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FINAL OPERABLE UNIT III
EXPLANATION OF SIGNIFICANT DIFFERENCES
FOR
BUILDING 96 REMEDIATION

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FINAL OU III Explanation of Significant Differences For Building 96 Remediation

Brookhaven National Laboratory Site

Upton, New York

Introduction

The groundwater cleanup decisions at Brookhaven National Laboratory (BNL), located in Upton, Suffolk County, New York, are documented in the Operable Unit III (OU III) Record of Decision (ROD) approved by the U. S. Department of Energy (DOE) and the U. S. Environmental Protection Agency (EPA), with the concurrence of the New York State Department of Environmental Conservation (NYSDEC). BNL was placed on the National Priorities List in 1989 and the OU III ROD was approved in June, 2000 and placed in the Administrative Record.

Any significant changes to the ROD must be publicly noticed through an Explanation of Significant Differences (ESD). As required under Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and pursuant to 40 Code of Federal Regulations (CFR) Section 300.435 (c)(2)(i) (Fed.Reg. Vol. 55, No. 46 [March 8, 1990]), an ESD is required because a significant, but not fundamental change is proposed to the final remedy described in the OU III ROD for the BNL Site. This ESD has been prepared to describe the proposed changes to the Building 96 groundwater remedy to include excavation and off-site disposal of contaminated soils. This will optimize the remedy by reducing the number of years of active treatment and enable BNL to achieve the ROD cleanup goal for this groundwater plume (by meeting drinking water standards for volatile organic compounds by 2030).

The lead regulatory agency for this ESD is the DOE. In addition to the DOE, EPA, NYSDEC, the New York State Department of Health (NYSDOH), and the Suffolk County Department of Health Services (SCDHS) oversee the BNL Site clean up and have commented on this ESD. All regulatory agency comments have been incorporated in this document.

This ESD includes a brief summary of the remedy selected in the ROD, a description of the proposed change, and a description of why DOE and the regulators are proposing to make this change to the selected remedy.

This ESD was prepared according to EPA guidance (EPA, 1999). While 40 CFR Section 300.435(c)(2)(i) does not require a public comment period for an ESD, DOE performed the following actions informing the public as to this change, including presenting the change described in this ESD to the Community Advisory Council (CAC) and the Brookhaven Executive Roundtable (BER) for the BNL site on November 13, 2008 and January 28, 2009, respectively. The CAC and BER will continue to be informed of the status of this project in the fall of 2009. In addition, the approved ESD will be made

available to the public via the BNL website at *http://www.bnl.gov/ltra/reports.asp*. The ESD and other relevant documents such as the OU III Building 96 Recommendation for Source Area Remediation Report (DOE, 2009) will become part of the Administrative Record file for the BNL site. Further information on the site description and history can be found in the OU III Remedial Investigation Report (IT, 1999), the OU III Feasibility Study Report (IT, 1999), and the OU III ROD (DOE, 2000). A notice will be published in *Newsday* that briefly summarizes this ESD.

The Administrative Record for BNL is available for review at the following locations:

Brookhaven National Laboratory Research Library
Information Services Division
Building 477A
Upton, NY 11973
Phone: (631) 344-3483

U. S. EPA – Region II Administrative Records Room
290 Broadway, 18th floor
New York, NY 10007
Phone: (212) 637-4308

Stony Brook University
Melville Library
Special Collections and University Archives
Room E-2320
Stony Brook, NY 11794
Phone: (631) 632-7119

Remedy Selected in the OU III ROD

In 1989, the BNL site was included on EPA's National Priorities List because of soil and groundwater contamination that resulted from past operations. The DOE, EPA, and NYSDEC then entered into a Federal Facilities Agreement (FFA) that became effective in May 1992 that set the framework for the cleanup activities. The FFA is also referred to as an Interagency Agreement (IAG). The lead agency for remedial action at BNL is DOE. In addition, the SCDHS, while not a signatory to the FFA, has historically been and continues to be involved with cleanup work at BNL. To effectively manage remediation of the BNL site, 31 Areas of Concern (AOCs) were identified and divided into discrete groups called Operable Units (OUs). The BNL site is divided into six OUs. OU III was developed to address groundwater contamination in the central and southern portion of the site and in the areas beyond the BNL property line where groundwater contamination has migrated. The Building 96 area was designated as AOC 26B.

The 1999 Remedial Investigation and Feasibility Study for OU III identified groundwater contaminated with volatile organic compounds (VOCs) on BNL property and outside BNL property. The OU III ROD establishes the cleanup decisions for several groundwater contamination plumes at Brookhaven. The cleanup objectives included in the OU III ROD to address the VOC contamination are:

- Meet the drinking water standards in groundwater in the Upper Glacial aquifer for VOCs in 30 years or less, and
- Prevent or minimize further migration of VOCs in groundwater.

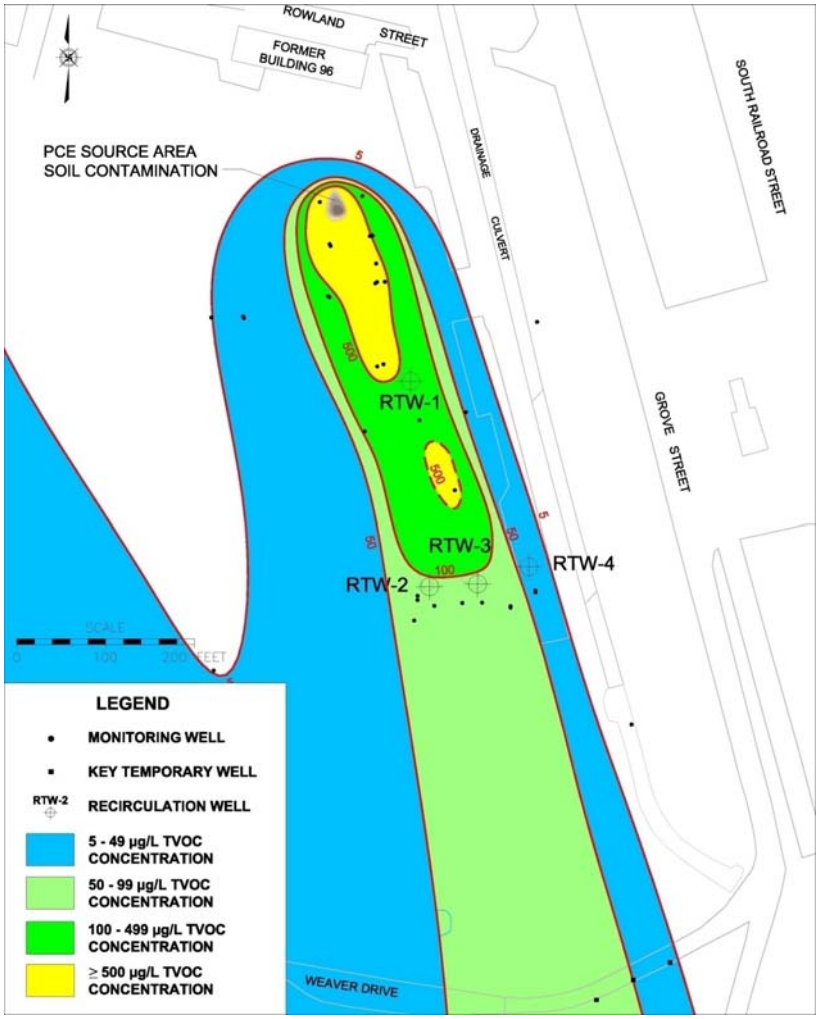
Active treatment using various treatment technologies and continued monitoring were selected to meet these cleanup objectives. The remedy for the OU III VOC plume near Building 96 called for a source removal system using recirculation wells with air stripping treatment. The primary contaminant in the groundwater at the Building 96 area is tetrachloroethylene or PCE.

To be consistent with the ROD, following regulator concurrence BNL designed and installed a system in 2001 consisting of four re-circulation wells with air-stripping treatment (Figure 1 shows the locations of the treatment wells). The treated water is recharged back into the Upper Glacial aquifer.

Detailed information on the operation of the treatment system as well as the groundwater monitoring data is presented in the annual Groundwater Status Reports at (http://www.bnl.gov/ltra/GW_Annual.asp). Following four years of operation, in 2005 BNL determined that the system was no longer effectively reducing VOC concentrations from what appeared to be a continuing source in the shallow Upper Glacial aquifer. A Petition for Shutdown of the system was submitted to the FFA members and approved. This petition called for the placement of the extraction wells on standby with continued monitoring, and source area remediation through the injection of the oxidizer potassium permanganate into the saturated zone between 20 and 40 feet below land surface (bls). It appeared, at the time, that PCE was being retained within the silt layers present beneath

the water table in this area. An initial round of potassium permanganate injections had been performed at the time of the submittal of the Petition for Shutdown, and the data showed a reduction of PCE in groundwater associated with the source area. The Petition for Shutdown had provision for additional injections as necessary to reduce the PCE concentrations to levels that would allow BNL to achieve the OU III ROD cleanup goals.

Figure 1. Location of Building 96 Groundwater Plume, Treatment Wells, and Soil Contamination Source Area

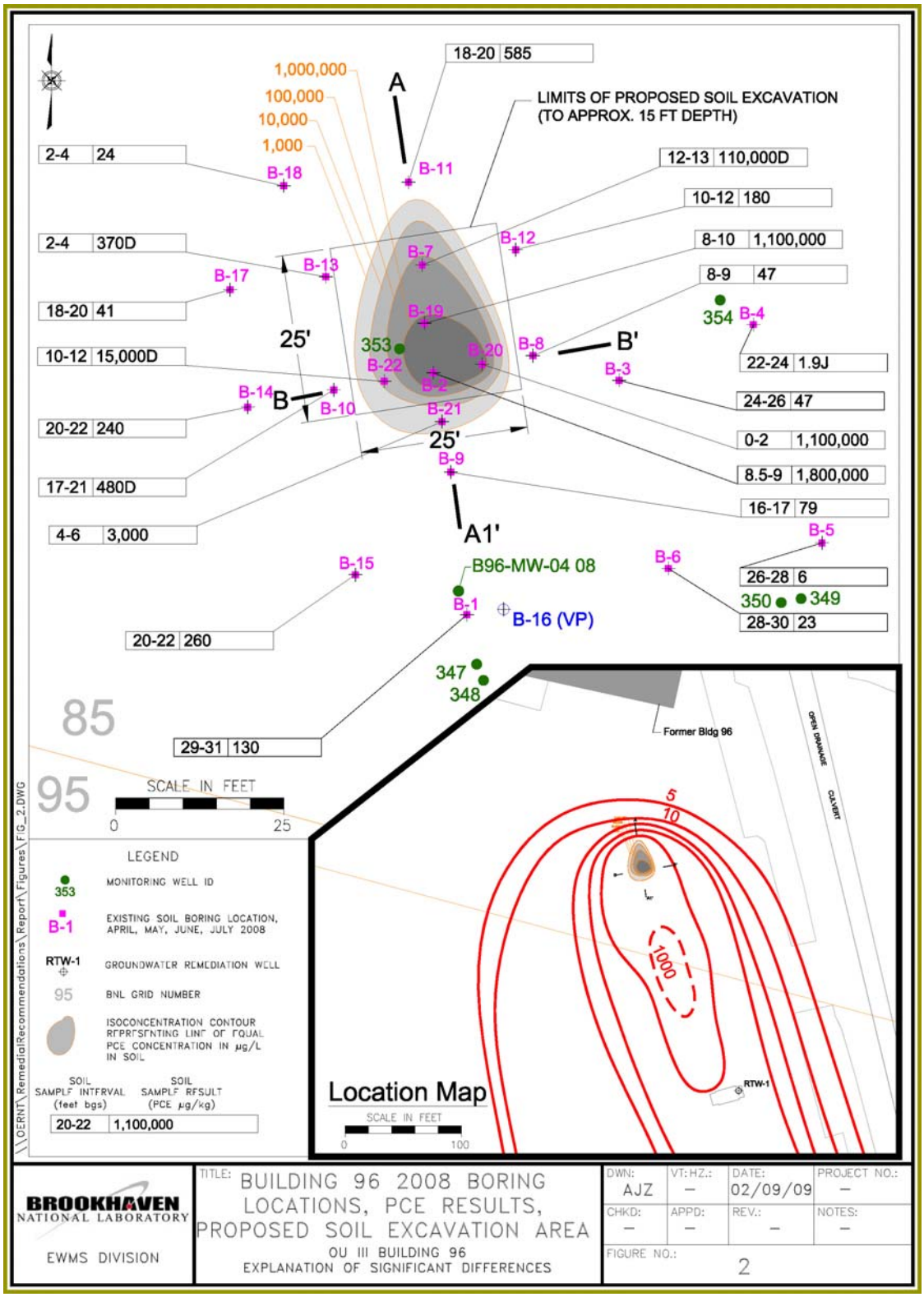


Two additional potassium permanganate injections were performed, one in 2005 and one in 2006, and subsequent groundwater monitoring data indicated that PCE concentrations were rebounding to pre-injection levels. As a result, a recommendation was made in the 2006 BNL Groundwater Status Report to conduct an evaluation of alternatives for addressing the continuing PCE source. Several technologies were reviewed including soil mixing with vapor extraction, electrical resistance heating, and excavation. During the evaluation of alternatives, BNL determined that it would be beneficial to more precisely define the source area.

Additional characterization work that included soil borings and a soil vapor survey were performed at the Building 96 area during 2008. The soil data indicated that PCE was present in the unsaturated zone from just below the land surface to a depth of approximately 15 feet bls and not below the water table as previously thought. The unsaturated zone was also characterized by interbedded thin silt layers. Concentrations of PCE in soil reached a maximum of 1,800,000 micrograms per kilogram (µg/kg). These findings explained the lack of success of the potassium permanganate injections, as the source of PCE was primarily located above the water table. The mechanism for transport of PCE in the unsaturated zone to groundwater is precipitation infiltration to the water table. Detailed soil and soil vapor data has defined the area of soils contaminated with high concentrations of PCE to an area approximately 25 by 25 foot by 15 feet deep just south of the former Building 96. Figure 2 shows the location and maximum PCE concentrations detected in the soil borings. This general area had been historically utilized for drum storage/rinsing and a truck wash. The delineation of the contaminated soils to a discrete relatively small and shallow area resulted in the focusing of remedial alternatives to excavation due to its implementability and effectiveness in completely removing the contamination.

Additional details on the history of the operations of the groundwater treatment system, as well as the 2008 soil characterization investigation, are presented in the OU III Building 96 Recommendation for Source Area Remediation Report (DOE, 2009).

Figure 2. Location of Building 96 Soil Borings, PCE Results, and Proposed Soil Excavation Area



Description of the Significant Differences and the Basis for the Differences

The significant differences between the current remedy and the proposed remedy are described below.

Description:

At the time of the OU III ROD, the presence of a continuing discrete source of high PCE concentrations in the soil above the water table was not identified. Optimization of the Building 96 remedy by excavation and removal of the contaminant source area will result in reducing the number of years of system operation and allow for achievement of the cleanup goal of meeting drinking water standards within 30 years or less.

This proposed change includes the continued operation of the groundwater treatment system (by running extraction wells RTW-1 through RTW-4) in order to maintain hydraulic control of the plume downgradient of the source area until the capture goal is attained. Groundwater modeling indicates that capture goals will be achieved approximately 3-6 years following the removal of the source area. Based on the groundwater monitoring results, the highest contaminant concentrations are within the capture zone of the extraction wells. The Building 96 Treatment System capture goal of 50 micrograms per liter (µg/L) for total volatile organic compounds (TVOCs) will be the basis for determining shutdown of individual extraction wells. This will be based upon the individual monitoring wells within the capture zone of each extraction well along with the extraction well data. This value of 50 µg/L TVOC is consistent with the operation and maintenance manual exit strategy criteria used for most of the other on site treatment systems at BNL.

Basis for the Differences

If the source area soil remediation is not conducted, the treatment system would continue to capture low levels of PCE that would continue to be transported to the water table from precipitation infiltration of the highly contaminated soils.

Following soil excavation, it is expected that the wells closest to the source area should show improvement in groundwater quality first, followed by wells further downgradient. It is recommended that three additional monitoring wells be installed following the soil removal, one immediately upgradient of the excavation for background water quality and one immediately downgradient of it to monitor progress of the cleanup. The other well will be installed at the southern extent of the excavation. This well will replace existing monitoring well 085-353 located in the excavation area that will be removed.

Approximately 350 cubic yards of contaminated soil would be removed, characterized for proper disposal, and transported to an off-site disposal facility. Figure 2 shows the location of the proposed soil excavation area. This area closely encompasses the area identified during the 2008 soil characterization with concentrations exceeding 1,400

µg/kg of PCE. This level, based on NYSDEC TAGM 4046, is a soil cleanup objective to protect groundwater. Endpoint samples will be taken from the bottom of the excavation for confirmation and if necessary additional excavation on the bottom of the excavation will be made.

DOE believes that it is prudent to perform the excavation of the contaminated soils at Building 96 to:

- Remove known localized high concentration continuing source area
- Meet the ROD cleanup goals of reaching drinking water standards in the Upper Glacial aquifer within 30 years or less (by 2030)
- Optimize the remedy by reducing treatment system duration and minimizing life cycle cleanup cost
- Limit plume growth

Photograph showing the proposed soil excavation area (near yellow tape to the right at the tree line) in relation to the existing extraction wells (shown in sheds in background). Groundwater monitoring wells in orange.

Table 1 below provides a summary of the proposed change described in this ESD to the Building 96 remedy included in the OU III ROD.

Table 1. Significant Differences Between Current and Proposed Bldg. 96 Remedy

Item	Current (2000 ROD)	Proposed (ESD)
Scope	Pump and treat using four wells and air stripping	Pump and treat using four wells and air stripping
		Soil excavation and off-site disposal of source area
Performance	Continue long-term pump and treat	Soil excavation would help optimize the pump and treat remedy by reducing the number of years of treatment
	Due to continuing source, may not meet cleanup goal by 2030	Time to reach cleanup goals would be reduced to sooner than 2030.
Cost	The capital cost in the OU III ROD for the selected VOC remedy is $10.5M*	Additional $415K for soil excavation and disposal

* Of the $10.5M capital cost identified in the ROD for the entire OU III VOC remedy, the Building 96 treatment system construction was estimated at $1.3M. After including the ROD projected operation and maintenance (O&M) cost for this system, the total estimated planned life cycle cost was $2.070M. Due to the additional number of years the system has run and will continue to run following excavation, the projected life cycle cost (capital and O&M) is now approximately $3.175M. This includes the cost for the proposed soil excavation work of approximately $415,000. If the excavation is not performed, the projected life cycle cost would be approximately $4.260M, which includes the continued operation of the system until the cleanup goals are met. By performing the excavation, approximately $1.1M in future system operations costs are being avoided.

Public Participation and Regulatory Agency Comments

NSYDEC and NYSDOH comments were provided in a letter dated May 26, 2009. EPA comments were provided June 4, 2009. Responses to comments were provided to the regulators as well as a Draft Final ESD. All regulatory comments have been incorporated into this final document.

Because the Building 96 area is located within the central portion of the BNL site, and because the contamination originating from this source is hydraulically controlled both at the Building 96 Treatment System, and the Middle Road Treatment System, there is no

direct risk to the public. This proposed change will help optimize the existing groundwater remedy by reducing the number of years of active treatment. Therefore, BNL and DOE did not recommend a 30-day public comment period prior to submission of the ESD for NYSDEC concurrence and EPA approval. However, BNL/DOE did brief the Community Advisory Council (A group who advises the Laboratory Director on environment, health, and safety issues that are important to the community) and the Brookhaven Executive Roundtable (A forum for frequent, routine, and executive level communications about BNL) on the recommendation to address the contaminated soils in November 2008 and January 2009, respectively. The Council and Roundtable will continue to be updated in the fall of 2009 on project status.

A notice will be published in *Newsday* that briefly summarizes the Building 96 ESD. The ESD will be made available on the BNL website at *http://www.bnl.gov/ltra/reports.asp*. In addition, the ESD and other relevant documents such as the OU III Building 96 Recommendation for Source Area Remediation Report (DOE, 2009) are part of the Administrative Record file for the BNL site. The Administrative Record includes, among other things, the ROD and technical documents. These documents are available for review at the BNL Research, EPA Region II, and the Stony Brook University libraries.

Affirmation of Statutory Determinations

Considering the new information that has been developed, DOE, EPA, and NYSDEC have determined that the remedy selected for the Building 96 groundwater contaminant plume remains protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective. In addition, this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site.

DOE, EPA, and NYSDEC believe that a change in the scope of the remedy has occurred in which a determination was made for the need for excavation and off-site disposal of VOC contaminated soils at Building 96. Nevertheless, the agencies believe that this change does not fundamentally alter the remedy selected in the ROD or its appropriateness.

The State of New York concurs with the ESD.

AUTHORIZING SIGNATURES

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References

U.S. Department of Energy (DOE) (2000), *Operable Unit III Record of Decision for Brookhaven National Laboratory*, Upton, NY.

U.S. Department of Energy (DOE) (2005), *Operable Unit III Explanation of Significant Differences for Brookhaven National Laboratory*, Upton, NY.

U.S. Department of Energy (DOE) (2009), *Operable Unit III Building 96 Recommendation for Source Area Remediation,* Upton, NY.