mobility and volume, and cost; and Modifying criteria that measure the acceptability of the alternatives to state agencies and the community.

The following sections summarize the detailed comparative analyses of the alternatives contained in Chapter 5 of the FFS Report and the OU VI Contingency Remedy Evaluation

Report (BNL February 2000). A summary of comparative analysis of alternatives, based upon the evaluation criteria noted above, is given below.

9.1 Threshold Criteria

The remedial alternatives were evaluated in relation to the threshold criteria: overall protection of human health and the environment and compliance with ARARs. The threshold criteria must be met by the remedial alternatives for further consideration as potential remedies for the ROD.

Overall Protection of Human Health and the Environment:

Alternatives 1 and 2 do not reduce the risk of human health exposure to the EDB contaminated groundwater and allows the EDB plume to migrate significant distances, thus contaminating clean groundwater. Alternative 3 eliminates the potential risk of human exposure to off-site contamination by preventing human consumption of the groundwater, but the EDB contaminated groundwater is still allowed to migrate significant distances. Alternative 4 reduces the potential future risk of human exposure by reducing EDB contamination in groundwater and significantly shortening the time period to reach health based standards in the groundwater (i.e. the drinking water standards). Alternative 4 also prevents or minimizes further migration of EDB contaminated groundwater.

Compliance with Applicable, or Relevant and Appropriate Requirements (ARARs):

All four alternatives will ultimately meet ARARs, i.e. the drinking water standard in the groundwater. Alternatives 1,2 and 3 will meet ARARs within 30 years for the Upper Glacial aquifer and about 40 years for the Upper Magothy aquifer. Compliance with ARARs is estimated to take up to 10 years for Alternative 4 since this alternative actively remediates the groundwater.

9.2 Balancing Criteria

Long-Term Effectiveness and Permanence:

Alternatives 1, 2, and 3 provide long-term protection of public health as natural attenuation reduces off-site groundwater contamination to below the drinking water standard. Further long-term effectiveness and permanence is provided with Alternatives 3 and 4. Alternative 3 prevents human exposure to contaminated groundwater through public water hookup. Alternative 4 reduces further migration of groundwater contamination by actively remediating contaminated groundwater.

Reduction of Toxicity, Mobility or Volume:

Alternatives 1, 2, and 3 do not actively remediate the groundwater contamination though the toxicity of the groundwater will be reduced as EDB concentrations decrease through natural attenuation. While the volume of contaminated groundwater may increase, concentrations in the aquifer will decrease with time. Alternative 4 reduces toxicity, mobility and volume of

groundwater contamination through active remediation of the aquifer. The plume will also not migrate as far and mobility will be reduced.

Short-Term Effectiveness and Environmental Impacts:

Alternatives 1, 2, and 3 can be implemented rather rapidly. Due to the permitting and coordination required for the construction of a groundwater treatment system on non-BNL property, Alternative 4 may be difficult to implement in the short-term.

At present, there are no known private wells directly within the contaminated plume with the exception of the well at the LILCO substation; therefore, in the short term, all alternatives are protective of the public in the neighboring communities. The workers performing the installation of new monitoring wells and vertical profile wells, the periodic groundwater sampling events, and extraction/recharge pipe installation would have health and safety training and use appropriate health and safety protocols to minimize any unacceptable exposure to contaminants by inhalation, direct contact or ingestion.

Implementability:

Alternative 1 and 2 can be implemented easily. Alternative 3 has already been implemented. Alternative 4 includes access and implementation issues associated with building a treatment plant on non-BNL owned property.

Cost:

Cost information for all alternatives is contained in Section 8 and summarized in Table 3.

9.3 Modifying Criteria

State Acceptance:

State acceptance addresses whether the State agrees with, opposes, or has no comment on the preferred alternative. The State of New York concurs with the selection of remedial actions described in this Record of Decision.

Community Acceptance:

Written and verbal comments received from the community during the 1996 public comment period and at the public meeting held on November 13, 1996, as well as the 2000 public comment period and at the information session held on August 8, 2000, have been evaluated. The Responsiveness Summary Section of the ROD contains the comments from the community and the appropriate responses. Most concerns expressed involved expansion of the public water hookup area. In response to concerns expressed by the Town of Brookhaven, elected officials and concerned citizens, DOE expanded the public water hookup area to include the area bounded on the north by North Street, on the east by Wading River Road, on the south by Sunrise Highway, and on the west by Sleepy Hollow Drive to Moriches-Middle Island Road to Cranford

Boulevard. This action was taken in the interest of being a good neighbor and to give residents additional confidence in the quality of their drinking water.

10. SELECTED REMEDY

The remedy has been selected based on consideration of CERCLA requirements, the analysis of alternatives, public comments and feedback from the regulatory agencies. The selected remedies are believed to provide the best balance of tradeoffs among alternatives with respect to the nine CERCLA evaluation criteria used to evaluate the alternatives in Section 9.

The selected remedy for Operable Unit VI groundwater (AOC 28) is a combination of Alternatives 3 "Residential Connections to Public Water Supply" and 4 "Remediate OU VI EDB Plume to Cleanup Goals Via Extraction and Carbon Adsorption". The selected remedy consists of the following major components:

- Public water service was provided by the U.S. Department of Energy (DOE) to all developed properties in the vicinity of EDB contaminant migration. In response to concerns expressed by the Town of Brookhaven, elected officials and concerned citizens, DOE also provided public water to the area bounded on the north by North Street, on the east by Wading River Road, on the south by Sunrise Highway, and on the west by Sleepy Hollow Drive to Moriches-Middle Island Road to Cranford Boulevard. This action was taken to give residents additional confidence in the quality of their drinking water.

- Active remediation involving the extraction of EDB contaminated groundwater and subsequent treatment with activated carbon will be performed. The treated groundwater will be discharged back to the aquifer. Groundwater data and regulatory feedback obtained since publication of the Focused Feasibility Study and Proposed Remedial Action Plan in 1996 have indicated the need for an active remediation system. Details of the system, such as the exact number and location of extraction wells, will be developed during the design phase. If an assessment and evaluation indicates that continued operation of the components of the selected remedy is not producing further reductions in the concentrations of contaminants in groundwater, the DOE, NYSDEC and EPA will evaluate whether discontinuance of the remedy is warranted or if modification and/or augmentation of the treatment system is needed to ensure that cleanup objectives are met.

- Implementation of a groundwater monitoring program to monitor and verify the cleanup of EDB with time.

- Suffolk County private water system requirements prohibit the installation of additional residential wells where public water mains exist. Suffolk County private water system requirements will also help limit the installation of new private wells in the undeveloped area where groundwater contains EDB. To ensure that private supply wells are not installed in areas where groundwater contains EDB from BNL that is above the drinking water standard, DOE and BNL will continue to monitor the development of the undeveloped property in Operable Unit VI. In the unlikely event that: 1) the land is developed as separate parcels according to the present tax map, 2) the land contains

groundwater contaminated with EDB from BNL that is above the drinking water standard, and 3) the installation of individual private supply wells for separate parcels is allowed, DOE will provide public water to these separate parcels.

- Institutional controls will be implemented on the BNL property to prevent use of contaminated groundwater in the Operable Unit VI area.

The components of the selected remedy are final response actions. Soils in AOC 8 do not represent an unacceptable risk to human health and the environment and do not require remedial action to ensure protection of human health and the environment. The remediation of sediments in AOC 8 is addressed in the Operable Unit I Record of Decision.

This remedy is a modification of the proposed remedy in the FFS. Based on new monitoring data, an active remediation system has been added that will be implemented because additional data and groundwater modeling demonstrate that natural attenuation alone will not meet the cleanup objectives. The area connected to the public water system has been expanded in response to public concerns.

11. STATUTORY DETERMINATIONS

Remedy selection is based on CERCLA, as amended by SARA, and the regulations contained in the NCP. All remedies must meet the threshold criteria established in the NCP: protection of human health and the environment, and compliance with ARARs. CERCLA also requires that the remedy use permanent solutions and alternative treatment technologies to the maximum extent practicable and that the implemented action must be cost effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

11.1 Protection of Human Health and the Environment

The selected remedy satisfies the criterion of overall protection of human health and the environment by eliminating the potential risk of human exposure to off-site contamination by preventing human consumption of the groundwater and by remediating and limiting the spread of EDB contaminated groundwater.

11.2 Compliance with ARARs

The NCP Section 300.430 (P) (5) (ii) (B) requires that the selected remedy attain the federal and state ARARs or obtain a waiver of an ARAR.

The following Chemical-Specific ARARs that the remedies will meet are listed below.

1. Safe Drinking Water Act, Public Law 95-523, as amended by Public Law 965,22 USC 300 et. Seq. National Primary Drinking Water Regulations (40 Code of Federal Regulations 141).

This establishes MCLs for public drinking water supplies that are relevant and appropriate for establishing goals for remediating groundwater.

2. New York Water Quality Standards, 6 NYCRR Part 703. This requirement establishes the standards of quality for groundwaters of the State and effluent standards for discharges to groundwater.

3. 10NYCRR Part 5-1, New York State Department of Health Drinking Water Standards.

No Location-specific or Action-specific ARARs were identified.

11.3 Cost Effectiveness

Based on the expected performance standards, the selected remedies were determined to be cost-effective because they provide overall protection of human health and the environment, long- and short-term effectiveness, and eventual compliance with ARARs, at an acceptable cost. Table 3 provides a comparison of present worth costs for all remedial alternatives.

11.4 Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The NCP prefers a permanent solution whenever possible. The preferred alternative is a final action, which utilizes permanent solutions to the maximum extent practicable for OU VI.

11.5 Preference of Treatment as a Principal Element

The remedy involves the extraction and treatment of EDB contaminated groundwater thus satisfying the statutory preference for treatment.

11.6 Documentation of Significant Changes

In response to concerns expressed by the Town of Brookhaven, elected officials and concerned citizens, DOE also provided public water to the area bounded on the north by North Street, on the east by Wading River Road, on the south by Sunrise Highway, and on the west by Sleepy Hollow Drive to Moriches-Middle Island Road to Cranford Boulevard. This action has been taken to give residents additional confidence in the quality of their drinking water. In addition, active treatment has been selected based on more recent groundwater data and modeling predictions performed after the PRAP was issued for public review and comment.

11.7 Five Year Review

Five-year reviews will be needed to document the effectiveness of the groundwater treatment system and the effectiveness of the institutional controls.

12. REFERENCES

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CDM Federal Programs Corporation (CDM Federal). 1996a. Remedial Investigation/Risk Assessment Report, Brookhaven National Laboratory, Operable Unit I/VI.

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DOE, 1999. Record of Decision Operable Unit I and Radiologically Contaminated Soils. August 25, 1999.

NYSDEC. 1992. Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels at hazardous Waste Sites.

NYSDEC. 1993. Division of Hazardous Substances Regulation Technical and Administrative Guidance Memorandum: Cleanup Guidelines for Soil Contaminated with Radioactive Materials.

U. S. Geological Survey (USGS). 1991. Open File Report 91-80.

TABLES

Table 1
Description of Operable Units at BNL

Operable Unit	Description
I	*Operable Unit I* is a relatively undeveloped 950-acre area in the southeastern part of the site. It includes historical waste handling areas, such as the Former and Current Landfills (AOCs 2 and 3), and the Former Hazardous Waste Management Facility (AOC 1). It also includes the Ash Pit (AOC 2F) and two recharge basins (AOCs 24E & 24F). Operable Unit I contains six areas covered by accelerated removal actions: the Current and Former Landfills, Chemical/Animal Pits and Glass Holes, the Interim Landfill, the Slit Trench and Groundwater. A Record of Decision has been issued for this operable unit.
II/VII	*Operable Unit II/VII* consists of several AOCs located in the developed central portion of the site. It includes contaminated soils and out-of-service underground storage tanks and pipelines proposed for removal at the Waste Concentration Facility (AOC 10), along with various isolated areas of contaminated surface soils (AOC 16,17,18). It also includes the BLIP facility (AOC 16K).
III	*Operable Unit III* contains the south central and developed portions of the site. This operable unit contains most of the site's contaminated groundwater. A Record of Decision has been issued for this operable unit.
IV	*Operable Unit IV* is located on the east-central edge of the developed portion of the site. It includes the 1977 Oil/Solvent Spill (AOC 5) as well as the Reclamation Facility Building 650 and Sump Outfall Area (AOC 6), where radiologically contaminated soils have been found. A Record of Decision has been issued for this Operable Unit and an Interim Remedy of access restrictions and monitoring has been implemented for AOC 6.
V	*Operable Unit V* is located in the northeast portion of the site and includes the Sewage Treatment Plant (AOC 4) and releases to the Peconic River.
VI	*Operable Unit VI* is located on the southeastern edge of the site. It is a largely wooded area that contains various agricultural research fields (AOC 8). Contaminated sediments and surface water in two of the man made basins in AOC 8 pose an ecological risk to the Tiger Salamander and they are addressed in the Operable Unit I ROD. Ethylene dibromide, a pesticide, has been found in groundwater south of BNL's southern boundary (AOC 28).

Table 2
SUMMARY OF SITE HISTORY

AOC No.	Name	Description	Contaminated Media	Primary Contaminants of Concern	Maximum Concentration	Reference
28	EDB Contaminated Groundwater	Consists of contaminated groundwater in the southeast portion of BNL and off site. The most probable source of the EDB contamination is the Biology Fields.	Groundwater	Ethylene Dibromide (EDB)	6 ug/l	BNL, 1999e.
8	Biology Fields	Used for experiments on agricultural crops (e.g. evaluating the effects of acid precipitation and ozone). Employee interviews indicated that EDB was likely used to sterilize the soil prior to certain experiments. Groundwater quality data and modeling also suggests that these fields are the source of the EDB groundwater contamination. EDB was not detected in the soil. Human health risk criteria were not exceeded in the Risk Assessment.	Groundwater Soil	See AOC 28. No contaminants of concern were identified.	-	CDM, 1996a.
8	Gamma Field	Used to assess the effects of radiation on crops. Fields were irradiated using Co-60 and Cs-137 sources which have been removed. No evidence of leakage from the sources was found during the Remedial Investigation. Human health risk criteria were not exceeded in the Risk Assessment.	Soil	No contaminants of concern were identified	-	CDM, 1996a.
8	Upland Recharge/Meadow Marsh Area	Used for experiments in the 1960s and 1970s on use of natural ecosystems for treatment of sewage and recharge to groundwater. The sewage reportedly contained metal and radionuclide contaminants. Human health risk criteria were not exceeded in the Risk Assessment. The area contains several abandoned artificial basins and ponds. Metal contaminated sediments and surface water pose a potential risk for the New York State endangered Tiger Salamander. Remedial actions for these basins and ponds are contained in the OU I ROD.	Surface Water Sediment	Aluminum Cadmium Copper Zinc Cadmium Copper Mercury Silver	5,110 µg/l 73 µg/l 1,550 µg/l 27,800 µg/l 22 mg/kg 1,880 mg/kg 12 mg/kg 138 mg/kg	CDM, 1996a. DOE, 1999.

Table 3

SUMMARY OF ESTIMATED COSTS FOR ALTERNATIVES			
ALTERNATIVE	DESCRIPTION	PRESENT WORTH (X$1000)	UPDATED PRESENT WORTH
Alternative 1	No Further Action	109.6	109.6
Alternative 2	Natural Attenuation with Additional Monitoring	1,817.6	2,950.0
Alternative 3	Residential Connections to Public Water Supply	1,500.1	1,500.1
Alternative 4	Groundwater Extraction and Treatment by Carbon Absorption	8,757.5 - 10,464.4	2,240.0

FIGURES

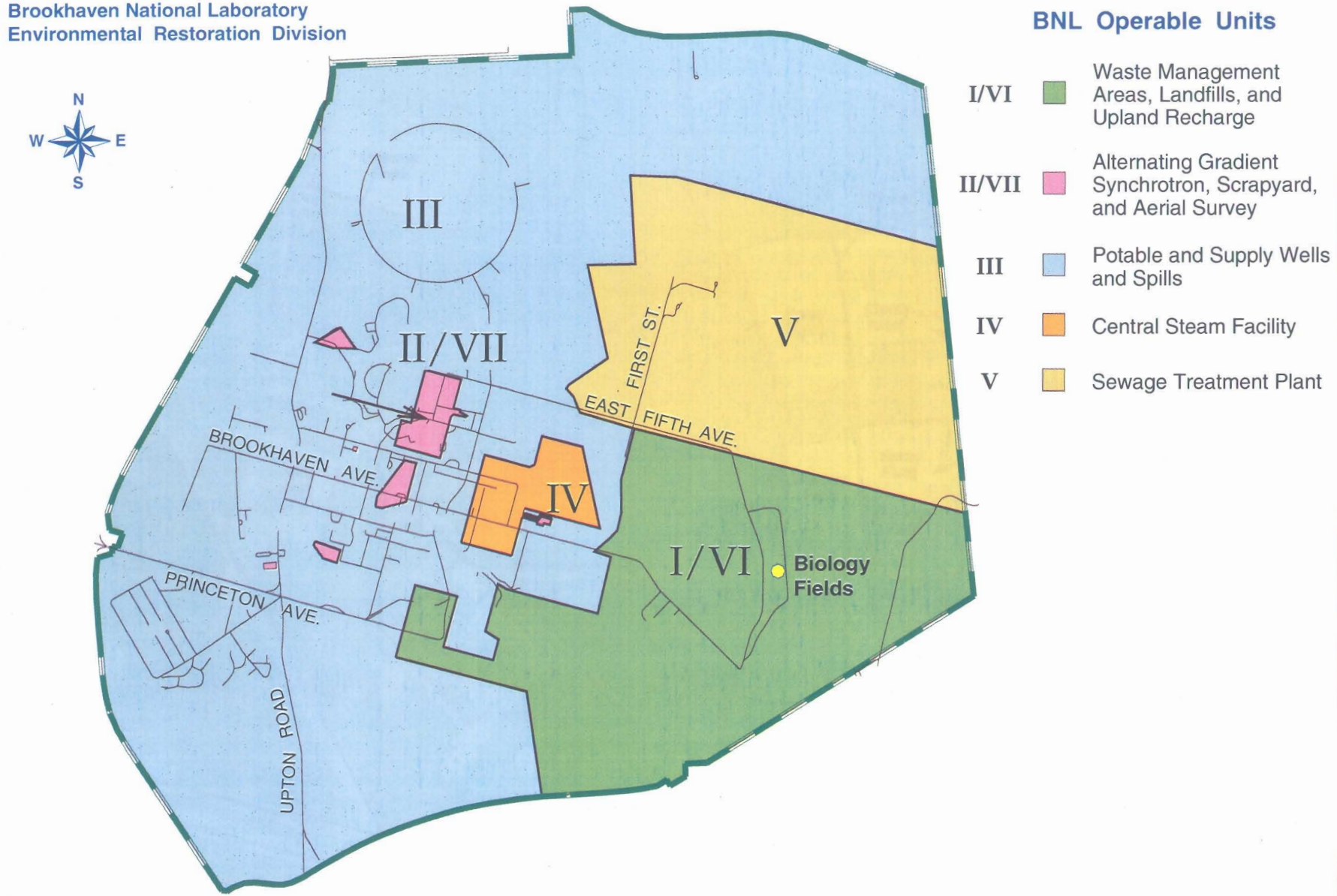

Figure 1

Operable Unit VI and Area of Concern 8 (Biology Fields)

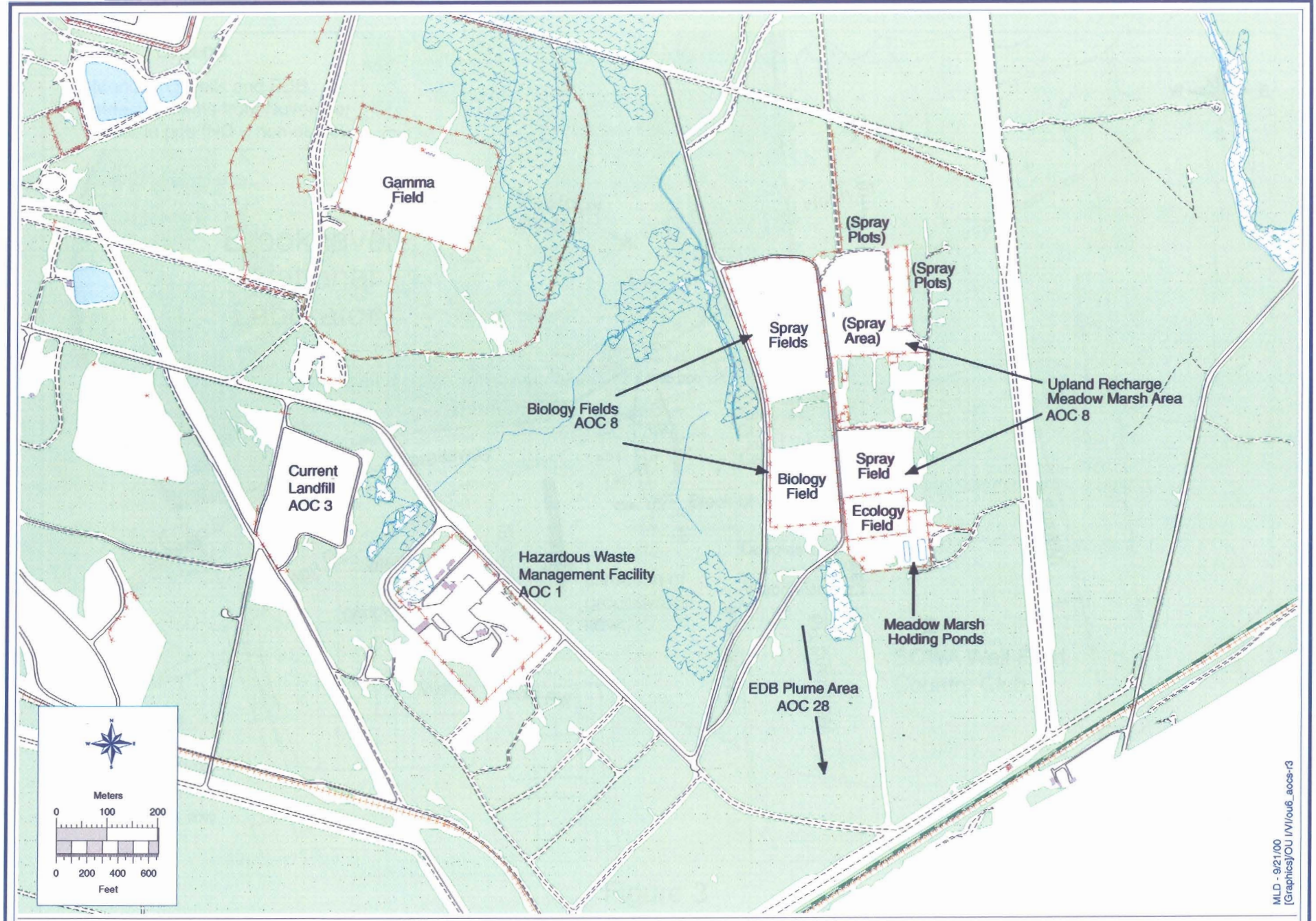

Figure 2

Operable Unit VI Areas of Concern (AOCs)

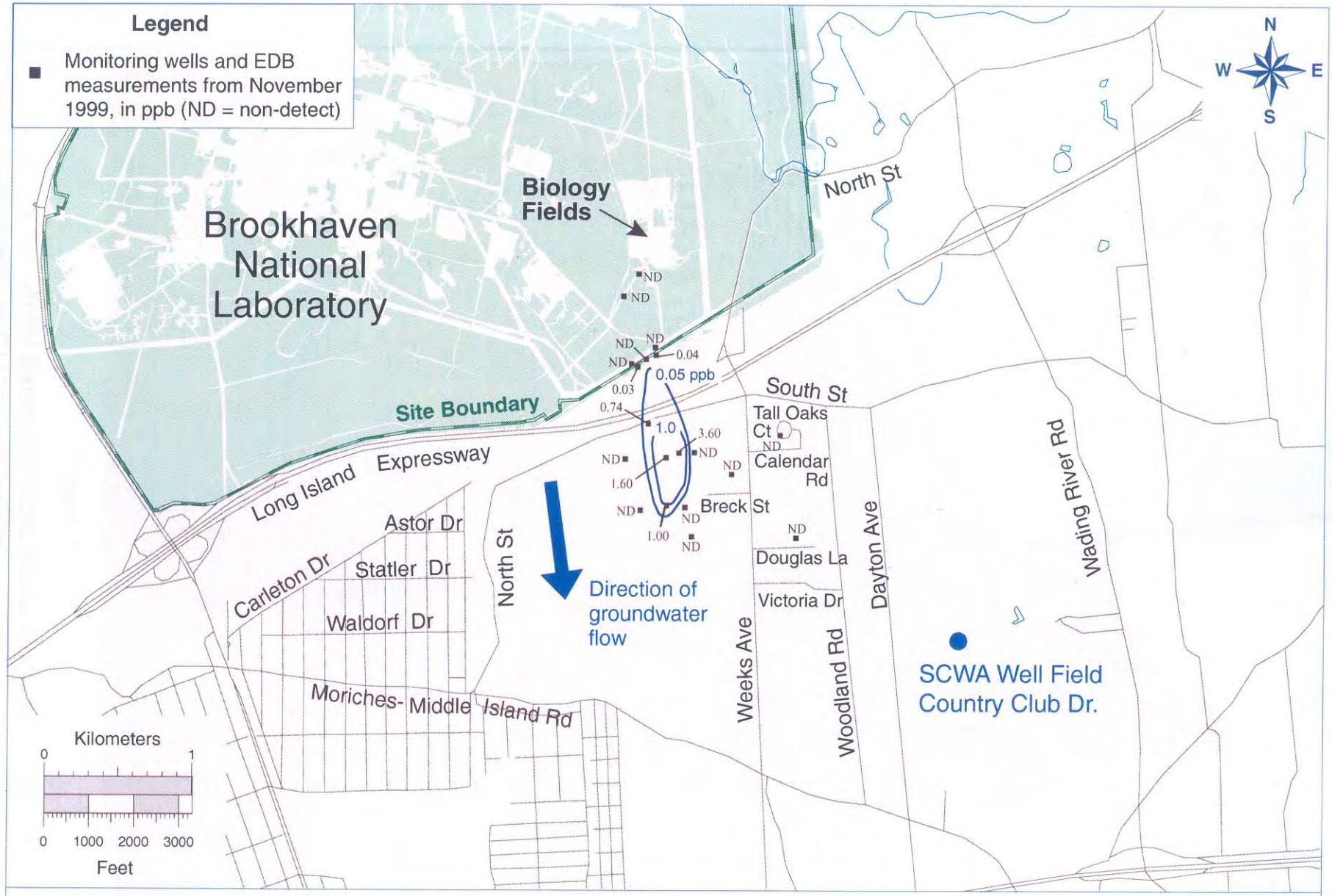

Figure 3

OU VI EDB Plume Map

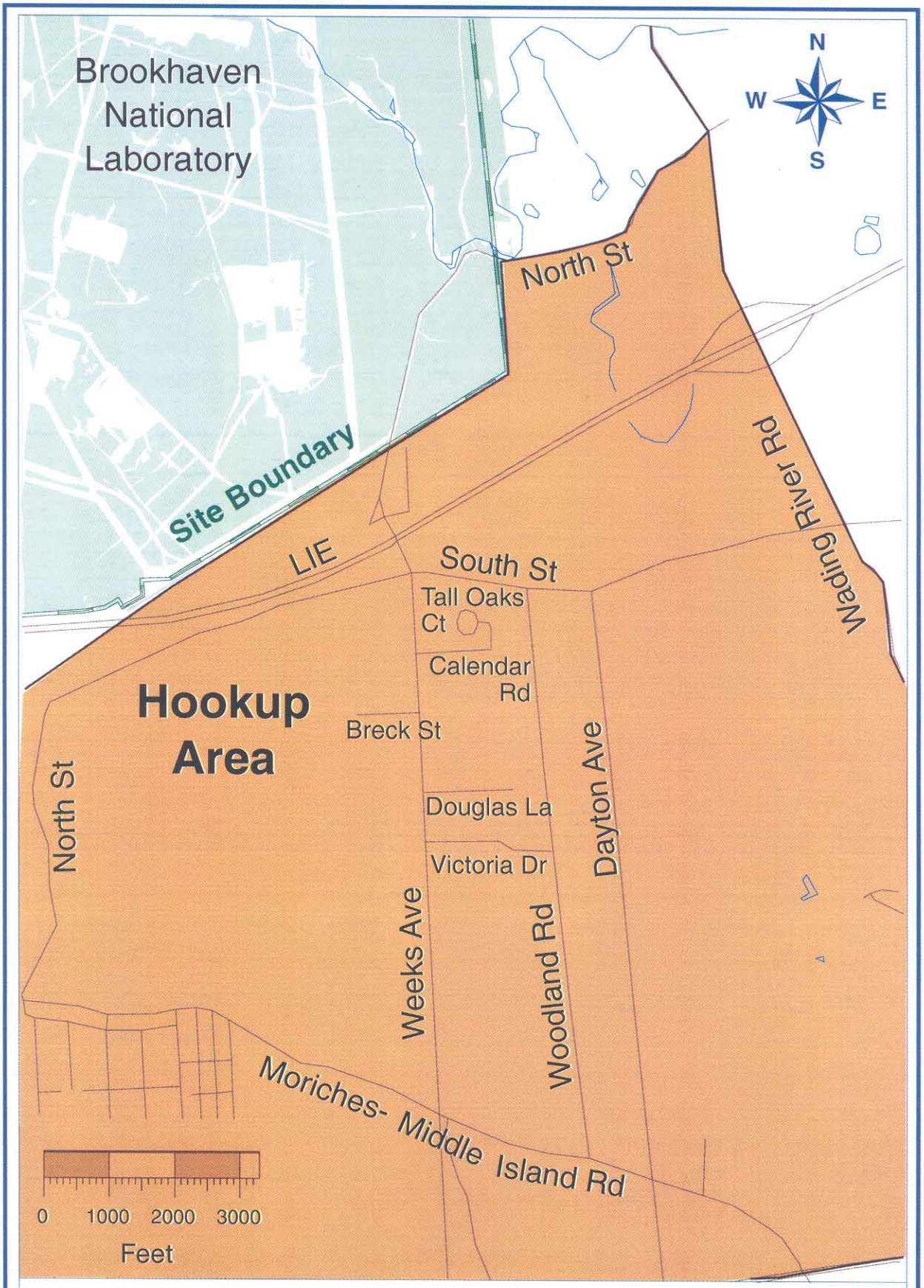

Figure 4

Areal Extent of Public Water Hookup
in Proximity to OU VI and Brookhaven National Laboratory

III. RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

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INTRODUCTION

This Responsiveness Summary (RS) of the Operable Unit (OU) VI Record of Decision (ROD) summarizes public comments and concerns and the U.S. Department of Energy's (DOE) responses to those comments on the OU VI cleanup proposals and preferred remedial alternative at Brookhaven National Laboratory (BNL).

The RS serves two functions:

1. It provides decision-makers with information about the views of the community regarding the proposed remedial action and any alternatives; and,

2. It documents how public comments have been considered during the decision-making process and provides answers to major comments.

The DOE's selected alternatives for this remedial action are:

- Public water service was provided by the U.S. Department of Energy (DOE) to all developed properties in the vicinity of EDB contaminant migration. In response to concerns expressed by the Town of Brookhaven, elected officials and concerned citizens, DOE also provided public water to the area bounded on the north by North Street, on the east by Wading River Road, on the south by Sunrise Highway, and on the west by Sleepy Hollow Drive to Moriches-Middle Island Road to Cranford Boulevard. This action was taken to give residents additional confidence in the quality of their drinking water.

- Active remediation involving the extraction of EDB contaminated groundwater and subsequent treatment with activated carbon. Details of the system, such as the exact number and location of extraction wells, will be developed during the design phase. If an assessment and evaluation indicates that continued operation of the components of the selected remedy is not producing further reductions in the concentrations of contaminants in groundwater, DOE, the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency (EPA) will evaluate whether discontinuance of the remedy is warranted or if modification and/or augmentation of the treatment system is needed to ensure that cleanup objectives are met.

- Implementation of a groundwater monitoring program to monitor and verify the cleanup of EDB with time.

- Suffolk County private water system requirements prohibit the installation of additional residential wells where public water mains exist. Suffolk County

private water system requirements will also help limit the installation of new private wells in the undeveloped area where groundwater contains EDB. To ensure that private supply wells are not installed in areas where groundwater contains EDB from BNL that is above the drinking water standard, DOE and BNL will continue to monitor the development of the undeveloped property in Operable Unit VI. In the unlikely event that: 1) the land is developed as separate parcels according to the present tax map, 2) the land contains groundwater contaminated with EDB from BNL that is above the drinking water standard, and 3) the installation of individual private supply wells for separate parcels is allowed, DOE will provide public water to these separate parcels.

- For soils in the Experimental Agricultural Fields (AOC 8), it was determined that an unacceptable risk to human health and the environment did not exist and that remedial action was not required. Remediation of sediments in the Upland Recharge/Meadow Marsh area of AOC 8 is documented in the *Operable Unit I Record of Decision.*

A public comment period for the review of the "OU VI FFS" and "OU VI Proposed Remedial Action Plan" (PRAP) began on October 3, 1996, and ended on December 6, 1996. A public meeting was held on November 13, 1996 at 7:00 p.m. at the Dayton Avenue School in Manorville, New York. This meeting was attended by approximately 120 members of the community. DOE and BNL distributed copies of the PRAP and other related information at this meeting. Copies of the FFS and PRAP were provided at the following locations for public review during the 1996 public comment period:

1. U. S. Environmental Protection Agency - Region II Library, Administrative Records Room, New York, NY
2. Longwood Public Library, Middle Island, NY
3. Brookhaven National Laboratory Research Library, Upton, NY
4. Mastics-Moriches-Shirley Community Library, Shirley, New York

A second cleanup proposal was issued in July 2000, with a second public comment period that began on July 24, 2000 and ended on August 24, 2000. An information session was held on August 8, 2000 at 7:00 p.m. at the Manorville Fire House in Manorville, New York. Eighteen community members attended this information session. The BNL Community Advisory Council was briefed on the cleanup proposal on August 10, 2000.

This document summarizes written and oral comments on the FFS, 1996 PRAP, 2000 fact sheet PRAP, and the preferred remedial alternatives, DOE's responses, and changes made to the proposed remedial action.

Modifications to the preferred remedial alternative based on public concern and input include:

- The public water hookup area was extended to include the area bounded on the north by North Street, on the east by Wading River Road, on the south by Sunrise Highway, and on the west by Sleepy Hollow Drive to Moriches-Middle Island Road to Cranford Boulevard in response to concerns expressed by the Town of Brookhaven, elected officials and concerned citizens. This action was taken to give residents additional confidence in the quality of their drinking water.

- The selected remedy now includes active remediation involving the extraction of EDB contaminated groundwater and subsequent treatment with activated carbon. Groundwater data, updated information on cost effectiveness, and regulatory feedback obtained since publication of the Focused Feasibility Study and Proposed Remedial Action Plan in 1996 have indicated the need for an active remediation system. Details of the system, such as the exact number and location of extraction wells, will be developed during the design phase.

The RS is divided into the following sections:

I. RESPONSIVENESS SUMMARY OVERVIEW: This section briefly describes the site background and DOE's preferred alternatives.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS: This section provides the history of community concerns and describes community involvement in the process of selecting a remedy for Operable Unit VI. A detailed chronology of community relations activities is presented in Section IV.

III. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, AND CONCERNS AND DOE RESPONSES: This section summarizes the written comments DOE received during the 1996 and 2000 public comment periods and the oral and written comments received during the 1996 public meeting and 2000 information session, and DOE's responses. Specific written responses to the significant comment letters are included in Section IV. Comments from these letters have been reflected in the summaries presented in Section III of this document.

IV. COMMUNITY RELATIONS ACTIVITIES: This section gives a chronology of the significant Community Relations activities regarding OU VI.

I. RESPONSIVENESS SUMMARY OVERVIEW

Site History

Brookhaven National Laboratory is a multi-disciplinary scientific research center owned by DOE and operated by Brookhaven Science Associates. The Laboratory conducts basic and applied research in the fields of high-energy nuclear and solid state physics, fundamental material and structural properties and the interactions of matter, nuclear medicine, biomedical and environmental sciences, and selected energy technologies.

Brookhaven National Laboratory is located about 60 miles east of New York City, in Upton, Suffolk County, New York, near the geographic center of Long Island. The BNL site, formerly Camp Upton, was occupied by the U. S. Army during World Wars I and II. The site was transferred to the Atomic Energy Commission in 1947, to the Energy Research and Development Administration in 1975, and to DOE in 1977.

The BNL property is an irregular polygon that is roughly square, and each side is approximately 2.5 miles long. The site consists of 5,321 acres. The site terrain is gently rolling, with elevations varying between 40 to 120 feet above sea level. The land lies on the western rim of the shallow Peconic River watershed, with a tributary of the river rising in marshy areas in the northern section of the tract.

The aquifer beneath BNL is comprised of three water-bearing units: the moraine and outwash deposits (known as the Glacial Aquifer); 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 from a depth of 45 feet to 1,500 feet below the land surface. These three water-bearing units are designated as a "sole-source" aquifer by the U.S. Environmental Protection Agency (EPA) and serve as the primary drinking water source for Nassau and Suffolk Counties.

As a result of historical operations at the site, BNL was placed on the EPA National Priorities List in December, 1989. In May, 1992, DOE entered into an Interagency Agreement for the BNL site with EPA and the New York State Department of Environmental Conservation (NYSDEC) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and corresponding state regulations. This Agreement established the framework and schedule for characterizing, assessing and remediating the site in accordance with CERCLA.

The BNL property has been divided into six Operable Units for the purposes of the site remediation. The Operable Units are areas for which independent removal or remedial actions may be performed as part of the overall BNL site remediation.

Operable Unit VI

Operable Unit VI, comprised of approximately 340 acres, is located along BNL's southeastern boundary. Operable Unit VI is a relatively undeveloped section of the BNL facility, containing large wooded tracts and few structures. In addition to pine forests, OU VI contains cultivated field and forest plots that have been and continue to be used for agricultural experiments. OU VI contains two Areas of Concern (AOCs), which were investigated in the Remedial Investigation/Risk Assessment (RI/RA) for OU I/VI. AOC 8 consists of various experimental agricultural fields; AOC 28 consists of a groundwater contaminant plume containing EDB above drinking water standards. Groundwater flowing beneath OU VI moves off site towards agricultural and residential areas along the BNL southern boundary.

Based on the RI/RAs, DOE, BNL, EPA, and NYSDEC have determined that the only environmental medium in OU VI that may require an action for protection of human health is groundwater. The only chemical in groundwater presenting a human health risk is EDB.

Groundwater Remedial Action for OU VI

EDB-contaminated groundwater will be actively remediated by extracting the contaminated groundwater and treating it with activated carbon. Groundwater data collected since publication of the Focused Feasibility Study and the Proposed Remedial Action Plan, updated information on cost effectiveness, and regulatory feedback have indicated the need for an active remediation system. This remedy will be implemented because additional monitoring data found that the Remedial Action Objectives (or "cleanup objectives") may not be met by natural attenuation alone. These objectives are to meet the drinking water standards for EDB in the Upper Glacial Aquifer within 30 years, protect human health and the environment, and prevent or minimize further migration of EDB in groundwater vertically as well as horizontally. Details of the active remediation system will be developed during the design phase. The remedy also includes implementation of a groundwater monitoring program to monitor and verify the cleanup of EDB with time. To address the risk to public health from EDB in the groundwater and public concern, public water has been provided to homes in the vicinity of the EDB plume. County private water systems standards will limit the installation of new water supply wells at new homes where a water main exists in the area. On-site institutional controls will prevent the installation of water supply wells on the BNL site.

Level of Community Support for Proposed Alternative

Based on comments received during the 1996 public comment period, DOE and BNL believe that the public and local elected officials were in general agreement with the originally proposed remedial alternative (number 3), which provides public water and continues to monitor the natural attenuation of the EDB in the potentially impacted area. There were no comments indicating a preference for additional active remediation of the EDB contaminants such as pump and treat or enhanced biodegradation. The projected dilution of the EDB by natural attenuation

seemed to be acceptable to the public and elected officials. However, at that time, EDB concentrations were lower than those found after the publication of the PRAP. There were also no comments regarding additional remediation to be performed at the Biology Fields source area.

Based on comments received during the 2000 public comment period, DOE and BNL believe that the public and local elected officials support the selected remedial alternatives, including active treatment of the EDB plume by groundwater extraction and treatment with activated carbon.

Significant disagreement was evident with the proposed extent of DOE's public water hookup area in 1996. Most members of the public who commented expressed the desire to extend the hookup area to the south and to the east of its proposed location due to the perception that drinking water supplies were at risk in these areas from the EDB in the aquifer. The comments presented the argument that the public water hookup area should be extended about twice as far as the projected 20-year future EDB migration distance to compensate for the hydrogeologic uncertainties and modeling assumptions described in the FFS. Two citizen petitions and a letter from the Town of Brookhaven Supervisor to former U.S. Senator Alfonse D'Amato were presented at the public meeting to underscore this opinion. The petitions and the letter are attached as an appendix to this document.

After consideration of these comments, DOE and BNL have concluded that the original hookup area is protective of the public health because it is based on worst-case assumptions and includes several safety factors. In combination with the proposed long-term monitoring activities, the overall proposed remedial action is still considered appropriate by DOE and BNL. However, to give residents additional confidence in the quality of their drinking water, DOE has extended the public water hookup area to the area bounded on the north by North Street, on the east by Wading River Road, on the south by Sunrise Highway, and on the west by Sleepy Hollow Drive to Moriches-Middle Island Road to Cranford Boulevard. The action was taken in response to a request made by the Town of Brookhaven and concerns expressed by elected officials and concerned citizens.

NYSDEC and EPA, based on their review of the Administrative Record and supporting information, have concurred with the selected remedial action.

Changes to the Proposed Alternative

The preferred remedial alternative was modified based on public concern and input as follows:

To give residents additional confidence in the quality of their drinking water, DOE has extended the public water hookup to the area bounded on the north by North Street, on the east by Wading River Road, on the south by Sunrise Highway, and on the west by Sleepy Hollow Drive to Moriches-Middle Island Road to Cranford Boulevard. The action was taken in response

to a request made by the Town of Brookhaven and concerns expressed by elected officials and concerned citizens.

The selected remedy now includes active remediation involving the extraction of EDB contaminated groundwater and subsequent treatment with activated carbon. Groundwater data, updated information on cost effectiveness and regulatory feedback obtained since publication of the Focused Feasibility Study and Proposed Remedial Action Plan in 1996 have indicated the need for an active remediation system. This remedy will be implemented because additional monitoring data found that the Remedial Action Objectives (or "cleanup objectives") may not be met by natural attenuation alone. These objectives are to meet the drinking water standards for EDB in the Upper Glacial Aquifer within 30 years, protect human health and the environment, and prevent or minimize further migration of EDB in groundwater vertically as well as horizontally. Details of the system, such as the exact number and location of extraction wells, will be developed during the design phase.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Community Profile

Brookhaven National Laboratory is located in Brookhaven Town in Suffolk County, which encompasses the central and eastern part of Long Island. Brookhaven Town accounts for almost a third of Long Island's 1.3 million residents with a population of 421,000.

Suffolk County is governed by a County Executive and an 18-member legislature, while the town of Brookhaven employs a Town Council (six at-large Councilors) and a Supervisor. Both County and Town governments maintain professional planning, development, and environment departments as well as a planning board.

Many hamlets, villages, and unincorporated communities dot Brookhaven Town's 940 square kilometers (368 square miles). Located within a five-mile radius of BNL are the unincorporated communities of Yaphank, Middle Island, Ridge, East Shoreham, Wading River, Calverton, Manorville, Center Moriches, Moriches, Mastic, and Shirley. Most of these communities have citizen-run civic or taxpayers organizations with large and active memberships. Their goal is to benefit their communities. Most organizations are affiliated with one or both of the area's two umbrella civic groups, Affiliated Brookhaven Civic Organizations and/or the Longwood Alliance. These same communities support Rotary and other service clubs, which represent businesses and other aligned interests within the community.

The Town of Riverhead is another town in Suffolk County where BNL activities generate interest. The Town of Riverhead, located to the east of BNL and the Town of Brookhaven, has a population of about 23,800 and an area of about 200 square kilometers (78 square miles), about 40 percent of which is farmed. Riverhead employs a supervisor-town council government which

maintains professional planning, development, and environment departments, as well as a planning board.

History of Community Involvement

Historically, public involvement in BNL's environmental restoration activities has been low, but after the establishment of a Community Relations Program in 1991, public interest and contact with BNL has steadily increased. Evidence of the growth of community involvement can be measured by the steady increase in the size of the Environmental Restoration Division's (ERD) stakeholder mailing list, which currently numbers about 2,550. BNL has made concerted efforts to inform and involve the community in its remediation efforts since the formation of ERD.

On March 1, 1998 Brookhaven Science Associates became the management group responsible for BNL. Since then, interaction with the community has been a major focus of BNL's administration and employees.

The focus of the BNL Community Relations Program has been:

- To inform stakeholders (on-site employees and members of the public) about the issues being addressed.
- To solicit input from stakeholders about these issues.
- To provide stakeholder input to DOE/BNL senior management and regulators to be used as one of the decision-making criteria for evaluating cleanup alternatives.
- To develop relationships with on-site employees, community members and leaders, and community environmental activists.
- To increase regular communication with stakeholders through expansion of the BNL stakeholder mailing list.

Two established mechanisms for community involvement meet monthly at BNL. The Brookhaven Executive Roundtable (BER) (established in August 1997) is composed of elected officials (or their representatives), regulators, and the Suffolk County Water Authority. Community members routinely attend the meetings and an opportunity for public comment is routinely on the agenda. The BER was created to facilitate and expedite the flow of information from BNL to some of its key stakeholders on significant environmental, operational and/or regulatory/oversight issues. An independent Community Advisory Council has been meeting since September 1998. Composed of representatives of established stakeholder groups on Long Island, BNL employees and several individuals, the council meets to learn about and discuss issues relating to the laboratory and to offer recommendations to BNL's director.

Regular communication with stakeholders about BNL cleanup activities is maintained through the production and distribution of the *cleanupdate* newsletter. Publication of this

quarterly newsletter began in early 1996. It is currently distributed to more than 5,000 BNL employees and retirees, as well as more than 2,550 households on the ERD mailing list.

A variety of additional activities are used to provide information and to seek public participation, including the following:

- Meetings held with stakeholders in the form of roundtables, workshops, public meetings or individual stakeholder contacts.
- Maintenance of the ERD home page on the internet.
- Attendance at and updates provided to civic organization monthly meetings.
- Mailings of fact sheets about specific projects.
- An Administrative Record, documenting the basis for the selection of removal and remedial actions at the BNL site, has been established and is maintained at local libraries.

Summary of Community Participation Activities

An OU VI-EDB community relations plan was produced and used as the primary guide for the following activities. Its goal was to maximize the potentially-affected community's involvement in, and understanding of, the OU VI remedial alternative selection process, so as to facilitate implementation of an Operable Unit VI remedial alternative.

The OU I/VI Remedial Investigation/Risk Assessment (RI/RA) Report was made available to the public and submitted to the Administrative Record on June 27, 1996. The public comment period began on July 29, 1996 and ended on September 30, 1996. This period reflects a 30-day extension, which was requested by the Environmental Advocates of Long Island office. A summary sheet titled, "Remedial Investigation and Risk Assessment of the Southeast Area of the Laboratory" was sent to the BNL OER mailing list (approximately 1,100 people at that time).

In mid-August 1996, the community relations activities for OU VI began. These activities included extensive door-to-door canvassing to approximately 90 residences, briefings to 16 elected officials, and mailings. Follow-up visits and phone contacts continued throughout the summer and into the fall.

DOE issued several press releases in August 1996 announcing the off-site EDB contamination and the public water hookups. Also, application packages were mailed to residents in the hookup area.

Additionally, two summary sheets, "EDB In Groundwater, Operable Unit VI" and "Focused Feasibility Study and Proposed Remedial Action Plan, Operable Unit VI" were

produced and distributed to the BNL Community Involvement mailing list on August 12, 1996 and November 4, 1996, respectively.

On September 24, 1996, the Action Memorandum for OU VI Public Water Hookups was submitted to the Administrative Record. Following this document, two additional OU VI documents, the Operable Unit VI Focused Feasibility Study (FFS) and Proposed Remedial Action Plan (PRAP) were made available to the public and submitted to the Administrative Record on October 3, 1996. The public comment period for these two documents was October 3, 1996 through December 6, 1996.

Poster sessions played an important part in the community participation activities. These allowed the community and other interested people to meet informally with project managers and representatives from the regulatory agencies and express their concerns about Operable Unit VI. Two poster sessions were held at the Manorville Fire House on September 25, 1996 and October 5, 1996. A poster session was also held prior to the November 13, 1996 public meeting.

Another avenue for community relations was the sharing of information at local civic meetings. In particular, a presentation regarding OU VI was given to the Manorville Taxpayers Association on October 3, 1996.

These activities preceded the November 13, 1996 public meeting, which was another opportunity for the community and general public to comment on and ask questions about the above documents and the public water hookups. In response to public requests, the meeting was held in the community at the Dayton Avenue School in Manorville. Approximately 120 people were in attendance and many shared their concerns and asked questions of the eight member panel, which included representatives from BNL, DOE, EPA, NYSDEC, New York State Department of Health (NYSDOH), and the Suffolk County Department of Health Services (SCDHS). A transcript was made of the meeting, which is included in the Administrative Record.

In 2000, the proposed cleanup remedy was changed to active treatment by groundwater extraction and carbon adsorption, followed by re-injection of water at concentrations less than the MCL. A fact sheet PRAP giving the details of this changed proposal, titled "Operable Unit VI Groundwater Cleanup," was produced and distributed. On July 21, 2000 this fact sheet was mailed to 2,550 homes on the Community Involvement mailing list and was placed on the ERD web site.

Both the fact sheet PRAP and newspaper ads published in Suffolk Life and Newsday announced an information session that was held on August 8, 2000 in the Manorville Fire House. This session was also announced on the ERD web site. A public comment period was held from July 24 to August 24, 2000. A presentation on the cleanup proposal was provided to the Community Advisory Council on August 10, 2000.

A chronological summary of the significant community participation activities to date for OU VI is provided in Section IV of this Responsiveness Summary.

The Administrative Record documents can be found at the following repositories:

1. Brookhaven National Laboratory Research Library, Bldg. 477A, Upton, NY
2. Longwood Public Library, Middle Island, NY
3. Mastics-Moriches-Shirley Community Library, Shirley, NY
4. U.S. EPA Region II Library, New York, NY

III. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, AND CONCERNS AND DOE RESPONSES

Overview

A number of questions and comments were made during the 1996 public meeting that did not relate to the proposed remedial action that is the subject of the ROD accompanying this RS. These comments were addressed by the panel at the public meeting and were followed up through community meetings, a community forum and *cleanupdate* articles. Only questions and comments directly related to the proposed remedial action alternatives are addressed in this RS.

Written public comments and questions received during the 1996 and 2000 public comment periods and oral and written comments received during the November 1996 public meeting and August 2000 information session are summarized and addressed below. The format of this RS is that similar questions or comments from different sources have been combined and summarized for a common response. Written comment letters are reproduced in Appendix I.

General Topics

- Predicted path and boundaries of hookup area based on modeling;
- Tritium and other radionuclides in groundwater;
- Suffolk County Water Authority wells;
- Drinking water standards and potential health effects;
- Safety of well water outside the hookup area;
- Use of well water for non-drinking purposes;
- Other sources of contamination (non-BNL);
- Operable Unit VI and overall Environmental Restoration Program;
- Property values;
- Future property uses;

- Cost of alternative remedies;
- Oversight and trust;
- Monitoring program;
- Use of EDB.

Questions and Comments

1. Predicted path and boundaries of hookup area based on modeling.

1a. The majority of concerns were expressed by those residents living in areas that were not scheduled for hookup to public water– primarily, the southern end of Weeks Avenue, Woodland and Dayton Avenues, and any adjoining side streets. The residents were concerned that their wells could become contaminated with EDB and that the proposed hookup area was based, to a great extent, on modeling or projections.

The proposed hookup area was based on both monitoring well data and modeling projections, and there are uncertainties in the information, as was discussed in the FFS and at the 1996 public meeting. In order to compensate for the uncertainties, the hookup area delineation included safety factors such as the 20-year EDB future travel distance, and a high EDB migration rate. Using available data and conservative assumptions, DOE and BNL concluded that the homes south of Victoria Drive and on Dayton and Woodland Avenues were in no danger of well contamination from BNL for at least 20 years, if at all. Nevertheless, in response to concerns expressed by the Town of Brookhaven, elected officials and concerned citizens, the hookup area was expanded to include these streets. This action was undertaken to give residents additional confidence about the quality of their water.

In addition to the monitoring well data, approximately 125 residential wells in the hookup area and outside the hookup area along south Weeks Avenue were sampled by the SCDHS in October 1996. The October information indicated that no EDB was detected in any of the sampled wells.

1b. There were concerns about the path of the EDB and that if it should begin to migrate in a southeasterly manner, the residential wells along Weeks, Woodland, and Dayton Avenues could be affected by the EDB. There were two SCDHS temporary wells on South Street that showed elevated levels of EDB. What is the potential for that contamination to migrate south into residential wells?

The proposed hookup area was based on both monitoring well data and modeling projections, and there are uncertainties in the information, as was discussed in the FFS and at the 1996 public meeting. In order to compensate for the uncertainties,

the hookup area delineation included safety factors such as the 20-year EDB future travel distance, and a high EDB migration rate. Using available data and conservative assumptions, DOE and BNL concluded that the homes south of Victoria Drive and on Dayton and Woodland Avenues were in no danger of well contamination from BNL for at least 20 years, if at all. Nevertheless, in response to concerns expressed by the Town of Brookhaven, elected officials and concerned citizens, the hookup area was expanded to include these streets. This action was undertaken to give residents additional confidence about the quality of their water.

All current information indicates that the EDB will continue to move south and not cross to the east of Weeks Avenue. In 1998 and 1999, BNL installed 15 temporary and 14 additional permanent wells in the general area south of North Street on both sides of Weeks Avenue. These wells were measured for water levels as well as organic and radiological contaminants. This monitoring will continue until the plume achieves drinking water standards.

1c. *Sometimes there is no apparent rhyme or reason to a hookup area. DOE is hooking up very far east of the EDB contamination and in another project hooked up communities as far south as Sunrise Highway.*

Initially, the OU VI hookup area was based on groundwater modeling projections of the furthest extent of the plume. These areas were then expanded further at the request of elected officials and community members. This is the reason that homes on South Street, north Woodland Avenue, and the eastern part of Victoria Lane were hooked up.

The other hookup project that extended mains to Sunrise Highway was in response to requests from elected officials. The two hookup projects are not related.

1d. *The modeling was uncalibrated and not based on sufficient data to make accurate predictions.*

For the FFS, the groundwater model was applied in three ways:

- First, to identify a source area and an approximate release time which can explain the observed pattern of EDB contamination. This was achieved by running a particle back-track analysis from all monitoring well locations and depths where EDB has been detected historically.

- Second, to estimate the worst case vertical and horizontal extent of contamination since 1970 from that source area by simulating a continuous source particle cloud. Simulations do not imply concentrations and represent

conservative estimates of the areal and vertical extent of contamination. Based on available data, model results were in agreement with the observed pattern of EDB contamination. However, DOE and BNL did not rely entirely on modeling results to determine the original hookup area. The model was used to understand the migration of EDB and, as explained in the FFS, modeling results were to be confirmed with additional monitoring well data. At the time of the FFS (1996), more data were needed to define the downgradient and lateral extent of contamination, and confirm the absence or presence of contamination in the area between the OU VI property boundary and the Biology Fields. Since the FFS, 15 temporary wells and 14 permanent monitoring wells have been installed and the leading edge of the EDB plume has been defined.

- Third, based on the observed pattern of contamination (represented by a slug of contamination detected by monitoring well data), the attenuation of EDB was simulated forward in time (from the present day and not from 1970) to estimate the duration and extent to which EDB will migrate at concentrations that exceed the drinking water standard.

The modeling (calibration, sensitivity analysis, and application) was performed in accordance with American Society of Testing Materials (ASTM) guides for Groundwater Modeling and is calibrated sufficiently to meet the objectives of the FFS. Uncertainties in the analysis have been objectively identified in the FFS and discussed relative to their significance. The objective of the modeling analysis was to provide guidance in selecting appropriate remedial alternatives and focusing future data collection efforts. The groundwater model was calibrated to approximately 100 monitoring well data points (four off-site) for three separate annual events and the model strongly agrees with the regional groundwater flow patterns as developed independently by the U.S. Geological Survey and the SCDHS for the same years.

Groundwater sampling data and modeling performed during the Remedial Investigation indicated that natural attenuation would reduce the concentrations of EDB in the plume below drinking water standards within 30 years. Additional modeling based on more recent field data suggested the need for an active remediation system to meet Remedial Action Objectives.

The OU VI groundwater flow and transport model described in the Long-term Monitoring Work Plan (February 22, 1999) was calibrated for both flow and contaminant transport with the current data, ending November 1999. When natural attenuation only is assumed, the model predicts that the EDB plume will migrate beyond Sunrise Highway and into the Magothy aquifer and will persist for approximately 40 years. When active remediation is assumed, the model

predicts that the plume will decline to less than the drinking water standard of 0.05 µg/L in eight to nine years.

1e. *Since there is no monitoring well data at the southern end of the plume how do you know that the EDB does not extend further to the south or southeast?*

Please see the response to 1d, above.

2. Tritium and other radionuclides in groundwater

2a. *The South Street School in Manorville was hooked up to public water in 1985. Wasn't this due to BNL?*

The school was hooked up to public water because of high levels of agricultural contaminants including nitrates and the pesticide aldicarb. Tritium was present at 5 percent of the drinking water standard. This tritium did come from BNL. Based on the evaluation of groundwater flow rates and direction presented in the FFS and on numerous other sources of information such as SCDHS maps, the pesticide contamination at the school was not related to the migration of the EDB from the BNL Biology fields.

2b. *Some residents are curious about the type of analysis that BNL does during their groundwater monitoring. Does it include analysis for tritium and other radiological compounds?*

Tritium is analyzed from all temporary and permanent well samples associated with OU VI, along with a list of approximately 60 volatile organic compounds (VOCs) including EDB. Only permanent monitoring wells can yield a sufficient volume of water for the analysis of strontium-90, gross alpha, gross beta, and gamma radiological parameters. In the October 1996 sampling round, 125 residential wells were analyzed for VOCs, metals and standard water quality parameters (e.g., coliform), as well as tritium and the other radiological parameters mentioned above. Since then, these analyses have been performed annually in samples from BNL's permanent monitoring wells.

3. Suffolk County Water Authority (SCWA) wells

3a. *Several concerns directly related to the supply wells owned by the SCWA have been expressed: Will the supply wells be affected by the EDB migration? What part did the wells play in the modeling? What will be the depth of the EDB as it attenuates, and will the EDB contamination ever have the potential to enter our drinking water supply?*

The SCWA water supply wells located on Country Club Drive, about a mile and a half southeast of the EDB plume, were included in the modeling of the EDB migration. The pumpage from these wells had no effect on the EDB movement and it is predicted that the contaminants will never reach the water supply wells. The monitoring wells installed in the area will verify this prediction. BNL is also adding an active remediation system to treat and control the movement of the EDB plume.

In addition, the SCDHS has already installed and sampled new permanent monitoring wells on Dayton Avenue between the water supply wells and the current EDB location. Water samples from these wells were analyzed for EDB and more than 60 VOCs and five radiological parameters. None of these analytes were detected. These wells are to be monitored quarterly, along with the water supply wells, for the complete list of analytes so that if the predictions of plume migration are inaccurate, there is adequate time to protect the water supply.

The OU VI groundwater flow and transport model described in the Long-term Monitoring Work Plan was calibrated for both flow and contaminant transport with the current data, ending November 1999. When natural attenuation only is assumed, the model suggests that the EDB plume will migrate beyond Sunrise Highway and into the Magothy aquifer and will persist for approximately 40 years. When active remediation is assumed, the model suggests that the plume will decline to less than the drinking water standard of 0.05 µg/L in eight to nine years.

3b. *Many people have shallow wells and may not be affected by contamination that is found at much deeper depths. There is a common misbelief that the deeper a well, the cleaner the water.*

All residences near the current and future predicted location of the EDB have been hooked up to public water and will not need to rely on private wells for drinking water.

4. Drinking water standards and potential health effects.

4a. *Many concerns were expressed about the possible health effects from drinking water with any level of EDB, a suspected carcinogen, and the potential pathways of exposure to EDB, other than drinking. Some people were interested in knowing how the drinking water standards are set and why the drinking water standard for EDB is so low.*

Drinking water quality standards are established in consideration of health effects and other factors such as analytical capability. Standards are reviewed regularly

by the EPA and NYSDOH, and are updated as new information becomes available. Revised standards can either be raised or lowered, depending on the new information. The drinking water standard of 0.05 parts per billion (ppb), or micrograms per liter (µg/L) is so low for EDB because of its possible carcinogenic effects. EPA has determined that this is the lowest level that laboratories can measure accurately and consistently with the available analytical methods. This corresponds to an increased lifetime cancer risk of 1×10^{-4} or one in ten thousand.

DOE and BNL understand the deep concern that people have for the health of themselves and their children. This is the reason that DOE has taken the precaution of connecting residents in the designated area to public water even though there is currently no evidence that residents are being exposed to contaminants from the Laboratory in their drinking water.

Government and private-sector scientific/medical organizations have generated substantial amounts of information and many studies on the scientific characteristics and health/environmental effects of the chemicals of concern in the BNL Environmental Restoration program.

Following is information to assist community members in learning more about the possible health and environmental effects of the chemicals of concern in BNL's cleanup. Five of the contacts are County, State, and Federal government agencies involved in public health administration. Three of the contacts are databases (two governmental, one private).

Resources for scientific and health information regarding chemicals and radionuclides:

1. ATSDR Public Health Statements
Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, NE, Mail Stop E-29,
Atlanta, GA 30333,
Phone: 1-888-422-8737, Fax: (404) 639-6359
Internet Web page: http://www.atsdr.cdc.gov

2. The Centers for Disease Control and Prevention
1600 Clifton Road, NE
Atlanta, GA 30333
Phone: 1-800-311-3435 or (404) 639-3534
Internet address: http://www.cdc.gov

3. U.S. Environmental Protection Agency
Public Information Center, 3404
401 M Street, SW
Washington, DC 20460
Phone: (202) 260-5922
E-mail address: Public-Access@epamail.epa.gov or
Internet: www.epa.gov/epahome/pic.htm

4. Suffolk County Department of Health Services
Water Resources Division
225 Rabro Drive
Hauppauge, NY 11788
Phone: (631) 853-2250

5. New York State Department of Health/Bureau of Toxic Substance Assessment
Flanigan Square
547 River Street, Room 330
Troy, NY 12180
Phone: (518) 402-7800
Internet: http://www.health.state.ny.us/nysdoh/environ/btsa.htm

6. There are several databases available for extensive summaries and data. You can access the information by calling the source directly. Many local libraries and/or universities have the databases available for the general public.

   a. IRIS (Integrated Risk Information System)
   U.S. EPA, Environmental Health and Safety Series, 1995
   Public Information Center, 3404
   401 M Street, SW
   Washington, DC 20460
   Phone: (202) 260-5922
   E-mail address: Public-Access@epamail.epa.gov or
   RIH.IRIS@epamail.epa.gov
   Internet: http://www.epa.gov/ngispgm3/iris/index.html

Produced by Micromedex, Inc.
6200 South Syracuse Way, Suite 300
Englewood, CO 80111
Phone: (303) 486-6400

b. HSDB Hazardous Substance Databank
Produced by National Library of Medicine
8600 Rockville Pike
Bethesda, MD 20894
Phone: 800-272-4787 or (301) 496-4000
Internet address: http://www.nlm.nih.gov or http://toxnet.nlm.nih.gov

c. CHRIS Chemical Hazard Response Information System produced by the U.S. Coast Guard (Hazardous Materials Branch, Office of Marine Safety):
Commandant (MOS-3)
U.S. Coast Guard
2100 Second St. SW
Washington, DC 20593
Attention: Dr. Alan Schneider
Phone: (202) 267-1577

Despite the quality, breadth, and depth of information available, this information does not provide conclusive answers about all of the possible health and environmental effects of the chemicals of concern at BNL.

In 1997, the ATSDR, a federal agency independent of DOE and BNL, performed a short-term groundwater public health consultation on BNL contamination at the request of DOE and local citizens. This consultation included an examination of residential well monitoring results and a determination of potential impacts on local residents if they were to use private well water for potable (drinking) and non-potable purposes.

In 1997, the ATSDR issued a draft Groundwater Consultation Report for public review and comment. The draft report determined that the levels of contamination found in residential wells (including those in Operable Unit VI) were not expected to cause noncancerous effects. Due to a lack of data, ATSDR was unable to determine the excess risk of developing cancer. This draft report has not been finalized. ATSDR intends to include a groundwater section, which will follow up on the draft Consultation, in its final Public Health Assessment on BNL.

5. Safety of well water outside the hookup area.

5a. Some residents who live outside the hookup area were concerned about the safety of their well water and whether it might have been impacted by the EDB plume or other groundwater contamination.

The extent of the BNL EDB plume is well defined, and it has not impacted any residential wells. As a precautionary measure due to this and other areas of groundwater contamination from BNL, approximately 1,500 homes south of the Laboratory have been provided public water hookups.

It is a good practice for residents outside of the hookup area who use a private well for drinking water to have their well tested periodically. The group to contact for well water testing is the Suffolk County Department of Health Services, Water Resources Division. Their number is (631) 853-2250. The cost is normally $65, but if a resident's income is less than $25,000 per year, testing is free.

6. Use of well water for non-drinking purposes.

6a. Two participants of the August 2000 information session who live within the public water hookup area asked whether it was safe to use their well water to irrigate vegetation, such as a garden.

The BNL EDB plume has not impacted any private residential wells. Using these wells for irrigation should be safe. However, it is recommended that individuals using well water for any purpose have their water tested periodically. See question 5, above, for contact information.

7. Other sources of contamination (non-BNL).

7a. Several participants of the 1996 public meeting expressed concerns about groundwater contamination from other non-BNL sources, and wondered why aren't all potentially affected communities connected to public water.

There may be other funds at the state and local level which are geared to the types of hookups in question and concerned citizens may contact the Town of Brookhaven or SCWA for more information.

7b. Several questions concerned the off-site detections of EDB on South Street and Weeks Avenue and the reasoning behind BNL not taking responsibility for these detections.

The proposed hookup area was based on both monitoring well data and modeling projections, and there are uncertainties in the information, as was discussed in the FFS and at the 1996 public meeting. In order to compensate for the uncertainties, the hookup area delineation included safety factors such as the 20-year EDB future travel distance, and a high EDB migration rate. Using available data and conservative assumptions, DOE and BNL concluded that the homes south of Victoria Drive and on Dayton and Woodland Avenues were in no danger of well contamination from BNL for at least 20 years, if at all. Nevertheless, in response to concerns expressed by the Town of Brookhaven, elected officials and concerned citizens, the hookup area was expanded to include these streets. This action was undertaken to give residents additional confidence about the quality of their water.

8. Operable Unit VI and the overall BNL Environmental Restoration Program

8a. One question raised at the 1996 public meeting asked about the other activities or "Areas of Concern" within OU VI and why they are being investigated.

There were originally two "Areas of Concern," or AOCs, identified in OU VI. The two AOCs (8 and 28) were investigated in the RI/RA for OU I/VI prepared by CDM-Federal Programs Corporation (1996). AOC 8 consists of various experimental agricultural fields including the Upland Recharge/Meadow Marsh Area, the Biology Fields, and the Gamma Field. The Upland Recharge/Meadow Marsh Area was used in experiments designed to evaluate the capacity of small natural and man-made terrestrial and aquatic ecosystems to treat sewage and recharge ground and surface waters. The Biology Fields were used in experiments which measured the effect of acid precipitation and ozone on agricultural crops. The Gamma Field was used in research studies designed to assess the effects of radiation on agricultural crops. The fields were irradiated but radioactive isotopes were not applied to the soil or plants. AOC 28 consists of the groundwater plume of EDB above drinking water standards. The three agricultural areas of AOC 8 have been investigated with numerous soil samples and borings and no further action is required, as documented in the RI/RA Report and summarized in the OU VI FFS.

8b. The same commentor was concerned about the scope of the remedy for OU VI as compared to potential remedies for the other operable units on site.

The general complexity of the operable units relates to the number of source areas, type of source areas (scattered or easily located), type and number of contaminants, hydrogeology, type of remedial activities, and ongoing activities (is it in use today). Based on these characteristics, OU VI is one of the less complex operable units. There is one defined source area which is no longer contributing contaminants to the aquifer. There is only one compound of concern and the

proposed remedy is relatively simple to implement. This does not imply that the investigation and assessment activities (including monitoring well installation, laboratory analyses, and groundwater modeling) are less complex than at other operable units. Also, the uncertainties associated with the results of the investigations are more or less similar to those of the other operable units. However, with a clear direction in which to move ahead, including addressing the uncertainties, OU VI can be considered less complex overall than some of the other operable units.

9. Property values

9a. Several residents expressed their feeling that living near groundwater contamination will have a damaging effect on their property value, and asked who is responsible for compensation?

In the short term, we do not know how property values will be affected by the BNL cleanup or the connection to public water. In the long term, the connections to public water should increase property values because the source of the drinking water will be a public water source.

While the news of the contamination has been upsetting to local residents, DOE will not be providing restitution for pain and suffering. The public water hookup project was proposed in part so that residents will not have to worry about the quality of their drinking water because of BNL contamination.

10. Future property uses

10a. Does the current owner of the property over the EDB plume have plans to develop it in the future? Will there be any restrictions against building residential homes there?

The property directly above the EDB plume is privately owned. Neither DOE nor BNL can place restrictions on the use of this property. Property zoning and development control is the responsibility of the Town of Brookhaven and subject to Suffolk County Sanitary Code requirements.

Suffolk County private water system requirements prohibit the installation of additional residential wells where public water mains exist. Suffolk County private water system requirements will also help limit the installation of new private wells in the undeveloped area where groundwater contains EDB. To ensure that private supply wells are not installed in areas where groundwater contains EDB from BNL that is above the drinking water standard, DOE and BNL will continue to monitor the development of the undeveloped property in

Operable Unit VI. In the unlikely event that: 1) the land is developed as separate parcels according to the present tax map, 2) the land contains groundwater contaminated with EDB from BNL that is above the drinking water standard, and 3) the installation of individual private supply wells for separate parcels is allowed, DOE will provide public water to these separate parcels.

11. Cost of alternative remedies

11a. Some questions and comments addressed the cost of each of the remedial alternatives. Some residents felt that the money would be more wisely spent hooking up a larger area versus spending the money on monitoring.

The proposed hookup area was based on both monitoring well data and modeling projections, and there are uncertainties in the information, as was discussed in the FFS and at the 1996 public meeting. In order to compensate for the uncertainties, the hookup area delineation included safety factors such as the 20-year EDB future travel distance, and a high EDB migration rate. Using available data and conservative assumptions, DOE and BNL concluded that the homes south of Victoria Drive and on Dayton and Woodland Avenues were in no danger of well contamination from BNL for at least 20 years, if at all. Nevertheless, in response to concerns expressed by the Town of Brookhaven, elected officials and concerned citizens, the hookup area was expanded to include these streets. This action was undertaken to give residents additional confidence about the quality of their water.

As discussed in the ROD, the currently proposed active remediation system was evaluated against natural attenuation and monitoring and the costs for the active system were slightly less.

11b. There were two copies of the OU VI FFS which were made available to the public. In the first copy, a projected cost was given to hookup an area that included Weeks Avenue to Moriches-Middle Island Road. The second copy contained a similar cost projection to hookup Weeks Avenue to just south of Victoria Lane.

The DOE and BNL apologize for the mixup due to the two sets of maps being circulated among the public. The first map, which showed the water main extending to Moriches-Middle Island Road, was from a draft document that did not take into account that the existing water main was located at Rosewood Drive and it did not account for several side streets off Weeks Avenue. On the second map, the length of main decreased on Weeks Avenue, but the water main was projected to go further along South Street to the existing water main at Rosewood Drive and include the side roads of Tall Oaks Court, Calendar Road, Douglas Lane, Victoria Lane, and the northern portion of Woodland Avenue. At the level

of detail of the FFS, the cost estimates for both configurations of the water main were essentially the same and were therefore unchanged.

12. Oversight and trust

12a. Many residents had questions about what other agencies oversee the work at BNL. Some expressed mistrust of the information given to the public and a feeling that it seems unrealistic to expect an honest and accurate reporting system if one government agency is overseeing another. In some situations it appears that DOE is the watchdog for itself.

Environmental cleanup work is performed by the BNL Environmental Restoration Division under contract to DOE. Detailed work plans and quality assurance plans are reviewed, approved, and overseen by DOE, EPA, and NYSDEC. The NYSDOH, SCDHS, and U.S. Geological Survey also review work and provide input. EPA and NYSDEC are notified of analytical laboratories to be used in advance to ensure that competent labs are selected. Also, almost all Superfund-related environmental samples are analyzed not by BNL but by independent commercial laboratories that specialize in this type of work.

Significant efforts have been made to increase communications with local communities and provide information on the BNL environmental restoration program. Both DOE and BNL have tried to improve communications with the community and have formally adopted policies of openness over the past few years. Brookhaven National Laboratory's mailing list has been greatly expanded, and information and notices of important events are distributed on a routine basis to keep the community up-to-date. The BNL newsletter *cleanupdate* began publishing in 1996 and is currently distributed to more than 7,500 BNL employees and retirees, local residents, the general public, and elected officials.

All reports and documents generated by the BNL environmental restoration program are made available for the public to review, and strong efforts are underway to make this information both understandable and easily available to the public. Informal workshops in the community, where local residents can ask questions of DOE and BNL staff in a friendlier environment, have been conducted. BNL community relations staff also regularly attend local civic association meetings to hear community concerns.

12b. Concerns about the 20 year projection were raised. What guarantee does the general public have that BNL will still be here to monitor the EDB attenuation?

DOE has an Interagency Agreement with EPA and NYSDEC for the assessment and cleanup of the BNL Superfund site, including the area with EDB. This

Agreement contains provisions for schedules and penalties by EPA if certain milestones are missed. Funding must be provided by DOE for cleaning up the BNL site or DOE will face penalties by EPA. While NYSDEC cannot fine DOE under the Agreement, NYSDEC has reserved its rights to take independent enforcement actions if work is not performed in accordance with the Agreement. As long as a potential public health threat remains, the federal government is bound by the agreement to continue remedial activities, which includes a period of active treatment and longer-term monitoring of the wells in the OU VI downgradient area.

13. Monitoring program

13a. Questions were asked about the groundwater monitoring program at BNL. What has been the extent of monitoring for EDB and what is planned for the future?

The Remedial Investigation for OU VI characterized the nature, magnitude, and extent of contamination due to the AOCs included in OU VI, and the potential health risks and environmental impacts of any contaminants present. The Remedial Investigation included soil, sediment and groundwater sampling; chemical and radiological analyses; data validation; and the preparation of the Remedial Investigation/Risk Assessment Reports.

Additional groundwater data were collected after the public comment period for the FFS and PRAP. This effort, performed during 1998 and 1999, resulted in model calibration and refinement of two of the alternatives discussed in this ROD. The natural attenuation alternative (No. 2) and the active remediation with carbon treatment alternative (No. 4) were reevaluated based on the new data. The results are presented in the Contingency Evaluation Report (BNL, February 2000), which is included in the Administrative Record.

During the Remedial Investigation, EDB was detected in both rounds of sampling in wells 99-11, 100-13 and 100-14, and in one round each in wells 89-14 and 99-10. Well 89-14 is a shallow well located near a suspected source area (Biology Fields), while the other wells are screened at deeper intervals within the Upper Glacial aquifer and are located along the southern property boundary of OU VI downgradient of the Biology Fields. Concentrations of detected organic compounds were low (<15 µg/L). EDB was the only VOC to exceed the drinking water standard of 0.05 µg/L. The highest concentration was detected in an off-site monitoring well at a much higher concentration than the highest on-site well, 1.2 µg/L and 0.08 µg/L respectively. However, 3.5 µg/L of EDB was detected in one of the temporary vertical profile wells, off site. Data from these wells are primarily used to evaluate screening level data.

During the summer and fall of 1998, eleven new permanent monitoring wells and several vertical profile borings were installed at the site boundary and in off-site locations. Groundwater samples were collected during May to October 1998 from a total of 25 permanent monitoring wells. The furthest downgradient contamination was found in permanent monitoring well 000-209 at 2.6 µg/L EDB. The highest EDB contamination was found to be 6.0 µg/L in well 000-173. The contamination was bounded by concentration values below the drinking water standard, or not detected in permanent outpost wells to the west, south and east. In the north, the data supported the conclusion that the Biology Fields are no longer a continuing source of EDB and that minimal concentrations remain on the BNL property.

EDB was detected at concentrations less than the drinking water standard in the permanent well installed east of Weeks Avenue (000-180). EDB contamination at well 000-180 is considered a localized area, possibly coming from farms located upgradient of the well.

In February 1999, a Long-term Monitoring Work Plan was prepared to describe the field data collected from 5/98 to 10/98, and to provide the results of updated groundwater modeling projections performed with the new field information. Modifications to the existing groundwater monitoring program were also proposed.

In August and September 1999, two additional vertical profile borings and three additional permanent monitoring wells were installed in downgradient locations. The data from the vertical profile borings and the permanent wells are included in the July-September 1999 Quarterly Report.

In addition to the groundwater monitoring wells described in the 1999 Long-term Monitoring Work Plan, the Suffolk County Department of Health Services (SCDHS) maintains and monitors two wells located on Dayton Avenue located near the Suffolk County Water Authority (SCWA) Country Club Drive potable supply wells. These supply wells are located approximately 8,000 feet southeast of the EDB plume. The SCWA regularly monitors the quality of the potable supply wells for volatile organic compounds and radionuclides to ensure its safety.

A decreasing EDB concentration trend was observed in all wells with previous detections of EDB. The highest level detected was in well 000-175, which decreased from 4.15 µg/L in the September 1999 sampling round to 3.60 µg/L in

the November 1999 sampling round. EDB was detected in recently installed well 000-283 with a concentration of 1.00 µg/L. EDB was not detected in the two additional new wells 000-284 and 000-285.

Concentrations on-site and at the site boundary remained low, and the highest concentrations are located in a well-defined volume of contaminated groundwater just south of North Street. Wells with non-detected results continue to bound the plume, although data from well 000-283 indicate that the plume may have less of a southeasterly and more of a southerly flow direction than was previously estimated. Additional monitoring wells may be added south of this well in the future.

The furthest downgradient monitoring wells 800-24, 800-25 and 800-54 continue to have non-detected results. Wells 000-180 and 000-285 located east of Weeks Avenue are below the drinking water standard of 0.05 µg/L with non-detected EDB concentrations.

In addition to the monitoring well data, approximately 125 residential wells in the hookup area and outside the hookup area along south Weeks Avenue were sampled by the SCDHS in October 1996. This sampling detected no EDB or other organic compound (including pesticides) in any of the wells. This information was reviewed to help verify the extent of the contaminants and the resulting proposed hookup area.

The remedy for EDB contaminated groundwater in OU VI includes implementation of a groundwater monitoring program to monitor and verify the cleanup of EDB with time.

13b. How are samples analyzed and by whom?

Groundwater samples from the OU VI monitoring wells are analyzed using standard EPA methods by outside commercial laboratories that are certified by NYSDOH to perform the work. All residential well samples were collected by the SCDHS and analyzed for nonradiological parameters at their laboratory in Hauppauge. All tritium samples from the residential wells were analyzed by the BNL laboratory, and approximately 10 percent were split samples that were also analyzed independently by NYSDOH to verify the results. All strontium-90 samples were analyzed by outside commercial laboratories that are certified by the NYSDOH. All gross alpha, gross beta, and gamma analyses were performed by BNL.

Since the FFS (1996), 15 temporary and 14 permanent monitoring wells have been installed to address data gaps. This has resulted in the definition of the leading edge of the EDB plume. Presently, 28 monitoring wells are sampled four times per year.

14. Use Of EDB

14a. Even though EDB was banned in 1984 for most uses, it is still in use today for limited purposes. Residents wondered how can they be assured that future uses of EDB or other pesticides and chemicals don't contaminate their groundwater.

EDB uses that are still approved include use as a leaded gasoline additive, in the manufacture of dyes and waxes, and to control moths in beehives. None of these uses are practiced today at BNL. Other chemicals in use at BNL today are controlled by strict inventory systems and application restrictions which did not exist years ago. Brookhaven National Laboratory follows all federal, state, and local requirements regarding the usage of hazardous chemicals. Brookhaven National Laboratory is also very concerned about being a good neighbor to the surrounding communities and will continue to monitor our operations and perform corrective actions if there should be an accidental spill.

IV. COMMUNITY RELATIONS ACTIVITIES

Below is a chronological summary of OU VI-focused community participation activities conducted by BNL and DOE.

1996

July 27	OU I/VI Remedial Investigation/Risk Assessment (RI/RA) Report was entered into BNL's Administrative Record. A public notice announcing the availability of this report and the public comment period was published in *Suffolk Life* on 7/24/96 and *Newsday* on 7/25/96.
July 29 - September 30	Public comment period for OU I/VI RI/RA Report. This time frame reflects a 30-day extension requested by the Environmental Advocates of Long Island.
August 1	Met with Suffolk County Executive Assistant George Proios for an OU VI briefing.
August 5	Sent an information letter to the OER mailing list regarding the availability of the OU I/VI RI/RA Report, and included a summary sheet, "Remedial

	Investigation and Risk Assessment of the Southeast Area of the Laboratory," and a copy of the OU I/VI RI/RA public notice.
August 8	Met with Town of Brookhaven Councilwoman Pat Strebel for an OU VI briefing.
August 12	Met with NYSDEC Region I representatives Ray Cowen, Bob Becherer, and Josh Epstein, and S.C. Legislator Towle's aid, for an OU VI briefing. Mailed a pre-canvas letter and an "EDB In Groundwater" summary sheet to the Weeks Avenue community.
August 14	Began canvassing Weeks Avenue area. Met with aides from Congressman Forbes' office and former Senator D'Amato's office, and S.C. Legislator George Guildi for an OU VI briefing.
August 27	Suffolk County Water Authority representatives distributed hookup information, SCWA applications, and a letter from Carson Nealy, DOE Brookhaven Group Manager, to residents in the proposed hookup area.
August 29	Met with Assemblyman Fred Thiele for an OU VI briefing.
August 30	Met with Town of Brookhaven representatives Bob Reutzel, Paulette Brinka, Kevin Molloy, and Dennis Lynch for an OU VI briefing.
September 3	Met with Assemblywoman Pat Acampora for an OU VI briefing.
September 9	The BNL OER made an OU VI presentation to the Community Work Group.
September 16	An information sheet was sent to the BNL OER mailing list regarding the public comment period for OU I/VI RI/RA Report and the two upcoming poster sessions, and enclosed a community fact sheet on EDB by the federal ATSDR.
September 25	A public notice of availability regarding OU VI Action Memorandum for public water hookups appeared in *Suffolk Life* and *Newsday*. A letter was sent to the BNL OER mailing list regarding the availability of the Action Memorandum and included a copy of the public notice. The first of two OU VI and public water hookups poster sessions was held at the Manorville Fire House, Manorville.

September 30	An announcement for the second OU VI and public water hookups poster session was hand-delivered to approximately 150 homes on Dayton and Woodland avenues and Moriches-Middle Island Road.
October 2	BNL OER and DOE-Brookhaven Group staff met with a small group of Weeks Avenue residents to discuss concerns and answer questions.
October 3 - December 6	Public comment period for OU VI FFS and PRAP announced by a public notice in *Newsday* on October 3, 1996 and in *Suffolk Life* on October 16, 1996. A letter was sent to the OER mailing list regarding the availability of OU VI FFS and PRAP and the November 13, 1996 public meeting, and included a copy of a DOE press release ("U.S. DOE Seeks Public Comment on Groundwater Contamination In Manorville") and the aforementioned public notice.
October 3	Made presentation regarding OU VI to the Manorville Taxpayers' Association.
October 4	Met with an aide from State Senator LaValle's office for an OU VI briefing. Sent a letter to the BNL OER mailing list announcing the OU VI November public meeting and the availability of OU VI FFS and PRAP, and enclosed a copy of the public notice for the OU VI FFS & PRAP, and DOE press release ("U.S. Department of Energy Seeks Public Comment On Contamination In Manorville").
October 5	Held the second OU VI and public water hookups poster session at the Manorville Fire House.
November 7	An announcement of the OU VI November 13th public meeting was sent to the BNL OER mailing list.
November 13	Held the third poster session at the Dayton Avenue School prior to the 7 p.m. public meeting, which was also at the school. Presented at the public meeting an OU VI-EDB video produced by the BNL OER.

A number of news stories and press releases also addressed the Operable Unit VI project, and are listed below.

"Autumn public meeting anticipated at Lab," Summer 1996 *cleanupdate*.

"U.S. DOE Reports Results of Groundwater Tests," DOE press release, August 20, 1996.

"Input Wanted" and "BNL Hearing," *Suffolk Life*, August 21, 1996.

"DOE Announces Free Public Water Hookups," DOE press release, August 23, 1996.

"Contamination In Manorville," *Newsday*, August 23, 1996.

"Pesticide Found In Wellwater," *Riverhead News Review*, August 27, 1996.

"Manorville Water Contaminated, Admits DOE," *South Shore Press*, August 27, 1996.

"Toxins Spur 100 Water Hookups," *Newsday*, September 4, 1996.

"U.S. Department of Energy Seeks Public Comment On Groundwater Contamination In Manorville," DOE press release, October 4, 1996.

"Discussing EDB In Manorville," BNL's weekly *Bulletin*, November 8, 1996.

"Lab Rejects More Water Hookups," *Newsday*, November 19, 1996.

"Community concerns voiced at Manorville public meeting," Winter 1996-97 *cleanupdate*.

The following events occurred during the 1996 public comment period:

- Two petitions were received from local residents.
- A letter from Town of Brookhaven Supervisor Grucci to former Senator D'Amato was read and submitted at the November public meeting.
- A letter from a resident on Weeks Avenue was submitted at the November public meeting and contained 56 concerns and questions regarding OU VI.
- A letter was sent to Dr. Carson Nealy, DOE Brookhaven Group Manager, from Mr. John Pavacic of the Town of Brookhaven's Waste Management and Mr. David Tonjes of the NYS University at Stony Brook's Waste Reduction and Management Institute containing lengthy comments and concerns regarding OU VI and the proposed remedial action.
- Five letters were received from community residents.
- Three comment/question sheets were received from the November public meeting.
- One letter was sent to Ms. Angela Harvey of the DOE Brookhaven Group from Assemblyman Fred Thiele.

1997-98

Public water hookups were provided to approximately 1,500 homes south of the Laboratory, including several hundred homes that were originally proposed for hookups in the OU VI PRAP. Progress on these hookups was reported in the *cleanupdate* newsletter as a regular feature titled "hookupdate." This feature appeared in the Spring 1997, July 1997, September 1997, November 1997, January 1998, May 1998, and August 1998 issues.

1999

DOE and BNL re-evaluated the proposed remedy for OU VI. This re-evaluation considered additional four years of groundwater monitoring data from a more extensive monitoring well network, as well as real-world knowledge from a treatment system already operational at Otis Air Force Base in Massachusetts. The conclusion was that active treatment by carbon filters would best meet cleanup objectives.

2000

July 13	The Community Advisory Council was briefed on the OU VI project by the Assistant Laboratory Director for Environmental Management. Also, a notice of the upcoming August 8 information session was placed on the ERD web site.
July 19, 23	A public notice and display ad announcing the upcoming public comment period and information session on the OU VI cleanup proposal were published in *Suffolk Life* and *Newsday*, respectively.
July 21	A fact sheet PRAP on the new proposed cleanup remedy titled "Operable Unit VI Groundwater Cleanup" was mailed to approximately 2,550 homes on the ERD mailing list. This fact sheet included an announcement of the August 8 information session. The fact sheet was also placed on the ERD web site.
July 24 - August 24	A public comment period was held for the new proposed remedy.
August 8	An information session was held from 7:00-9:00 p.m. in the Manorville Fire House, attended by 18 members of the public. Two written comments were received at this session.

August 10 — A presentation on the OU VI project was provided to the Community Advisory Council.

September — An article titled "Cleanup plan for EDB in groundwater changed" was published in the *cleanupdate* newsletter, which is distributed to approximately 5,000 BNL employees and retirees, as well as over 2,500 homes on the ERD mailing list.

V. REFERENCES

Brookhaven National Laboratory, OER. 1996. OU VI Proposed Remedial Action Plan.

Brookhaven National Laboratory, ERD. 2000a. Operable Unit VI Contingency Remedy Evaluation.

Brookhaven National Laboratory, ERD. 2000b. Operable Unit VI Groundwater Cleanup.

CDM Federal Programs Corporation. 1996a. Remedial Investigation/Risk Assessment Report, Brookhaven National Laboratory, Operable Unit I/VI.

CDM Federal Programs Corporation. 1996b. Final Focused Feasibility Study, Operable Unit VI, Brookhaven National Laboratory.

Appendix I

Comment Letters

Town of
Brookhaven
Long Island

Felix J. Grucci, Jr., Supervisor

Sent via fax on this date. 11/7/96
November 6, 1996

Hon. Alfonse D'Amato
United States Senate
520 Hart Senate Office Building
Washington, D.C. 20510

RE: EDB Groundwater Contamination from Brookhaven National Laboratory

Dear Senator D'Amato:

Once again I am compelled to write to you on behalf of our mutual constituents who face degradation of their drinking water.

I am unhappy to inform you that the source of the problem appears to be the Brookhaven National Laboratory. I have assigned staff to monitor the ongoing clean-up developments underway at BNL and a copy of the most recent staff report is enclosed for your review.

To the credit of federal officials at BNL, they have continued to disclose water contamination detected through their remediation programs. Furthermore, they have also developed a strategy to address private well contamination as identified by their monitoring efforts.

However, the contaminant now detected, a chemical known as ethylene dibromide (EDB) which was used as a pesticide at BNL, has been detected in groundwater over a broad area of the hamlet known as Manorville.

Officials at BNL indicate that their responsibility is limited only to specific sites within the community and that other instances of EDB contamination were not caused by their activities.

This presents obvious problems especially when homes with EDB contamination are addressed by federal actions while others several blocks away are left unattended. The average layman does not see the justice nor the logic of such decision making.

I have had my Commissioner of Housing and Community Development, Robert Reutzel review this area for the eligibility of Community Development Block Grant funding. Unfortunately the income data for this area greatly exceeds the federal requirement established by the U.S. Department of Housing and Urban Development. Subsequently, the Town is left without a solution to address the necessary construction of public water mains to

provide clean drinking water. I, therefore, am once again relying upon your good graces to assist the Town of Brookhaven in resolving this dilemma.

Attached is information recently submitted to the Town from the local civic association at our annual community development public hearing indicating the streets in need of public water and the estimated costs. Information regarding the health effects of EDB has also been attached.

On behalf of the many residents of the Town of Brookhaven who have benefitted through your efforts over the years, thank you. The residents of Manorville now are in need of your help, please review their case and do everything in your power to find a solution.

Sincerely,

Felix J. Grucci, Jr.
Supervisor

FJG:RR:kr

Town of
Brookhaven
New York

Felix J. Grucci, Jr., Supervisor

October 17, 1996

TO: Jesse Garcia, Chief of Staff

RE: Brookhaven Lab Meeting on October 3, 1996 at Manorville Firehouse

Dear Jesse:

On October 3, 1996 I and Dave Tonjes of Waste Management attended the October 3, 1996 meeting at the Manorville Firehouse sponsored by Brookhaven Lab in regard to Operable Unit VI remediation. The meeting was chaired by Mr. Zurich, Vice President of the Manorville Taxpayers Association and a presentation was given by John Carter, Bill Gunther and Mike Hauptmann of the Lab. The following is a synopsis of the meeting:

1) There are at least 4 groundwater plumes emanating from BNL. BNL indicates that groundwater moves due south in the area of the plume covered by their Operable Unit VI investigation. However, no test holes or test wells have been installed southward of what BNL describes as the current southward extent of the plume. Data appear to be lacking to define the southward edge of the plume, and to confirm assumptions regarding groundwater movement or subsurface geological structure (e.g. presence of clay lenses).

2) The plume is comprised of Ethylene Dibromide (EDB), used primarily as a pesticide at BNL in biology fields.

3) Alternative solutions were discussed including pumping and treating contaminated groundwater through air-stripping. This alternative was rejected due to the fact that the effectiveness of this method decreases below a certain concentration of EDB.

4) The proposed solution is to allow EDB to naturally degrade and dissipate below .05 ppb (the current regulatory standard) by the time it reaches Victoria Lane (in South Manor Estates) in 20 years. Public water will be extended to areas in the expected path of EDB concentrations greater than .05 ppb.

5) Water mains are currently being installed to affected areas and will be extended from South Street west to North Street and down Weeks Avenue to Victoria Lane. A portion of Woodland Avenue is also included.

6) Monitoring wells will be installed in the next 2 to 3 years downgradient of the plume in its expected path. Data from these wells will be used to ensure the concentration of EDB approaches zero as is predicted.

7) Another EDB plume is located between Weeks and Dayton Avenues at a depth of 120 feet. BNL states this plume is not due to activity at the Lab but is due to private agricultural use on farms in the area. The current concentration is .12 ppb. Concerned residents wanted to know who was taking responsibility for this plume and who would provide public water down Dayton Avenue which is in the path of this plume and is not slated to receive public water from the BNL water main extension program. A number of residents from the nearby Rosewood Gardens stated their developer didn't tell homeowners they had Temik-contaminated wells before they moved in and noted how they petitioned the Town and got Community Development Funds for water mains.

8) On 11/13/96 a formal hearing will be held at Dayton Avenue Middle School

It appears the Town may be receiving requests for water mains from certain residents in the Dayton Avenue area of Manorville which is being impacted by what BNL describes as a non-BNL EDB plume. The Town may wish to meet with Suffolk County Health and Suffolk County Water Authority to determine responsibilities and proposed corrective action.

Furthermore, based on the meeting, it appears that BNL has made certain assumptions regarding groundwater movement and the current and future extent and concentration of the EDB plume which may not be supported by existing data. Accordingly, it is recommended that the Town continue to review BNL's documents concerning this matter, provide appropriate comments and continue to monitor the situation. Please note that both myself and the Department of Waste Management have received copies of the pertinent BNL documents entitled "Operable Unit VI Focused Feasibility Study" and "Operable Unit VI Proposed Remedial Action Plan." I recommend that our Division and the Department of Waste Management collaborate on a joint review of these documents and provide joint comments as we have done on a number of other BNL and U S. Department of Energy documents in the past.

If you have any questions or need additional information, please feel free to contact me.

Sincerely,

John W. Pavacic
Assistant Director

JWP/jp

cc: Paulette Brinka, Citizen Advocate
Thomas W. Cramer, A.S.L.A., Commissioner
Jeffrey Kassner, Director, DEP
Dennis Lynch, Commissioner, Dept. of Waste Management
Robert Reutzel, Commissioner, Dept. of Housing, Community Development & Intergovernmental Affairs
Richard Friscia, Dept. of Public Safety
James Graham, Commissioner, Dept. of Engineering
John Girandola, Division Head, Planning Division
Dave Tonjes, Waste Management
Barbara Wiplush, Assistant Town Attorney, Department of Law

Submitted by [illegible] at [illegible] CDBG Public Hearing of [illegible]

TO: MANORVILLE TAXPAYERS ASSOCIATION - Request for Water Main Extension Proposal for submission to Town Of Brookhaven

FROM: Jean E. Mannhaupt, Member MTA
Co-Director Environmental Advocates of Long Island

Work Scope: SCWA mains & service through the South Manor area of Manorville two (2) to three (3) year implementation period commencing in 1997 with beginning funding from Town of Brookhaven Community Development Block Grants.

Cost Estimates & breakdown of proposal:

PRIORITY

Area Location & Definition	Footage	Cost of Main ~~[illegible]~~	# of homes	Service cost for hook up	Dollar Total per Area
Moriches Middle Island Rd. - from Dayton Ave. W. to Weeks Avenue	3,600	126,000	22	38,000	164,000
Weeks Ave. - from Moriches Middle Is. No. to tie in	3,921	137,000	26	45,000	182,000
Dayton Ave. - from South St. - So. to Moriches Middle Is. inclusive of Maria Ct. & John Street	10,640	372,400	74	127,650	500,050
Country Club Drive from Pump Station W. to Dayton Ave.	900	32,000	——	——	32,000
Woodland Rd. - from Moriches Middle Is. No. to house #202, including Pine Needle Dr.	3,465	121,275	34	58,650	179,925
Cumulative Totals:	22,526	788,675	156	269,300	1,057,975

Note: All costs are estimated based on SCWA figures and estimates. The SCWA has been apprised of this proposal.

Dr. Carson Nealy
U.S. Department of Energy - Brookhaven Group

Dear Sir:

We, the undersigned residents who live on Dayton Avenue in Manorville hereby petition you as follows:

(1) To include Dayton Avenue in the remedial action plan currently being undertaken by the U.S. Department of Energy.

(2) To provide public water hookups at no cost to all residents on Dayton Avenue.

(3) To take this action as a precautionary measure to prevent future exposure to ethylene dibromide (EDB) contaminated groundwater and its possible health effects on the residents of Dayton Avenue.

We urgently request that this matter be given your immediate attention.

Date	Name	Address
10/19/96	Louis Melli	35 DAYTON AVE. MANORVILLE
10/19/96	Laura Melli	35 Dayton Ave. Manorville
10/26/96	Margaret M. Prestia	331 Dayton Ave., Manorville
10/26/96	Vincent Prestia	331 Dayton ave manorville
10/27/96	Adolf W. Schellinger	62 Dayton ave Manorville
11/1/96	Henry F. Rose	277 - Dayton Av - Manorville
11/1/96	Marie Macomelly	315 Dayton Ave Manorville
11/1/96	William J Kelly	274 DAYTON AVE MANORVILLE
11/1/96	Willa Donald	132 DAYTON AVE MANORVILLE
11/1/96	Lorraine Kugust	145 Dayton Ave Manorville
11/1/96	Debra Kugust	148 A. Dayton Ave Manorville
11/2/96	Michael Spencer	325 DAYTON AVE Manorville
11/2/96	James Hayes	224 - Dayton Ave manorville
11/2/96	Margaret Stroup	318 - DAYTON AVE, Manorville
11/2/96	Erma Strong	316 - Dayton Ave Manorville
11/2/96	Kathy Rogers	320 Dayton Avenue, Manorville
11/2/96	[illegible]	312 [illegible] Ave Manorville

Date	Name	Address
11/2/96	DAmelio	319 Dayton AVE MANORVILLE NY 11949
11/2/96	A. Caracciolo	302 DAYTON AVE
11/2/96	Barbara Barry	108 DAYTON AVE 11949
11/2/96		286 Dayton Ave 11949
11/2/96		269 Dayton AVE 11949
11/9/96		83 Dayton Ave
11/2/96		103 Dayton Ave 11949
11/2/96		104 DAYTON AVE 11949
11/2/96	Agnes & Steve Pecoraro	104 Dayton Ave 11949
11/2/96	Irene McAnulty	105 Dayton Ave 11949
11/2/96	Marie Gunn	112 DAYTON Ave 11949
11/2/96	James Juliano	129A Dayton Ave 11949
11/2/96		129A Dayton Ave 11949
11/2/96	John DeLucia	296 DAYTON Ave 11949
11/2/96	Richard Stein	292 DAYTON AVE (1949)
11/2/96	Carolyn Stein	292 Dayton Ave. 11949
11-2-96	Stacie Mogel	127 Dayton Ave 11949
11/2/96	Elsie H. Brown	80 Dayton Ave Manville 11949
11/3/96	Ernie Campbell	121 CHESTNUT ST. MT. SINAI 1176
11/3/96	Denise Serves	OWN 11 ACRES ON DAYTON AVE. 43 Dayton Ave manville #473-1394
11/3/96	William T. Serves	45 Dayton Ave manville
11/3/96	William T. Serves	47 Dayton Ave manville 8186114
11/3/96	William Serves	49 Dayton Ave Manville
11/3/96		126-B DAYTON AVE.

Date	Name	Address
Nov 3, 1996	Denice Smith & Brad M. Smith	180 Dayton Ave Manorville, NY
Nov 3 1996	Richard Schmitt	215 Dayton Ave
Nov 3 1996	[illegible]	Manorville 221 Dayton Ave Manorville, N.Y 11949
Nov. 3, 1996	Theresia L. Hambsch	231 Dayton Ave. Manorville, N.Y. 11949
Nov. 3, 1996	Charles Hambsch	231 Dayton Ave Manorville N.Y.
Nov 3rd 1996	Fred Bryan	268 Dayton AVE Manorville NY 11949
Nov 3rd	[illegible] Gustav Mommueller	273
Nov 3, 1996	Frances Reising	285 Dayton Ave Manorville N.Y.
Nov 3, 1996	Thomas Reising	285 Dayton Ave Manorville N.Y.
Nov 3, 1996	Thomas Reising Jr	285 Dayton Ave Manorville NY
Nov 3, 1996	Robert [illegible]	300 Dayton Ave Manorville NY.
11-3-96	James J. Snyder	317 Dayton Ave Manorville NY.
11-3-96	Debbie [illegible]	343 Dayton Ave Manorville N
11/3/96	James H. Pautzel	48 Dayton Ave Manorville
11/3/96	Michael M[illegible]	170 Dayton Ave Manorville
11/4/96	[illegible] E. Romeo	393 Dayton Ave Manorville N
[illegible]	[illegible]	333 Dayton Ave Manorville NY

Date	Name	Address
11/5/96	[signature]	120 DAYTON AV. MANORVILLE
11/5/96	[signature]	172 DAYTON Ave Manorville
11.5.96	Vito [signature]	301 Dayton ave. manorville
11/7/96	Lysia Cadiz	246 Dayton Ave Manorville

11/13/96

This form is provided for your convenience in submitting written comments to the DOE concerning the Operable Unit VI Proposed Remedial Action Plan.

Name: HELEN GRUBE

Address: 417 WEEKS AVE.

City: MANORVILLE State: NY Zip: 11949

Comments:

1. How much money has been allotted to BNL for the Superfund?
2. How much did Phase II of the North Shirley area cost?
3. Was there a concern for the quality of water in the Phase II area?
4. If so, what was the concern?
5. How many private wells were tested in the Phase II area ?
6 What was the cost of this testing?

7. Ref. BNL EDB in Groundwater Operable Unit VI
EDB was used by BNL during 60s & 70s ...How many applications were made?

Pg.3 of Proposed Remedial Action Plan ...Desc. of uses of EDB:
"In the 1970's and 1980's EDB was used in soil as an insecticide/pesticide"..."it was also used to fumigate soils"...its use was ceased in 1984 for these applications"

8. What was the concentration of each application?
9. What other pesticides or contaminants were used in OU VI?
10. Have these other pecticides or contaminants been tested for?
11. Ref.Pg. 2-1 FFS Sept.96
AOC 8 (Area of Concern)
Upland Recharge/Meadow Marsh - Experiments with sewage
Biology Fields use of EDB: 4 Army fields, 2 biology fields and a nursery
Gamma Fields - effects of gamma radiation, acid, etc on crops
It is also reported that fumigants were used in this area.
How much of these contaminants have leaked into the soil/water?
12. Pg. 2-2 AOC 28 - EDB Plume
FACT: BNL & CDM indicate that groundwater flow of the plume is south/southeast.
13. Pg. 2-2 -- 2.2.1 General
FACT: '73-'78 BNL conducted experiments using untreated sewage in the Meadow Marsh area. (amt. of discharge varied from .46 to 1.1 million gals. per month. Numerous contaminants and elements were released into the soil as a result. That is a 5 year period!
FACT: EDB was applied to the Biology Fields 60s and 70s ...how much is unknown!
14. Pg. 2-8
Please explain the 1st. paragraph re: groundwater flow?

15. Pg. 2-10 1st Para.
FACT: AOC 28 EDB Plume -- "future residential ingestion carcinogenic risks were at the upper bound of EPA's target risk range, due to the concentrations of EDB"

16. Pg.2-13
FACT: "EDB contamination is approaching the base of the Upper Glacial aquifer as it moves offsite." ...Fig. 2-13, 2-14 and 2-15 show cross-section of EDB contamination...result..."depiction represents a composite time slice, which cannot accurately portray the present extent of EDB contam. and migration."

17. Pg. 2-14 1st Para.
After testing verticle profile well #HP 000-14 on North St.
FACT: EDB was present in the Upper Glacier Acquifer.

18. Pg. 2-17 2.6 Proposed Additional Data Collection
Major uncertainties re: EDB contamination OU VI:
(listing of six)...including:
Downgradient extent of BNL contaminants?
Whether EDB will enter the Magothy aquifer?
Migration rates of EDB offsite?
Whether EDB has the potential to be influenced and intercepted by the Country Club Drive public water supply wells?

Please explain all six of these concerns in detail.

Pg. 2-18 **FACT: "the plume's rate of travel offsite is not accurately known...**
19. Explain the term "Unidentified Unit"?
20. Explain "identifying statrigraphic features" ...and there impact on the migration of EDB?

Para. 2 ...Alt. 3 involves hooking offsite residents to public water. This "would require a less extensive data collection and monitoring program, since the risk of exposure to contaminated ground water would be eliminated."

21. How many vertical profile wells and permanent monitoring wells need to be installed?

22. What is the cost of installation?
23. What is the cost of monitoring?
24. What is the duration of this monitoring?

Pg. 2-20 2.7.1.3 Summary OU VI Baseline Chemical Risk Assessment

Carcinogenic Risk: "For OU VI groundwater, future residential ingestion carcinogenic risks were 4.3 x 10-4, which is at the upper bound of EPA's target risk range. EDB contributed 3.5 x 10-4 of the risk.

25. Please explain the above statement.

Offsite Risk: "A quantitative risk assessment has not be performed for offsite groundwater because most of the available offsite data is of screening level quality. However, reported offsite concentrations of EDB are approximately twice as high as onsite concentrations..."

26. Please explain "screening level quality"?

Pg. 2-22 2.9 Basis for Conducting the FFS
"...the only chemical in OU VI media presenting a significant human health risk is EDB in groundwater." ...."The EDB plume is not precisely defined." "The estimated length of the plume, based on observed data and modeling, assuming continuous groundwater contamination rather than a slug or multiple slugs, is approximately 8,000 feet. ...max. width 1,500 ft. ...height of contaminated water column is 80 ft.

27. Please explain the size of the plume? 8,000 ft. is approx. 1 and 1/2 miles.

Memo dated 7/31/97 from M.Hauptmann re: Useage of EDB
Volumn applied ...unknown
# of appplication ...unknown
FACT: No recorded information

Para. 2

28. Explain the statement "...because of its low retardation coefficient very little attenuation would be expected."

Pg. 3-1 Remedial Action Objectives
1. Protect public health and the sole source aquifer.

Pg.4-10 Alt. 2 Natural Attenuation with Addl. Monitoring

"Attenuate" in bacteriology term -- "to make less deadly"

"Additional groundwater characterization on and off site will be performed."

29. Explain "characterizations" ?

"Onsite institutional controls will be implemented to prevent onsite use of contaminated groundwater."

30. What about use of contaminated groundwater offsite ?
Irrigation wells???

Pg. 5-1 Detailed Analysis of Alternatives

The four alternatives are evaluated based on the following nine evaluation criteria: (as specified in EPA RI/FS Guidance 1988)

a) Overall Protection of Human Health & Environment
31. Will the site be cleaned up to within risk range?

b) Compliance with ARARs re: environmental status
31. What are these requirements?

c) Long-Term Effectiveness & Permanence
32. Does the remedy maintain reliable protection of human health and the environment once the cleanup goals have been met?

33. Is this referring to the 20 year time period?

d) Reduction in toxicity, mobility or volumn through treatment
34. Explain how this will affect EDB contamination?

e) Short term Effectiveness
The period of time needed to achieve protection and any adverse impact on human health & environment that may be posed during construction and implementation period until cleanup goals are achieved.

35. How long of a period of time? ...20 yrs.

f) Implementability -- The feasibility of a remedy

36. Is it feasible to monitor EDB for 20 yrs. at an approx. cost in excess of $267,000 (Table 5-3 under Alt.3) (Monitoring, O & M, Data Review & Report Prep.) or hookup all developed properties along Weeks Ave. for approx. $250,000 with less monitoring and thereby eliminating the human health risk?????????

g) Cost -- as stated above.

h) State Acceptance -- refers to EPA and NYS acceptance

i) Community Acceptance -- refers to public response and acceptance
37. Does the public accept the findings?? ...No..not under the proposed remedy to date.

Pg. 5-2 -- The accuracy of typical feasibility study cost estimates:

"In this case, there is an additional cost uncertainty because the extent of EDB contamination in groundwater is not well known, especially offsite."

5.3 Description & Analysis of Remedial Action Alter.

5.3.1 Basis of Design Common to all Alter.

3) Evaluating natural attenuation scenarios for the alternatives. "the model was used to provide preliminary conservative estimates of changing EDB concentrations with time, without decay of EDB in the aquifer. These simulations were performed to provide insight into the migration of EDB away from OU VI and are not intended to represent final conclusions, as all simulations are subject to limiting assumptions. Results should therefore be used to guide the selection of remedial alternatives.

Assumption: "a taking upon oneself, taking for granted"

Simulation: "pretense"

Guide: "to point the way"

4) "South of BNL site, the existing groundwater model compares well with the limited data and information from regional groundwater studies. However, because of limited data south and southeast of OU VI, more uncertainty concerning stratigraphy and local flow directions exists. Therefore the accuracy of simulations of offsite EDB migration downgradient from OUVI is limited by the existing data base and the assumptions modeled. Better definition of offsite stratigraphy and water levels downgradient of OU VI would improve the confidence in model estimates of migration rates and concentrations."

FACT: Once again the "unknown" continues.

5) "Natural attenuation simulations do not account for irrigation well pumping in agricultural fields southeast of OU VI.

8) "Under Alter. 3, limited additional monitoring wells and vertical profile wells would be installed and monitored. The objectives of this additional monitoring would be to monitor the migration of EDB and verify that natural attenuation of EDB continues in the groundwater."

38. "limited addl. monitoring well and vertical profile wells" ... How many? ...is this more or less than the "revised FFS" since the same statement appears in both reports????

Pg. 5-12 Preliminary Design Assumptions

Per Figure 5-3: (1st Final FFS)

"To be conservative for costing purposes, it is assumed all homes on Weeks Ave. will be hooked up to public water."
"Approx. 10,000 ft. of force main along Weeks Ave. to provide service to a minimum of 74 identified developed properties. In addition, approx. 3,100 ft. to be installed along North St. and Weeks Ave. north of LIE minimum of 10 developed properties."

"It is assumed that 4 onsite & 7 offsite wells would be monitored to track the attenuation and migration of EDB contamination. Since the risks to public health are eliminated by providing a public water supply, no monitoring of private wells is proposed for this alterative."

(2nd Final FFS)

"To be conservative for costing purposes, it is assumed that all potentially impacted homes on Weeks Ave. will be hooked up to public water" (referring to Victoria Lane)

39. Based on the above two scenarios...why is the cost of hookup the same whether it is the entire length of Weeks Ave. or half the length of Weeks Ave.?

40. "no monitoring of private wells is proposed for this alternative" ????? Why not ? Are we to "assume" that there is no health risk to the remaining developed properties on Weeks Ave. ??

41. Regarding the new onsite and offsite monitoring wells:

Since there is no monitoring of private wells...we then rely on data collected from BNL monitoring wells.

"monitoring would occur semi-annually for the first 5 yrs., annually for the next 5 years, and biannually thereafter. A report would be prepared every 5 yrs. to evaluate any changes in groundwater conditions."

5 yrs. is a long time to ingest EDB.

Pg. 5-13

"Samples would be analyzed for EPA's TCL of VOCs, EDB, and tritium."

42. Explain each of these.

43. Tritium keeps coming up? WHY? What is the whole story behind Tritium?

44. 5.3.4.4. Compliance with ARARs

"groundwater modeling indicated that natural attenuation will reduce contaminant level to ARARs within approx. 20 yrs. in the Upper Glacial aquifer"

According to a 1980 report (Pg. 2-9 2.4.3. Water Supply Pumping) the town of Brookhaven pumped 78% of its water from the Upper Glacial aquifer...How does this affect EDB?

5.3.4.5. Long Term Effectiveness

"Adequacy of Controls: all residents will be offered public water and force mains will be provided for undeveloped properties along North Street and Weeks Avenue to prevent human consumption of potentially contaminated groundwater."

45. What about the developed properties along the remaining approx. 1/2 mile of Weeks Ave?

46. Isn't this discrimination? You repeatedly use the words "assume, simulation, guide, potential, unknown, undetermined, etc." This contaminant is also a human health risk to us!

Pg. 5-14 5.3.4.7 Short Term Effectiveness
"The workers performing the installation of new monitoring wells, vertical profile wells, and the periodic groundwater sampling would have health and safety training, and would use appropriate health and safety protocols to minimize any unacceptable exposure to contaminants by inhalation, direct contact or ingestion."

47. I assume (as you assume) that this is a liability...again what about the developed properties along the remaining approx. 1/2 mile of Weeks Ave.? There are monitoring and vertical wells along this portion...quite obviously you feel it is a health risk!!

"Potential risks associated with future use of the Upper Glacial aquifer are eliminated with this alternative by the required connection to public water supply in areas with force mains, and the hookup of all potentially impacted developed properties to public water."

Since we are not slated to receive public water hookup, then I guess we are a potential risk....you stated that the workers will be required to be trained in health & safety training etc.

Pg. 5-15 Cost

(1st Final FFS) $1,500,100 (to Moriches-Mid Island Rd.)
(2nd Final FFS) $1,500,100 (to Victoria Lane)

48. Explain this cost? ....exactly the same in both reports?

5.3.4.10 State Acceptance

"Comments received from the State after their review of the draft focused feasibility study report indicate that the State concurs with this remedial alternative."

49. Which one the 1st or 2nd ...this statement appears in both reports??

50. If the 2nd report --- perhaps it should be reviewed to see where the $ are going???

51. I assume the alternative proposed is initially made by the DOE?

52. DOE means federal monies...our monies...this should be reviewed...I want to know how this $1,500,100 is being spent--penny by penny?

Pg. 5-25 5.4.6 Implementability (comparing all Alter.)

"Alternative 3 also involves basic construction practices and is easily implemented, assuming the force mains in the Weeks Avenue area have sufficient capacity to support the additional flow required to connect all homes on Weeks Avenue to public wate supply."

PROPOSED REMEDIAL ACTION PLAN

Pg. 5
Human Health Risk -- "For the EDB goundwater plume, future residential (adult and child) ingestion carcinogenic risks were above EPA's target risk range for developing cancer."

"A quantitative risk assessment has not been performed for offsite groundwater because most of the available offsite data were obtained only to determine the existence of EDB, not the precise concentration. Offsite concentrations of EDB are approximately twice as high as on site concentrations...Since there is a linear relationship between dose and risk, the off site risks for 30 yrs. of residential exposure to groundwater would be about twice as high as the on site carcinogenic risk. (offsite screening level data from 1993 and 1995)

Pg.8 Overall Protection of Human Health & Environ.

"Alter.3 eliminates the potential risk of human exposure to offsite contamination by preventing human consumption of ground water."

Long Term Effectiveness -- "Only Alter.3 provides long term elimination of potential public health risks by providing an alternate water supply."

Pg. 10 Preferred Alter.

"The public water hookups began in the fall of 1996 in response to concerns expressed by elected officials and concerned residents."

53. Explain what a "concerned resident" is?

54. Explain "concerns expressed by elected officials" ?

"Permanent monitoring wells will be installed to ensure that natural attenuation is taking place in the aquifer and that EDB migration remains west of Weeks Avenue as predicted."

55. If this is so...why are you hooking up Woodland Ave.?

56. Explain the concern re: contaminated sediments?

SUMMARY

Based on my review of the Final FFS (the second edition), I feel there are many unknowns. Much of your study is based upon assumptions not only on-site (example: amount of EDB applied during the 60's and 70's (number of applications and the amounts).

Off-site unknowns:

Foremost, will there be natural attenuation of EDB?

Throughout this study you assume this is what will happen. There is no concrete evidence to support this statement. You are depending on 20 years of monitoring to determine if this is so.

In the mean time, the cost for this monitoring is in excess of $267,000. The funds are available now to continue the public water hookup for the remaining approximately 1/2 mile of Weeks Avenue where it intersects with Moriches-Middle Island Road.

You state in the study that "the natural attenuation model was use to provide *preliminary conservative estimates* of changing EDB concentrations with time, without decay of EDB in the aquifer. These simulations were performed to provide *insight* into the migration of EDB away from OU VI and *are not intended to represent final conclusions, as all simulations are subject to limiting assumptions."*

FACT: Both FFS 1 and FFS 2 allows for approximately 10,000 feet of pipe along Weeks Avenue for a cost of $1,500,100. This is the same amount of money you have allotted for only 1/2 of Weeks Avenue??

Unknowns:

Effect of irrigation?
Country Club Dr. (SCWA volumn from the Glacier Aquifer)?
Migration rates of EDB offsite?
The plume's rate of travel?
Availability of offsite data?
Extent of EDB contamination?
Stratigraphy and local flow directions offsite?
Precise concentration of EDB offsite?

FACT:

Carcinogen "future residential ingestion carcinogenic risks were above EPA's target risk range for developing cancer."

A human health risk

Areas of concern lie south, southeast of the EDB plume...Weeks Avenue properites.

It took you two years to inform the public of this problem, how long do we have to ingest contaminated water before you advise us?

I have spoken with a realtor...this has a definite bearing on my real estate value.

FACT: You make a statement in your report referring to public water hookup..."to prevent human consumption of potentially contaminated groundwater" ...I believe this statement alone is sufficient reason to continue the public water hookup to the remainder of Weeks Avenue as originally planned. With the many unknowns, I think the other residents of Weeks Avenue deserve peace of mind and public water hookup. You created this problem, you should accept responsibility...the remainder of Weeks Avenue lies south, southeast of the plume...don't put a price on our lives...hook us up to public water.

I "ASSUME" YOU DO HAVE A CONSCIENCE.

I look forward to your reply.

Helen Grube
417 Weeks Avenue
Manorville, N.Y. 11949

The U. S. Department of Energy and Brookhaven National Laboratory's
Operable Unit VI Public Meeting
Dayton Avenue School, Manorville, NY
November 13, 1996

Question/Comments: (1) I live on Weeks Ave a known contamination site from BNL unfortunately I'm not receiving water hookup. They justified not hooking up because they said it take 20 years to reach you low with attenuation. What happens then? We are in the direct south east flow of the plume! It would be more cost effective to put the water hook up in the monitoring and legal fees.

We live 2/10 ths of a mile from the cut off on Weeks yet live due south of the plume - You're putting in water in a south - east direction - Why have you ignored the homes due south (+ I'm not a believer in the model)).

Name: BRIAN HEIM + BARBARA HEIM

Address: 304 WEEKS AVE

Town: MANORVILLE **State/Zip Code:** NY

Phone Number: 874-8745 **Affiliation:** Resident

The U. S. Department of Energy and Brookhaven National Laboratory's
Operable Unit VI Public Meeting
Dayton Avenue School, Manorville, NY
November 13, 1996

Question/Comments:

Our street - Pine Needle Dr does not appear on your map. Pine Needle Dr. is approx 1/4 mile down Woodland Ave - off Moriches-Middle Island Rd. Is this area to be included in public water hookups? In the meantime, will my well be tested without cost to me? I am quite concerned.

It seems like a lack of "short term & cost effectiveness" may cause a bypassing of our area because of the dirt road portion of Woodland North of our street. Is our health to be threatened by economics? We pay the same taxes.....

Name: Jolaine Watson & Doc Watson

Address: 10 Pine Needle Dr

Town: Manorville State/Zip Code: NY 11949

Phone Number: 8784748 Affiliation: Concerned ~~Env~~ Citizen

DOE's Cleanup Proposal for BNL's Operable Unit VI
(EDB in Groundwater)
Questions/Comments:

I am in favor of the proposed groundwater clean-up

Name Jeanne Mangan Phone

Address 343 Weeks Ave, Manorville NY

For further information, please contact BNL's Community Relations representative:
Ken White (631) 344-4423

Would you like to be included on our mailing list? Yes ☐ No ☐ Already on it ☒